Roboy Vision Module Documentation

Release 0.0.

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Usage and Installation

1 What Roboy Vision can do: 3

This project's goal is to provide Roboy with extensive vision capabilities. This means to recognize, localize and classify objects in its environment as well as to provide data for localization to be processed by other modules. The input will be a realsense camera device, the output should be high-level data about Roboy's environment provided using ROS messages and services.

The most import task in Vision for human interaction is to detect and recognize faces, which is why this was considered the highest priority of this project. The current main tasks of this project are:

- Identification of Roboy Team Members
- Pose estimation of a detected face and Roboy Motor Control
- Tracking of detected objects
- Person Talking detection
- Mood Recognition
- Gender Recognition
- Remebering faces online
- Age classification
- Scene and object classification

CHAPTER 1

What Roboy Vision can do:

- Face detection.
- Speaker detection.
- Object detection.
- Multitracking.

Relevant Background Information and Pre-Requisits

Our approach to tackle the given tasks in Vision is to use machine learning methods. Therefore a basic understanding of machine learning, specifically also deep Neural Networks and Convolutional Neural Networks will be necessary.

The following links are to be seen as suggestions for getting started on machine learning:

- Crash Course on Deep Learning in the form of Youtube tutorials: DeepLearning.tv
- Closer Look at the implementation of Neural Networks: The Foundations of deep learning
- An introduction to Convolutional Neural Networks (CNNs): Deep learning in Computer vision
- The machine learning framework used for implementation: Tensorflow
- Furthermore a basic understanding of simple machine learning approaches like Regression, Tree Learning, K-Nearest-Neighbours (KNN), Support Vector Machines (SVMs), Gaussian Models, Eigenfaces, etc. will be helpful.

The papers currently used for implementation should be understood:

- Joint Face Detection and Alignment using Multi-task Cascaded Convolutional Networks
- FaceNet: A Unified Embedding for Face Recognition and Clustering
- DLIB: Facial landmarks and face recognition
- ‘You Only Look Once: Unified, Real-Time Object Detection <https://pjreddie.com/media/files/papers/yolo.pdf>‘_

Furthermore there are plans to extend the implementation using this paper:

- An All-In-One Convolutional Neural Network for Face Analysis

Contents

Installation

Running all sub modules in realtime requires Ubuntu 16.04 with Kernel version 4.4.x. For getting started a jupyter notebook installation using anaconda will be sufficient. Tutorials in form of jupyter notebooks are provided.

Anaconda

We recommend the use of Anaconda. This allows all python libraries to only be installed in a virtual environment which then won't have any influence on other programs you are running. We will create a virtual environment using python 3.

- Download Anaconda from https://www.continuum.io/downloads#linux:
- Install Anaconda:

```
bash ~/Downloads/Anaconda3-4.3.0-Linux-x86_64.sh
```

- Enter 'yes' when prompted with the following question:

> Do you wish the installer to prepend the Anaconda install location to PATH in your /home/name/.bashrc ? [yes|no]

- Restart the terminal.
- Create a Conda Environment with the name "roboy" and python 3:

```
conda create --name roboy python=3
```

- To work on the created environment it has to be activated:

```
source activate roboy
```

- When you want to leave the environmant you have to use:

```
source deactivate
```

Dependencies

Now you should be working in your virtual environment. We then will install all requirements. We are working with python 3, because of tensorflow requirements.

- First clone the Vision repository and run the setup script to install most of the necessary dependencies:

```
cd ~/
git clone https://github.com/Roboy/Vision

cd ~/Vision
chmod +x setup.sh
sudo ./setup.sh
```

- Download Cuda from https://developer.nvidia.com/cuda-downloads
- Install Cuda with instructions from http://docs.nvidia.com/cuda/cuda-installation-guide-linux/index.html#axzz4rHIEa0GY

Build

To build doxygen documentation offline for viewing you can run:

```
cd ~/Vision
sphinx-build -b html ./docs ./build/docs
```

Please download the files

- SharedLibs
- StaticLibs

from https://drive.google.com/drive/folders/0B0cOyLVrawK5TFJhdGJvNE9wNzg

Compiling opencv from source (MacOS)

Note: This is required only if you want to work with multiple object/face tracking. This step is needed as this Multiple tracking is part of opencv_contrib module which needs to be compiled along with opencv, as it doesnt gets shipped with openv. The following instructions are for Mac.

First you will need:

1. Mac OSX 10.12
2. XCode
3. Command Line Tools (This is done from inside XCode)
4. CMake(http://www.cmake.org/download/)

Step 1: Download openCV and unzip it somewhere on your computer. Create two new folders inside of the openCV directory, one called StaticLibs and the other SharedLibs.

Step 2a: Build the Static Libraries with Terminal. To build the libraries in Terminal.

- Open CMake.
- Click Browse Source and navigate to your openCV folder.
- Click Browse Build and navigate to your StaticLib Folder.
- Click the configure button. You will be asked how you would like to generate the files. Choose Unix-Makefile from the Drop Down menu and Click OK. CMake will perform some tests and return a set of red boxes appear in the CMake Window.

You will need to uncheck and add to the following options.

- Uncheck BUILD_SHARED_LIBS
- Uncheck BUILD_TESTS
- Add an SDK path to CMAKE_OSX_SYSROOT, it will look something like this "/Applications/Xcode.app/Contents/Developer/Platforms/MacOSX.platform/Developer/SDKs/MacOSX10.9.sdk". (NOTE: make sure your version of SDK is used here)
- Add x86_64 to CMAKE_OSX_ARCHITECTURES, this tells it to compile against the current system

- Uncheck WITH_1394
- Uncheck WITH_FFMPEG

Click Configure again, then Click Generate.

When the application has finished generating, Open Terminal and type the following commands.

  - cd <path/to/your/opencv/staticlibs/folder/>
  - make (This will take awhile)
  - sudo make install

Enter your password. This will install the static libraries on your computer.

Step 2c: Build the Shared Libraries with Terminal.

- Open CMake.
- Click Browse Source and navigate to your openCV folder.
- Click Browse Build and navigate to your SharedLib Folder.
- Click the configure button. You will be asked how you would like to generate the files. Choose Unix-Makefile from the Drop Down menu and Click OK. CMake will perform some tests and return a set of red boxes appear in the CMake Window.

You will need to uncheck and add to the following options.

- Check BUILD_SHARED_LIBS
- Uncheck BUILD_TESTS
- Add an SDK path to CMAKE_OSX_SYSROOT, it will look something like this "/Applications/Xcode.app/Contents/Developer/Platforms/MacOSX.platform/Developer/SDKs/MacOSX10.9.sdk".
- Add x86_64 to CMAKE_OSX_ARCHITECTURES, this tells it to compile against the current system
- Uncheck WITH_1394
- Uncheck WITH_FFMPEG
- Click Configure again, then Click Generate.

When the application has finished generating, Open Terminal.

- cd <path/to/your/opencv/SharedLibs/folder/>
- make (This will take awhile)
- sudo make install

You should see the libraries build in the shared and static libraries folders.

- cd /Users/<Username>/<path-to-installation>/StaticLibs/lib/python3
- ls -s cv2.cpython-36m-darwin.so cv2.so

The above step would help in creating a symbolic link so you can use it with python.

Compiling opencv from source (Linux)

You will need the following packages:

- GCC 4.4.x or later
- CMake 2.6 or higher

- Git
- GTK+2.x or higher, including headers (libgtk2.0-dev)
- pkg-config
- Python 2.6 or later and Numpy 1.5 or later with developer packages (python-dev, python-numpy)
- ffmpeg or libav development packages: libavcodec-dev, libavformat-dev, libswscale-dev
- [optional] libtbb2 libtbb-dev
- [optional] libdc1394 2.x
- [optional] libjpeg-dev, libpng-dev, libtiff-dev, libjasper-dev, libdc1394-22-dev

Step 1: The packages can be installed using Terminal as follows:

[compiler] sudo apt-get install build-essential

[required] sudo apt-get install cmake git libgtk2.0-dev pkg-config libavcodec-dev libavformat-dev libswscale-dev

[optional] sudo apt-get install python-dev python-numpy libtbb2 libtbb-dev libjpeg-dev libpng-dev libtiff-dev libjasper-dev libdc1394-22-dev

Step 2: Get the latest stable version of OpenCV from https://sourceforge.net/projects/opencvlibrary/

2a: Download the source tarball and unpack it.

2b: In terminal, cd into the working directory followed by cloning the OpenCV repository:

```
cd ~/<my_working_directory>

git clone https://github.com/opencv/opencv.git
```

Step 3: Building OpenCV from source using CMake:

3a: Create a temporary directory, here denoted as <cmake_binary_dir>, where you want to put the generated Makefiles, project files as well the object files and output binaries.

3b: Enter the <cmake_binary_dir> and type:

```
cmake <path to the OpenCV source directory>
```

Step 4: Enter the created temporary directory (<cmake_binary_dir>) and proceed with:

```
make

sudo make install
```

Running the Vision module

Finally, to run the entire module, run the ‘RoboyVision.py’ script in the ‘src’ folder:

```
python RoboyVision.py
```

Getting started

Tutorials

As a start run the jupyter notebooks in tutorials section:

```
source activate roboy
cd ~/Vision/tutorials
jupyter notebook
```

There is four different tutorials:

- **Face_Detection** tutorial will show you how to run a face detection an an image or webcam input using the MTCNN neural network. Additionally also DLib face detector is used.
- **Facenet_Embeddings** tutorial shows how to calculate the 128D embeddings given a face using facenet. There exist 2 versions of this tutorial. One is using MTCNN for face detection, the other one using DLib. This tutoial provides the functionality to caluclate and save embeddings on a database of pictures, where all pictures are stored in a folder structure, with the folder name being the person in the picture.
- **Classifier_Training** uses embeddings calculated in the previous tutorial to train a classifier to distinguish between the classes in these embeddings. Currently only SVM and a binary Tree have been implemented.
- **Face_Recognition** tutorial shows how to run the classification on an image or webcam input. It demonstrates this using KNN and the classifiers trained in the previous tutorial.

Real Time - How to run Vision module.

For running face detection in real time you can run the script:

```
source activate roboy
cd ~/Vision/src
python RoboyVision.py
```

Context

The Vision package receives ZED stereo camera input which is then processed internally. Other than that, it should also receive data from Roboy motor control about Roboy's current position. This can later be used to calculate the relative and absolute positions of detected objects.

The main output of the Vision module will be detected objects and some object properties (e.g. detected face, name of person, mood, gender, ...). The receiver for this will be Roboy's Dialog and Memory modules. This is illustrated in the following contect overview:

Solution Strategy

Basic decisions for Vision Package:

- Seperation of different tasks into sub-modules (Face Detection, Object Detection, Object tracking, face recognition, mood recognition, age estimation, scene classification, ...)
- Highest priority on face detection and face pose estimation. Recognition of people as second priority. All other properties concerning people with lower priority and general object detection with least importance.
- Face detection using this approach: Joint Face Detection and Alignment using MTCNNs. Good real time performance, other modules to be built on top.
- Face embeddings using FaceNet. These embeddings can be used for recognition.

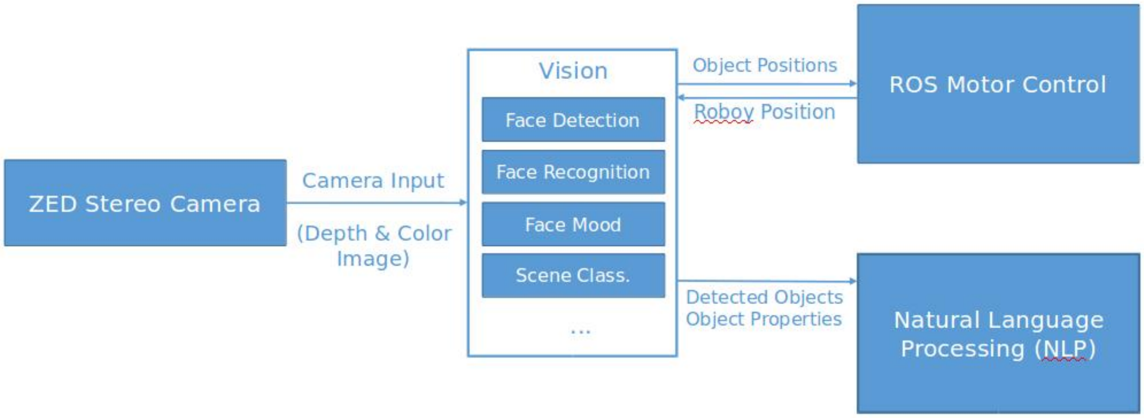


Fig. 1.1: **Context diagram** - shows the birds eye view of the vision system (black box) described by this architecture within the ecosystem it is to be placed in. Shows orbit level interfaces on the user interaction and component scope.

- Speaker detection using facial landmarks from DLIB
- Object recognition using YOLO

Current implementation:

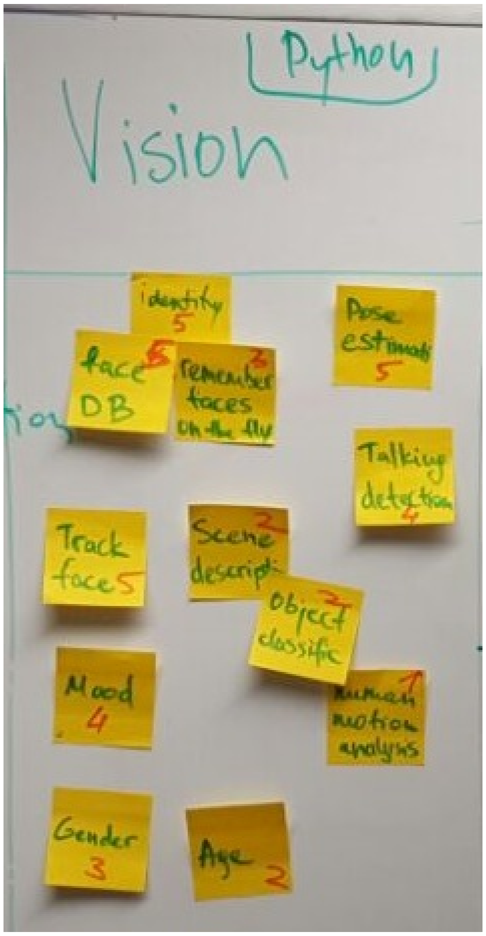
- **RoboyVision as main, handling all sub-modules:**
  - **Face Detection** using Facenet for calculating embeddings for a given face and SVM for classification. SVM currently trained on pictures of LFW (labelled Faces in the Wild) dataset, using Roboy Team members as next step. Sends coordinates to **Tracker** and facial landmarks to **Speaker Detection**
  - **Speaker Detection** using DLIB's facial landmarks to calculate specific mouth parameters (width, lip distance) of each face to determine, whether a person is speaking
  - **ROS services** are handled by RoboyVision via websocket
  - **Object recognition** is implemented based on YOLO
  - **Tracking objects/faces** running in realtime. This implementation is based on the MIL(Visual Tracking with Online Multiple Instance Learning). Also part of the Opencv_contrib module.

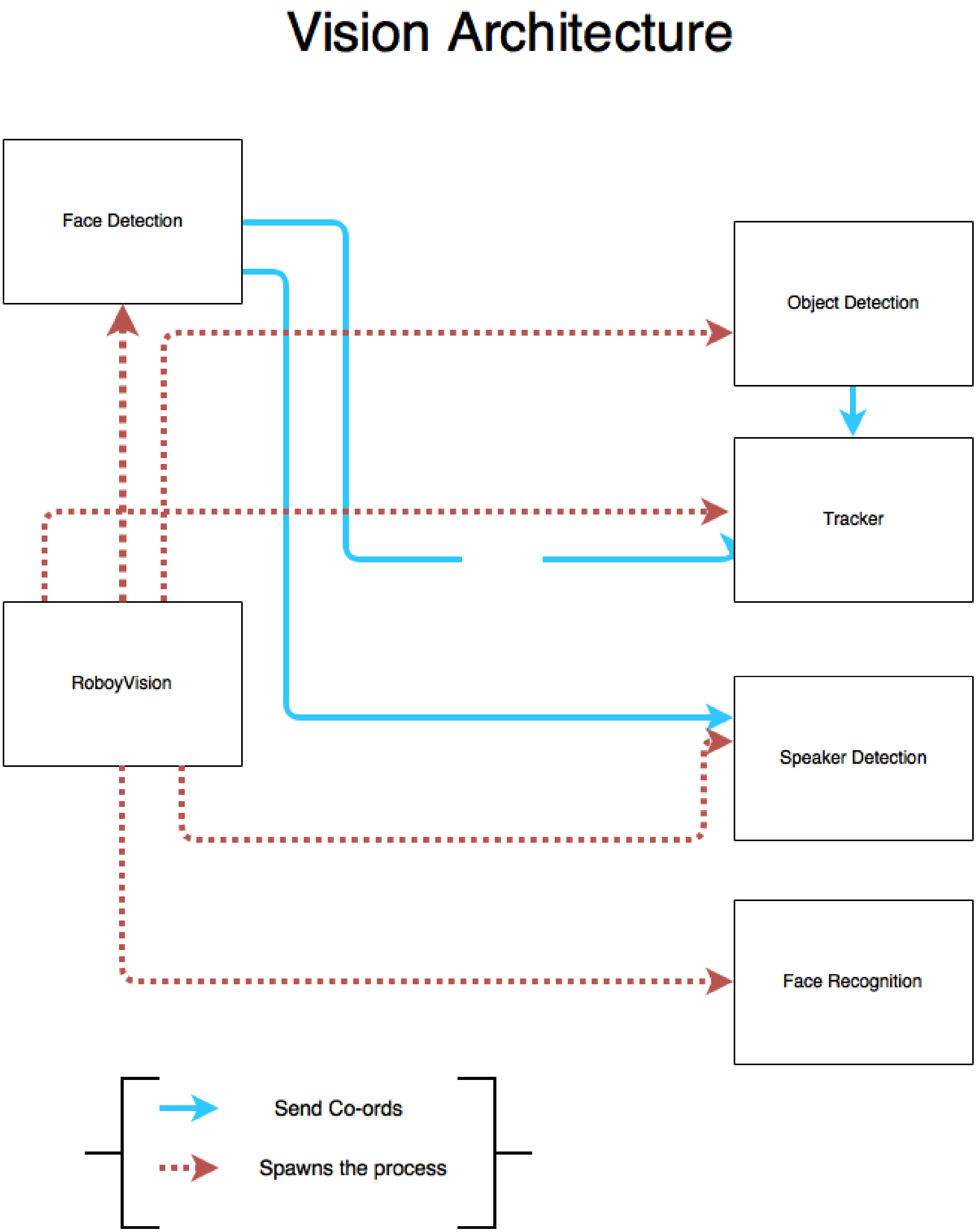
Read about the Public Interfaces (ROS) here

Plan for this semester with priorities in red (5 being highest priority):

Future plans on current implentation: * Improve tracking by implementing the GOTURN algorithm.

Architecture of the current System:


Python
Vision
identity 5
face DB 5
remember faces on the fly 3
Pose estimati 5
Talking detection 4
Track face 5
Scene descripti 2
Object classific 2
human motion analysis 1
Mood 4
Gender 3
Age 2


Vision Architecture
Face Detection
Object Detection
Tracker
RoboyVision
Speaker Detection
Face Recognition
Send Co-ords
Spawns the process

Public Interfaces(ROS)

Interfaces to other modules will be realized using ROS Communication. Currently 5 interfaces have been designed for communication, although not all have been fully implemented due to the not fully assembled Roboy to test it on. Due to version clashes and Rospy not being available for Python 3, the ROS Communication is implemented using websocket.

- **FaceCoordinates message**: For each recognized face in the current frame, this message publishes the id, a boolean indicating whether the person is speaking and the 3D position (depth from ZED camera still to be implemented):

  ```
  # returns: int32 id, bool speaking, float32 x, float32 y, float32 z

  rostopic echo /roboy/cognition/vision/FaceCoordinates
  ```

- **NewFacialFeatures message**: For each unrecognized face in the current frame, this message publishes the facial features as a 128-dimensional vector and a boolean indicating whether the person is speaking:

  ```
  # returns: bool speaking, float64[128] ff

  rostopic echo /roboy/cognition/vision/NewFacialFeatures
  ```

- **DescribeScene service**: Service called to list all objects detected in the current frame, ordered from left to right:

  ```
  # argument:
  # returns: String[] objects_detected

  rosservice call /roboy/cognition/vision/DescribeScnee
  ```

- **FindObject service**: Service called to find an object in the current frame. Given an object type, the position of the object is returned:

  ```
  # argument: String type
  # returns: bool found, float32 x, float32 y, float32 z

  rosservice call /roboy/cognition/vision/FindObject *type*
  ```

- **LookAtSpeaker service**: Service called to turn towards to closest speaking face. Due to Roboy not being assembled yet, this service hasn't been implemented yet:

  ```
  # argument:
  # returns: bool turned

  rosservice call /roboy/cognition/vision/LookAtSpeaker
  ```

A more detailed documentation of the ROS Communication as well as future plans can be viewed here: https://devanthro.atlassian.net/wiki/spaces/HT/pages/76402960/ROS+services+messages+overview

Architecture Constraints

Hardware Constraints

Operating System Constraints

Programming Constraints

Constraint Name	Description
Python 3	Tensorflow v1.0 required for facenet implementation which uses Python 3
Python 2	ROS requires Python 2 still

Conventions

We follow the coding guidelines:

Language	Guideline	Tools
Python	https://www.python.org/dev/peps/pep-0008/	pep-format: https://github.com/google/yapf
C++	http://wiki.ros.org/CppStyleGuide	clang-format: https://github.com/davetcoleman/roscpp_code_format

Libraries and external Software

Name	URL/Author	License	Description
MTCNN face detection & alignment	https://github.com/kpzhang93/MTCNN_face_detection_alignment	MIT license	Joint Face Detection and Alignment using Multi-task Cascaded Convolutional Neural Networks
Facenet	https://github.com/davidsandberg/facenet	MIT License	Face recognition using Tensorflow
Object Detection	https://github.com/pjreddie/darknet	GNU General Public License	Object Detection Using YOLO9000
arc42	http://www.arc42.de/template/	Creative Commens Attribution license.	Template for documenting and developing software
DLIB	https://github.com/davisking/dlib	Boost Software License	ML toolkit, mainly used for face detection and facial landmarks
YOLO	https://github.com/pjreddie/darknet/wiki/YOLO:-Real-Time-Object-Detection		Real-time object recognition system

Presentations

This section lists presentations of Roboy Vision Team.

Midterm/ Final Presentations

- Midterm Presentation WS 2016/17
- Final Presentation WS 2016/17
- Midterm Presentation SS 2017
- Final Presentation SS 2017

Other Presentations

- RoadMap 2017

API

struct augment_args

Public Members

int **w**

int **h**

float **scale**

float **rad**

float **dx**

float **dy**

float **aspect**

class BOX
Inherits from Structure

Private Static Attributes

list ObjectRecognition.BOX._fields_ = [("x", c_float), ("y", c_float), ("w", c_float), ("h", c_float)]

struct box

Public Members

float **x**

float **y**

float **w**

float **h**

class BOX
Inherits from Structure

Private Static Attributes

list FaceDetect.BOX._fields_ = [("x", c_float), ("y", c_float), ("w", c_float), ("h", c_float)]

struct box_label

Public Members

int **id**

float **x**

float **y**

float **w**

float **h**

float **left**

float **right**

float **top**

float **bottom**

struct **CalibrationParameters**

#include <Core.hpp> Intrinsic parameters of each cameras and extrinsic (translation and rotation).

Note The calibration/rectification process, called during *sl::Camera::open*, is using the raw parameters defined in the SNXXX.conf file, where XXX is the ZED Serial Number. Those values may be adjusted or not by the Self-Calibration to get a proper image alignment. After *sl::Camera::open* is done (with or without Self-Calibration activated) success, most of the stereo parameters (except Baseline of course) should be 0 or very close to 0. It means that images after rectification process (given by retrieveImage()) are aligned as if they were taken by a "perfect" stereo camera, defined by the new *CalibrationParameters*.

Public Members

sl::*float3* **R**

Rotation (using Rodrigues' transformation) between the two sensors. Defined as 'tilt', 'convergence' and 'roll'.

sl::*float3* **T**

Translation between the two sensors. T.x is the distance between the two cameras (baseline) in the sl::UNIT chosen during *sl::Camera::open* (mm, cm, meters, inches...).

CameraParameters **left_cam**

Intrinsic parameters of the left camera

CameraParameters **right_cam**

Intrinsic parameters of the right camera

class **Camera**

#include <Camera.hpp> The main class to use the ZED camera.

Camera infos

void **setSVOPosition**(int *frame_number*)

Sets the position of the SVO file to a desired frame.

Note Works only if the camera is open in SVO playback mode.

Parameters

- `frame_number`: : the number of the desired frame to be decoded.

int **getSVOPosition**()

Returns the current position of the SVO file.

Return The current position in the SVO file as int (-1 if the SDK is not reading a SVO).

Note Works only if the camera is open in SVO reading mode.

int **getSVONumberOfFrames**()

Returns the number of frames in the SVO file.

Return The total number of frames in the SVO file (-1 if the SDK is not reading a SVO).

Note Works only if the camera is open in SVO reading mode.

void **setCameraSettings**(*CAMERA_SETTINGS settings*, int *value*, bool *use_default* = false)

Sets the value to the corresponding sl::CAMERA_SETTINGS (Gain, brightness, hue, exposure...).

Note Works only if the camera is open in live mode.

Parameters

- `settings`: : enum for the control mode.
- `value`: : value to set for the corresponding control.
- `use_default`: : will set default (or automatic) value if set to true (value (int) will not be taken into account).

int **getCameraSettings**(*CAMERA_SETTINGS setting*)

Returns the current value to the corresponding sl::CAMERA_SETTINGS (Gain, brightness, hue, exposure...).

Return The current value for the corresponding control (-1 if something wrong happened).

Note Works only if the camera is open in live mode.

Parameters

- `setting`: : enum for the control mode.

float **getCameraFPS**()

Returns the current FPS of the camera.

Return The current FPS (or recorded FPS for SVO). Return -1.f if something goes wrong.

void **setCameraFPS**(int *desired_fps*)

Sets a new frame rate for the camera, or the closest available frame rate.

Note Works only if the camera is open in live mode.

Parameters

- `desired_fps`: : the new desired frame rate.

float **getCurrentFPS**()

Returns the current FPS of the application/callback. It is based on the difference of camera timestamps between two successful *grab()*.

Return The current FPS of the application (if grab leads the application) or callback (if ZED is called in a thread)

unsigned long long **getCameraTimestamp**()

Returns the timestamp at the time the frame has been extracted from USB stream. (should be called after a *grab()*).

Return The timestamp of the frame grab in ns. -1 if not available (SVO file without compression).

Note SVO file from SDK 1.0.0 (with compression) contains the camera timestamp for each frame.

unsigned long long **getCurrentTimestamp**()

Returns the current timestamp at the time the function is called. Can be compared to the camera *sl::Camera::getCameraTimestamp* for synchronization. Use this function to compare the current timestamp and the camera timestamp, since they have the same reference (Computer start time).

Return The current timestamp in ns.

unsigned int **getFrameDroppedCount**()

Returns the number of frame dropped since *sl::Camera::grab* has been called for the first time. Based on camera timestamp and FPS comparison.

Return The number of frame dropped since first *sl::Camera::grab* call.

CameraInformation **getCameraInformation**()

Returns camera informations (calibration parameters, serial number and current firmware version).

Return *CameraInformation* containing the calibration parameters of the ZED, as well as serial number and firmware version It also returns the ZED Serial Number (as uint) (Live or SVO) and the ZED Firmware version (as uint), 0 if the ZED is not connected.

Self calibration

SELF_CALIBRATION_STATE **getSelfCalibrationState**()

Returns the current status of the self-calibration.

Return A status code given informations about the self calibration status. For more details see sl::SELF_CALIBRATION_STATE.

void **resetSelfCalibration**()

Resets the self camera calibration. This function can be called at any time AFTER the *sl::Camera::open* function has been called. It will reset and calculate again correction for misalignment, convergence and color mismatch. It can be called after changing camera parameters without needing to restart your executable.

if no problem was encountered, the camera will use new parameters. Otherwise, it will be the old ones.

Tracking

ERROR_CODE **enableTracking**(*TrackingParameters tracking_params* = TrackingParameters ())

Initializes and start the tracking processes.

Return sl::ERROR_CODE_FAILURE if the *sl::TrackingParameters::area_file_path* file wasn't found, sl::SUCCESS otherwise.

Warning The area localization is a beta feature, the behavior might change in the future.

Parameters

- `tracking_params`: : Structure of *sl::TrackingParameters*, which defines specific parameters for tracking. default : Leave it empty to get best default parameters or create your own structure to change tracking parameters according to *sl::TrackingParameters* documentation.

sl::*TRACKING_STATE* **`getPosition`**(*sl*::*Pose* *&camera_pose*, *REFERENCE_FRAME* *reference_frame* = sl::REFERENCE_FRAME_WORLD)

Fills the position of the camera frame in the world frame and return the current state of the Tracker.

Extract *Rotation* Matrix : camera_pose.getRotation(); Extract *Translation* Vector: camera_pose.getTranslation(); Convert to *Orientation* / quaternion : camera_pose.getOrientation();

Note The camera frame is positioned at the back of the left eye of the ZED.

Return The current state of the tracking process.

Parameters

- `camera_pose`: (out) : the pose containing the position of the camera (path or position) and other information (timestamp, confidence)
- `reference_frame`: : defines the reference from which you want the pose to be expressed.

sl::*AREA_EXPORT_STATE* **`getAreaExportState`**()

Returns the state of exportation of the area database (spatial memory).

Return The current state of the exportation of the area file.

void **`disableTracking`**(*sl*::String *area_file_path* = "")

Disables motion tracking.

Warning This feature is still in beta, you might encounter reloading issues. Please also note that the '.area' database depends on the depth map sl::SENSING_MODE chosen during the recording. The same mode must be used to reload the database.

Note The saving is done asynchronously, the state can be get by *getAreaExportState()*.

Parameters

- `area_file_path`: (optional) : if set, save the spatial database in a '.area' file. areaFilePath is the name and path of the database, e.g. : "path/to/file/myArea1.area".

void **`resetTracking`**(*sl*::*Transform* *&path*)

Resets the tracking, re-initializes the path with the transformation matrix given.

Note Please note that this function will also flush the area database built / loaded.

Spatial Mapping

ERROR_CODE **`enableSpatialMapping`**(*SpatialMappingParameters* *spatial_mapping_parameters* = SpatialMappingParameters ())

Initializes and starts the spatial mapping processes. The spatial mapping will create a geometric representation of the scene based on both tracking data and 3D point clouds. The resulting output is a *sl::Mesh* and can be obtained by the *sl::Camera::extractWholeMesh* function or with *sl::Camera::retrieveMeshAsync* after calling *sl::Camera::requestMeshAsync*.

Return sl::SUCCESS if everything went fine, sl::ERROR_CODE_FAILURE otherwise

Warning The tracking needs to be enabled to create a map

Warning The performance greatly depends on the input parameters. If the mapping framerate is too slow in live mode, consider using a SVO file, or choose a coarser mesh resolution

Note This features is using host memory (RAM) to store the 3D map, the maximum amount of available memory allowed can be tweaked using the *SpatialMappingParameters*.

Parameters

- `spatial_mapping_parameters`: : the structure containing all the specific parameters for the spatial mapping. default : Leave it empty to get best default parameters or initialize it from a preset. For more informations, checkout the *sl::SpatialMappingParameters* documentation.

void **`pauseSpatialMapping`**(bool *status*)

Switches the pause status of the data integration mechanism for the spatial mapping.

Parameters

- `status`: : if true, the integration is paused. If false, the spatial mapping is resumed.

SPATIAL_MAPPING_STATE **`getSpatialMappingState`**()

Returns the current spatial mapping state.

Return status The current state of the spatial mapping process

ERROR_CODE **`extractWholeMesh`**(*sl*::*Mesh* &*mesh*)

Extracts the current mesh from the spatial mapping process.

Note This function will return when the mesh has been created or updated. This is therefore a blocking function. You should either call it in a thread or at the end of the mapping process. Calling this function in the grab loop will block the depth and tracking computation and therefore gives bad results.

Return sl::SUCCESS if the mesh is filled and available, otherwise sl::ERROR_CODE_FAILURE.

Parameters

- `mesh`: (out) : The mesh to be filled.

void **`requestMeshAsync`**()

Starts the mesh generation process in a non blocking thread from the spatial mapping process.

Note Only one mesh generation can be done at a time, consequently while the previous launch is not done every call will be ignored.

ERROR_CODE **`getMeshRequestStatusAsync`**()

Returns the mesh generation status, useful to after calling requestMeshAsync.

Return sl::SUCCESS if the mesh is ready and not yet retrieved, otherwise sl::ERROR_CODE_FAILURE.

ERROR_CODE **`retrieveMeshAsync`**(*sl*::*Mesh* &*mesh*)

Retrieves the generated mesh after calling requestMeshAsync.

Return sl::SUCCESS if the mesh is retrieved, otherwise sl::ERROR_CODE_FAILURE.

Parameters

- `mesh`: (out) : The mesh to be filled.

void **`disableSpatialMapping`**()

Disables the Spatial Mapping process. All the spatial mapping functions are disables, mesh cannot be retrieves after this call.

Recorder

ERROR_CODE **`enableRecording`**(*sl*::String *video_filename*, *SVO_COMPRESSION_MODE compression_mode* = SVO_COMPRESSION_MODE_LOSSLESS)

Creates a file for recording the current frames.

Warning This function can be called multiple times during ZED lifetime, but if video_filename is already existing, the file will be erased.

Return an sl::ERROR_CODE that defines if file was successfully created and can be filled with images. * sl::SUCCESS if file can be filled * sl::ERROR_CODE_SVO_RECORDING_ERROR if something wrong happens.

Parameters

- `video_filename`: : can be a *.svo file or a *.avi file (detected by the suffix name provided).
- `compression_mode`: : can be one of the sl::SVO_COMPRESSION_MODE enum.

sl::*RecordingState* **`record`**()

Records the current frame provided by *grab()* into the file.

Warning *grab()* must be called before *record()* to take the last frame available. Otherwise, it will be the last grabbed frame.

Return The recording state structure, for more details see *sl::RecordingState*.

void **`disableRecording`**()

Disables the recording and closes the generated file.

Public Functions

`Camera`()

Default constructor which creates an empty *Camera*.

`~Camera`()

Camera destructor.

void **`close`**()

Closes the camera and free the memory. *Camera::open* can then be called again to reset the camera if needed.

ERROR_CODE **`open`**(*InitParameters init_parameters* = InitParameters ())

Opens the ZED camera in the desired mode (live/SVO), sets all the defined parameters, checks hardware requirements and launch internal self calibration.

Return An error code given informations about the internal process, if SUCCESS is returned, the camera is ready to use. Every other code indicates an error and the program should be stopped. For more details see sl::ERROR_CODE.

Parameters

- `init_parameters`: : a structure containing all the individual parameters

bool **`isOpened`**()

Tests if the camera is opened and running.

Return true if the ZED is already setup, otherwise false.

ERROR_CODE **`grab`**(*RuntimeParameters rt_parameters* = RuntimeParameters ())

Grabs a new image, rectifies it and computes the disparity map and optionally the depth map. The grabbing function is typically called in the main loop.

Return An sl::SUCCESS if no problem was encountered, sl::ERROR_CODE_NOT_A_NEW_FRAME otherwise if something wrong happens

Parameters

- `rt_parameters`: : a structure containing all the individual parameters.

ERROR_CODE **`retrieveImage`**(*Mat* &*mat*, *VIEW view* = VIEW_LEFT, *MEM type* = MEM_CPU)

Downloads the rectified image from the device and returns the CPU buffer. The retrieve function should be called after the function *Camera::grab*.

Return SUCCESS if the method succeeded, ERROR_CODE_FAILURE if an error occurred.

Parameters

- `mat`: : the *Mat* to store the image.
- `view`: : defines the image side wanted (see sl::VIEW)
- `type`: : the memory type desired. sl::MEM_CPU by default.

ERROR_CODE **`retrieveMeasure`**(*Mat* &*mat*, *MEASURE measure* = MEASURE_DEPTH, *MEM type* = MEM_CPU)

Downloads the measure (disparity, depth or confidence of disparity) from the device and returns the CPU buffer. The retrieve function should be called after the function *Camera::grab*.

Return SUCCESS if the method succeeded, ERROR_CODE_FAILURE if an error occurred.

Parameters

- `mat`: : the *Mat* to store the measures.
- `measure`: : defines the type wanted, such as disparity map, depth map or the confidence (see sl::MEASURE)
- `type`: : the memory type desired. sl::MEM_CPU by default.

void **`setConfidenceThreshold`**(int *conf_threshold_value*)

Sets a threshold for the disparity map confidence (and by extension the depth map). The function should be called before *Camera::grab* to be taken into account.

Parameters

- `conf_threshold_value`: : a value in [1,100]. A lower value means more confidence and precision (but less density), an upper value reduces the filtering (more density, less certainty). Other value means no filtering.

int **getConfidenceThreshold**()

Returns the current confidence threshold value apply to the disparity map (and by extension the depth map).

Return The current threshold value between 0 and 100.

CUcontext **getCUDAContext**()

Returns the CUDA context used for all the computation.

Return The CUDA context created by the inner process.

Resolution **getResolution**()

Returns the current image size.

Return The image resolution.

void **setDepthMaxRangeValue**(float *depth_max_range*)

Sets the maximum distance of depth/disparity estimation (all values after this limit will be reported as TOO_FAR value).

Parameters

- `depth_max_range`: : maximum distance in the defined sl::UNIT.

float **getDepthMaxRangeValue**()

Returns the current maximum distance of depth/disparity estimation.

Return The current maximum distance that can be computed in the defined sl::UNIT.

float **getDepthMinRangeValue**()

Returns the closest measurable distance by the camera, according to the camera and the depth map parameters.

Return The minimum distance that can be computed in the defined sl::UNIT.

Public Static Functions

static *sl*::String **getSDKVersion**()

Returns the version of the currently installed ZED SDK.

Return The ZED SDK version as a string with the following format : MAJOR.MINOR.PATCH

static int **isZEDconnected**()

Checks if ZED cameras are connected, can be called before instantiating a *Camera* object.

Return The number of connected ZED.

Warning On Windows, only one ZED is accessible so this function will return 1 even if multiple ZED are connected.

static *sl*::*ERROR_CODE* **`sticktoCPUCore`**(int *cpu_core*)
Sticks the calling thread to a specific CPU core. This function is only available for Jetson TK1 and TX1.

Return sl::SUCCESS if stick is OK, otherwise status error.

Warning Function only available for Jetson. On other platform, result will be always 0 and no operations are performed.

Parameters

- `cpuCore`: : int that defines the core the thread must be run on. could be between 0 and 3. (cpu0,cpu1,cpu2,cpu3).

Private Functions

ERROR_CODE **`openCamera`**(bool)

bool **`nextImage`**(bool)

int **`initMemory`**()

bool **`initRectifier`**()

Private Members

CameraMemberHandler ***`h`** = 0

bool **`opened`** = false

struct `CameraInformation`
#include <Core.hpp> *Camera* specific parameters.

Public Members

CalibrationParameters **`calibration_parameters`**
Intrinsic and Extrinsic stereo parameters for rectified images (default).

CalibrationParameters **`calibration_parameters_raw`**
Intrinsic and Extrinsic stereo parameters for original images (unrectified).

unsigned int **`serial_number`** = 0
camera dependent serial number.

unsigned int **`firmware_version`** = 0
current firmware version of the camera.

struct `CameraParameters`
#include <Core.hpp> Intrinsic parameters of a camera.

Note Similar to the *CalibrationParameters*, those parameters are taken from the settings file (SNXXX.conf) and are modified during the *sl::Camera::open* call (with or without Self-Calibration). Those parameters given after *sl::Camera::open* call, represent the "new camera matrix" that fits/defines each image taken after rectification (through retrieveImage).

Note fx,fy,cx,cy must be the same for Left and Right *Camera* once *sl::Camera::open* has been called. Since distortion is corrected during rectification, distortion should not be considered after *sl::Camera::open* call.

Public Functions

void **`SetUp`**(float *focal_x*, float *focal_y*, float *center_x*, float *center_y*)

Setups the parameter of a camera.

Parameters

- `focal_x`: : horizontal focal length.
- `focal_y`: : vertical focal length.
- `focal_x`: : horizontal optical center.
- `focal_x`: : vertical optical center.

Public Members

float **`fx`**

Focal length in pixels along x axis.

float **`fy`**

Focal length in pixels along y axis.

float **`cx`**

Optical center along x axis, defined in pixels (usually close to width/2).

float **`cy`**

Optical center along y axis, defined in pixels (usually close to height/2).

double **`disto`**[5]

Distortion factor : [k1, k2, p1, p2, k3]. Radial (k1,k2,k3) and Tangential (p1,p2) distortion.

float **`v_fov`**

Vertical field of view after stereo rectification, in degrees.

float **`h_fov`**

Horizontal field of view after stereo rectification, in degrees.

float **`d_fov`**

Diagonal field of view after stereo rectification, in degrees.

Resolution **`image_size`**

size in pixels of the images given by the camera.

struct **`data`**

Public Members

int **`w`**

int **`h`**

matrix **`X`**

matrix **`y`**

int **shallow**

int ***num_boxes**

box ****boxes**

struct **dbox**

Public Members

float **dx**

float **dy**

float **dw**

float **dh**

struct **detection_info**

Public Members

char **name**[32]

int **left**

int **right**

int **top**

int **bottom**

float **prob**

struct **float_pair**

Public Members

float ***x**

float ***y**

class **IMAGE**
Inherits from Structure

Private Static Attributes

list FaceDetect.IMAGE._fields_ = [("w", c_int), ("h", c_int), ("c", c_int), ("data", POINTER(c_float))]

class **IMAGE**
Inherits from Structure

Private Static Attributes

list ObjectRecognition.IMAGE._fields_ = [("w", c_int), ("h", c_int), ("c", c_int), ("data", POINTER(c_float))]

class **IMAGE**
Inherits from Structure

Private Static Attributes

list darknet.IMAGE._fields_ = [("w", c_int), ("h", c_int), ("c", c_int), ("data", POINTER(c_float))]

struct **image**

Public Members

int **w**

int **h**

int **c**

float ***data**

class **ImageClass**

Public Functions

__init__(*self self*, *name name*, *image_paths image_paths*)

__str__(*self self*)

__len__(*self self*)

Public Members

name

image_paths

struct **Indice**

#include <Mesh.hpp> Store the index per faces of the associated vertices/normals/texture coordinates.

Note Contains data only after you call *Mesh::applyTexture()*.

Public Members

sl::*uint3* **v_vn_ind**

vertices and normals indices.

sl::*uint3* **uv_ind**

texture coordinates indices.

struct **InfoOption**

Public Members

std::string **svo_path**

bool **recordingMode** = false

std::string **output_path**

bool **computeDisparity** = false

bool **videoMode** = false

class **InitParameters**

#include <Camera.hpp> Parameters for ZED initialization.

A default constructor is enable.

Public Functions

InitParameters(*RESOLUTION camera_resolution_* = RESOLUTION_HD720, int *camera_fps_* = 0, int *camera_linux_id_* = 0, *sl*::String *svo_input_filename_* = sl::String(), bool *svo_real_time_mode_* = false, *DEPTH_MODE depth_mode_* = DEPTH_MODE_PERFORMANCE, *UNIT coordinate_units_* = UNIT_MILLIMETER, *COORDINATE_SYSTEM coordinate_system_* = COORDINATE_SYSTEM_IMAGE, bool *sdk_verbose_* = false, int *sdk_gpu_id_* = -1, float *depth_minimum_distance_* = -1., bool *camera_disable_self_calib_* = false, bool *camera_image_flip_* = false, int *camera_buffer_count_linux_* = 4)

Default constructor, set all parameters to their default and optimized values.

bool **save**(*sl*::String *filename*)

Saves the current bunch of parameters into a file.

Return true if file was successfully saved, otherwise false.

Parameters

- `filename`: : the path to the file in which the parameters will be stored.

bool **load**(*sl*::String *filename*)

Loads the values of the parameters contained in a file.

Return true if the file was successfully loaded, otherwise false.

Parameters

- `filename`: : the path to the file from which the parameters will be loaded.

Public Members

RESOLUTION **camera_resolution**

Define the chosen ZED resolution default : RESOLUTION_HD720.

int **camera_fps**

Requested FPS for this resolution.

set as 0 will choose the default FPS for this resolution (see User guide). default : 0

int **camera_linux_id**

ONLY for LINUX : if multiple ZEDs are connected, it will choose the first zed listed (if zed_linux_id=0), the second listed (if zed_linux_id=1), ...

Each ZED will create its own memory (CPU and GPU), therefore the number of ZED available will depend on the configuration of your computer. Currently not available for Windows default : 0

sl::String **svo_input_filename**

Path with filename to the recorded SVO file.

bool **svo_real_time_mode**

When enabled the timestamp is taken as reference to determine the reading framerate.

This mode simulates the live camera and consequently skipped frames if the computation framerate is too slow. default : false

UNIT **coordinate_units**

Define the unit for all the metric values (depth, point cloud, tracking).

default : sl::UNIT::UNIT_MILLIMETER

COORDINATE_SYSTEM **coordinate_system**

Define the coordinate system of the world frame (and the camera frame as well).

This defines the order of the axis of the coordinate system. see COORDINATE_SYSTEM for more information. default : COORDINATE_SYSTEM::COORDINATE_SYSTEM_IMAGE

DEPTH_MODE **depth_mode**

Defines the quality of the depth map, affects the level of details and also the computation time.

default : DEPTH_MODE::DEPTH_MODE_PERFORMANCE

float **depth_minimum_distance**

Specify the minimum depth information that will be computed, in the sl::UNIT you previously define.

default : 70cm (-1)

Warning The computation time is affected by the value, exponentially. The closer it gets the longer the disparity search will take. In case of limited computation power, consider increasing the value.

Note This value is used to calculate the disparity range estimation (in pixels). Due to metric to pixel conversion, a small difference may occur with the value returned by getDepthMinRange().

int **camera_image_flip**

Defines if the image are horizontally flipped.

default : 0

bool **camera_disable_self_calib**

If set to true, it will disable self-calibration and take the optional calibration parameters without optimizing them.

It is advised to leave it as false, so that calibration parameters can be optimized. default : false

int **camera_buffer_count_linux**

Set the number of buffers in the internal grabbing process.

decrease this number may reduce latency but can also produce more corrupted frames. default: 4

Warning Linux Only, this parameter has no effect on Windows.

bool **sdk_verbose**

If set to true, it will output some information about the current status of initialization.

default : false

int **sdk_gpu_id**

Defines the graphics card on which the computation will be done.

The default value search the more powerful (most CUDA cores) usable GPU. default : -1

struct kvp

Public Members

char ***key**

char ***val**

int **used**

struct **layer**

Public Members

LAYER_TYPE **type**

ACTIVATION **activation**

COST_TYPE **cost_type**

void (***forward**) (**struct** *layer*, **struct** *network*)

void (***backward**) (**struct** *layer*, **struct** *network*)

void (***update**) (**struct** *layer*, *update_args*)

void (***forward_gpu**) (**struct** *layer*, **struct** *network*)

void (***backward_gpu**) (**struct** *layer*, **struct** *network*)

void (***update_gpu**) (**struct** *layer*, *update_args*)

int **batch_normalize**

int **shortcut**

int **batch**

int **forced**

int **flipped**

int **inputs**

int **outputs**

int **nweights**

int **nbiases**

int **extra**

int **truths**

int **h**

int **w**

int **c**

int **out_h**

int **out_w**

int **out_c**

int **n**

int **max_boxes**

int **groups**

int **size**

int **side**

int **stride**

int **reverse**

int **flatten**

int **spatial**

int **pad**

int **sqrt**

int **flip**

int **index**

int **binary**

int **xnor**

int **steps**

int **hidden**

int **truth**

float **smooth**

float **dot**

float **angle**

float **jitter**

float **saturation**

float **exposure**

float **shift**

float **ratio**

float **learning_rate_scale**

int **softmax**

int **classes**

int **coords**

int **background**

int **rescore**

int **objectness**

int **does_cost**

int **joint**

int **noadjust**

int **reorg**

int **log**

int **tanh**

float **alpha**

float **beta**

float **kappa**

float **coord_scale**

float **object_scale**

float **noobject_scale**

float **mask_scale**

float **class_scale**

int **bias_match**

int **random**

float **thresh**

int **classfix**

int **absolute**

int **onlyforward**

int **stopbackward**

int **dontload**

int **dontloadscales**

float **temperature**

float **probability**

float **scale**

char ***cweights**

int ***indexes**

int ***input_layers**

int ***input_sizes**

int ***map**

float ***rand**

float ***cost**

float ***state**

float ***prev_state**

float ***forgot_state**

float ***forgot_delta**

float ***state_delta**

float ***combine_cpu**

float ***combine_delta_cpu**

float ***concat**

float ***concat_delta**

float ***binary_weights**

float ***biases**

float ***bias_updates**

float ***scales**

float ***scale_updates**

float ***weights**

float ***weight_updates**

float ***delta**

float ***output**

float ***squared**

float ***norms**

float ***spatial_mean**

float ***mean**

float ***variance**

float ***mean_delta**

float ***variance_delta**

float ***rolling_mean**

float ***rolling_variance**

float ***x**

float ***x_norm**

float ***m**

float ***v**

float ***bias_m**

float ***bias_v**

float ***scale_m**

float ***scale_v**

float ***z_cpu**

float ***r_cpu**

float ***h_cpu**

float ***prev_state_cpu**

float ***temp_cpu**

float ***temp2_cpu**

float ***temp3_cpu**

float ***dh_cpu**

float ***hh_cpu**

float ***prev_cell_cpu**

float ***cell_cpu**

float ***f_cpu**

float ***i_cpu**

float ***g_cpu**

float ***o_cpu**

float ***c_cpu**

float ***dc_cpu**

float ***binary_input**

struct *layer* ***input_layer**

struct *layer* ***self_layer**

struct *layer* ***output_layer**

struct *layer* ***reset_layer**

struct *layer* ***update_layer**

struct *layer* ***state_layer**

struct *layer* ***input_gate_layer**

struct *layer* ***state_gate_layer**

struct *layer* ***input_save_layer**

struct *layer* ***state_save_layer**

struct *layer* ***input_state_layer**

struct *layer* ***state_state_layer**

struct *layer* ***input_z_layer**

struct *layer* ***state_z_layer**

struct *layer* ***input_r_layer**

struct *layer* ***state_r_layer**

struct *layer* ***input_h_layer**

struct *layer* ***state_h_layer**

struct *layer* ***wz**

struct *layer* ***uz**

struct *layer* ***wr**

struct *layer* ***ur**

struct *layer* ***wh**

struct *layer* ***uh**

struct *layer* ***uo**

struct *layer* ***wo**

struct *layer* ***uf**

struct *layer* ***wf**

struct *layer* ***ui**

struct *layer* ***wi**

struct *layer* ***ug**

struct *layer* ***wg**

tree ***softmax_tree**

size_t **workspace_size**

struct **list**

Public Members

int **size**

node ***front**

node ***back**

struct **load_args**

Public Members

int **threads**

char ****paths**

char ***path**

int **n**

int **m**

char ****labels**

int **h**

int **w**

int **out_w**

int **out_h**

int **nh**

int **nw**

int **num_boxes**

int **min**

int **max**

int **size**

int **classes**

int **background**

int **scale**

int **center**

int **coords**

float **jitter**

float **angle**

float **aspect**

float **saturation**

float **exposure**

float **hue**

data ***d**

image ***im**

image ***resized**

data_type **type**

tree ***hierarchy**

class **Mat**

#include <Core.hpp> The *Mat* class can handle multiple matrix format from 1 to 4 channels, with different value types (float or uchar), and can be stored CPU and/or GPU side. *sl::Mat* is defined in a row-major order: - It means that, in the image buffer, the entire first row is stored first, followed by the entire second row, and so on. The CPU and GPU buffer aren't automatically synchronized for performance reasons, you can use *Mat::updateCPUfromGPU* / *Mat::updateGPUfromCPU* to do it. If you are using the GPU side of the *Mat* object, you need to make sure to call *sl::Mat::free()* before destroying the *sl::Camera* object. The destruction of the *sl::Camera* object delete the CUDA context needed to free the GPU *Mat* memory.

Public Functions

Mat ()

empty *Mat* default constructor.

Mat (size_t *width*, size_t *height*, *MAT_TYPE mat_type*, *MEM memory_type* = MEM_CPU)

Mat constructor.

Parameters

- `width`: : width of the matrix in pixels.
- `height`: : height of the matrix in pixels.
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `memory_type`: : defines where the buffer will be stored. (sl::MEM_CPU and/or sl::MEM_GPU). This function directly allocates the requested memory. It calls *Mat::alloc*.

Mat (size_t *width*, size_t *height*, *MAT_TYPE mat_type*, *sl*::*uchar1* **ptr*, size_t *step*, *MEM memory_type* = MEM_CPU)

Mat constructor from an existing data pointer.

Parameters

- `width`: : width of the matrix in pixels.

- `height`: : height of the matrix in pixels.
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `ptr`: : pointer to the data array. (CPU or GPU).
- `step`: : step of the data array. (the Bytes size of one pixel row)
- `memory_type`: : defines where the buffer will be stored. (sl::MEM_CPU and/or sl::MEM_GPU). This function doesn't allocate the memory.

Mat (size_t *width*, size_t *height*, *MAT_TYPE* *mat_type*, *sl*::*uchar1* **ptr_cpu*, size_t *step_cpu*, *sl*::*uchar1* **ptr_gpu*, size_t *step_gpu*)
Mat constructor from two existing data pointers, CPU and GPU.

Parameters

- `width`: : width of the matrix in pixels.
- `height`: : height of the matrix in pixels.
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `ptr_cpu`: : CPU pointer to the data array.
- `step_cpu`: : step of the CPU data array. (the Bytes size of one pixel row)
- `ptr_gpu`: : GPU pointer to the data array.
- `step_gpu`: : step of the GPU data array. (the Bytes size of one pixel row) This function doesn't allocate the memory.

Mat (*sl*::*Resolution* *resolution*, *MAT_TYPE* *mat_type*, *MEM* *memory_type* = MEM_CPU)
Mat constructor.

Parameters

- `resolution`: : the size of the matrix in pixels.
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `memory_type`: : defines where the buffer will be stored. (sl::MEM_CPU and/or sl::MEM_GPU). This function directly allocates the requested memory. It calls *Mat::alloc*.

Mat (*sl*::*Resolution* *resolution*, *MAT_TYPE* *mat_type*, *sl*::*uchar1* **ptr*, size_t *step*, *MEM* *memory_type* = MEM_CPU)
Mat constructor from an existing data pointer.

Parameters

- `resolution`: : the size of the matrix in pixels.
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `ptr`: : pointer to the data array. (CPU or GPU).
- `step`: : step of the data array. (the Bytes size of one pixel row)
- `memory_type`: : defines where the buffer will be stored. (sl::MEM_CPU and/or sl::MEM_GPU). This function doesn't allocate the memory.

Mat (*sl*::*Resolution resolution*, *MAT_TYPE mat_type*, *sl*::*uchar1 *ptr_cpu*, size_t *step_cpu*, *sl*::*uchar1 *ptr_gpu*, size_t *step_gpu*)

Mat constructor from two existing data pointers, CPU and GPU.

Parameters

- `resolution`: : the size of the matrix in pixels.
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `ptr_cpu`: : CPU pointer to the data array.
- `step_cpu`: : step of the CPU data array. (the Bytes size of one pixel row)
- `ptr_gpu`: : GPU pointer to the data array.
- `step_gpu`: : step of the GPU data array. (the Bytes size of one pixel row) This function doesn't allocate the memory.

Mat (**const** *sl*::*Mat &mat*)

Mat constructor by copy (deep copy).

Parameters

- `mat`: : the reference to the *sl::Mat* to copy. This function allocates and duplicates the data

void **alloc** (size_t *width*, size_t *height*, *MAT_TYPE mat_type*, *MEM memory_type* = MEM_CPU)

Allocates the *Mat* memory.

Warning It erases previously allocated memory.

Parameters

- `width`: : width of the matrix in pixels
- `height`: : height of the matrix in pixels
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `memory_type`: : defines where the buffer will be stored. (sl::MEM_CPU and/or sl::MEM_GPU).

void **alloc** (*sl*::*Resolution resolution*, *MAT_TYPE mat_type*, *MEM memory_type* = MEM_CPU)

Allocates the *Mat* memory.

Warning It erases previously allocated memory.

Parameters

- `resolution`: : the size of the matrix in pixels.
- `mat_type`: : the type of the matrix (sl::MAT_TYPE_32F_C1,sl::MAT_TYPE_8U_C4...)
- `memory_type`: : defines where the buffer will be stored. (sl::MEM_CPU and/or sl::MEM_GPU).

~Mat ()

Mat destructor. This function calls *Mat::free* to release owned memory.

void **free** (*MEM memory_type* = MEM_CPU|MEM_GPU)

Free the owned memory.

Parameters

- `memory_type:` : specify whether you want to free the sl::MEM_CPU and/or sl::MEM_GPU memory.

Mat &**`operator=`**(**const** *Mat* &*that*)

Performs a shallow copy. This function doesn't copy the data array, it only copies the pointer.

Return The new *sl::Mat* object which point to the same data as that.

Parameters

- `that:` : the *sl::Mat* to be copied.

ERROR_CODE **`updateCPUfromGPU`**()

Downloads data from DEVICE (GPU) to HOST (CPU), if possible.

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Note If no CPU or GPU memory are available for this *Mat*, some are directly allocated.

Note If verbose sets, you have informations in case of failure.

ERROR_CODE **`updateGPUfromCPU`**()

Uploads data from HOST (CPU) to DEVICE (GPU), if possible.

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Note If no CPU or GPU memory are available for this *Mat*, some are directly allocated.

Note If verbose sets, you have informations in case of failure.

ERROR_CODE **`copyTo`**(*Mat* &*dst*, *COPY_TYPE* *cpyType* = COPY_TYPE_CPU_CPU) **const**

Copies data an other *Mat* (deep copy).

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Note If the destination is not allocated or has a not a compatible sl::MAT_TYPE or *sl::Resolution*, current memory is freed and new memory is directly allocated.

Parameters

- `dst:` : the *Mat* where the data will be copied.
- `cpyType:` : specify the memories that will be used for the copy.

ERROR_CODE **`setFrom`**(**const** *Mat* &*src*, *COPY_TYPE* *cpyType* = COPY_TYPE_CPU_CPU)

Copies data from an other *Mat* (deep copy).

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Note If the current *Mat* is not allocated or has a not a compatible sl::MAT_TYPE or *sl::Resolution* with the source, current memory is freed and new memory is directly allocated.

Parameters

- `src:` : the *Mat* where the data will be copied from.
- `cpyType:` : specify the memories that will be used for the update.

ERROR_CODE **read**(**const** char **filePath*)

Reads an image from a file (only if sl::MEM_CPU is available on the current *sl::Mat*).

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Note Supported sl::MAT_TYPE are : sl::MAT_TYPE_8U_C1, sl::MAT_TYPE_8U_C3 and sl::MAT_TYPE_8U_C4. input files format are PNG and JPEG. verbose sets, you have informations in case of failure.

Parameters

- `filePath`: : file path including the name and extension.

ERROR_CODE **write**(**const** char **filePath*)

Writes the *sl::Mat* (only if sl::MEM_CPU is available) into a file as an image.

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Note Supported sl::MAT_TYPE are : sl::MAT_TYPE_8U_C1, sl::MAT_TYPE_8U_C3 and sl::MAT_TYPE_8U_C4. output files format are PNG and JPEG. verbose sets, you have informations in case of failure.

Parameters

- `filePath`: : file path including the name and extension.

template <**typename** T>
ERROR_CODE **setTo**(T *value*, *MEM* *memory_type* = MEM_CPU)

Fills the *Mat* with the given value.

Note This function is templated for sl::uchar1, sl::uchar2, sl::uchar3, sl::uchar4, sl::float1, sl::float2, sl::float3, sl::float4.

Parameters

- `value`: : the value to be copied all over the matrix.
- `memory_type`: : defines which buffer to fill, CPU and/or GPU. This function overwrite all the matrix.

template <**typename** N>
ERROR_CODE **setValue**(size_t *x*, size_t *y*, N *value*, *MEM* *memory_type* = MEM_CPU)

Sets a value to a specific point in the matrix.

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Warning Not efficient for sl::MEM_GPU, use it on sparse data.

Note This function is templated for sl::uchar1, sl::uchar2, sl::uchar3, sl::uchar4, sl::float1, sl::float2, sl::float3, sl::float4.

Parameters

- `x`: : specify the column.
- `y`: : specify the row.
- `value`: : the value to be set.
- `memory_type`: : defines which memory will be updated.

template <**typename** N>

ERROR_CODE **getValue** (size_t *x*, size_t *y*, N **value*, *MEM memory_type* = MEM_CPU)

Returns the value of a specific point in the matrix.

Return sl::SUCCESS if everything went well, sl::ERROR_CODE_FAILURE otherwise.

Warning Not efficient for sl::MEM_GPU, use it on sparse data.

Note This function is templated for sl::uchar1, sl::uchar2, sl::uchar3, sl::uchar4, sl::float1, sl::float2, sl::float3, sl::float4.

Parameters

- `x`: : specify the column
- `y`: : specify the row
- `memory_type`: : defines which memory should be read.

size_t **getWidth** () **const**

brief Returns the width of the matrix.

Return The width of the matrix in pixels.

size_t **getHeight** () **const**

brief Returns the height of the matrix.

Return The height of the matrix in pixels.

Resolution **getResolution** () **const**

brief Returns the height of the matrix.

Return The height of the matrix in pixels.

size_t **getChannels** () **const**

brief Returns the number of values stored in one pixel.

Return The number of values in a pixel.

MAT_TYPE **getDataType** () **const**

brief Returns the format of the matrix.

Return The format of the current *Mat*.

MEM **getMemoryType** () **const**

brief Returns the type of memory (CPU and/or GPU).

Return The type of allocated memory.

template <typename N**>**
N ***getPtr** (*MEM memory_type* = MEM_CPU)

brief Returns the CPU or GPU data pointer.

Return The pointer of the *Mat* data.

Parameters

- `memory_type`: : specify whether you want sl::MEM_CPU or sl::MEM_GPU step.

size_t **getStepBytes** (*MEM memory_type* = MEM_CPU)

brief Returns the memory step in Bytes (the Bytes size of one pixel row).

Return The step in bytes of the specified memory.

Parameters

- `memory_type`: : specify whether you want sl::MEM_CPU or sl::MEM_GPU step.

template <typename N**>**
size_t **`getStep`**(*MEM memory_type* = MEM_CPU)

brief Returns the memory step in number of elements (the number of values in one pixel row).

Return The step in number of elements.

Parameters

- `memory_type`: : specify whether you want sl::MEM_CPU or sl::MEM_GPU step.

size_t **`getStep`**(*MEM memory_type* = MEM_CPU)

brief Returns the memory step in number of elements (the number of values in one pixel row).

Return The step in number of elements.

Parameters

- `memory_type`: : specify whether you want sl::MEM_CPU or sl::MEM_GPU step.

size_t **`getPixelBytes`**()

brief Returns the size in bytes of one pixel.

Return The size in bytes of a pixel.

size_t **`getWidthBytes`**()

brief Returns the size in bytes of a row.

Return The size in bytes of a row.

sl::String **`getInfos`**()

brief Return the informations about the *Mat* into a sl::String.

Return A string containing the *Mat* informations.

bool **`isInit`**()

brief Defines whether the *Mat* is initialized or not.

Return True if current *Mat* has been allocated (by the constructor or therefore).

bool **`isMemoryOwner`**()

brief Returns whether the *Mat* is the owner of the memory it access. If not, the memory won't be freed if the *Mat* is destroyed.

Return True if the *Mat* is owning its memory, else false.

void **`clone`**(**const** *Mat* &*src*)

Duplicates *Mat* by copy (deep copy).

Parameters

- `src`: : the reference to the *Mat* to copy. This function copies the data array(s), it mark the new *Mat* as the memory owner.

Public Members

sl::String **`name`**

bool **`verbose`** = false

Private Members

Resolution **size**

size_t **channels** = 0

size_t **step_gpu** = 0

size_t **step_cpu** = 0

size_t **pixel_bytes** = 0

MAT_TYPE **data_type**

MEM **mem_type** = sl::MEM_CPU

uchar1 ***ptr_cpu** = NULL

uchar1 ***ptr_gpu** = NULL

uchar1 ***ptr_internal** = NULL

bool **init** = false

bool **memory_owner** = false

struct matrix

Public Members

int **rows**

int **cols**

float ****vals**

class Matrix3f

#include <types.hpp> The class *Matrix3f* represent a generic three-dimensional matrix.

sl::Matrix3f is defined in a row-major order: - It means that, in the value buffer, the entire first row is stored first, followed by the entire second row, and so on. - you can access the data with the 'r' ptr or by element name as : r00, r01, r02 | 0 1 2 | r10, r11, r12 <-> r| 3 4 5 | r20, r21, r21 | 6 7 8 |

Subclassed by *sl::Rotation*

Public Functions

Matrix3f()

Matrix3f default constructor.

Matrix3f(float *data*[])

Matrix3f copy constructor (deep copy).

Matrix3f(**const** *Matrix3f* &*mat*)

brief *Matrix3f* copy constructor (deep copy).

Parameters

- `rotation`: : the *Matrix3f* to copy.

Matrix3f **operator***(**const** *Matrix3f* &*mat*) **const**

brief Gives the result of the multiplication between two *Matrix3f*

Matrix3f **operator***(**const** double &*scalar*) **const**
: brief Gives the result of the multiplication between a *Matrix3f* and a scalar.

bool **operator==**(**const** *Matrix3f* &*mat*) **const**
: brief Test two *Matrix3f* equality.

bool **operator!=**(**const** *Matrix3f* &*mat*) **const**
: brief Test two *Matrix3f* inequality.

float &**operator()**(int *u*, int *v*)
: Gets access to a specific point in the *Matrix3f* (read / write).

Return The value at the u, v coordinates.

Parameters

- `u`: : specify the row
- `v`: : specify the column

void **inverse**()
: Sets the *Matrix3f* to its inverse.

void **transpose**()
: Sets the RotationArray to its transpose.

void **setIdentity**()
: Sets the *Matrix3f* to identity.

void **setZeros**()
: Sets the *Matrix3f* to zero.

sl::String **getInfos**()
: Return the components of the *Matrix3f* in a sl::String.

Return A sl::String containing the components of the current Matix3f.

Public Members

float **r00**

float **r01**

float **r02**

float **r10**

float **r11**

float **r12**

float **r20**

float **r21**

float **r22**

float **r**[nbElem]

union sl::Matrix3f::@1 sl::Matrix3f::@2

sl::String **`matrix_name`**
Name of the matrix (optional).

Public Static Functions

static *Matrix3f* **`inverse`**(**const** *Matrix3f* &*rotation*)
Returns the inverse of a *Matrix3f*.

Return The inverse of the given *Matrix3f*

Parameters

- `rotation`: : the *Matrix3f* to compute the inverse from.

static *Matrix3f* **`transpose`**(**const** *Matrix3f* &*rotation*)
Returns the transpose of a *Matrix3f*.

Return The transpose of the given *Matrix3f*

Parameters

- `rotation`: : the *Matrix3f* to compute the transpose from.

static *Matrix3f* **`identity`**()
Creates an identity *Matrix3f*.

Return A *Matrix3f* set to identity.

static *Matrix3f* **`zeros`**()
Creates a *Matrix3f* filled with zeros.

Return A *Matrix3f* set to zero.

Public Static Attributes

const int **`nbElem`** = 9

class **`Matrix4f`**
#include <types.hpp> The class *Matrix4f* represent a generic fourth-dimensional matrix.

sl::Matrix4f is defined in a row-major order: - It means that, in the value buffer, the entire first row is stored first, followed by the entire second row, and so on. - you can access the data by the 'm' ptr or by the element name as : r00, r01, r02, tx | 0 1 2 3 | r10, r11, r12, ty <-> m| 4 5 6 7 | r20, r21, r22, tz | 8 9 10 11 | m30, m31, m32, m33 | 12 13 14 15 |

Subclassed by *sl::Transform*

Public Functions

`Matrix4f`()
Matrix4f default constructor.

`Matrix4f`(float *data*[])
Matrix4f copy constructor (deep copy).

Matrix4f (**const** *Matrix4f* *&mat*)

brief *Matrix4f* copy constructor (deep copy).

Parameters

- `rotation`: : the *Matrix4f* to copy.

Matrix4f **operator*** (**const** *Matrix4f* *&mat*) **const**

brief Gives the result of the multiplication between two *Matrix4f*.

Matrix4f **operator*** (**const** double *&scalar*) **const**

brief Gives the result of the multiplication between a *Matrix4f* and a scalar.

bool **operator==** (**const** *Matrix4f* *&mat*) **const**

brief Test two *Matrix4f* equality.

bool **operator!=** (**const** *Matrix4f* *&mat*) **const**

brief Test two *Matrix4f* inequality.

float &**operator()** (int *u*, int *v*)

Gets access to a specific point in the *Matrix4f* (read / write).

Return The value at the u, v coordinates.

Parameters

- `u`: : specify the row.
- `v`: : specify the column.

ERROR_CODE **inverse** ()

Sets the *Matrix4f* to its inverse.

Return SUCCESS if the inverse has been computed, ERROR_CODE_FAILURE is not (det = 0).

void **transpose** ()

Sets the *Matrix4f* to its transpose.

void **setIdentity** ()

Sets the *Matrix4f* to identity.

void **setZeros** ()

Sets the *Matrix4f* to zero.

ERROR_CODE **setSubMatrix3f** (*sl*::*Matrix3f* *input*, int *row* = 0, int *column* = 0)

Sets a 3x3 Matrix inside the *Matrix4f*.

Note Can be used to set the rotation matrix when the matrix4f is a pose or an isometric matrix.

Return SUCCESS if everything went well, ERROR_CODE_FAILURE otherwise.

Parameters

- `sl::Matrix3f`: : sub matrix to put inside the *Matrix4f*.
- `row`: : index of the row to start the 3x3 block. Must be 0 or 1.
- `column`: : index of the column to start the 3x3 block. Must be 0 or 1.

ERROR_CODE **setSubVector3f** (*sl*::Vector3<float> *input*, int *column* = 3)

Sets a 3x1 Vector inside the *Matrix4f* at the specified column index.

Note Can be used to set the Translation/Position matrix when the matrix4f is a pose or an isometry.

Return SUCCESS if everything went well, ERROR_CODE_FAILURE otherwise.

Parameters

- `sl::Vector3`: : sub vector to put inside the *Matrix4f*.
- `column`: : index of the column to start the 3x3 block. By default, it is the last column (translation for a *Pose*).

ERROR_CODE **setSubVector4f** (*sl*::Vector4<float> *input*, int *column* = 3)

Sets a 4x1 Vector inside the *Matrix4f* at the specified column index.

Note Can be used to set the Translation/Position matrix when the matrix4f is a pose or an isometry.

Return SUCCESS if everything went well, ERROR_CODE_FAILURE otherwise.

Parameters

- `sl::Vector4`: : sub vector to put inside the *Matrix4f*.
- `column`: : index of the column to start the 3x3 block. By default, it is the last column (translation for a *Pose*).

sl::String **getInfos** ()

Return the components of the *Matrix4f* in a sl::String.

Return A sl::String containing the components of the current *Matrix4f*.

Public Members

float **r00**

float **r01**

float **r02**

float **tx**

float **r10**

float **r11**

float **r12**

float **ty**

float **r20**

float **r21**

float **r22**

float **tz**

float **m30**

float **m31**

float **m32**

float **m33**

float **m**[nbElem]

union sl::Matrix4f::@5 sl::Matrix4f::@6

sl::String **matrix_name**
Name of the matrix (optional).

Public Static Functions

static *Matrix4f* **inverse**(**const** *Matrix4f* &*mat*)
Creates the inverse of a *Matrix4f*.

Return The inverse of the given *Matrix4f*.

Parameters

- `rotation`: : the *Matrix4f* to compute the inverse from.

static *Matrix4f* **transpose**(**const** *Matrix4f* &*mat*)
Creates the transpose of a *Matrix4f*.

Return The transpose of the given *Matrix4f*.

Parameters

- `rotation`: : the *Matrix4f* to compute the transpose from.

static *Matrix4f* **identity**()
Creates an identity *Matrix4f*.

Return A *Matrix4f* set to identity.

static *Matrix4f* **zeros**()
Creates a *Matrix4f* filled with zeros.

Return A *Matrix4f* set to zero.

Public Static Attributes

const int **nbElem** = 16

class Mesh
#include <Mesh.hpp> A mesh contains the geometric data of the scene computed by the spatial mapping.

Public Functions

Mesh()
Default constructor which creates an empty *Mesh*.

~Mesh()
Mesh destructor.

bool **filter** (*MeshFilterParameters params* = MeshFilterParameters ())

Filters the mesh according to the given parameters.

Return True if the filtering was successful, false otherwise.

Note The filtering is a costly operation but the resulting mesh is significantly lighter and less noisy, the parameters can be tweaked to get a mesh that fit better the final application. For instance a collision mesh will need to have a coarser, more decimated resolution.

Parameters

- `params`: : defines the filtering parameters, for more info checkout the *sl::MeshFilterParameters* documentation.

bool **applyTexture** (*MESH_TEXTURE_FORMAT texture_format* = MESH_TEXTURE_RGB)

Applies texture to the mesh.

Return True if the texturing was successful, false otherwise.

Warning SpatialMappingParams::saveTextureData must be set as true when enabling the spatial mapping to be able to apply the textures.

Warning The mesh should be filtered before calling this function since *Mesh::filter* will erased the textures, the texturing is also significantly slower on non-filtered meshes.

bool **save** (*std*::string *filename*, *MESH_FILE_FORMAT type* = MESH_FILE_OBJ)

Saves the mesh into a file.

Return True if the file was successfully saved, false otherwise.

Note Only the sl::MESH_FILE_OBJ support the textures recording

Parameters

- `filename`: : the path and filename of the mesh
- `type`: : defines the file type (extension)

bool **load** (**const** *std*::string *filename*)

Loads the mesh from a file.

Parameters

- `filename`: : the path and filename of the mesh.

Return Value

- `true`: if the loading was successful, false otherwise.

void **clear** ()

Clears all the mesh data (empty the vectors).

Public Members

std::vector<*sl*::*float3*> **vertices**

Vertices are defined by a 3D point {x,y,z}.

std::vector<*sl*::*uint3*> **triangles**

Triangles (or faces) contains the index of its three vertices.

It corresponds to the 3 vertices of the triangle {v1, v2, v3}.

std::vector<*sl*::*float3*> **normals**

Normals are defined by three conponant, {nx, ny, nz}.

Normals are defined for each vertices (*Mesh::vertices* and *Mesh::normals* are the same size).

std::vector<*sl*::*float2*> **uv**

Texture coordinates defines 2D points on a texture.

std::vector<*std*::vector<*Indice*>> **material_indices**

Store the list of vertices index affected to each texture image.

The first vector has the same size as *Mesh::textures*, the size of the second vector represents the number of faces associated to this texture. By running over the second vector you can access the vertices/normals and texture coordinates of the current texture.

Note Contains data only after you call *Mesh::applyTexture()*.

std::vector<*Texture*> **textures**

List of textures images.

Private Members

sl::TextureImagePool **im_pool**

sl::*CameraParameters* **cam_param**

float **min_d**

float **max_d**

bool **welded**

size_t **memory** = 0

class MeshFilterParameters

#include <Mesh.hpp> Parameters for the optional filtering step of a *sl::Mesh*.

A default constructor is enabled and set to its default parameters.

Note Parameters can be user adjusted.

Public Types

enum FILTER

Values:

FILTER_LOW

Soft decimation and smoothing.

FILTER_MEDIUM

Decimate the number of faces and apply a soft smooth.

FILTER_HIGH

Drasticly reduce the number of faces.

Public Functions

MeshFilterParameters(*FILTER filtering_* = FILTER_LOW)

Default constructor, set all parameters to their default and optimized values.

void **set**(*FILTER filtering_* = FILTER_LOW)

Sets the filtering intensity.

Parameters

- `filtering_`: : the desired *sl::MeshFilterParameters::FILTER*.

bool **save**(*sl*::String *filename*)

Saves the current bunch of parameters into a file.

Return true if the file was successfully saved, otherwise false.

Parameters

- `filename`: : the path to the file in which the parameters will be stored.

bool **load**(*sl*::String *filename*)

Loads the values of the parameters contained in a file.

Return true if the file was successfully loaded, otherwise false.

Parameters

- `filename`: : the path to the file from which the parameters will be loaded.

Public Members

FILTER **filtering** = FILTER::FILTER_LOW

class **METADATA**

Inherits from Structure

Private Static Attributes

list ObjectRecognition.METADATA._fields_ = [(“classes”, c_int), (“names”, POINTER(c_char_p))]

struct **metadata**

Public Members

int **classes**

char ****names**

class **METADATA**

Inherits from Structure

Private Static Attributes

list FaceDetect.METADATA._fields_ = [("classes", c_int), ("names", POINTER(c_char_p))]

class **METADATA**

Inherits from Structure

Private Static Attributes

list darknet.METADATA._fields_ = [("classes", c_int), ("names", POINTER(c_char_p))]

struct **moves**

Public Members

char ****data**

int **n**

struct **network**

Public Members

int **n**

int **batch**

size_t ***seen**

int ***t**

float **epoch**

int **subdivisions**

layer ***layers**

float ***output**

learning_rate_policy **policy**

float **learning_rate**

float **momentum**

float **decay**

float **gamma**

float **scale**

float **power**

int **time_steps**

int **step**

int **max_batches**

float ***scales**

int ***steps**

int **num_steps**

int **burn_in**

int **adam**

float **B1**

float **B2**

float **eps**

int **inputs**

int **outputs**

int **truths**

int **notruth**

int **h**

int **w**

int **c**

int **max_crop**

int **min_crop**

int **center**

float **angle**

float **aspect**

float **exposure**

float **saturation**

float **hue**

int **gpu_index**

tree ***hierarchy**

float ***input**

float ***truth**

float ***delta**

float ***workspace**

int **train**

int **index**

float ***cost**

struct node

Public Members

void ***val**

struct *node* ***next**

struct *node* ***prev**

class **`Orientation`**

#include <Core.hpp> The class *Orientation* is designed to contains orientation data from the tracking. *sl::Orientation* is a vector defined as [ox, oy, oz, ow].

Inherits from Vector4< float >

Public Functions

`Orientation``()`

empty *Orientation* default constructor.

`Orientation``(`**const** *Orientation &orientation*`)`

brief *Orientation* copy constructor (deep copy).

Parameters

- `orientation`: : the *Orientation* to copy.

`Orientation``(`**const** Vector4<float> &*in*`)`

brief *Orientation* copy constructor (deep copy).

Parameters

- `in`: : the vector to copy.

`Orientation``(`**const** *Rotation &rotation*`)`

brief *Orientation* constructor from an *Rotation*. It converts the *Rotation* representation to the *Orientation* one.

Parameters

- `rotation`: : the *Rotation* to be used.

`Orientation``(`**const** *Translation &tr1*, **const** *Translation &tr2*`)`

brief *Orientation* constructor from a vector represented by two *Translation*.

Parameters

- `tr1`: : the first point of the vector.
- `tr2`: : the second point of the vector.

float **`operator()`**`(`int *x*`)`

Returns the value at specific position in the *Orientation*.

Return The value at the x position.

Parameters

- `x`: : the position of the value

Orientation **`operator*`**`(`**const** *Orientation &orientation*`)` **const**

brief Multiplication operator by an *Orientation*.

Return The current orientation after being multiplied by the other orientation.

Parameters

- `orientation`: : the orientation.

void **`setRotation`**`(`**const** *Rotation &rotation*`)`

Sets the orientation from a *Rotation*.

Parameters

- `rotation`: : the *Rotation* to be used.

Rotation **`getRotation`**() **const**

Returns the current orientation as a *Rotation*.

Return The rotation computed from the orientation data.

void **`setIdentity`**()

Sets the current *Orientation* to identity.

void **`setZeros`**()

Fills the current *Orientation* with zeros.

void **`normalise`**()

Normalizes the current *Orientation*.

Public Static Functions

static *Orientation* **`identity`**()

Creates an *Orientation* initialized to identity.

Return An identity *Orientation*.

static *Orientation* **`zeros`**()

Creates an *Orientation* filled with zeros.

Return An *Orientation* filled with zeros.

static *Orientation* **`normalise`**(**const** *Orientation* &*orient*)

Creates the normalized version of an existing *Orientation*.

Return The normalized version of the *Orientation*.

Parameters

- `orient`: : the *Orientation* to be used.

class **`Pose`**

#include <Camera.hpp> The class *Pose* contains the Motion tracking data which gives the position and orientation of the ZED in space (orientation/quaternion, rotation matrix, translation/position) and other connected values (timestamp, confidence).

Public Functions

`Pose`()

Default constructor which creates an empty *Pose*.

`Pose`(**const** *Pose* &*pose*)

Pose constructor with deep copy.

Pose(**const** *sl*::*Transform* &*pose_data*, unsigned long long *mtimestamp* = 0, int *mconfidence* = 0)

Pose constructor with deep copy.

~Pose()

Pose destructor.

sl::*Translation* **getTranslation**()

Returns the camera translation from the pose.

Return The translation vector of the ZED position.

sl::*Orientation* **getOrientation**()

Returns the camera orientation from the pose.

Return The orientation vector of the ZED position.

sl::*Rotation* **getRotation**()

brief Returns the camera rotation (3x3) from the pose.

Return The rotation matrix of the ZED position.

sl::Vector3<float> **getRotationVector**()

Returns the camera rotation (3x1) of the pose.

Return The rotation vector of the ZED position.

Public Members

bool **valid**

boolean that indicates if tracking is activated or not. You should check that first if something wrong.

unsigned long long **timestamp**

Timestamp of the pose. This timestamp should be compared with the camera timestamp for synchronization.

sl::*Transform* **pose_data**

4x4 Matrix which contains the rotation (3x3) and the translation. *Orientation* is extracted from this transform as well.

int **pose_confidence**

Confidence/Quality of the pose estimation for the target frame A confidence metric of the tracking [0-100], 0 means that the tracking is lost, 100 means that the tracking can be fully trusted.

struct RecordingState

#include <defines.hpp> Recording structure that contains information about SVO.

Public Members

bool **status**

status of current frame. May be true for success or false if frame could not be written in the SVO file.

double **current_compression_time**

compression time for the current frame in ms.

double **current_compression_ratio**

compression ratio (% of raw size) for the current frame.

double **average_compression_time**
average compression time in ms since beginning of recording.

double **average_compression_ratio**
compression ratio (% of raw size) since beginning of recording.

struct Resolution
#include <Core.hpp> Width and height of an array.

Public Functions

Resolution(size_t *w_* = 0, size_t *h_* = 0)

size_t **area**()
Returns the area of the image.

Return The number of pixels of the array.

bool **operator==**(**const** *Resolution* &*that*) **const**
Tests if the given *sl::Resolution* has the same properties.

Return True if the sizes matches.

bool **operator!=**(**const** *Resolution* &*that*) **const**
Tests if the given *sl::Resolution* has different properties.

Return True if the sizes are not equal.

Public Members

size_t **width**
array width in pixels

size_t **height**
array height in pixels

class Rotation
#include <Core.hpp> The class *Rotation* is designed to contains rotation data from the tracking.

It inherits from the generic *sl::Matrix3f*

Inherits from *sl::Matrix3f*

Public Functions

Rotation()
empty *Rotation* default constructor.

Rotation(**const** *Rotation* &*rotation*)
brief *Rotation* copy constructor (deep copy).

Parameters

- `rotation`: : the *Rotation* to copy.

Rotation(**const** *Matrix3f &mat*)

brief *Rotation* copy constructor (deep copy).

Parameters

- `mat`: : the mat to copy.

Rotation(**const** *Orientation &orientation*)

brief *Rotation* constructor from an *Orientation*. It converts the *Orientation* representation to the *Rotation* one.

Parameters

- `orientation`: : the *Orientation* to be used.

Rotation(**const** float *angle*, **const** *Translation &axis*)

brief Creates a *Rotation* representing the 3D rotation of angle around an arbitrary 3D axis.

Parameters

- `angle`: : the rotation angle in rad.
- `axis`: : the 3D axis to rotate around.

void **setOrientation**(**const** *Orientation &orientation*)

Sets the *Rotation* from an *Orientation*.

Parameters

- `orientation`: : the *Orientation* containing the rotation to set.

Orientation **getOrientation**()

Returns the *Orientation* corresponding to the current *Rotation*.

Return The rotation of the current orientation.

sl::Vector3<float> **getRotationVector**()

Returns the rotation vector (Rx,Ry,Rz) corresponding to the current *Rotation* (using Rodrigues' transformation).

Return The rotation vector .

void **setRotationVector**(**const** *sl*::Vector3<float> *&vec_rot*)

Sets the *Rotation* from a rotation vector (using Rodrigues' transformation).

Parameters

- `vec_rot`: : the *Rotation* Vector.

class **RuntimeParameters**

#include <Camera.hpp> Contains all the *Camera::grab()* parameters.

Public Functions

RuntimeParameters (*SENSING_MODE sensing_mode_* = SENSING_MODE::SENSING_MODE_STANDARD, bool *enable_depth_* = true, bool *enable_point_cloud_* = true, bool *move_point_cloud_to_world_frame_* = false)

Default constructor, set all parameters to their default and optimized values.

bool **save** (*sl*::String *filename*)

Saves the current bunch of parameters into a file.

Return true if the file was successfully saved, otherwise false.

Parameters

- `filename`: : the path to the file in which the parameters will be stored.

bool **load** (*sl*::String *filename*)

Loads the values of the parameters contained in a file.

Return true if the file was successfully loaded, otherwise false.

Parameters

- `filename`: : the path to the file from which the parameters will be loaded.

Public Members

SENSING_MODE **sensing_mode**

Defines the type of disparity map, more info : sl::SENSING_MODE definition.

bool **enable_depth**

Defines if the depth map should be computed.

If false, only the images are available.

bool **enable_point_cloud**

Defines if the point cloud should be computed (including XYZRGBA).

bool **move_point_cloud_to_world_frame**

Apply the current pose to the point cloud.

It means that values of point cloud will be defined in world frame (as opposite to the camera frame).

struct **section**

Public Members

char ***type**

list ***options**

struct **size_params**

Public Members

int **batch**

int **inputs**

int **h**

int **w**

int **c**

int **index**

int **time_steps**

network **net**

struct sortable_bbox

Public Members

int **index**

int sortable_bbox::class

float ****probs**

network **net**

char ***filename**

int **classes**

float **elo**

float ***elos**

class SpatialMappingParameters

#include <Camera.hpp> Parameters for ZED scanning initialization.

A default constructor is enabled and set to its default parameters.

Note Parameters can be user adjusted.

Public Types

enum RESOLUTION

List the spatial mapping resolution presets.

Values:

RESOLUTION_HIGH

Create a detail geometry, requires lots of memory.

RESOLUTION_MEDIUM

Smalls variations in the geometry will disappear, useful for big object

RESOLUTION_LOW

Keeps only huge variations of the geometry , useful outdoor.

enum **`RANGE`**

List the spatial mapping depth range presets.

Values:

`RANGE_NEAR`

Only depth close to the camera will be used by the spatial mapping.

`RANGE_MEDIUM`

Medium depth range.

`RANGE_FAR`

Takes into account objects that are far, useful outdoor.

typedef *std*::pair<float, float> **`interval`**

Public Functions

`SpatialMappingParameters` (*RESOLUTION resolution* = RESOLUTION_HIGH, *RANGE range* = RANGE_MEDIUM, int *max_memory_usage_* = 2048, bool *save_texture_* = true)

Default constructor, set all parameters to their default and optimized values.

void **`set`** (*RESOLUTION resolution* = RESOLUTION_HIGH)

Sets the resolution corresponding to the given sl::SpatialMappingParameters::RESOLUTION preset.

Parameters

- `resolution`: : the desired sl::SpatialMappingParameters::RESOLUTION.

void **`set`** (*RANGE range* = RANGE_MEDIUM)

Sets the maximum value of depth corresponding to the given sl::SpatialMappingParameters::RANGE presets.

Parameters

- `range`: : the desired sl::SpatialMappingParameters::RANGE.

bool **`save`** (*sl*::String *filename*)

Saves the current bunch of parameters into a file.

Return true if the file was successfully saved, otherwise false.

Parameters

- `filename`: : the path to the file in which the parameters will be stored.

bool **`load`** (*sl*::String *filename*)

Loads the values of the parameters contained in a file.

Return true if the file was successfully loaded, otherwise false.

Parameters

- `filename`: : the path to the file from which the parameters will be loaded.

Public Members

int **max_memory_usage** = 2048

The maximum CPU memory (in mega bytes) allocated for the meshing process (will fit your configuration in any case).

bool **save_texture** = true

Set to true if you want be able to apply texture to your mesh after its creation.

Note This option will take more memory.

const *interval* **allowed_min** = std::make_pair(0.3f, 10.f)

The minimal depth value allowed by the spatial mapping.

const *interval* **allowed_max** = std::make_pair(2.f, 20.f)

The maximal depth value allowed by the spatial mapping.

interval **range_meter** = std::make_pair(0.7f, 5.f)

Depth integration range in meters. range_meter.first should fit interval::allowed_min. range_meter.first will be set to *sl::Camera::getDepthMinRangeValue* if you do not change it. range_meter.second should fit interval::allowed_max.

const *interval* **allowed_resolution** = std::make_pair(0.01f, 0.2f)

The resolutions allowed by the spatial mapping.

float **resolution_meter** = 0.03f

Spatial mapping resolution in meters, should fit interval::allowed_resolution.

Public Static Functions

static float **get** (*RESOLUTION resolution* = RESOLUTION_HIGH)

Return the resolution corresponding to the given sl::SpatialMappingParameters::RESOLUTION preset.

Return The resolution in meter.

Parameters

- `resolution`: : the desired sl::SpatialMappingParameters::RESOLUTION.

static float **get** (*RANGE range* = RANGE_MEDIUM)

Return the maximum value of depth corresponding to the given sl::SpatialMappingParameters::RANGE presets.

Return The maximum value of depth.

Parameters

- `range`: : the desired sl::SpatialMappingParameters::RANGE.

struct stbi_io_callbacks

Public Members

int (***read**) (void *user, char **data*, int size)

void (***skip**) (void *user, int n)

int (***eof**) (void *user)

struct **Texture**

#include <Mesh.hpp> Contains information about texture images associated to the *Mesh*.

Public Members

std::string **name**

The name of the file in which the texture is saved.

sl::*Mat* **texture**

A *sl::Mat* that contains the data of the texture.

unsigned int **indice_gl**

useful for openGL binding reference (value not set by the SDK).

class **TrackingParameters**

#include <Camera.hpp> Parameters for ZED tracking initialization.

A default constructor is enabled and set to its default parameters.

Note Parameters can be user adjusted.

Public Functions

TrackingParameters (*sl*::*Transform* *init_pos* = sl::Transform (), bool *_enable_memory* = true, *sl*::String *_area_path* = sl::String())

Default constructor, set all parameters to their default and optimized values.

bool **save** (*sl*::String *filename*)

Saves the current bunch of parameters into a file.

Return true if the file was successfully saved, otherwise false.

Parameters

- `filename`: : the path to the file in which the parameters will be stored.

bool **load** (*sl*::String *filename*)

Loads the values of the parameters contained in a file.

Return true if the file was successfully loaded, otherwise false.

Parameters

- `filename`: : the path to the file from which the parameters will be loaded.

Public Members

sl::*Transform* **initial_world_transform**

Position of the camera in the world frame when camera is started.

By default it should be identity.

Note The camera frame (defines the reference frame for the camera) is by default positioned at the world frame when tracking is started. Use this *sl::Transform* to place the camera frame in the world frame. default : Identity matrix bool **enable_spatial_memory**

This mode enables the camera to learn and remember its surroundings.

This helps correct motion tracking drift and position different cameras relative to each other in space.

Warning : This mode requires few resources to run and greatly improves tracking accuracy. We recommend to leave it on by default. default : true

sl::String **area_file_path**

Area localization mode can record and load (if areaFilePath is specified) a file that describes the surroundings.

Note Loading an area file will start a searching phase during which the camera will try to position itself in the previously learned area.

Warning : The area file describes a specific location. If you are using an area file describing a different location, the tracking function will continuously search for a position and may not find a correct one.

Warning The '.area' file can only be used with the same depth mode (sl::MODE) as the one used during area recording. default : NULL

class **Transform**

#include <Core.hpp> The class *Transform* contains a 4x4 matrix that specifically contains a rotation 3x3 and a 3x1 translation.

It then contains the orientation as well. It can be used to create any type of Matrix4x4 or *sl::Matrix4f* that must be specifically used for handling a rotation and position information (OpenGL, Tracking...) It inherits from the generic *sl::Matrix4f*

Inherits from *sl::Matrix4f*

Public Functions

Transform()

brief *Transform* default constructor.

Transform(**const** *Transform* *&motion*)

brief *Transform* copy constructor (deep copy).

Parameters

- `motion`: : the *Transform* to copy.

Transform(**const** *Matrix4f* *&mat*)

brief *Transform* copy constructor (deep copy).

Parameters

- `mat`: : the *Matrix4f* to copy.

Transform(**const** *Rotation* *&rotation*, **const** *Translation* *&translation*)

brief *Transform* constructor from a *Rotation* and a *Translation*.

Parameters

- `rotation`: : the *Rotation* to copy.
- `translation`: : the *Translation* to copy.

Transform(**const** *Orientation* *&orientation*, **const** *Translation* *&translation*)

brief *Transform* constructor from an *Orientation* and a *Translation*.

Parameters

- `orientation`: : the *Orientation* to copy.
- `translation`: : the *Translation* to copy.

void **`setRotation`**(**const** *Rotation* &*rotation*)

Sets the rotation of the current *Transform* from an *Rotation*.

Parameters

- `rotation`: : the *Rotation* to be used.

Rotation **`getRotation`**() **const**

Returns the *Rotation* of the current *Transform*.

Return The *Rotation* created from the *Transform* values.

Warning The given *Rotation* contains a copy of the *Transform* values. Not references.

void **`setTranslation`**(**const** *Translation* &*translation*)

Sets the translation of the current *Transform* from an *Translation*.

Parameters

- `translation`: : the *Translation* to be used.

Translation **`getTranslation`**() **const**

Returns the *Translation* of the current *Transform*.

Return The *Translation* created from the *Transform* values.

Warning The given *Translation* contains a copy of the *Transform* values. Not references.

void **`setOrientation`**(**const** *Orientation* &*orientation*)

Sets the orientation of the current *Transform* from an *Orientation*.

Parameters

- `orientation`: : the *Orientation* to be used.

Orientation **`getOrientation`**() **const**

Returns the *Orientation* of the current *Transform*.

Return The *Orientation* created from the *Transform* values.

Warning The given *Orientation* contains a copy of the *Transform* values. Not references.

sl::Vector3<float> **`getRotationVector`**()

Returns the vector *Rotation* (3x1) of the *Transform*.

Return The rotation value for each axis (rx,ry,rz).

void **`setRotationVector`**(**const** *sl*::Vector3<float> &*vec_rot*)

Sets the *Rotation* 3x3 of the *Transform* with a 3x1 rotation vector (using Rodrigues' transformation).

Parameters

- `vec_rot`: : vector that contains the rotation value for each axis (rx,ry,rz).

class **`Translation`**

#include <Core.hpp> The class *Translation* is designed to contains translation data from the tracking. *sl::Translation* is a vector as [tx, ty, tz]. You can access the data with the 't' ptr or by element name as : tx, ty, tz <-> | 0 1 2 |.

Inherits from Vector3< float >

Public Functions

`Translation`()

empty *Translation* default constructor.

`Translation`(**const** *Translation* &*translation*)

brief *Translation* copy constructor (deep copy).

Parameters

- `translation`: : the *Translation* to copy.

`Translation`(float *t1*, float *t2*, float *t3*)

brief *Translation* constructor.

Parameters

- `t1`: : the x translation.
- `t2`: : the y translation.
- `t3`: : the z translation.

`Translation`(Vector3<float> *in*)

brief *Translation* constructor.

Parameters

- `in`: : vector.

Translation **`operator*`**(**const** *Orientation* &*mat*) **const**

brief Multiplication operator by an *Orientation*.

Return The current *Translation* after being multiplied by the orientation.

Parameters

- `mat`: : *Orientation*.

void **`normalize`**()

Normalizes the current translation.

float &**`operator()`**(int *x*)

Get the value at specific position in the *Translation*.

Return The value at the x position.

Parameters

- `x`: : the position of the value

Public Static Functions

static *Translation* **`normalize`**(**const** *Translation* &*tr*)

brief Get the normalized version of a given *Translation*.

Return An other *Translation* object, which is equal to tr.normalize.

Parameters

- `tr`: : the *Translation* to be used.

struct `tree`

Public Members

int ***`leaf`**

int **`n`**

int ***`parent`**

int ***`child`**

int ***`group`**

char ****`name`**

int **`groups`**

int ***`group_size`**

int ***`group_offset`**

struct `update_args`

Public Members

int **`batch`**

float **`learning_rate`**

float **`momentum`**

float **`decay`**

int **`adam`**

float **`B1`**

float **`B2`**

float **`eps`**

int **`t`**

struct `yolo_obj`

Public Members

char **darknet_path**[1024]

char ****names**

float **nms**

box ***boxes**

float ****probs**

network **net**

namespace **ctypes**

namespace **darknet**

Functions

load_meta (*f f*)

load_net (*cfg cfg*, *weights weights*)

load_img (*f f*)

letterbox_img (*im im*, *w w*, *h h*)

predict (*net net*, *im im*)

classify (*net net*, *meta meta*, *im im*)

detect (*net net*, *meta meta*, *im im*)

Variables

lib = CDLL("/home/pjreddie/documents/darknet/libdarknet.so", RTLD_GLOBAL)

argtypes

restype

net = load_net("cfg/densenet.cfg", "/home/pjreddie/trained/densenet201.weights")

im = load_img("data/wolf.jpg")

meta = load_meta("cfg/imagenet1k.data")

r = classify(net, meta, im)

namespace **DescribeSceneSrv**

Functions

service_callback ()

namespace **example**

Variables

`string example.darknet_path` = './darknet'

`string example.datacfg` = 'cfg/coco.data'

`string example.cfgfile` = 'cfg/tiny-yolo.cfg'

`string example.weightfile` = '../tiny-yolo.weights'

`string example.filename` = "/home/roboy/outputRoboy.mp4"

`float example.thresh` = 0.24

`float example.hier_thresh` = 0.5

`cam` = cv2.VideoCapture(filename)

`ret_val`

`img` = img.transpose(2,0,1)

`fourcc` = cv2.VideoWriter_fourcc(*'XVID')

`outVideo` = cv2.VideoWriter('outputRoboySkyfall.mp4',fourcc, 20.0, (800,533))

`ok`

`frame` = imutils.resize(img, width=800)

`c`

`h`

`w`

`data` = img.ravel()/255.0

`outputs` = pyyolo.detect(w, h, c, *data*, thresh, hier_thresh)

`tuple example.p1` = (output['left'],output['top'])

`tuple example.p2` = (output['right'],output['bottom'])

namespace `face_detection`

This module processes realsense camera input and runs face detection, alignment and pose estimation.

Module Tasks:

- Main loop to process realsense camera input
- Run Face Detection based MTCNN for Joint Face Detection & Alignment for each frame
- Track Face over frames
- Calculate Face Position in 3D coordinates
- Send ROS msg containing face area, key points and face pose and unique ID for each detected face

Current Workarounds:

- Tracking not implemented (no unique face id provided)
- 3D coodinates not implemented (face region used as distance measure)
- Function for Face Recognition also implemented in this modue for simplicity (to be put into anothe rmodule)
- No ROS communication

Functions

`detect_face_and_landmarks_mtcnn`(*img img*)

Function to do face detection and alignment on an image.

Run face detection on the full input image using a MTCNN for Joint Detection and Alignment from here: https://github.com/pangyupo/mxnet_mtcnn_face_detection

Return Bounding boxes bb and landmark points for eyes, nose and mouth edges.

Parameters

- `img`: The RGB image

`align_face_mtcnn`(*img img*, *bb bb*)

Function to align detected faces.

The current implementation crops the picture given a face region. We do not use actual alignment because performance increase for face recognition is marginal and only slows down realtime performance as is also argued here: https://github.com/davidsandberg/facenet/issues/93

Return Returns the cropped face region.

Parameters

- `img`: The RGB image
- `bb`: The bounding box of a face as tuple (x1, y1, x2, y2)

`draw_rects`(*img img*, *bbs bbs*, *resize_factor resize_factor = 1*)

Function to draw bounding boxes in a picture.

Given an image, the bounding boxes for the corresponding face regions are drawn. Additionally a resize_factor is used if the bounding boxes were calculated on a scaled version of the input image. Default value of the resize factor is 1, meaning bounding boxes were calculated on the same image size.

Return Image overlayed with the bounding boxes.

Parameters

- `img`: The RGB image
- `bbs`: An array of bounding boxes of a face as tuple (x1, y1, x2, y2) factor to scale up bounding box size if calculated on different picture scale.

`draw_landmarks`(*img img*, *points points*, *resize_factor resize_factor*)

Function to draw feature points in a picture.

Given an image, the feature points for the corresponding faces are drawn. Additionally a resize_factor is used if the feature points were calculated on a scaled version of the input image. Default value of the resize factor is 1, meaning the feature points were calculated on the same image size.

Return Image overlayed with the feature points

Parameters

- `img`: The RGB image
- `points`: An array containing arrays of feature points of a face factor to scale up bounding box size if calculated on different picture scale.

`get_closest_face`(*bbs bbs*)

Returns the closest face of all detected faces.

Current implementation uses bounding box size to compare proximity

Return The array index of the biggest bounding box.

Parameters

- `bbs`: An array of bounding boxes of a face as tuple (x1, y1, x2, y2).

face_detected (*bbs bbs*)

Checks whether a face is visible within certain distance.

Current implementation uses bounding box to check for proximity. Key value defined in FACE_AREA.

Return True if a face is close enough, False otherwise

Parameters

- `bbs`: An array of bounding boxes of a face as tuple (x1, y1, x2, y2).

recognize_face (*face_img face_img*, *session session*, *classifier classifier*)

Identifies a face using Facenet.

TODO: To be moved into other module The function calculates the 128D embeddings of a given face using facenet in this implementation: https://github.com/davidsandberg/facenet Then the embeddings are run through a SVM classifier to identify the face. The cropped image of the face region.

Return Return the name of the face.

Parameters

- `session`: The tensorflow session with FaceNet already loaded
- `classifier`: The SVM classifier already loaded

load_model (*model_dir model_dir*, *model_meta model_meta*, *model_content model_content*)

Function to load a tensorflow model.

TODO: To be moved into other module

Return Returns a tensorflow session

Parameters

- `model_dir`: model directory
- `model_meta`: meta file
- `model_content`: checpoint file

get_model_filenames (*model_dir model_dir*)

Helper Function to load a tensorlow model.

TODO: To be moved into other module The function finds the meta_file and checkpoint within a given path

Return Returns meta_file and checkpoint

Parameters

- `model_dir`: Path where the model is stored

Variables

int face_detection.EXPECT_SIZE = 160

int face_detection.FACE_AREA = 1500

int face_detection.x_pixel = 640
Entry Point to run face detection.

Loads all data and processes realsense camera input in a loop.

int face_detection.y_pixel = 480

float face_detection.resize_factor = 0.5

bool face_detection.face_nearby = False

int face_detection.no_face_detect_counter = 0

dev = pyrs.Device(device_id=0, streams=[pyrs.ColourStream(width=*x_pixel*, height=y_pixel, fps=30), pyrs.DepthStream()])

sess = tf.Session(config=tf.ConfigProto(log_device_placement=False))

pnet

rnet

onet

int face_detection.minsize = 20

list face_detection.threshold = [0.6, 0.7, 0.7]

float face_detection.factor = 0.709

string face_detection.tree_model = “models/Tree/own.mod”

string face_detection.svm_model = “models/SVM/svm_lfw.mod”

clf = pickle.load(open(tree_model, “rb”))

string face_detection.model_dir = ‘models/facenet’

meta_file

ckpt_file

session = *load_model*(model_dir, meta_file, ckpt_file)

graph = tf.get_default_graph()

image_batch = graph.get_tensor_by_name(“input:0”)

phase_train_placeholder = graph.get_tensor_by_name(“phase_train:0”)

embeddings = graph.get_tensor_by_name(“embeddings:0”)

c = cv2.cvtColor(dev.colour, cv2.COLOR_RGB2BGR)

int face_detection.d = dev.depth*dev.depth_scale*1000

img = cv2.resize(c, (int(resize_factor * *x_pixel*), int(resize_factor * y_pixel)))

d_img = cv2.resize(d, (int(resize_factor * *x_pixel*), int(resize_factor * y_pixel)))

total_boxes

points

start_recognize_face = false

draw = *draw_rects*(c.copy(), total_boxes, resize_factor)

namespace FaceDetect

```
@package FaceDetect
1. Face is detected using Dlib library
2. 68 landmarks are located on the face and circles are drawn over the landmarks.
3. The position(rect) of the face is sent to the main process throught the RectQueue.
4. Frame queue is as a future reference to send data to the main process
```

Functions

StartDetection (*CameraQueue CameraQueue*, *FrameQueue FrameQueue*, *RectQueue RectQueue*, *FacepointQueue FacepointQueue*, *SpeakerQueue SpeakerQueue*)

sample (*probs probs*)

c_array (*ctype ctype*, *values values*)

detect (*net net*, *meta meta*, *image image*, *thresh thresh = .5*, *hier_thresh hier_thresh = .5*, *nms nms = .45*)

draw_results (*res res*, *img img*)

Initialize ()

detectObjects (*frame frame*, *detect_net detect_net*, *detect_meta detect_meta*)

Variables

lib = CDLL(”../darknet/libdarknet.so”, RTLD_GLOBAL)

argtypes

restype

predict = lib.network_predict_p

make_boxes = lib.make_boxes

free_ptrs = lib.free_ptrs

num_boxes = lib.num_boxes

make_probs = lib.make_probs

detect = lib.network_predict_p

reset_rnn = lib.reset_rnn

load_net = lib.load_network_p

free_image = lib.free_image

letterbox_image = lib.letterbox_image

load_meta = lib.get_metadata

load_image = lib.load_image_color

predict_image = lib.network_predict_image

network_detect = lib.network_detect

int FaceDetect.DONE = 0

namespace FindObjectSrv

Functions

service_callback()

Variables

int FindObjectSrv.i = 1

request = awaitwebsocket.recv()

type = json.loads(request)[”type”]

FoundObjects = ObjectRects.getQueue();

bool FindObjectSrv.found = False

dictionary FindObjectSrv.coordinates = {}

dictionary FindObjectSrv.answer = {‘found’: found, ‘coordinates’: coordinates}

level

namespace FreezeModel

Functions

freeze_graph(*model_folder model_folder*)

Variables

dir = os.path.dirname(os.path.realpath(__file__))

parser = argparse.ArgumentParser()

type

str

help

args = parser.parse_args()

namespace make_labels

Functions

make_labels(*s s*)

Variables

string make_labels.font = ‘futura-normal’

namespace multiprocess

Functions

TestProcess (*number number*)

detectFaces (*FrameQueue FrameQueue*, *RectQueue RectQueue*)

tracking (*RectQueue RectQueue*, *TrackQueue TrackQueue*)

Variables

list multiprocess.procs = []

FrameQueue = Queue();

RectQueue = Queue();

TrackQueue = Queue();

detectFaceProc = Process(target=detectFaces,args=(FrameQueue,RectQueue,))

trackProc = Process(target=tracking,args=(RectQueue,TrackQueue,))

namespace **Multitracking**

```
@package Multitracking
1. Coordinates of the detected object is send though Rects Queue.
2. Currently, MIL tracking algorithm has been employed.
3. A rectangle is drawn over the tracked object andis sent to the main process␣
↪through TrackQueue
```

Functions

StartTracking (*RectQueue RectQueue*, *TrackQueue TrackQueue*)

```
The co-ords of the object to be tracked is received through the Rects Queue.␣
↪MIL MultiTracking is used through OpenCV Contrib
Drawn rectangle is passed over the TrackQueue
```

namespace **NewFacialFeaturesMsg**

Functions

service_callback ()

namespace **ObjectRecognition**

```
@package ObjectRecognition
1. This is a python wrapper for the YOLO implementation in C.
2. uses Ctypes as a way to access C module.
3. libdarknet.so is a pre compiled library which works only on Linux!
```

Functions

sample (*probs probs*)

c_array (*ctype ctype*, *values values*)

detect (*net net*, *meta meta*, *image image*, *thresh thresh = .5*, *hier_thresh hier_thresh = .5*, *nms nms = .45*)

draw_results (*res res*, *img img*)

Initialize()

detectObjects(*frame frame*)

Variables

int ObjectRecognition.detect_net = 0

int ObjectRecognition.detect_meta = 0

lib = CDLL(”../darknet/libdarknet.so”, RTLD_GLOBAL)

argtypes

restype

predict = lib.network_predict_p

make_boxes = lib.make_boxes

free_ptrs = lib.free_ptrs

num_boxes = lib.num_boxes

make_probs = lib.make_probs

detect = lib.network_predict_p

reset_rnn = lib.reset_rnn

load_net = lib.load_network_p

free_image = lib.free_image

letterbox_image = lib.letterbox_image

load_meta = lib.get_metadata

load_image = lib.load_image_color

predict_image = lib.network_predict_image

network_detect = lib.network_detect

int ObjectRecognition.DONE = 0

namespace RecogniseFace

```
@package RecogniseFace
1. Module responsible for Face Recognition
2. This uses a model already trained on LWF, to extract facial features
3. Another model of members from Roboy are trained
4. We use a SVM classifier to classify the detected face to match with the model of trained faces
```

Functions

recogniseFace(*RectsQueue RectsQueue*)

align_face_dlib(*image image*, *face_box face_box*, *landmarkIndices landmarkIndices = AlignDlib.OUTER_EYES_AND_NOSE*)

load_model(*model_dir model_dir*, *model_meta model_meta*, *model_content model_content*)

Function to load a tensorflow model.

TODO: To be moved into other module

Return Returns a tensorflow session

Parameters

- `model_dir`: model directory
- `model_meta`: meta file
- `model_content`: checpoint file

`get_model_filenames` (*model_dir model_dir*)

Helper Function to load a tensorlow model.

TODO: To be moved into other module The function finds the meta_file and checkpoint within a given path

Return Returns meta_file and checkpoint

Parameters

- `model_dir`: Path where the model is stored

`get_image_paths_and_labels` (*dataset dataset*)

`get_image_paths` (*facedir facedir*)

`get_dataset` (*paths paths*, *has_class_directories has_class_directories = True*)

`load_data` (*image_paths image_paths*, *do_random_crop do_random_crop*, *do_random_flip do_random_flip*, *image_size image_size*, *do_prewhiten do_prewhiten = True*)

`processImage` (*img img*, *do_random_crop do_random_crop*, *do_random_flip do_random_flip*, *image_size image_size*, *do_prewhiten do_prewhiten = True*)

`to_rgb` (*img img*)

`prewhiten` (*x x*)

`crop` (*image image*, *random_crop random_crop*, *image_size image_size*)

`flip` (*image image*, *random_flip random_flip*)

`train` (*session session*)

Variables

`int RecogniseFace.IMAGE_SIZE` = 160

`int RecogniseFace.EXPECT_SIZE` = 160

namespace `RoboyVision`

```
@package roboyVision
1. This is the main module.
2. Each other components are created as seperate processes and spawned.
3. This also creates Message queues and passes them onto different processes
```

Functions

`detectFaces` (*CameraQueue CameraQueue*, *FrameQueue FrameQueue*, *RectQueue RectQueue*, *FacePointQueue FacePointQueue*, *SpeakerQueue SpeakerQueue*)

`tracking` (*RectQueue RectQueue*, *TrackQueue TrackQueue*)

`speakerDetect` (*FacePointQueue FacePointQueue*, *SpeakerQueue SpeakerQueue*, *FrameQueue FrameQueue*, *VisualQueue VisualQueue*)

recogniseFace (*RectsQueue RectsQueue*)

visualizer (*CameraQueue CameraQueue*, *RectQueue RectQueue*, *FacePointQueue FacePointQueue*, *SpeakerQueue SpeakerQueue*, *FrameQueue FrameQueue*, *VisualQueue VisualQueue*)

ObjectRecognise (*CameraQueue CameraQueue*, *ObjectsQueue ObjectsQueue*)

Variables

list RoboyVision.procs = []

CameraQueue = Queue()

FrameQueue = Queue()

RectQueue = Queue()

TrackQueue = Queue()

VisualQueue = Queue()

SpeakerQueue = Queue()

FacePointQueue = Queue()

ObjectsQueue = Queue()

detectFaceProc = \

target

detectFaces

args

SpeakerProc = \

speakerDetect

namespace RosMsgUtil

```
@package RosMsgUtil
1. This module has Util functions to send out ROS messages.
2. The send functions here are called from different modules.
```

Functions

AdvertiseNewFacialFeatures ()

AdvertiseFaceCoordinates ()

AdvertiseFindObject ()

AdvertiseDescribeScene ()

AdvertiseLookAtSpeaker ()

AdvertiseContinously ()

SendNewFacialFeatures (*ff ff*, *speaking speaking*, *i i*)

SendFaceCoordinates (*id id*, *speaking speaking*, *position position*, *i i*)

FindObject (*type type*, *i i*)

DescribeScene (*i i*)

LookAtSpeaker (*i i*)

ReceiveServiceRequests ()

Variables

ws = websocket.WebSocket();

namespace **setup**

Variables

module = Extension('pyyolo', library_dirs=['.'], libraries=['yolo'], include_dirs=[numpy.get_include(), './darknet/include'], sou

name

version

description

ext_modules

namespace **setup_gpu**

Variables

module = Extension('pyyolo', library_dirs=['.', '/usr/local/cuda/lib64', '/usr/local/'], #libraries=['yolo', 'cuda', 'cudart', 'cublas

name

version

description

ext_modules

namespace **sl**

ENUM to string

static *std*::string **resolution2str** (*RESOLUTION res*)

static *std*::string **statusCode2str** (*SELF_CALIBRATION_STATE stat*)

static *DEPTH_MODE* **str2mode** (*std*::string *mode*)

static *std*::string **depthMode2str** (*DEPTH_MODE mode*)

static *std*::string **sensingMode2str** (*SENSING_MODE mode*)

static *std*::string **unit2str** (*UNIT unit*)

static *UNIT* **str2unit** (*std*::string *unit*)

static *std*::string **trackingState2str** (*TRACKING_STATE state*)

static *std*::string **spatialMappingState2str** (*SPATIAL_MAPPING_STATE state*)

Typedefs

typedef float **`float1`**

typedef Vector2<float> **`float2`**

typedef Vector3<float> **`float3`**

typedef Vector4<float> **`float4`**

typedef unsigned char **`uchar1`**

typedef Vector2<unsigned char> **`uchar2`**

typedef Vector3<unsigned char> **`uchar3`**

typedef Vector4<unsigned char> **`uchar4`**

typedef double **`double1`**

typedef Vector2<double> **`double2`**

typedef Vector3<double> **`double3`**

typedef Vector4<double> **`double4`**

typedef unsigned int **`uint1`**

typedef Vector2<unsigned int> **`uint2`**

typedef Vector3<unsigned int> **`uint3`**

typedef Vector4<unsigned int> **`uint4`**

Enums

enum `MEM`

List available memory type.

Values:

`MEM_CPU` = 1

CPU Memory (Processor side).

`MEM_GPU` = 2

GPU Memory (Graphic card side).

enum `COPY_TYPE`

List available copy operation on *Mat*.

Values:

`COPY_TYPE_CPU_CPU`

copy data from CPU to CPU.

`COPY_TYPE_CPU_GPU`

copy data from CPU to GPU.

`COPY_TYPE_GPU_GPU`

copy data from GPU to GPU.

`COPY_TYPE_GPU_CPU`

copy data from GPU to CPU.

enum MAT_TYPE

List available *Mat* formats.

Values:

MAT_TYPE_32F_C1
float 1 channel.

MAT_TYPE_32F_C2
float 2 channels.

MAT_TYPE_32F_C3
float 3 channels.

MAT_TYPE_32F_C4
float 4 channels.

MAT_TYPE_8U_C1
unsigned char 1 channel.

MAT_TYPE_8U_C2
unsigned char 2 channels.

MAT_TYPE_8U_C3
unsigned char 3 channels.

MAT_TYPE_8U_C4
unsigned char 4 channels.

enum RESOLUTION

List available video resolutions.

Warning Since v1.0, VGA mode has been updated to WVGA (from 640*480 to 672*376) and requires a firmware update to function (>= 1142). Firmware can be updated in the ZED Explorer.

Warning NVIDIA Jetson boards do not support all ZED video resolutions and framerates. For more information, please read the on-line API documentation.

Values:

RESOLUTION_HD2K
2208*1242, available framerates: 15 fps.

RESOLUTION_HD1080
1920*1080, available framerates: 15, 30 fps.

RESOLUTION_HD720
1280*720, available framerates: 15, 30, 60 fps.

RESOLUTION_VGA
672*376, available framerates: 15, 30, 60, 100 fps.

RESOLUTION_LAST

enum CAMERA_SETTINGS

List available camera settings for the ZED camera (contrast, hue, saturation, gain...).

Each enum defines one of those settings.

Values:

CAMERA_SETTINGS_BRIGHTNESS
Defines the brightness control. Affected value should be between 0 and 8.

CAMERA_SETTINGS_CONTRAST
Defines the contrast control. Affected value should be between 0 and 8.

CAMERA_SETTINGS_HUE
Defines the hue control. Affected value should be between 0 and 11.

CAMERA_SETTINGS_SATURATION
Defines the saturation control. Affected value should be between 0 and 8.

CAMERA_SETTINGS_GAIN
Defines the gain control. Affected value should be between 0 and 100 for manual control. If ZED_EXPOSURE is set to -1, the gain is in auto mode too.

CAMERA_SETTINGS_EXPOSURE
Defines the exposure control. A -1 value enable the AutoExposure/AutoGain control,as the boolean parameter (default) does. Affected value should be between 0 and 100 for manual control.

CAMERA_SETTINGS_WHITEBALANCE
Defines the color temperature control. Affected value should be between 2800 and 6500 with a step of 100. A value of -1 set the AWB (auto white balance), as the boolean parameter (default) does.

CAMERA_SETTINGS_AUTO_WHITEBALANCE
Defines the status of white balance (automatic or manual). A value of 0 disable the AWB, while 1 activate it.

CAMERA_SETTINGS_LAST

enum SELF_CALIBRATION_STATE
Status for self calibration.

Since v0.9.3, self-calibration is done in background and start in the *sl::Camera::open* or Reset function. You can follow the current status for the self-calibration any time once ZED object has been construct.

Values:

SELF_CALIBRATION_STATE_NOT_STARTED
Self calibration has not run yet (no *sl::Camera::open* or *sl::Camera::resetSelfCalibration* called).

SELF_CALIBRATION_STATE_RUNNING
Self calibration is currently running.

SELF_CALIBRATION_STATE_FAILED
Self calibration has finished running but did not manage to get accurate values. Old parameters are taken instead.

SELF_CALIBRATION_STATE_SUCCESS
Self calibration has finished running and did manage to get accurate values. New parameters are set.

SELF_CALIBRATION_STATE_LAST

enum DEPTH_MODE
List available depth computation modes.

Values:

DEPTH_MODE_NONE
This mode does not compute any depth map. Only rectified stereo images will be available.

DEPTH_MODE_PERFORMANCE
Fastest mode for depth computation.

DEPTH_MODE_MEDIUM
Balanced quality mode. Depth map is robust in any environment and requires medium resources for computation.

DEPTH_MODE_QUALITY
Best quality mode. Requires more compute power.

DEPTH_MODE_LAST

enum SENSING_MODE
List available depth sensing modes.

Values:

SENSING_MODE_STANDARD
This mode outputs ZED standard depth map that preserves edges and depth accuracy. Applications example: Obstacle detection, Automated navigation, People detection, 3D reconstruction.

SENSING_MODE_FILL
This mode outputs a smooth and fully dense depth map. Applications example: AR/VR, Mixed-reality capture, Image post-processing.

SENSING_MODE_LAST

enum UNIT
Enumerate for available metric unit of the depth.

Values:

UNIT_MILLIMETER

UNIT_CENTIMETER

UNIT_METER

UNIT_INCH

UNIT_FOOT

UNIT_LAST

enum COORDINATE_SYSTEM
List available coordinates systems for positional tracking and points cloud representation.

Positional tracking is provided in the given coordinates system.

Values:

COORDINATE_SYSTEM_IMAGE
Standard coordinates system in computer vision. Used in OpenCV : see here : http://docs.opencv.org/2.4/modules/calib3d/doc/camera_calibration_and_3d_reconstruction.html

COORDINATE_SYSTEM_LEFT_HANDED_Y_UP
Left-Handed with Y up and Z forward. Used in Unity with DirectX.

COORDINATE_SYSTEM_RIGHT_HANDED_Y_UP
Right-Handed with Y pointing up and Z backward. Used in OpenGL.

COORDINATE_SYSTEM_RIGHT_HANDED_Z_UP
Right-Handed with Z pointing up and Y forward. Used in 3DSMax.

COORDINATE_SYSTEM_LEFT_HANDED_Z_UP
Left-Handed with Z axis pointing up and X forward. Used in Unreal Engine.

COORDINATE_SYSTEM_LAST

enum MEASURE
List retrievable measures.

Values:

MEASURE_DISPARITY
Disparity map, 1 channel, FLOAT.

MEASURE_DEPTH
Depth map, 1 channel, FLOAT.

MEASURE_CONFIDENCE
Certainty/confidence of the disparity map, 1 channel, FLOAT.

MEASURE_XYZ
Point cloud, 4 channels, FLOAT, channel 4 is empty.

MEASURE_XYZRGBA
Colored point cloud, 4 channels, FLOAT, channel 4 contains color in R-G-B-A order.

MEASURE_XYZBGRA
Colored point cloud, 4 channels, FLOAT, channel 4 contains color in B-G-R-A order.

MEASURE_XYZARGB
Colored point cloud, 4 channels, FLOAT, channel 4 contains color in A-R-G-B order.

MEASURE_XYZABGR
Colored point cloud, 4 channels, FLOAT, channel 4 contains color in A-B-G-R order.

MEASURE_LAST

enum VIEW
List available views.

Values:

VIEW_LEFT
Rectified left image.

VIEW_RIGHT
Rectified right image.

VIEW_LEFT_GRAY
Rectified left grayscale image.

VIEW_RIGHT_GRAY
Rectified right grayscale image.

VIEW_LEFT_UNRECTIFIED
Raw left image.

VIEW_RIGHT_UNRECTIFIED
Raw right image.

VIEW_LEFT_UNRECTIFIED_GRAY
Raw left grayscale image.

VIEW_RIGHT_UNRECTIFIED_GRAY
Raw right grayscale image.

VIEW_SIDE_BY_SIDE
Left and right image (the image width is therefore doubled).

VIEW_DEPTH
Normalized depth image.

VIEW_CONFIDENCE
Normalized confidence image.

VIEW_LAST

enum DEPTH_FORMAT

List available file formats for saving depth maps.

Values:

DEPTH_FORMAT_PNG

PNG image format in 16bits. 32bits depth is mapped to 16bits color image to preserve the consistency of the data range.

DEPTH_FORMAT_PFM

stream of bytes, graphic image file format.

DEPTH_FORMAT_PGM

gray-scale image format.

DEPTH_FORMAT_LAST

enum POINT_CLOUD_FORMAT

List available file formats for saving point clouds.

Stores the spatial coordinates (x,y,z) of each pixel and optionally its RGB color.

Values:

POINT_CLOUD_FORMAT_XYZ_ASCII

Generic point cloud file format, without color information.

POINT_CLOUD_FORMAT_PCD_ASCII

Point Cloud Data file, with color information.

POINT_CLOUD_FORMAT_PLY_ASCII

PoLYgon file format, with color information.

POINT_CLOUD_FORMAT_VTK_ASCII

Visualization ToolKit file, without color information.

POINT_CLOUD_FORMAT_LAST

enum TRACKING_STATE

List the different states of positional tracking.

Values:

TRACKING_STATE_SEARCHING

The camera is searching for a previously known position to locate itself.

TRACKING_STATE_OK

Positional tracking is working normally.

TRACKING_STATE_OFF

Positional tracking is not enabled.

TRACKING_STATE_FPS_TOO_LOW

Effective FPS is too low to give proper results for motion tracking. Consider using PERFORMANCES parameters (DEPTH_MODE_PERFORMANCE, low camera resolution (VGA,HD720))

TRACKING_STATE_LAST

enum AREA_EXPORT_STATE

List the different states of spatial memory area export.

Values:

AREA_EXPORT_STATE_SUCCESS

The spatial memory file has been successfully created.

AREA_EXPORT_STATE_RUNNING
The spatial memory is currently written.

AREA_EXPORT_STATE_NOT_STARTED
The spatial memory file exportation has not been called.

AREA_EXPORT_STATE_FILE_EMPTY
The spatial memory contains no data, the file is empty.

AREA_EXPORT_STATE_FILE_ERROR
The spatial memory file has not been written because of a wrong file name.

AREA_EXPORT_STATE_SPATIAL_MEMORY_DISABLED
The spatial memory learning is disable, no file can be created.

AREA_EXPORT_STATE_LAST

enum REFERENCE_FRAME
Define which type of position matrix is used to store camera path and pose.

Values:

REFERENCE_FRAME_WORLD
The transform of *sl::Pose* will contains the motion with reference to the world frame (previously called PATH).

REFERENCE_FRAME_CAMERA
The transform of *sl::Pose* will contains the motion with reference to the previous camera frame (previously called POSE).

REFERENCE_FRAME_LAST

enum SPATIAL_MAPPING_STATE
Gives the spatial mapping state.

Values:

SPATIAL_MAPPING_STATE_INITIALIZING
The spatial mapping is initializing.

SPATIAL_MAPPING_STATE_OK
The depth and tracking data were correctly integrated in the fusion algorithm.

SPATIAL_MAPPING_STATE_NOT_ENOUGH_MEMORY
The maximum memory dedicated to the scanning has been reach, the mesh will no longer be updated.

SPATIAL_MAPPING_STATE_NOT_ENABLED
Camera::enableSpatialMapping() wasn't called (or the scanning was stopped and not relaunched).

SPATIAL_MAPPING_STATE_FPS_TOO_LOW
Effective FPS is too low to give proper results for spatial mapping. Consider using PERFORMANCES parameters (DEPTH_MODE_PERFORMANCE, low camera resolution (VGA,HD720), spatial mapping low resolution)

SPATIAL_MAPPING_STATE_LAST

enum SVO_COMPRESSION_MODE
List available compression modes for SVO recording.

sl::SVO_COMPRESSION_MODE_LOSSLESS is an improvement of previous lossless compression (used in ZED Explorer), even if size may be bigger, compression time is much faster.

Values:

SVO_COMPRESSION_MODE_RAW
RAW images, no compression.

SVO_COMPRESSION_MODE_LOSSLESS
new Lossless, with PNG/ZSTD based compression : avg size = 42% of RAW).

SVO_COMPRESSION_MODE_LOSSY
new Lossy, with JPEG based compression : avg size = 22% of RAW).

SVO_COMPRESSION_MODE_LAST

enum MESH_FILE_FORMAT
Values:

MESH_FILE_PLY
Contains only vertices and faces.

MESH_FILE_PLY_BIN
Contains only vertices and faces, encoded in binary.

MESH_FILE_OBJ
Contains vertices, normals, faces and textures informations if possible.

MESH_FILE_LAST

enum MESH_TEXTURE_FORMAT
Values:

MESH_TEXTURE_RGB

MESH_TEXTURE_RGBA

MESH_TEXTURE_LAST

enum ERROR_CODE
List error codes in the ZED SDK.

Values:

SUCCESS
Standard code for successful behavior.

ERROR_CODE_FAILURE
Standard code for unsuccessful behavior.

ERROR_CODE_NO_GPU_COMPATIBLE
No GPU found or CUDA capability of the device is not supported.

ERROR_CODE_NOT_ENOUGH_GPUMEM
Not enough GPU memory for this depth mode please try a faster mode (such as PERFORMANCE mode).

ERROR_CODE_CAMERA_NOT_DETECTED
The ZED camera is not plugged or detected.

ERROR_CODE_INVALID_RESOLUTION
For Jetson only, resolution not yet supported (USB3.0 bandwidth).

ERROR_CODE_LOW_USB_BANDWIDTH
This issue can occurs when you use multiple ZED or a USB 2.0 port (bandwidth issue).

ERROR_CODE_CALIBRATION_FILE_NOT_AVAILABLE
ZED calibration file is not found on the host machine. Use ZED Explorer or ZED Calibration to get one.

ERROR_CODE_INVALID_SVO_FILE
The provided SVO file is not valid.

ERROR_CODE_SVO_RECORDING_ERROR
An recorder related error occurred (not enough free storage, invalid file).

ERROR_CODE_INVALID_COORDINATE_SYSTEM
The requested coordinate system is not available.

ERROR_CODE_INVALID_FIRMWARE
The firmware of the ZED is out of date. Update to the latest version.

ERROR_CODE_NOT_A_NEW_FRAME
in grab() only, the current call return the same frame as last call. Not a new frame.

ERROR_CODE_CUDA_ERROR
in grab() only, a CUDA error has been detected in the process. Activate verbose in *sl::Camera::open* for more info.

ERROR_CODE_CAMERA_NOT_INITIALIZED
in grab() only, ZED SDK is not initialized. Probably a missing call to *sl::Camera::open*.

ERROR_CODE_NVIDIA_DRIVER_OUT_OF_DATE
your NVIDIA driver is too old and not compatible with your current CUDA version.

ERROR_CODE_INVALID_FUNCTION_CALL
the call of the function is not valid in the current context. Could be a missing call of *sl::Camera::open*.

ERROR_CODE_CORRUPTED_SDK_INSTALLATION
The SDK wasn't able to load its dependencies, the installer should be launched.

ERROR_CODE_LAST

Functions

SLSTEREO_EXPORT_DLL bool sl::saveDepthAs(sl::Camera & zed, sl::DEPTH_FORMAT format, s
Writes the current depth map into a file.

Return False if something wrong happen, else return true.

Parameters

- `zed`: : the current camera object.
- `format`: : the depth file format you desired.
- `name`: : the name (path) in which the depth will be saved.
- `factor`: : only for PNG and PGM, apply a gain to the depth value (default 1.). The maximum value is 65536, so you can set the Camera::setDepthClampValue to 20000 and give a factor to 3, Do not forget to scale (by 1./factor) the pixel value to get the real depth. The occlusions are represented by 0.

SLSTEREO_EXPORT_DLL bool sl::savePointCloudAs(sl::Camera & zed, sl::POINT_CLOUD_FORMA
Writes the current point cloud into a file.

Return False if something wrong happen, else return true.

Note The color is not saved for XYZ and VTK files.

Parameters

- `zed`: : the current camera object.
- `format`: : the point cloud file format you desired.
- `name`: : the name (path) in which the point cloud will be saved.
- `with_color`: : indicates if the color must be saved (default false). Not available for XYZ and VTK.
- `keep_occluded_point`: : indicates if the non available data should be saved and set to 0 (default false), if set to true this give a Point Cloud with a size = height * width.

MEM **`operator|`** (*MEM a*, *MEM b*)

static cudaError **`__cudaSafeCall`** (cudaError *err*, **const** char **func*, **const** char **file*, **const** int *line*)

static *std*::string **`errorCode2str`** (*ERROR_CODE err*)

void **`sleep_ms`** (int *time*)

Tells the program to wait for x ms.

Parameters

- `time`: : the number of ms to wait.

template <**typename** T>
std::ostream &**`operator<<`** (*std*::ostream &*os*, **const** Vector2<T> &*v2*)

template <**typename** T>
std::ostream &**`operator<<`** (*std*::ostream &*os*, **const** Vector3<T> &*v3*)

template <**typename** T>
std::ostream &**`operator<<`** (*std*::ostream &*os*, **const** Vector4<T> &*v4*)

Variables

class SL_CORE_EXPORT_DLL **`Rotation`**

class SL_CORE_EXPORT_DLL **`Translation`**

class SL_CORE_EXPORT_DLL **`Orientation`**

class SL_CORE_EXPORT_DLL **`Transform`**

std::vector<*std*::pair<int, int>> **`cameraResolution`** = [] { std::vector<std::pair<int, int>> v; v.emplace_back(2208, 1242); v.e

Available video modes for the ZED camera

namespace `SpeakerDetect`

```
@package SpeakerDetect
1. Face is received from the Facedetect module
2. The speaking algorithm tries to identify speaking
3. returns a dict of people who speak and their ID
```

Functions

`DetectSpeaker` (*FacepointQueue FacepointQueue*, *SpeakerQueue SpeakerQueue*, *FrameQueue FrameQueue*, *VisualQueue VisualQueue*)

namespace `std`

namespace `TransformCoordinates`

Functions

coordinate_transform (*x_camera x_camera*, *y_camera y_camera*, *z z*)

namespace **Visualizer**

```
@package RecogniseFace
This is currently not used. We need to figure out way to synchronize image access␣
↪across different processes.
1. One place used to visualization.
```

Functions

StartVisualization (*CameraQueue CameraQueue*, *RectQueue RectQueue*, *FacePointQueue FacePointQueue*, *SpeakerQueue SpeakerQueue*, *FrameQueue FrameQueue*, *VisualQueue VisualQueue*)

namespace **voc_label**

Functions

convert (*size size*, *box box*)

convert_annotation (*year year*, *image_id image_id*)

Variables

list voc_label.sets = [(‘2012’, ‘train’), (‘2012’, ‘val’), (‘2007’, ‘train’), (‘2007’, ‘val’), (‘2007’, ‘test’)]

list voc_label.classes = [”aeroplane”, “bicycle”, “bird”, “boat”, “bottle”, “bus”, “car”, “cat”, “chair”, “cow”, “diningta

wd = getcwd()

image_ids = open(‘VOCdevkit/VOC%s/ImageSets/Main/%s.txt’%(year, image_set)).read().strip().split()

list_file = open(‘%s_%s.txt’%(year, image_set), ‘w’)

namespace **zedRoboy**

Functions

load_meta (*f f*)

load_net (*cfg cfg*, *weights weights*)

load_img (*f f*)

letterbox_img (*im im*, *w w*, *h h*)

predict (*net net*, *im im*)

classify (*net net*, *meta meta*, *im im*)

detect (*net net*, *meta meta*, *im im*)

Variables

lib = CDLL("/usr/local/.so", RTLD_GLOBAL)

net = load_net("cfg/densenet.cfg", "/home/pjreddie/trained/densenet201.weights")

im = load_img("data/wolf.jpg")

meta = load_meta("cfg/imagenet1k.data")

r = classify(net, meta, im)

file **goal.txt**

file **make_labels.py**

file **DescribeSceneSrv.py**

file **FaceDetect.py**

file **FindObjectSrv.py**

file **FreezeModel.py**

file **multiprocess.py**

file **Multitracking.py**

file **NewFacialFeaturesMsg.py**

file **ObjectRecognition.py**

file **art.c**
#include "darknet.h"#include <sys/time.h>

Functions

void **demo_art** (char **cfgfile*, char **weightfile*, int *cam_index*)

void **run_art** (int *argc*, char ***argv*)

file **captcha.c**
#include "darknet.h"

Functions

void **fix_data_captcha** (*data* *d*, int *mask*)

void **train_captcha** (char **cfgfile*, char **weightfile*)

void **test_captcha** (char **cfgfile*, char **weightfile*, char **filename*)

void **valid_captcha** (char **cfgfile*, char **weightfile*, char **filename*)

void **run_captcha** (int *argc*, char ***argv*)

file **cifar.c**
#include "darknet.h"

Functions

void **`train_cifar`**(char **cfgfile*, char **weightfile*)

void **`train_cifar_distill`**(char **cfgfile*, char **weightfile*)

void **`test_cifar_multi`**(char **filename*, char **weightfile*)

void **`test_cifar`**(char **filename*, char **weightfile*)

void **`extract_cifar`**()

void **`test_cifar_csv`**(char **filename*, char **weightfile*)

void **`test_cifar_csvtrain`**(char **filename*, char **weightfile*)

void **`eval_cifar_csv`**()

void **`run_cifar`**(int *argc*, char ***argv*)

file **`classifier.c`**

#include "darknet.h"#include <sys/time.h>#include <assert.h>

Functions

float ***`get_regression_values`**(char ***labels*, int *n*)

void **`train_classifier`**(char **datacfg*, char **cfgfile*, char **weightfile*, int **gpus*, int *ngpus*, int *clear*)

void **`validate_classifier_crop`**(char **datacfg*, char **filename*, char **weightfile*)

void **`validate_classifier_10`**(char **datacfg*, char **filename*, char **weightfile*)

void **`validate_classifier_full`**(char **datacfg*, char **filename*, char **weightfile*)

void **`validate_classifier_single`**(char **datacfg*, char **filename*, char **weightfile*)

void **`validate_classifier_multi`**(char **datacfg*, char **filename*, char **weightfile*)

void **`try_classifier`**(char **datacfg*, char **cfgfile*, char **weightfile*, char **filename*, int *layer_num*)

void **`predict_classifier`**(char **datacfg*, char **cfgfile*, char **weightfile*, char **filename*, int *top*)

void **`label_classifier`**(char **datacfg*, char **filename*, char **weightfile*)

void **`test_classifier`**(char **datacfg*, char **cfgfile*, char **weightfile*, int *target_layer*)

void **`threat_classifier`**(char **datacfg*, char **cfgfile*, char **weightfile*, int *cam_index*, **const** char **filename*)

void **`gun_classifier`**(char **datacfg*, char **cfgfile*, char **weightfile*, int *cam_index*, **const** char **filename*)

void **`demo_classifier`**(char **datacfg*, char **cfgfile*, char **weightfile*, int *cam_index*, **const** char **filename*)

void **`run_classifier`**(int *argc*, char ***argv*)

file **`coco.c`**

#include "darknet.h"#include <stdio.h>

Functions

void **train_coco** (char **cfgfile*, char **weightfile*)

void **print_cocos** (FILE **fp*, int *image_id*, box **boxes*, float ***probs*, int *num_boxes*, int *classes*, int *w*, int *h*)

int **get_coco_image_id** (char **filename*)

void **validate_coco** (char **cfgfile*, char **weightfile*)

void **validate_coco_recall** (char **cfgfile*, char **weightfile*)

void **test_coco** (char **cfgfile*, char **weightfile*, char **filename*, float *thresh*)

void **run_coco** (int *argc*, char ***argv*)

Variables

char ***coco_classes**[] = {“person”,”bicycle”,”car”,”motorcycle”,”airplane”,”bus”,”train”,”truck”,”boat”,”traffic light”,”fire hyc

int **coco_ids**[] = {1,2,3,4,5,6,7,8,9,10,11,13,14,15,16,17,18,19,20,21,22,23,24,25,27,28,31,32,33,34,35,36,37,38,39,40,41,42,4

file **darknet.c**

#include “darknet.h”#include <time.h>#include <stdlib.h>#include <stdio.h>

Functions

void **predict_classifier** (char **datacfg*, char **cfgfile*, char **weightfile*, char **filename*, int *top*)

void **test_detector** (char **datacfg*, char **cfgfile*, char **weightfile*, char **filename*, float *thresh*, float *hier_thresh*, char **outfile*, int *fullscreen*)

void **run_voxel** (int *argc*, char ***argv*)

void **run_yolo** (int *argc*, char ***argv*)

void **run_detector** (int *argc*, char ***argv*)

void **run_coco** (int *argc*, char ***argv*)

void **run_writing** (int *argc*, char ***argv*)

void **run_captcha** (int *argc*, char ***argv*)

void **run_nightmare** (int *argc*, char ***argv*)

void **run_dice** (int *argc*, char ***argv*)

void **run_compare** (int *argc*, char ***argv*)

void **run_classifier** (int *argc*, char ***argv*)

void **run_regressor** (int *argc*, char ***argv*)

void **run_segmenter** (int *argc*, char ***argv*)

void **run_char_rnn** (int *argc*, char ***argv*)

void **run_vid_rnn** (int *argc*, char ***argv*)

void **run_tag** (int *argc*, char ***argv*)

void **run_cifar** (int *argc*, char ***argv*) void **run_go** (int *argc*, char ***argv*)

void **run_art** (int *argc*, char ***argv*)

void **run_super** (int *argc*, char ***argv*)

void **run_lsd** (int *argc*, char ***argv*)

void **average** (int *argc*, char **argv*[])

void **speed** (char **cfgfile*, int *tics*)

void **operations** (char **cfgfile*)

void **oneoff** (char **cfgfile*, char **weightfile*, char **outfile*)

void **oneoff2** (char **cfgfile*, char **weightfile*, char **outfile*, int *l*)

void **partial** (char **cfgfile*, char **weightfile*, char **outfile*, int *max*)

void **rescale_net** (char **cfgfile*, char **weightfile*, char **outfile*)

void **rgbgr_net** (char **cfgfile*, char **weightfile*, char **outfile*)

void **reset_normalize_net** (char **cfgfile*, char **weightfile*, char **outfile*)

layer **normalize_layer** (*layer l*, int *n*)

void **normalize_net** (char **cfgfile*, char **weightfile*, char **outfile*)

void **statistics_net** (char **cfgfile*, char **weightfile*)

void **denormalize_net** (char **cfgfile*, char **weightfile*, char **outfile*)

void **mkimg** (char **cfgfile*, char **weightfile*, int *h*, int *w*, int *num*, char **prefix*)

void **visualize** (char **cfgfile*, char **weightfile*)

int **main** (int *argc*, char ***argv*)

file **detector.c**

#include "darknet.h"

Functions

void **train_detector** (char **datacfg*, char **cfgfile*, char **weightfile*, int **gpus*, int *ngpus*, int *clear*)

static int **get_coco_image_id** (char **filename*)

static void **print_cocos** (FILE **fp*, char **image_path*, *box* **boxes*, float ***probs*, int *num_boxes*, int *classes*, int *w*, int *h*)

void **print_detector_detections** (FILE ***fps*, char **id*, *box* **boxes*, float ***probs*, int *total*, int *classes*, int *w*, int *h*)

void **print_imagenet_detections** (FILE **fp*, int *id*, *box* **boxes*, float ***probs*, int *total*, int *classes*, int *w*, int *h*)

void **validate_detector_flip** (char **datacfg*, char **cfgfile*, char **weightfile*, char **outfile*)

void **validate_detector** (char **datacfg*, char **cfgfile*, char **weightfile*, char **outfile*)

void **validate_detector_recall** (char **cfgfile*, char **weightfile*)

void **test_detector** (char **datacfg*, char **cfgfile*, char **weightfile*, char **filename*, float *thresh*, float *hier_thresh*, char **outfile*, int *fullscreen*)

void **run_detector** (int *argc*, char ***argv*)

Variables

int **coco_ids**[] = {1,2,3,4,5,6,7,8,9,10,11,13,14,15,16,17,18,19,20,21,22,23,24,25,27,28,31,32,33,34,35,36,37,38,39,40,41,42,4

file **dice.c**

#include "darknet.h"

Functions

void **train_dice** (char **cfgfile*, char **weightfile*)

void **validate_dice** (char **filename*, char **weightfile*)

void **test_dice** (char **cfgfile*, char **weightfile*, char **filename*)

void **run_dice** (int *argc*, char ***argv*)

Variables

char ***dice_labels**[] = {"face1","face2","face3","face4","face5","face6"}

file **go.c**

#include "darknet.h"#include <unistd.h>

Functions

char ***fgetgo** (FILE **fp*)

moves **load_go_moves** (char **filename*)

void **string_to_board** (char **s*, float **board*)

void **board_to_string** (char **s*, float **board*)

data **random_go_moves** (*moves m*, int *n*)

void **train_go** (char **cfgfile*, char **weightfile*, char **filename*, int **gpus*, int *ngpus*, int *clear*)

void **propagate_liberty** (float **board*, int **lib*, int **visited*, int *row*, int *col*, int *side*)

int ***calculate_liberties** (float **board*)

void **print_board** (FILE **stream*, float **board*, int *swap*, int **indexes*)

void **flip_board** (float **board*)

void **predict_move** (*network net*, float **board*, float **move*, int *multi*)

void **remove_connected** (float **b*, int **lib*, int *p*, int *r*, int *c*)

void **move_go** (float **b*, int *p*, int *r*, int *c*)

int **makes_safe_go** (float **b*, int **lib*, int *p*, int *r*, int *c*)

int **suicide_go** (float **b*, int *p*, int *r*, int *c*)

int **legal_go** (float **b*, char **ko*, int *p*, int *r*, int *c*)

int **generate_move** (*network net*, int *player*, float **board*, int *multi*, float *thresh*, float *temp*, char **ko*, int *print*)

void **valid_go** (char **cfgfile*, char **weightfile*, int *multi*, char **filename*) int **print_game** (float **board*, FILE **fp*)

void **engine_go** (char **filename*, char **weightfile*, int *multi*)

void **test_go** (char **cfg*, char **weights*, int *multi*)

float **score_game** (float **board*)

void **self_go** (char **filename*, char **weightfile*, char **f2*, char **w2*, int *multi*)

void **run_go** (int *argc*, char ***argv*)

Variables

int **inverted** = 1

int **noi** = 1

const int **nind** = 2

file **lsd.c**

#include "darknet.h"

Functions

void **test_dcgan** (char **cfgfile*, char **weightfile*)

void **dcgan_batch** (*network gnet*, *network anet*)

void **train_dcgan** (char **cfg*, char **weight*, char **acfg*, char **aweight*, int *clear*, int *display*, char **train_images*)

void **train_colorizer** (char **cfg*, char **weight*, char **acfg*, char **aweight*, int *clear*, int *display*)

void **test_lsd** (char **cfgfile*, char **weightfile*, char **filename*, int *gray*)

void **run_lsd** (int *argc*, char ***argv*)

file **nightmare.c**

#include "darknet.h"#include <math.h>

Functions

float **abs_mean** (float **x*, int *n*)

void **calculate_loss** (float **output*, float **delta*, int *n*, float *thresh*)

void **optimize_picture** (*network *net*, *image orig*, int *max_layer*, float *scale*, float *rate*, float *thresh*, int *norm*)

void **smooth** (*image recon*, *image update*, float *lambda*, int *num*)

void **reconstruct_picture** (*network net*, float **features*, *image recon*, *image update*, float *rate*, float *momentum*, float *lambda*, int *smooth_size*, int *iters*)

void **run_nightmare** (int *argc*, char ***argv*)

file **regressor.c**

#include "darknet.h"#include <sys/time.h>#include <assert.h>

Functions

void **train_regressor** (char **datacfg*, char **cfgfile*, char **weightfile*, int **gpus*, int *ngpus*, int *clear*)

void **predict_regressor** (char **cfgfile*, char **weightfile*, char **filename*)

void **demo_regressor** (char **datacfg*, char **cfgfile*, char **weightfile*, int *cam_index*, **const** char **filename*)

void **run_regressor** (int *argc*, char ***argv*)

file **rnn.c**

#include "darknet.h"#include <math.h>

Functions

int ***read_tokenized_data** (char **filename*, size_t **read*)

char ****read_tokens** (char **filename*, size_t **read*)

float_pair **get_rnn_token_data** (int **tokens*, size_t **offsets*, int *characters*, size_t *len*, int *batch*, int *steps*)

float_pair **get_rnn_data** (unsigned char **text*, size_t **offsets*, int *characters*, size_t *len*, int *batch*, int *steps*)

void **reset_rnn_state** (*network net*, int *b*)

void **train_char_rnn** (char **cfgfile*, char **weightfile*, char **filename*, int *clear*, int *tokenized*)

void **print_symbol** (int *n*, char ***tokens*)

void **test_char_rnn** (char **cfgfile*, char **weightfile*, int *num*, char **seed*, float *temp*, int *rseed*, char **token_file*)

void **test_tactic_rnn_multi** (char **cfgfile*, char **weightfile*, int *num*, float *temp*, int *rseed*, char **token_file*)

void **test_tactic_rnn** (char **cfgfile*, char **weightfile*, int *num*, float *temp*, int *rseed*, char **token_file*)

void **valid_tactic_rnn** (char **cfgfile*, char **weightfile*, char **seed*)

void **valid_char_rnn** (char **cfgfile*, char **weightfile*, char **seed*)

void **vec_char_rnn** (char **cfgfile*, char **weightfile*, char **seed*)

void **run_char_rnn** (int *argc*, char ***argv*)

file **rnn_vid.c**

#include "darknet.h"

Functions

void **run_vid_rnn** (int *argc*, char ***argv*)

file **segmenter.c**

#include "darknet.h"#include <sys/time.h>#include <assert.h>

Functions

void **train_segmenter**(char **datacfg*, char **cfgfile*, char **weightfile*, int **gpus*, int *ngpus*, int *clear*, int *display*)

void **predict_segmenter**(char **datafile*, char **cfgfile*, char **weightfile*, char **filename*)

void **demo_segmenter**(char **datacfg*, char **cfgfile*, char **weightfile*, int *cam_index*, **const** char **filename*)

void **run_segmenter**(int *argc*, char ***argv*)

file **super.c**

#include "darknet.h"

Functions

void **train_super**(char **cfgfile*, char **weightfile*, int *clear*)

void **test_super**(char **cfgfile*, char **weightfile*, char **filename*)

void **run_super**(int *argc*, char ***argv*)

file **swag.c**

#include "darknet.h"#include <sys/time.h>

Functions

void **train_swag**(char **cfgfile*, char **weightfile*)

void **run_swag**(int *argc*, char ***argv*)

file **tag.c**

#include "darknet.h"

Functions

void **train_tag**(char **cfgfile*, char **weightfile*, int *clear*)

void **test_tag**(char **cfgfile*, char **weightfile*, char **filename*)

void **run_tag**(int *argc*, char ***argv*)

file **voxel.c**

#include "darknet.h"

Functions

void **extract_voxel**(char **lfile*, char **rfile*, char **prefix*)

void **train_voxel**(char **cfgfile*, char **weightfile*)

void **test_voxel**(char **cfgfile*, char **weightfile*, char **filename*)

void **run_voxel**(int *argc*, char ***argv*)

file **writing.c**

#include "darknet.h"

Functions

void **train_writing**(char **cfgfile*, char **weightfile*)

void **test_writing**(char **cfgfile*, char **weightfile*, char **filename*)

void **run_writing**(int *argc*, char ***argv*)

file **yolo.c**

#include "darknet.h"

Functions

void **train_yolo**(char **cfgfile*, char **weightfile*)

void **print_yolo_detections**(FILE ***fps*, char **id*, *box* **boxes*, float ***probs*, int *total*, int *classes*, int *w*, int *h*)

void **validate_yolo**(char **cfgfile*, char **weightfile*)

void **validate_yolo_recall**(char **cfgfile*, char **weightfile*)

void **test_yolo**(char **cfgfile*, char **weightfile*, char **filename*, float *thresh*)

void **run_yolo**(int *argc*, char ***argv*)

Variables

char ***voc_names**[] = {"aeroplane", "bicycle", "bird", "boat", "bottle", "bus", "car", "cat", "chair", "cow", "diningtable", "dog'

file **darknet.h**

#include <stdlib.h>#include <stdio.h>#include <string.h>#include <pthread.h>

Defines

SECRET_NUM

Typedefs

typedef struct *network* **network**

typedef struct *layer* **layer**

typedef struct *matrix* **matrix**

typedef struct *load_args* **load_args**

typedef struct *node* **node**

typedef struct *list* **list**

Enums

enum ACTIVATION

Values:

LOGISTIC

RELU

RELIE

LINEAR

RAMP

TANH

PLSE

LEAKY

ELU

LOGGY

STAIR

HARDTAN

LHTAN

enum LAYER_TYPE

Values:

CONVOLUTIONAL

DECONVOLUTIONAL

CONNECTED

MAXPOOL

SOFTMAX

DETECTION

DROPOUT

CROP

ROUTE

COST

NORMALIZATION

AVGPOOL

LOCAL

SHORTCUT

ACTIVE

RNN

GRU

LSTM

CRNN

BATCHNORM

NETWORK

XNOR

REGION

REORG

BLANK

enum COST_TYPE

Values:

SSE

MASKED

L1

SEG

SMOOTH

enum learning_rate_policy

Values:

CONSTANT

STEP

EXP

POLY

STEPS

SIG

RANDOM

enum data_type

Values:

CLASSIFICATION_DATA

DETECTION_DATA

CAPTCHA_DATA

REGION_DATA

IMAGE_DATA

COMPARE_DATA

WRITING_DATA

SWAG_DATA

TAG_DATA

OLD_CLASSIFICATION_DATA

STUDY_DATA

DET_DATA

`SUPER_DATA`

`LETTERBOX_DATA`

`REGRESSION_DATA`

`SEGMENTATION_DATA`

`INSTANCE_DATA`

Functions

metadata **`get_metadata`** (char **file*)

void **`free_layer`** (*layer*)

network **`load_network`** (char **cfg*, char **weights*, int *clear*)

network ***`load_network_p`** (char **cfg*, char **weights*, int *clear*)

load_args **`get_base_args`** (*network net*)

void **`free_data`** (*data d*)

pthread_t **`load_data`** (*load_args args*)

list ***`read_data_cfg`** (char **filename*)

list ***`read_cfg`** (char **filename*)

void **`forward_network`** (*network net*)

void **`backward_network`** (*network net*)

void **`update_network`** (*network net*)

void **`axpy_cpu`** (int *N*, float *ALPHA*, float **X*, int *INCX*, float **Y*, int *INCY*)

void **`copy_cpu`** (int *N*, float **X*, int *INCX*, float **Y*, int *INCY*)

void **`scal_cpu`** (int *N*, float *ALPHA*, float **X*, int *INCX*)

void **`normalize_cpu`** (float **x*, float **mean*, float **variance*, int *batch*, int *filters*, int *spatial*)

int **`best_3d_shift_r`** (*image a*, *image b*, int *min*, int *max*)

void **`save_image_png`** (*image im*, **const** char **name*)

void **`get_next_batch`** (*data d*, int *n*, int *offset*, float **X*, float **y*)

void **`grayscale_image_3c`** (*image im*)

void **`normalize_image`** (*image p*)

void **`matrix_to_csv`** (*matrix m*)

float **`train_network_sgd`** (*network net*, *data d*, int *n*)

void **`rgbgr_image`** (*image im*)

data **`copy_data`** (*data d*)

data **`concat_data`** (*data d1*, *data d2*)

data **`load_cifar10_data`** (char **filename*)

float **`matrix_topk_accuracy`** (*matrix truth*, *matrix guess*, int *k*)

void **`matrix_add_matrix`** (*matrix from*, *matrix to*) void **scale_matrix** (*matrix m*, float *scale*)

matrix **csv_to_matrix** (char **filename*)

float ***network_accuracies** (*network net*, *data d*, int *n*)

float **train_network_datum** (*network net*)

image **make_random_image** (int *w*, int *h*, int *c*)

void **denormalize_connected_layer** (*layer l*)

void **denormalize_convolutional_layer** (*layer l*)

void **statistics_connected_layer** (*layer l*)

void **rescale_weights** (*layer l*, float *scale*, float *trans*)

void **rgbgr_weights** (*layer l*)

image ***get_weights** (*layer l*)

void **demo** (char **cfgfile*, char **weightfile*, float *thresh*, int *cam_index*, **const** char **filename*, char ***names*, int *classes*, int *frame_skip*, char **prefix*, int *avg*, float *hier_thresh*, int *w*, int *h*, int *fps*, int *fullscreen*)

void **get_detection_boxes** (*layer l*, int *w*, int *h*, float *thresh*, float ***probs*, *box *boxes*, int *only_objectness*)

char ***option_find_str** (*list *l*, char **key*, char **def*)

int **option_find_int** (*list *l*, char **key*, int *def*)

network **parse_network_cfg** (char **filename*)

void **save_weights** (*network net*, char **filename*)

void **load_weights** (*network *net*, char **filename*)

void **save_weights_upto** (*network net*, char **filename*, int *cutoff*)

void **load_weights_upto** (*network *net*, char **filename*, int *start*, int *cutoff*)

void **zero_objectness** (*layer l*)

void **get_region_boxes** (*layer l*, int *w*, int *h*, int *netw*, int *neth*, float *thresh*, float ***probs*, *box *boxes*, float ***masks*, int *only_objectness*, int **map*, float *tree_thresh*, int *relative*)

void **free_network** (*network net*)

void **set_batch_network** (*network *net*, int *b*)

image **load_image** (char **filename*, int *w*, int *h*, int *c*)

image **load_image_color** (char **filename*, int *w*, int *h*)

image **make_image** (int *w*, int *h*, int *c*)

image **resize_image** (*image im*, int *w*, int *h*)

image **letterbox_image** (*image im*, int *w*, int *h*)

image **crop_image** (*image im*, int *dx*, int *dy*, int *w*, int *h*)

image **resize_min** (*image im*, int *min*)

image **threshold_image** (*image im*, float *thresh*)

image **mask_to_rgb** (*image mask*)

int **resize_network** (*network *net*, int *w*, int *h*) void **free_matrix** (*matrix m*)

void **test_resize** (char **filename*)

void **save_image** (*image p*, **const** char **name*)

void **show_image** (*image p*, **const** char **name*)

image **copy_image** (*image p*)

void **draw_box_width** (*image a*, int *x1*, int *y1*, int *x2*, int *y2*, int *w*, float *r*, float *g*, float *b*)

float **get_current_rate** (*network net*)

void **composite_3d** (char **f1*, char **f2*, char **out*, int *delta*)

data **load_data_old** (char ***paths*, int *n*, int *m*, char ***labels*, int *k*, int *w*, int *h*)

size_t **get_current_batch** (*network net*)

void **constrain_image** (*image im*)

image **get_network_image_layer** (*network net*, int *i*)

layer **get_network_output_layer** (*network net*)

void **top_predictions** (*network net*, int *n*, int **index*)

void **flip_image** (*image a*)

image **float_to_image** (int *w*, int *h*, int *c*, float **data*)

void **ghost_image** (*image source*, *image dest*, int *dx*, int *dy*)

float **network_accuracy** (*network net*, *data d*)

void **random_distort_image** (*image im*, float *hue*, float *saturation*, float *exposure*)

void **fill_image** (*image m*, float *s*)

image **grayscale_image** (*image im*)

void **rotate_image_cw** (*image im*, int *times*)

double **what_time_is_it_now** ()

image **rotate_image** (*image m*, float *rad*)

void **visualize_network** (*network net*)

float **box_iou** (*box a*, *box b*)

void **do_nms** (*box* **boxes*, float ***probs*, int *total*, int *classes*, float *thresh*)

data **load_all_cifar10** ()

box_label ***read_boxes** (char **filename*, int **n*)

box **float_to_box** (float **f*, int *stride*)

void **draw_detections** (*image im*, int *num*, float *thresh*, *box* **boxes*, float ***probs*, float ***masks*, char ***names*, *image* ***alphabet*, int *classes*)

matrix **network_predict_data** (*network net*, *data test*)

image ****load_alphabet** ()

image **get_network_image** (*network net*)

float ***network_predict** (*network net*, float **input*)

float ***network_predict_p** (*network* **net*, float **input*) int network_width (network *net)

int network_height (network *net)

float *network_predict_image (network *net, image im)

char **get_labels (char *filename)

void do_nms_sort (box *boxes, float **probs, int total, int classes, float thresh)

void do_nms_obj (box *boxes, float **probs, int total, int classes, float thresh)

matrix make_matrix (int rows, int cols)

void free_image (image m)

float train_network (network net, data d)

pthread_t load_data_in_thread (load_args args)

void load_data_blocking (load_args args)

list *get_paths (char *filename)

void hierarchy_predictions (float *predictions, int n, tree *hier, int only_leaves, int stride)

void change_leaves (tree *t, char *leaf_list)

int find_int_arg (int argc, char **argv, char *arg, int def)

float find_float_arg (int argc, char **argv, char *arg, float def)

int find_arg (int argc, char *argv[], char *arg)

char *find_char_arg (int argc, char **argv, char *arg, char *def)

char *basecfg (char *cfgfile)

void find_replace (char *str, char *orig, char *rep, char *output)

void free_ptrs (void **ptrs, int n)

char *fgetl (FILE *fp)

void strip (char *s)

float sec (clock_t clocks)

void **list_to_array (list *l)

void top_k (float *a, int n, int k, int *index)

int *read_map (char *filename)

void error (const char *s)

int max_index (float *a, int n)

int sample_array (float *a, int n)

void free_list (list *l)

float mse_array (float *a, int n)

float variance_array (float *a, int n)

float mag_array (float *a, int n)

float mean_array (float *a, int n)

void normalize_array (float *a, int n)

int ***read_intlist**(char **s*, int **n*, int *d*)

size_t **rand_size_t**()

float **rand_normal**()

Variables

int **gpu_index**

file **darknet.py**

file **README.md**

file **README.md**

file **voc_label.py**

file **activation_layer.c**

#include "activation_layer.h"#include "utils.h"#include "cuda.h"#include "blas.h"#include "gemm.h"#include <math.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

layer **make_activation_layer**(int *batch*, int *inputs*, *ACTIVATION activation*)

void **forward_activation_layer**(*layer l*, *network net*)

void **backward_activation_layer**(*layer l*, *network net*)

file **activation_layer.h**

#include "activations.h"#include "layer.h"#include "network.h"

Functions

layer **make_activation_layer**(int *batch*, int *inputs*, *ACTIVATION activation*)

void **forward_activation_layer**(*layer l*, *network net*)

void **backward_activation_layer**(*layer l*, *network net*)

file **activations.c**

#include "activations.h"#include <math.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

char ***get_activation_string**(*ACTIVATION a*)

ACTIVATION **get_activation**(char **s*)

float **activate**(float *x*, *ACTIVATION a*)

void **activate_array**(float **x*, **const** int *n*, **const** *ACTIVATION a*)

float **gradient**(float *x*, *ACTIVATION a*)

void **gradient_array**(**const** float **x*, **const** int *n*, **const** *ACTIVATION a*, float **delta*)

file **activations.h**

#include "darknet.h"#include "cuda.h"#include "math.h"

Functions

ACTIVATION **get_activation** (char **s*)

char ***get_activation_string** (*ACTIVATION a*)

float **activate** (float *x*, *ACTIVATION a*)

float **gradient** (float *x*, *ACTIVATION a*)

void **gradient_array** (**const** float **x*, **const** int *n*, **const** *ACTIVATION a*, float **delta*)

void **activate_array** (float **x*, **const** int *n*, **const** *ACTIVATION a*)

static float **stair_activate** (float *x*)

static float **hardtan_activate** (float *x*)

static float **linear_activate** (float *x*)

static float **logistic_activate** (float *x*)

static float **loggy_activate** (float *x*)

static float **relu_activate** (float *x*)

static float **elu_activate** (float *x*)

static float **relie_activate** (float *x*)

static float **ramp_activate** (float *x*)

static float **leaky_activate** (float *x*)

static float **tanh_activate** (float *x*)

static float **plse_activate** (float *x*)

static float **lhtan_activate** (float *x*)

static float **lhtan_gradient** (float *x*)

static float **hardtan_gradient** (float *x*)

static float **linear_gradient** (float *x*)

static float **logistic_gradient** (float *x*)

static float **loggy_gradient** (float *x*)

static float **stair_gradient** (float *x*)

static float **relu_gradient** (float *x*)

static float **elu_gradient** (float *x*)

static float **relie_gradient** (float *x*)

static float **ramp_gradient** (float *x*)

static float **leaky_gradient** (float *x*)

static float **tanh_gradient** (float *x*)

static float **plse_gradient** (float *x*)

file **avgpool_layer.c**

#include "avgpool_layer.h"#include "cuda.h"#include <stdio.h>

Functions

avgpool_layer **make_avgpool_layer** (int *batch*, int *w*, int *h*, int *c*)

void **resize_avgpool_layer** (*avgpool_layer* **l*, int *w*, int *h*)

void **forward_avgpool_layer** (**const** *avgpool_layer l*, *network net*)

void **backward_avgpool_layer** (**const** *avgpool_layer l*, *network net*)

file **avgpool_layer.h**

#include "image.h"#include "cuda.h"#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **avgpool_layer**

Functions

image **get_avgpool_image** (*avgpool_layer l*)

avgpool_layer **make_avgpool_layer** (int *batch*, int *w*, int *h*, int *c*)

void **resize_avgpool_layer** (*avgpool_layer* **l*, int *w*, int *h*)

void **forward_avgpool_layer** (**const** *avgpool_layer l*, *network net*)

void **backward_avgpool_layer** (**const** *avgpool_layer l*, *network net*)

file **batchnorm_layer.c**

#include "convolutional_layer.h"#include "batchnorm_layer.h"#include "blas.h"#include <stdio.h>

Functions

layer **make_batchnorm_layer** (int *batch*, int *w*, int *h*, int *c*)

void **backward_scale_cpu** (float **x_norm*, float **delta*, int *batch*, int *n*, int *size*, float **scale_updates*)

void **mean_delta_cpu** (float **delta*, float **variance*, int *batch*, int *filters*, int *spatial*, float **mean_delta*)

void **variance_delta_cpu** (float **x*, float **delta*, float **mean*, float **variance*, int *batch*, int *filters*, int *spatial*, float **variance_delta*)

void **normalize_delta_cpu** (float **x*, float **mean*, float **variance*, float **mean_delta*, float **variance_delta*, int *batch*, int *filters*, int *spatial*, float **delta*)

void **resize_batchnorm_layer** (*layer* **layer*, int *w*, int *h*)

void **forward_batchnorm_layer** (*layer l*, *network net*)

void **backward_batchnorm_layer** (*layer l*, *network net*)

file **batchnorm_layer.h**

#include "image.h"#include "layer.h"#include "network.h"

Functions

layer **make_batchnorm_layer** (int *batch*, int *w*, int *h*, int *c*)

void **forward_batchnorm_layer** (*layer l*, *network net*)

void **backward_batchnorm_layer** (*layer l*, *network net*)

file **blas.c**

#include "blas.h"#include <math.h>#include <assert.h>#include <float.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

void **reorg_cpu** (float **x*, int *w*, int *h*, int *c*, int *batch*, int *stride*, int *forward*, float **out*)

void **flatten** (float **x*, int *size*, int *layers*, int *batch*, int *forward*)

void **weighted_sum_cpu** (float **a*, float **b*, float **s*, int *n*, float **c*)

void **weighted_delta_cpu** (float **a*, float **b*, float **s*, float **da*, float **db*, float **ds*, int *n*, float **dc*)

void **shortcut_cpu** (int *batch*, int *w1*, int *h1*, int *c1*, float **add*, int *w2*, int *h2*, int *c2*, float **out*)

void **mean_cpu** (float **x*, int *batch*, int *filters*, int *spatial*, float **mean*)

void **variance_cpu** (float **x*, float **mean*, int *batch*, int *filters*, int *spatial*, float **variance*)

void **normalize_cpu** (float **x*, float **mean*, float **variance*, int *batch*, int *filters*, int *spatial*)

void **const_cpu** (int *N*, float *ALPHA*, float **X*, int *INCX*)

void **mul_cpu** (int *N*, float **X*, int *INCX*, float **Y*, int *INCY*)

void **pow_cpu** (int *N*, float *ALPHA*, float **X*, int *INCX*, float **Y*, int *INCY*)

void **axpy_cpu** (int *N*, float *ALPHA*, float **X*, int *INCX*, float **Y*, int *INCY*)

void **scal_cpu** (int *N*, float *ALPHA*, float **X*, int *INCX*)

void **fill_cpu** (int *N*, float *ALPHA*, float **X*, int *INCX*)

void **deinter_cpu** (int *NX*, float **X*, int *NY*, float **Y*, int *B*, float **OUT*)

void **inter_cpu** (int *NX*, float **X*, int *NY*, float **Y*, int *B*, float **OUT*)

void **copy_cpu** (int *N*, float **X*, int *INCX*, float **Y*, int *INCY*)

void **mult_add_into_cpu** (int *N*, float **X*, float **Y*, float **Z*)

void **smooth_l1_cpu** (int *n*, float **pred*, float **truth*, float **delta*, float **error*)

void **l1_cpu** (int *n*, float **pred*, float **truth*, float **delta*, float **error*)

void **l2_cpu** (int *n*, float **pred*, float **truth*, float **delta*, float **error*)

float **dot_cpu** (int *N*, float **X*, int *INCX*, float **Y*, int *INCY*)

void **softmax** (float **input*, int *n*, float *temp*, int *stride*, float **output*)

void **softmax_cpu** (float **input*, int *n*, int *batch*, int *batch_offset*, int *groups*, int *group_offset*, int *stride*, float *temp*, float **output*)

file **blas.h**

#include "darknet.h"

Functions

void **flatten** (float *x, int size, int layers, int batch, int forward)

void **pm** (int M, int N, float *A)

float ***random_matrix** (int rows, int cols)

void **time_random_matrix** (int TA, int TB, int m, int k, int n)

void **reorg_cpu** (float *x, int w, int h, int c, int batch, int stride, int forward, float *out)

void **test_blas** ()

void **inter_cpu** (int NX, float *X, int NY, float *Y, int B, float *OUT)

void **deinter_cpu** (int NX, float *X, int NY, float *Y, int B, float *OUT)

void **mult_add_into_cpu** (int N, float *X, float *Y, float *Z)

void **const_cpu** (int N, float ALPHA, float *X, int INCX)

void **constrain_gpu** (int N, float ALPHA, float *X, int INCX)

void **pow_cpu** (int N, float ALPHA, float *X, int INCX, float *Y, int INCY)

void **mul_cpu** (int N, float *X, int INCX, float *Y, int INCY)

void **fill_cpu** (int N, float ALPHA, float *X, int INCX)

float **dot_cpu** (int N, float *X, int INCX, float *Y, int INCY)

int **test_gpu_blas** ()

void **shortcut_cpu** (int batch, int w1, int h1, int c1, float *add, int w2, int h2, int c2, float *out)

void **mean_cpu** (float *x, int batch, int filters, int spatial, float *mean)

void **variance_cpu** (float *x, float *mean, int batch, int filters, int spatial, float *variance)

void **scale_bias** (float *output, float *scales, int batch, int n, int size)

void **backward_scale_cpu** (float *x_norm, float *delta, int batch, int n, int size, float *scale_updates)

void **mean_delta_cpu** (float *delta, float *variance, int batch, int filters, int spatial, float *mean_delta)

void **variance_delta_cpu** (float *x, float *delta, float *mean, float *variance, int batch, int filters, int spatial, float *variance_delta)

void **normalize_delta_cpu** (float *x, float *mean, float *variance, float *mean_delta, float *variance_delta, int batch, int filters, int spatial, float *delta)

void **smooth_l1_cpu** (int n, float *pred, float *truth, float *delta, float *error)

void **l2_cpu** (int n, float *pred, float *truth, float *delta, float *error)

void **l1_cpu** (int n, float *pred, float *truth, float *delta, float *error)

void **weighted_sum_cpu** (float *a, float *b, float *s, int num, float *c)

void **weighted_delta_cpu** (float *a, float *b, float *s, float *da, float *db, float *ds, int n, float *dc)

void **softmax** (float *input, int n, float temp, int stride, float *output)

void **softmax_cpu** (float *input, int n, int batch, int batch_offset, int groups, int group_offset, int stride, float temp, float *output) *file* **box.c**

#include "box.h"#include <stdio.h>#include <math.h>#include <stdlib.h>

Functions

box **float_to_box** (float **f*, int *stride*)

dbox **derivative** (*box a*, *box b*)

float **overlap** (float *x1*, float *w1*, float *x2*, float *w2*)

float **box_intersection** (*box a*, *box b*)

float **box_union** (*box a*, *box b*)

float **box_iou** (*box a*, *box b*)

float **box_rmse** (*box a*, *box b*)

dbox **dintersect** (*box a*, *box b*)

dbox **dunion** (*box a*, *box b*)

void **test_dunion** ()

void **test_dintersect** ()

void **test_box** ()

dbox **diou** (*box a*, *box b*)

int **nms_comparator** (**const** void **pa*, **const** void **pb*)

void **do_nms_obj** (*box *boxes*, float ***probs*, int *total*, int *classes*, float *thresh*)

void **do_nms_sort** (*box *boxes*, float ***probs*, int *total*, int *classes*, float *thresh*)

void **do_nms** (*box *boxes*, float ***probs*, int *total*, int *classes*, float *thresh*)

box **encode_box** (*box b*, *box anchor*)

box **decode_box** (*box b*, *box anchor*)

file **box.h**

#include "darknet.h"

Functions

float **box_rmse** (*box a*, *box b*)

dbox **diou** (*box a*, *box b*)

box **decode_box** (*box b*, *box anchor*)

box **encode_box** (*box b*, *box anchor*)

file **classifier.h**

file **col2im.c**

#include <stdio.h>#include <math.h>

Functions

void **col2im_add_pixel**(float **im*, int *height*, int *width*, int *channels*, int *row*, int *col*, int *channel*, int *pad*, float *val*)

void **col2im_cpu**(float **data_col*, int *channels*, int *height*, int *width*, int *ksize*, int *stride*, int *pad*, float **data_im*)

file **col2im.h**

Functions

void **col2im_cpu**(float **data_col*, int *channels*, int *height*, int *width*, int *ksize*, int *stride*, int *pad*, float **data_im*)

file **compare.c**

#include <stdio.h>#include "network.h"#include "detection_layer.h"#include "cost_layer.h"#include "utils.h"#include "parser.h"#include "box.h"

Functions

void **train_compare**(char **cfgfile*, char **weightfile*)

void **validate_compare**(char **filename*, char **weightfile*)

int **elo_comparator**(**const** void **a*, **const** void **b*)

int **bbox_comparator**(**const** void **a*, **const** void **b*)

void **bbox_update**(*sortable_bbox* **a*, *sortable_bbox* **b*, int *class*, int *result*)

void **bbox_fight**(*network* *net*, *sortable_bbox* **a*, *sortable_bbox* **b*, int *classes*, int *class*)

void **SortMaster3000**(char **filename*, char **weightfile*)

void **BattleRoyaleWithCheese**(char **filename*, char **weightfile*)

void **run_compare**(int *argc*, char ***argv*)

Variables

int **total_compares** = 0

int **current_class** = 0

file **connected_layer.c**

#include "connected_layer.h"#include "convolutional_layer.h"#include "batchnorm_layer.h"#include "utils.h"#include "cuda.h"#include "blas.h"#include "gemm.h"#include <math.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

layer **make_connected_layer**(int *batch*, int *inputs*, int *outputs*, *ACTIVATION* *activation*, int *batch_normalize*, int *adam*)

void **update_connected_layer**(*layer* *l*, *update_args* *a*)

void **forward_connected_layer**(*layer* *l*, *network* *net*) void **backward_connected_layer** (*layer l*, *network net*)

void **denormalize_connected_layer** (*layer l*)

void **statistics_connected_layer** (*layer l*)

file **connected_layer.h**

#include "activations.h"#include "layer.h"#include "network.h"

Functions

layer **make_connected_layer** (int *batch*, int *inputs*, int *outputs*, *ACTIVATION activation*, int *batch_normalize*, int *adam*)

void **forward_connected_layer** (*layer l*, *network net*)

void **backward_connected_layer** (*layer l*, *network net*)

void **update_connected_layer** (*layer l*, *update_args a*)

file **convolutional_layer.c**

#include "convolutional_layer.h"#include "utils.h"#include "batchnorm_layer.h"#include "im2col.h"#include "col2im.h"#include "blas.h"#include "gemm.h"#include <stdio.h>#include <time.h>

Functions

void **swap_binary** (*convolutional_layer *l*)

void **binarize_weights** (float **weights*, int *n*, int *size*, float **binary*)

void **binarize_cpu** (float **input*, int *n*, float **binary*)

void **binarize_input** (float **input*, int *n*, int *size*, float **binary*)

int **convolutional_out_height** (*convolutional_layer l*)

int **convolutional_out_width** (*convolutional_layer l*)

image **get_convolutional_image** (*convolutional_layer l*)

image **get_convolutional_delta** (*convolutional_layer l*)

static size_t **get_workspace_size** (*layer l*)

convolutional_layer **make_convolutional_layer** (int *batch*, int *h*, int *w*, int *c*, int *n*, int *size*, int *stride*, int *padding*, *ACTIVATION activation*, int *batch_normalize*, int *binary*, int *xnor*, int *adam*)

void **denormalize_convolutional_layer** (*convolutional_layer l*)

void **resize_convolutional_layer** (*convolutional_layer *l*, int *w*, int *h*)

void **add_bias** (float **output*, float **biases*, int *batch*, int *n*, int *size*)

void **scale_bias** (float **output*, float **scales*, int *batch*, int *n*, int *size*)

void **backward_bias** (float **bias_updates*, float **delta*, int *batch*, int *n*, int *size*)

void **forward_convolutional_layer** (*convolutional_layer l*, *network net*)

void **backward_convolutional_layer** (*convolutional_layer l*, *network net*)

void **update_convolutional_layer** (*convolutional_layer l*, *update_args a*) *image* **get_convolutional_weight** (*convolutional_layer l*, int *i*)

void **rgbgr_weights** (*convolutional_layer l*)

void **rescale_weights** (*convolutional_layer l*, float *scale*, float *trans*)

image ***get_weights** (*convolutional_layer l*)

image ***visualize_convolutional_layer** (*convolutional_layer l*, char **window*, *image* **prev_weights*)

file **convolutional_layer.h**

#include "cuda.h"#include "image.h"#include "activations.h"#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **convolutional_layer**

Functions

convolutional_layer **make_convolutional_layer** (int *batch*, int *h*, int *w*, int *c*, int *n*, int *size*, int *stride*, int *padding*, *ACTIVATION activation*, int *batch_normalize*, int *binary*, int *xnor*, int *adam*)

void **resize_convolutional_layer** (*convolutional_layer* **layer*, int *w*, int *h*)

void **forward_convolutional_layer** (**const** *convolutional_layer layer*, *network net*)

void **update_convolutional_layer** (*convolutional_layer layer*, *update_args a*)

image ***visualize_convolutional_layer** (*convolutional_layer layer*, char **window*, *image* **prev_weights*)

void **binarize_weights** (float **weights*, int *n*, int *size*, float **binary*)

void **swap_binary** (*convolutional_layer* **l*)

void **binarize_weights2** (float **weights*, int *n*, int *size*, char **binary*, float **scales*)

void **backward_convolutional_layer** (*convolutional_layer layer*, *network net*)

void **add_bias** (float **output*, float **biases*, int *batch*, int *n*, int *size*)

void **backward_bias** (float **bias_updates*, float **delta*, int *batch*, int *n*, int *size*)

image **get_convolutional_image** (*convolutional_layer layer*)

image **get_convolutional_delta** (*convolutional_layer layer*)

image **get_convolutional_weight** (*convolutional_layer layer*, int *i*)

int **convolutional_out_height** (*convolutional_layer layer*)

int **convolutional_out_width** (*convolutional_layer layer*)

file **cost_layer.c**

#include "cost_layer.h"#include "utils.h"#include "cuda.h"#include "blas.h"#include <math.h>#include <string.h>#include <stdlib.h>#include <stdio.h>

Functions

COST_TYPE **get_cost_type**(char **s*)

char ***get_cost_string**(*COST_TYPE a*)

cost_layer **make_cost_layer**(int *batch*, int *inputs*, *COST_TYPE cost_type*, float *scale*)

void **resize_cost_layer**(*cost_layer* **l*, int *inputs*)

void **forward_cost_layer**(*cost_layer l*, *network net*)

void **backward_cost_layer**(**const** *cost_layer l*, *network net*)

file **cost_layer.h**

#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **cost_layer**

Functions

COST_TYPE **get_cost_type**(char **s*)

char ***get_cost_string**(*COST_TYPE a*)

cost_layer **make_cost_layer**(int *batch*, int *inputs*, *COST_TYPE type*, float *scale*)

void **forward_cost_layer**(**const** *cost_layer l*, *network net*)

void **backward_cost_layer**(**const** *cost_layer l*, *network net*)

void **resize_cost_layer**(*cost_layer* **l*, int *inputs*)

file **crnn_layer.c**

#include "crnn_layer.h"#include "convolutional_layer.h"#include "utils.h"#include "cuda.h"#include "blas.h"#include "gemm.h"#include <math.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

static void **increment_layer**(*layer* **l*, int *steps*)

layer **make_crnn_layer**(int *batch*, int *h*, int *w*, int *c*, int *hidden_filters*, int *output_filters*, int *steps*, *ACTIVATION activation*, int *batch_normalize*)

void **update_crnn_layer**(*layer l*, *update_args a*)

void **forward_crnn_layer**(*layer l*, *network net*)

void **backward_crnn_layer**(*layer l*, *network net*)

file **crnn_layer.h**

#include "activations.h"#include "layer.h"#include "network.h"

Functions

layer **make_crnn_layer** (int *batch*, int *h*, int *w*, int *c*, int *hidden_filters*, int *output_filters*, int *steps*, *ACTIVATION activation*, int *batch_normalize*)

void **forward_crnn_layer** (*layer l*, *network net*)

void **backward_crnn_layer** (*layer l*, *network net*)

void **update_crnn_layer** (*layer l*, *update_args a*)

file **crop_layer.c**

#include "crop_layer.h"#include "cuda.h"#include <stdio.h>

Functions

image **get_crop_image** (*crop_layer l*)

void **backward_crop_layer** (**const** *crop_layer l*, *network net*)

void **backward_crop_layer_gpu** (**const** *crop_layer l*, *network net*)

crop_layer **make_crop_layer** (int *batch*, int *h*, int *w*, int *c*, int *crop_height*, int *crop_width*, int *flip*, float *angle*, float *saturation*, float *exposure*)

void **resize_crop_layer** (*layer *l*, int *w*, int *h*)

void **forward_crop_layer** (**const** *crop_layer l*, *network net*)

file **crop_layer.h**

#include "image.h"#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **crop_layer**

Functions

image **get_crop_image** (*crop_layer l*)

crop_layer **make_crop_layer** (int *batch*, int *h*, int *w*, int *c*, int *crop_height*, int *crop_width*, int *flip*, float *angle*, float *saturation*, float *exposure*)

void **forward_crop_layer** (**const** *crop_layer l*, *network net*)

void **resize_crop_layer** (*layer *l*, int *w*, int *h*)

file **cuda.c**

Variables

int **gpu_index** = 0

file **cuda.h**

#include "darknet.h"

file **data.c**

#include "data.h"#include "utils.h"#include "image.h"#include "cuda.h"#include <stdio.h>#include <stdlib.h>#include <string.h>

Defines

NUMCHARS

Functions

list ***get_paths** (char **filename*)

char ****get_random_paths** (char ***paths*, int *n*, int *m*)

char ****find_replace_paths** (char ***paths*, int *n*, char **find*, char **replace*)

matrix **load_image_paths_gray** (char ***paths*, int *n*, int *w*, int *h*)

matrix **load_image_paths** (char ***paths*, int *n*, int *w*, int *h*)

matrix **load_image_augment_paths** (char ***paths*, int *n*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*, int *center*)

box_label ***read_boxes** (char **filename*, int **n*)

void **randomize_boxes** (*box_label* **b*, int *n*)

void **correct_boxes** (*box_label* **boxes*, int *n*, float *dx*, float *dy*, float *sx*, float *sy*, int *flip*)

void **fill_truth_swag** (char **path*, float **truth*, int *classes*, int *flip*, float *dx*, float *dy*, float *sx*, float *sy*)

void **fill_truth_region** (char **path*, float **truth*, int *classes*, int *num_boxes*, int *flip*, float *dx*, float *dy*, float *sx*, float *sy*)

void **load_rle** (*image im*, int **rle*, int *n*)

void **or_image** (*image src*, *image dest*, int *c*)

void **exclusive_image** (*image src*)

box **bound_image** (*image im*)

void **fill_truth_iseg** (char **path*, int *num_boxes*, float **truth*, int *classes*, int *w*, int *h*, *augment_args aug*, int *flip*, int *mw*, int *mh*)

void **fill_truth_detection** (char **path*, int *num_boxes*, float **truth*, int *classes*, int *flip*, float *dx*, float *dy*, float *sx*, float *sy*)

void **print_letters** (float **pred*, int *n*)

void **fill_truth_captcha** (char **path*, int *n*, float **truth*)

data **load_data_captcha** (char ***paths*, int *n*, int *m*, int *k*, int *w*, int *h*)

data **load_data_captcha_encode** (char ***paths*, int *n*, int *m*, int *w*, int *h*)

void **fill_truth** (char **path*, char ***labels*, int *k*, float **truth*)

void **fill_hierarchy** (float **truth*, int *k*, *tree* **hierarchy*)

matrix **load_regression_labels_paths** (char ***paths*, int *n*)

matrix **load_labels_paths** (char ***paths*, int *n*, char ***labels*, int *k*, *tree* **hierarchy*) *matrix* **load_tags_paths** (char ***paths*, int *n*, int *k*)

char ****get_labels** (char **filename*)

void **free_data** (*data d*)

image **get_segmentation_image** (char **path*, int *w*, int *h*, int *classes*)

image **get_segmentation_image2** (char **path*, int *w*, int *h*, int *classes*)

data **load_data_seg** (int *n*, char ***paths*, int *m*, int *w*, int *h*, int *classes*, int *min*, int *max*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*, int *div*)

data **load_data_iseg** (int *n*, char ***paths*, int *m*, int *w*, int *h*, int *classes*, int *boxes*, int *coords*, int *min*, int *max*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*)

data **load_data_region** (int *n*, char ***paths*, int *m*, int *w*, int *h*, int *size*, int *classes*, float *jitter*, float *hue*, float *saturation*, float *exposure*)

data **load_data_compare** (int *n*, char ***paths*, int *m*, int *classes*, int *w*, int *h*)

data **load_data_swag** (char ***paths*, int *n*, int *classes*, float *jitter*)

data **load_data_detection** (int *n*, char ***paths*, int *m*, int *w*, int *h*, int *boxes*, int *classes*, float *jitter*, float *hue*, float *saturation*, float *exposure*)

void ***load_thread** (void **ptr*)

pthread_t **load_data_in_thread** (*load_args args*)

void ***load_threads** (void **ptr*)

void **load_data_blocking** (*load_args args*)

pthread_t **load_data** (*load_args args*)

data **load_data_writing** (char ***paths*, int *n*, int *m*, int *w*, int *h*, int *out_w*, int *out_h*)

data **load_data_old** (char ***paths*, int *n*, int *m*, char ***labels*, int *k*, int *w*, int *h*)

data **load_data_super** (char ***paths*, int *n*, int *m*, int *w*, int *h*, int *scale*)

data **load_data_regression** (char ***paths*, int *n*, int *m*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*)

data **load_data_augment** (char ***paths*, int *n*, int *m*, char ***labels*, int *k*, *tree* **hierarchy*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*, int *center*)

data **load_data_tag** (char ***paths*, int *n*, int *m*, int *k*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*)

matrix **concat_matrix** (*matrix m1*, *matrix m2*)

data **concat_data** (*data d1*, *data d2*)

data **concat_datas** (*data* **d*, int *n*)

data **load_categorical_data_csv** (char **filename*, int *target*, int *k*)

data **load_cifar10_data** (char **filename*)

void **get_random_batch** (*data d*, int *n*, float **X*, float **y*)

void **get_next_batch** (*data d*, int *n*, int *offset*, float **X*, float **y*)

void **smooth_data** (*data d*)

data **load_all_cifar10** ()

data **load_go** (char **filename*)

void **randomize_data** (*data d*)

void **scale_data_rows** (*data d*, float *s*)

void **translate_data_rows** (*data d*, float *s*)

data **copy_data** (*data d*)

void **normalize_data_rows** (*data d*)

data **get_data_part** (*data d*, int *part*, int *total*)

data **get_random_data** (*data d*, int *num*)

data ***split_data** (*data d*, int *part*, int *total*)

Variables

pthread_mutex_t **mutex** = PTHREAD_MUTEX_INITIALIZER

file **data.h**

#include <pthread.h>#include "darknet.h"#include "matrix.h"#include "list.h"#include "image.h"#include "tree.h"

Functions

static float **distance_from_edge** (int *x*, int *max*)

void **load_data_blocking** (*load_args args*)

void **print_letters** (float **pred*, int *n*)

data **load_data_captcha** (char ***paths*, int *n*, int *m*, int *k*, int *w*, int *h*)

data **load_data_captcha_encode** (char ***paths*, int *n*, int *m*, int *w*, int *h*)

data **load_data_detection** (int *n*, char ***paths*, int *m*, int *w*, int *h*, int *boxes*, int *classes*, float *jitter*, float *hue*, float *saturation*, float *exposure*)

data **load_data_tag** (char ***paths*, int *n*, int *m*, int *k*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*)

matrix **load_image_augment_paths** (char ***paths*, int *n*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*, int *center*)

data **load_data_super** (char ***paths*, int *n*, int *m*, int *w*, int *h*, int *scale*)

data **load_data_augment** (char ***paths*, int *n*, int *m*, char ***labels*, int *k*, *tree* **hierarchy*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*, int *center*)

data **load_data_regression** (char ***paths*, int *n*, int *m*, int *min*, int *max*, int *size*, float *angle*, float *aspect*, float *hue*, float *saturation*, float *exposure*)

data **load_go** (char **filename*)

data **load_data_writing** (char ***paths*, int *n*, int *m*, int *w*, int *h*, int *out_w*, int *out_h*)

void **get_random_batch** (*data d*, int *n*, float **X*, float **y*)

data **get_data_part** (*data d*, int *part*, int *total*)

data **get_random_data** (*data d*, int *num*)

data **load_categorical_data_csv** (char **filename*, int *target*, int *k*) void **normalize_data_rows** (*data d*)

void **scale_data_rows** (*data d*, float *s*)

void **translate_data_rows** (*data d*, float *s*)

void **randomize_data** (*data d*)

data ***split_data** (*data d*, int *part*, int *total*)

data **concat_datas** (*data *d*, int *n*)

void **fill_truth** (char **path*, char ***labels*, int *k*, float **truth*)

file **deconvolutional_layer.c**

#include "deconvolutional_layer.h"#include "convolutional_layer.h"#include "batchnorm_layer.h"#include "utils.h"#include "im2col.h"#include "col2im.h"#include "blas.h"#include "gemm.h"#include <stdio.h>#include <time.h>

Functions

static size_t **get_workspace_size** (*layer l*)

layer **make_deconvolutional_layer** (int *batch*, int *h*, int *w*, int *c*, int *n*, int *size*, int *stride*, int *padding*, *ACTIVATION activation*, int *batch_normalize*, int *adam*)

void **denormalize_deconvolutional_layer** (*layer l*)

void **resize_deconvolutional_layer** (*layer *l*, int *h*, int *w*)

void **forward_deconvolutional_layer** (**const** *layer l*, *network net*)

void **backward_deconvolutional_layer** (*layer l*, *network net*)

void **update_deconvolutional_layer** (*layer l*, *update_args a*)

file **deconvolutional_layer.h**

#include "cuda.h"#include "image.h"#include "activations.h"#include "layer.h"#include "network.h"

Functions

layer **make_deconvolutional_layer** (int *batch*, int *h*, int *w*, int *c*, int *n*, int *size*, int *stride*, int *padding*, *ACTIVATION activation*, int *batch_normalize*, int *adam*)

void **resize_deconvolutional_layer** (*layer *l*, int *h*, int *w*)

void **forward_deconvolutional_layer** (**const** *layer l*, *network net*)

void **update_deconvolutional_layer** (*layer l*, *update_args a*)

void **backward_deconvolutional_layer** (*layer l*, *network net*)

file **demo.c**

#include "network.h"#include "detection_layer.h"#include "region_layer.h"#include "cost_layer.h"#include "utils.h"#include "parser.h"#include "box.h"#include "image.h"#include "demo.h"#include <sys/time.h>

Defines

DEMO

Functions

void **demo** (char **cfgfile*, char **weightfile*, float *thresh*, int *cam_index*, **const** char **filename*, char ***names*, int *classes*, int *delay*, char **prefix*, int *avg*, float *hier*, int *w*, int *h*, int *frames*, int *fullscreen*)

file **demo.h**

#include "image.h"

file **detection_layer.c**

#include "detection_layer.h"#include "activations.h"#include "softmax_layer.h"#include "blas.h"#include "box.h"#include "cuda.h"#include "utils.h"#include <stdio.h>#include <assert.h>#include <string.h>#include <stdlib.h>

Functions

detection_layer **make_detection_layer** (int *batch*, int *inputs*, int *n*, int *side*, int *classes*, int *coords*, int *rescore*)

void **forward_detection_layer** (**const** *detection_layer l*, *network net*)

void **backward_detection_layer** (**const** *detection_layer l*, *network net*)

void **get_detection_boxes** (*layer l*, int *w*, int *h*, float *thresh*, float ***probs*, *box *boxes*, int *only_objectness*)

file **detection_layer.h**

#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **detection_layer**

Functions

detection_layer **make_detection_layer** (int *batch*, int *inputs*, int *n*, int *size*, int *classes*, int *coords*, int *rescore*)

void **forward_detection_layer** (**const** *detection_layer l*, *network net*)

void **backward_detection_layer** (**const** *detection_layer l*, *network net*)

file **dropout_layer.c**

#include "dropout_layer.h"#include "utils.h"#include "cuda.h"#include <stdlib.h>#include <stdio.h>

Functions

dropout_layer **make_dropout_layer** (int *batch*, int *inputs*, float *probability*)

void **resize_dropout_layer** (*dropout_layer *l*, int *inputs*)

void **forward_dropout_layer** (*dropout_layer l*, *network net*)

void **backward_dropout_layer** (*dropout_layer l*, *network net*)

file **dropout_layer.h**

#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **`dropout_layer`**

Functions

dropout_layer **`make_dropout_layer`** (int *batch*, int *inputs*, float *probability*)

void **`forward_dropout_layer`** (*dropout_layer l*, *network net*)

void **`backward_dropout_layer`** (*dropout_layer l*, *network net*)

void **`resize_dropout_layer`** (*dropout_layer* **l*, int *inputs*)

file **`gemm.c`**

#include "gemm.h"#include "utils.h"#include "cuda.h"#include <stdlib.h>#include <stdio.h>#include <math.h>

Functions

void **`gemm_bin`** (int *M*, int *N*, int *K*, float *ALPHA*, char **A*, int *lda*, float **B*, int *ldb*, float **C*, int *ldc*)

float ***`random_matrix`** (int *rows*, int *cols*)

void **`time_random_matrix`** (int *TA*, int *TB*, int *m*, int *k*, int *n*)

void **`gemm`** (int *TA*, int *TB*, int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float *BETA*, float **C*, int *ldc*)

void **`gemm_nn`** (int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float **C*, int *ldc*)

void **`gemm_nt`** (int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float **C*, int *ldc*)

void **`gemm_tn`** (int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float **C*, int *ldc*)

void **`gemm_tt`** (int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float **C*, int *ldc*)

void **`gemm_cpu`** (int *TA*, int *TB*, int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float *BETA*, float **C*, int *ldc*)

file **`gemm.h`**

Functions

void **`gemm_bin`** (int *M*, int *N*, int *K*, float *ALPHA*, char **A*, int *lda*, float **B*, int *ldb*, float **C*, int *ldc*)

void **`gemm`** (int *TA*, int *TB*, int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float *BETA*, float **C*, int *ldc*)

void **`gemm_cpu`** (int *TA*, int *TB*, int *M*, int *N*, int *K*, float *ALPHA*, float **A*, int *lda*, float **B*, int *ldb*, float *BETA*, float **C*, int *ldc*)

file **`gru_layer.c`**

#include "gru_layer.h"#include "connected_layer.h"#include "utils.h"#include "cuda.h"#include "blas.h"#include "gemm.h"#include <math.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

static void **`increment_layer`** (*layer* **l*, int *steps*)

layer **`make_gru_layer`** (int *batch*, int *inputs*, int *outputs*, int *steps*, int *batch_normalize*, int *adam*)

void **`update_gru_layer`** (*layer l*, *update_args a*)

void **`forward_gru_layer`** (*layer l*, *network net*)

void **`backward_gru_layer`** (*layer l*, *network net*)

file **`gru_layer.h`**

#include "activations.h"#include "layer.h"#include "network.h"

Functions

layer **`make_gru_layer`** (int *batch*, int *inputs*, int *outputs*, int *steps*, int *batch_normalize*, int *adam*)

void **`forward_gru_layer`** (*layer l*, *network state*)

void **`backward_gru_layer`** (*layer l*, *network state*)

void **`update_gru_layer`** (*layer l*, *update_args a*)

file **`im2col.c`**

#include "im2col.h"#include <stdio.h>

Functions

float **`im2col_get_pixel`** (float **im*, int *height*, int *width*, int *channels*, int *row*, int *col*, int *channel*, int *pad*)

void **`im2col_cpu`** (float **data_im*, int *channels*, int *height*, int *width*, int *ksize*, int *stride*, int *pad*, float **data_col*)

file **`im2col.h`**

Functions

void **`im2col_cpu`** (float **data_im*, int *channels*, int *height*, int *width*, int *ksize*, int *stride*, int *pad*, float **data_col*)

file **`image.c`**

#include "image.h"#include "utils.h"#include "blas.h"#include "cuda.h"#include <stdio.h>#include <math.h>#include "stb_image.h"#include "stb_image_write.h"

Defines

`STB_IMAGE_IMPLEMENTATION`

`STB_IMAGE_WRITE_IMPLEMENTATION`

Functions

float **get_color** (int *c*, int *x*, int *max*)

image **mask_to_rgb** (*image mask*)

void **composite_image** (*image source*, *image dest*, int *dx*, int *dy*)

image **border_image** (*image a*, int *border*)

image **tile_images** (*image a*, *image b*, int *dx*)

image **get_label** (*image* ***characters*, char **string*, int *size*)

void **draw_label** (*image a*, int *r*, int *c*, *image label*, **const** float **rgb*)

void **draw_box** (*image a*, int *x1*, int *y1*, int *x2*, int *y2*, float *r*, float *g*, float *b*)

void **draw_box_width** (*image a*, int *x1*, int *y1*, int *x2*, int *y2*, int *w*, float *r*, float *g*, float *b*)

void **draw_bbox** (*image a*, *box bbox*, int *w*, float *r*, float *g*, float *b*)

image ****load_alphabet** ()

void **draw_detections** (*image im*, int *num*, float *thresh*, *box* **boxes*, float ***probs*, float ***masks*, char ***names*, *image* ***alphabet*, int *classes*)

void **transpose_image** (*image im*)

void **rotate_image_cw** (*image im*, int *times*)

void **flip_image** (*image a*)

image **image_distance** (*image a*, *image b*)

void **ghost_image** (*image source*, *image dest*, int *dx*, int *dy*)

void **embed_image** (*image source*, *image dest*, int *dx*, int *dy*)

image **collapse_image_layers** (*image source*, int *border*)

void **constrain_image** (*image im*)

void **normalize_image** (*image p*)

void **normalize_image2** (*image p*)

void **copy_image_into** (*image src*, *image dest*)

image **copy_image** (*image p*)

void **rgbgr_image** (*image im*)

void **show_image** (*image p*, **const** char **name*)

void **save_image_png** (*image im*, **const** char **name*)

void **save_image** (*image im*, **const** char **name*)

void **show_image_layers** (*image p*, char **name*)

void **show_image_collapsed** (*image p*, char **name*)

image **make_empty_image** (int *w*, int *h*, int *c*)

image **make_image** (int *w*, int *h*, int *c*)

image **make_random_image** (int *w*, int *h*, int *c*)

image **float_to_image** (int *w*, int *h*, int *c*, float **data*) void **place_image** (image im, int w, int h, int dx, int dy, image canvas)

image **center_crop_image** (image im, int w, int h)

image **rotate_crop_image** (image im, float rad, float s, int w, int h, float dx, float dy, float aspect)

image **rotate_image** (image im, float rad)

void **fill_image** (image m, float s)

void **translate_image** (image m, float s)

void **scale_image** (image m, float s)

image **crop_image** (image im, int dx, int dy, int w, int h)

int **best_3d_shift_r** (image a, image b, int min, int max)

int **best_3d_shift** (image a, image b, int min, int max)

void **composite_3d** (char *f1, char *f2, char *out, int delta)

void **letterbox_image_into** (image im, int w, int h, image boxed)

image **letterbox_image** (image im, int w, int h)

image **resize_max** (image im, int max)

image **resize_min** (image im, int min)

image **random_crop_image** (image im, int w, int h)

augment_args **random_augment_args** (image im, float angle, float aspect, int low, int high, int w, int h)

image **random_augment_image** (image im, float angle, float aspect, int low, int high, int w, int h)

float **three_way_max** (float a, float b, float c)

float **three_way_min** (float a, float b, float c)

void **yuv_to_rgb** (image im)

void **rgb_to_yuv** (image im)

void **rgb_to_hsv** (image im)

void **hsv_to_rgb** (image im)

void **grayscale_image_3c** (image im)

image **grayscale_image** (image im)

image **threshold_image** (image im, float thresh)

image **blend_image** (image fore, image back, float alpha)

void **scale_image_channel** (image im, int c, float v)

void **translate_image_channel** (image im, int c, float v)

image **binarize_image** (image im)

void **saturate_image** (image im, float sat)

void **hue_image** (image im, float hue)

void **exposure_image** (image im, float sat)

void **distort_image** (image im, float hue, float sat, float val)

void **random_distort_image** (image im, float hue, float saturation, float exposure) void **saturate_exposure_image** (*image im*, float *sat*, float *exposure*)

float **bilinear_interpolate** (*image im*, float *x*, float *y*, int *c*)

image **resize_image** (*image im*, int *w*, int *h*)

void **test_resize** (char **filename*)

image **load_image_stb** (char **filename*, int *channels*)

image **load_image** (char **filename*, int *w*, int *h*, int *c*)

image **load_image_color** (char **filename*, int *w*, int *h*)

image **get_image_layer** (*image m*, int *l*)

float **get_pixel** (*image m*, int *x*, int *y*, int *c*)

float **get_pixel_extend** (*image m*, int *x*, int *y*, int *c*)

void **set_pixel** (*image m*, int *x*, int *y*, int *c*, float *val*)

void **add_pixel** (*image m*, int *x*, int *y*, int *c*, float *val*)

void **print_image** (*image m*)

image **collapse_images_vert** (*image *ims*, int *n*)

image **collapse_images_horz** (*image *ims*, int *n*)

void **show_image_normalized** (*image im*, **const** char **name*)

void **show_images** (*image *ims*, int *n*, char **window*)

void **free_image** (*image m*)

Variables

int **windows** = 0

float **colors**[6][3] = { {1,0,1}, {0,0,1},{0,1,1},{0,1,0},{1,1,0},{1,0,0} }

file **image.h**

#include <stdlib.h>#include <stdio.h>#include <float.h>#include <string.h>#include <math.h>#include "box.h"#include "darknet.h"

Functions

float **get_color** (int *c*, int *x*, int *max*)

void **draw_box** (*image a*, int *x1*, int *y1*, int *x2*, int *y2*, float *r*, float *g*, float *b*)

void **draw_bbox** (*image a*, *box bbox*, int *w*, float *r*, float *g*, float *b*)

void **draw_label** (*image a*, int *r*, int *c*, *image label*, **const** float **rgb*)

void **write_label** (*image a*, int *r*, int *c*, *image *characters*, char **string*, float **rgb*)

image **image_distance** (*image a*, *image b*)

void **scale_image** (*image m*, float *s*)

image **rotate_crop_image** (*image im*, float *rad*, float *s*, int *w*, int *h*, float *dx*, float *dy*, float *aspect*)

image **center_crop_image** (*image im*, int *w*, int *h*) *image* **random_crop_image** (*image im*, int *w*, int *h*)

image **random_augment_image** (*image im*, float *angle*, float *aspect*, int *low*, int *high*, int *w*, int *h*)

augment_args **random_augment_args** (*image im*, float *angle*, float *aspect*, int *low*, int *high*, int *w*, int *h*)

void **letterbox_image_into** (*image im*, int *w*, int *h*, *image boxed*)

image **resize_max** (*image im*, int *max*)

void **translate_image** (*image m*, float *s*)

void **embed_image** (*image source*, *image dest*, int *dx*, int *dy*)

void **place_image** (*image im*, int *w*, int *h*, int *dx*, int *dy*, *image canvas*)

void **saturate_image** (*image im*, float *sat*)

void **exposure_image** (*image im*, float *sat*)

void **distort_image** (*image im*, float *hue*, float *sat*, float *val*)

void **saturate_exposure_image** (*image im*, float *sat*, float *exposure*)

void **rgb_to_hsv** (*image im*)

void **hsv_to_rgb** (*image im*)

void **yuv_to_rgb** (*image im*)

void **rgb_to_yuv** (*image im*)

image **collapse_image_layers** (*image source*, int *border*)

image **collapse_images_horz** (*image *ims*, int *n*)

image **collapse_images_vert** (*image *ims*, int *n*)

void **show_image_normalized** (*image im*, **const** char **name*)

void **show_images** (*image *ims*, int *n*, char **window*)

void **show_image_layers** (*image p*, char **name*)

void **show_image_collapsed** (*image p*, char **name*)

void **print_image** (*image m*)

image **make_empty_image** (int *w*, int *h*, int *c*)

void **copy_image_into** (*image src*, *image dest*)

float **get_pixel** (*image m*, int *x*, int *y*, int *c*)

float **get_pixel_extend** (*image m*, int *x*, int *y*, int *c*)

void **set_pixel** (*image m*, int *x*, int *y*, int *c*, float *val*)

void **add_pixel** (*image m*, int *x*, int *y*, int *c*, float *val*)

float **bilinear_interpolate** (*image im*, float *x*, float *y*, int *c*)

image **get_image_layer** (*image m*, int *l*)

file **layer.c**

#include "layer.h"#include "cuda.h"#include <stdlib.h>

Functions

void **free_layer** (*layer l*)

file **layer.h**

#include "darknet.h"

file **list.c**

#include <stdlib.h>#include <string.h>#include "list.h"

Functions

list ***make_list** ()

void ***list_pop** (*list *l*)

void **list_insert** (*list *l*, void **val*)

void **free_node** (*node *n*)

void **free_list** (*list *l*)

void **free_list_contents** (*list *l*)

void ****list_to_array** (*list *l*)

file **list.h**

#include "darknet.h"

Functions

list ***make_list** ()

int **list_find** (*list *l*, void **val*)

void **list_insert** (*list* *, void *)

void **free_list_contents** (*list *l*)

file **local_layer.c**

#include "local_layer.h"#include "utils.h"#include "im2col.h"#include "col2im.h"#include "blas.h"#include "gemm.h"#include <stdio.h>#include <time.h>

Functions

int **local_out_height** (*local_layer l*)

int **local_out_width** (*local_layer l*)

local_layer **make_local_layer** (int *batch*, int *h*, int *w*, int *c*, int *n*, int *size*, int *stride*, int *pad*, *ACTIVATION activation*)

void **forward_local_layer** (**const** *local_layer l*, *network net*)

void **backward_local_layer** (*local_layer l*, *network net*)

void **update_local_layer** (*local_layer l*, *update_args a*)

file **local_layer.h**

#include "cuda.h"#include "image.h"#include "activations.h"#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **`local_layer`**

Functions

local_layer **`make_local_layer`** (int *batch*, int *h*, int *w*, int *c*, int *n*, int *size*, int *stride*, int *pad*, *ACTIVATION activation*)

void **`forward_local_layer`** (**const** *local_layer* *layer*, *network net*)

void **`backward_local_layer`** (*local_layer* *layer*, *network net*)

void **`update_local_layer`** (*local_layer* *layer*, *update_args a*)

void **`bias_output`** (float **output*, float **biases*, int *batch*, int *n*, int *size*)

void **`backward_bias`** (float **bias_updates*, float **delta*, int *batch*, int *n*, int *size*)

file **`lstm_layer.c`**

#include "lstm_layer.h"#include "connected_layer.h"#include "utils.h"#include "cuda.h"#include "blas.h"#include "gemm.h"#include <math.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

static void **`increment_layer`** (*layer* **l*, int *steps*)

layer **`make_lstm_layer`** (int *batch*, int *inputs*, int *outputs*, int *steps*, int *batch_normalize*, int *adam*)

void **`update_lstm_layer`** (*layer l*, *update_args a*)

void **`forward_lstm_layer`** (*layer l*, *network state*)

void **`backward_lstm_layer`** (*layer l*, *network state*)

file **`lstm_layer.h`**

#include "activations.h"#include "layer.h"#include "network.h"

Defines

`USET`

Functions

layer **`make_lstm_layer`** (int *batch*, int *inputs*, int *outputs*, int *steps*, int *batch_normalize*, int *adam*)

void **`forward_lstm_layer`** (*layer l*, *network net*)

void **`update_lstm_layer`** (*layer l*, *update_args a*)

file **`matrix.c`**

#include "matrix.h"#include "utils.h"#include "blas.h"#include <stdio.h>#include <stdlib.h>#include <string.h>#include <assert.h>#include <math.h>

Functions

void **free_matrix** (*matrix m*)

float **matrix_topk_accuracy** (*matrix truth*, *matrix guess*, int *k*)

void **scale_matrix** (*matrix m*, float *scale*)

matrix **resize_matrix** (*matrix m*, int *size*)

void **matrix_add_matrix** (*matrix from*, *matrix to*)

matrix **copy_matrix** (*matrix m*)

matrix **make_matrix** (int *rows*, int *cols*)

matrix **hold_out_matrix** (*matrix* **m*, int *n*)

float ***pop_column** (*matrix* **m*, int *c*)

matrix **csv_to_matrix** (char **filename*)

void **matrix_to_csv** (*matrix m*)

void **print_matrix** (*matrix m*)

file **matrix.h**
#include "darknet.h"

Functions

matrix **copy_matrix** (*matrix m*)

void **print_matrix** (*matrix m*)

matrix **hold_out_matrix** (*matrix* **m*, int *n*)

matrix **resize_matrix** (*matrix m*, int *size*)

float ***pop_column** (*matrix* **m*, int *c*)

file **maxpool_layer.c**
#include "maxpool_layer.h"#include "cuda.h"#include <stdio.h>

Functions

image **get_maxpool_image** (*maxpool_layer l*)

image **get_maxpool_delta** (*maxpool_layer l*)

maxpool_layer **make_maxpool_layer** (int *batch*, int *h*, int *w*, int *c*, int *size*, int *stride*, int *padding*)

void **resize_maxpool_layer** (*maxpool_layer* **l*, int *w*, int *h*)

void **forward_maxpool_layer** (**const** *maxpool_layer l*, *network net*)

void **backward_maxpool_layer** (**const** *maxpool_layer l*, *network net*)

file **maxpool_layer.h**
#include "image.h"#include "cuda.h"#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **maxpool_layer**

Functions

image **get_maxpool_image** (*maxpool_layer l*)

maxpool_layer **make_maxpool_layer** (int *batch*, int *h*, int *w*, int *c*, int *size*, int *stride*, int *padding*)

void **resize_maxpool_layer** (*maxpool_layer* **l*, int *w*, int *h*)

void **forward_maxpool_layer** (**const** *maxpool_layer l*, *network net*)

void **backward_maxpool_layer** (**const** *maxpool_layer l*, *network net*)

file **network.c**

#include <stdio.h>#include <time.h>#include <assert.h>#include "network.h"#include "image.h"#include "data.h"#include "utils.h"#include "blas.h"#include "crop_layer.h"#include "connected_layer.h"#include "gru_layer.h"#include "rnn_layer.h"#include "crnn_layer.h"#include "local_layer.h"#include "convolutional_layer.h"#include "activation_layer.h"#include "detection_layer.h"#include "region_layer.h"#include "normalization_layer.h"#include "batchnorm_layer.h"#include "maxpool_layer.h"#include "reorg_layer.h"#include "avgpool_layer.h"#include "cost_layer.h"#include "softmax_layer.h"#include "dropout_layer.h"#include "route_layer.h"#include "shortcut_layer.h"#include "parser.h"

Functions

load_args **get_base_args** (*network net*)

network **load_network** (char **cfg*, char **weights*, int *clear*)

network ***load_network_p** (char **cfg*, char **weights*, int *clear*)

size_t **get_current_batch** (*network net*)

void **reset_momentum** (*network net*)

float **get_current_rate** (*network net*)

char ***get_layer_string** (*LAYER_TYPE a*)

network **make_network** (int *n*)

void **forward_network** (*network net*)

void **update_network** (*network net*)

void **calc_network_cost** (*network net*)

int **get_predicted_class_network** (*network net*)

void **backward_network** (*network net*)

float **train_network_datum** (*network net*)

float **train_network_sgd** (*network net*, *data d*, int *n*)

float **train_network** (*network net*, *data d*)

void **set_batch_network** (*network* **net*, int *b*)

int **resize_network** (*network* **net*, int *w*, int *h*) *detection_layer* **get_network_detection_layer** (*network net*)

image **get_network_image_layer** (*network net*, int *i*)

image **get_network_image** (*network net*)

void **visualize_network** (*network net*)

void **top_predictions** (*network net*, int *k*, int **index*)

float ***network_predict** (*network net*, float **input*)

float ***network_predict_p** (*network *net*, float **input*)

float ***network_predict_image** (*network *net*, *image im*)

int **network_width** (*network *net*)

int **network_height** (*network *net*)

matrix **network_predict_data_multi** (*network net*, *data test*, int *n*)

matrix **network_predict_data** (*network net*, *data test*)

void **print_network** (*network net*)

void **compare_networks** (*network n1*, *network n2*, *data test*)

float **network_accuracy** (*network net*, *data d*)

float ***network_accuracies** (*network net*, *data d*, int *n*)

layer **get_network_output_layer** (*network net*)

float **network_accuracy_multi** (*network net*, *data d*, int *n*)

void **free_network** (*network net*)

layer **network_output_layer** (*network net*)

int **network_inputs** (*network net*)

int **network_outputs** (*network net*)

float ***network_output** (*network net*)

file **network.h**

#include "darknet.h"#include "image.h"#include "layer.h"#include "data.h"#include "tree.h"

Functions

void **compare_networks** (*network n1*, *network n2*, *data d*)

char ***get_layer_string** (*LAYER_TYPE a*)

network **make_network** (int *n*)

float **network_accuracy_multi** (*network net*, *data d*, int *n*)

int **get_predicted_class_network** (*network net*)

void **print_network** (*network net*)

int **resize_network** (*network *net*, int *w*, int *h*)

void **calc_network_cost** (*network net*) *file* **normalization_layer.c**

#include "normalization_layer.h"#include "blas.h"#include <stdio.h>

Functions

layer **make_normalization_layer** (int *batch*, int *w*, int *h*, int *c*, int *size*, float *alpha*, float *beta*, float *kappa*)

void **resize_normalization_layer** (*layer* **layer*, int *w*, int *h*)

void **forward_normalization_layer** (**const** *layer layer*, *network net*)

void **backward_normalization_layer** (**const** *layer layer*, *network net*)

file **normalization_layer.h**

#include "image.h"#include "layer.h"#include "network.h"

Functions

layer **make_normalization_layer** (int *batch*, int *w*, int *h*, int *c*, int *size*, float *alpha*, float *beta*, float *kappa*)

void **resize_normalization_layer** (*layer* **layer*, int *h*, int *w*)

void **forward_normalization_layer** (**const** *layer layer*, *network net*)

void **backward_normalization_layer** (**const** *layer layer*, *network net*)

void **visualize_normalization_layer** (*layer layer*, char **window*)

file **option_list.c**

#include <stdlib.h>#include <stdio.h>#include <string.h>#include "option_list.h"#include "utils.h"

Functions

list ***read_data_cfg** (char **filename*)

metadata **get_metadata** (char **file*)

int **read_option** (char **s*, *list* **options*)

void **option_insert** (*list* **l*, char **key*, char **val*)

void **option_unused** (*list* **l*)

char ***option_find** (*list* **l*, char **key*)

char ***option_find_str** (*list* **l*, char **key*, char **def*)

int **option_find_int** (*list* **l*, char **key*, int *def*)

int **option_find_int_quiet** (*list* **l*, char **key*, int *def*)

float **option_find_float_quiet** (*list* **l*, char **key*, float *def*)

float **option_find_float** (*list* **l*, char **key*, float *def*)

file **option_list.h**

#include "list.h"

Functions

int **read_option** (char **s*, *list* **options*)

void **option_insert** (*list* **l*, char **key*, char **val*)

char ***option_find** (*list* **l*, char **key*)

int **option_find_int_quiet** (*list* **l*, char **key*, int *def*)

float **option_find_float** (*list* **l*, char **key*, float *def*)

float **option_find_float_quiet** (*list* **l*, char **key*, float *def*)

void **option_unused** (*list* **l*)

file **parser.c**

#include <stdio.h>#include <string.h>#include <stdlib.h>#include <assert.h>#include "activation_layer.h"#include "activations.h"#include "avgpool_layer.h"#include "batchnorm_layer.h"#include "blas.h"#include "connected_layer.h"#include "deconvolutional_layer.h"#include "convolutional_layer.h"#include "cost_layer.h"#include "crnn_layer.h"#include "crop_layer.h"#include "detection_layer.h"#include "dropout_layer.h"#include "gru_layer.h"#include "list.h"#include "local_layer.h"#include "maxpool_layer.h"#include "normalization_layer.h"#include "option_list.h"#include "parser.h"#include "region_layer.h"#include "reorg_layer.h"#include "rnn_layer.h"#include "route_layer.h"#include "shortcut_layer.h"#include "softmax_layer.h"#include "lstm_layer.h"#include "utils.h"

Typedefs

typedef struct *size_params* **size_params**

Functions

list ***read_cfg** (char **filename*)

LAYER_TYPE **string_to_layer_type** (char **type*)

void **free_section** (*section* **s*)

void **parse_data** (char **data*, float **a*, int *n*)

local_layer **parse_local** (*list* **options*, *size_params* *params*)

layer **parse_deconvolutional** (*list* **options*, *size_params* *params*)

convolutional_layer **parse_convolutional** (*list* **options*, *size_params* *params*)

layer **parse_crnn** (*list* **options*, *size_params* *params*)

layer **parse_rnn** (*list* **options*, *size_params* *params*)

layer **parse_gru** (*list* **options*, *size_params* *params*)

layer **parse_lstm** (*list* **options*, *size_params* *params*)

layer **parse_connected** (*list* **options*, *size_params* *params*)

softmax_layer **parse_softmax** (*list* **options*, *size_params* *params*)

layer **parse_region** (*list* **options*, *size_params* *params*)

detection_layer **parse_detection** (*list* **options*, *size_params* *params*) *cost_layer* **parse_cost** (*list *options*, *size_params params*)

crop_layer **parse_crop** (*list *options*, *size_params params*)

layer **parse_reorg** (*list *options*, *size_params params*)

maxpool_layer **parse_maxpool** (*list *options*, *size_params params*)

avgpool_layer **parse_avgpool** (*list *options*, *size_params params*)

dropout_layer **parse_dropout** (*list *options*, *size_params params*)

layer **parse_normalization** (*list *options*, *size_params params*)

layer **parse_batchnorm** (*list *options*, *size_params params*)

layer **parse_shortcut** (*list *options*, *size_params params*, *network net*)

layer **parse_activation** (*list *options*, *size_params params*)

route_layer **parse_route** (*list *options*, *size_params params*, *network net*)

learning_rate_policy **get_policy** (char **s*)

void **parse_net_options** (*list *options*, *network *net*)

int **is_network** (*section *s*)

network **parse_network_cfg** (char **filename*)

void **save_convolutional_weights_binary** (*layer l*, FILE **fp*)

void **save_convolutional_weights** (*layer l*, FILE **fp*)

void **save_batchnorm_weights** (*layer l*, FILE **fp*)

void **save_connected_weights** (*layer l*, FILE **fp*)

void **save_weights_upto** (*network net*, char **filename*, int *cutoff*)

void **save_weights** (*network net*, char **filename*)

void **transpose_matrix** (float **a*, int *rows*, int *cols*)

void **load_connected_weights** (*layer l*, FILE **fp*, int *transpose*)

void **load_batchnorm_weights** (*layer l*, FILE **fp*)

void **load_convolutional_weights_binary** (*layer l*, FILE **fp*)

void **load_convolutional_weights** (*layer l*, FILE **fp*)

void **load_weights_upto** (*network *net*, char **filename*, int *start*, int *cutoff*)

void **load_weights** (*network *net*, char **filename*)

file **parser.h**

#include “darknet.h”#include “network.h”

Functions

void **save_network** (*network net*, char **filename*)

void **save_weights_double** (*network net*, char **filename*)

file **region_layer.c**

#include “region_layer.h”#include “activations.h”#include “blas.h”#include “box.h”#include “cuda.h”#include “utils.h”#include <stdio.h>#include <assert.h>#include <string.h>#include <stdlib.h>

Functions

layer **make_region_layer** (int *batch*, int *w*, int *h*, int *n*, int *classes*, int *coords*)

void **resize_region_layer** (*layer* **l*, int *w*, int *h*)

box **get_region_box** (float **x*, float **biases*, int *n*, int *index*, int *i*, int *j*, int *w*, int *h*, int *stride*)

float **delta_region_box** (*box* *truth*, float **x*, float **biases*, int *n*, int *index*, int *i*, int *j*, int *w*, int *h*, float **delta*, float *scale*, int *stride*)

void **delta_region_mask** (float **truth*, float **x*, int *n*, int *index*, float **delta*, int *stride*, int *scale*)

void **delta_region_class** (float **output*, float **delta*, int *index*, int *class*, int *classes*, *tree* **hier*, float *scale*, int *stride*, float **avg_cat*)

float **logit** (float *x*)

float **tisnan** (float *x*)

int **entry_index** (*layer* *l*, int *batch*, int *location*, int *entry*)

void **forward_region_layer** (**const** *layer* *l*, *network* *net*)

void **backward_region_layer** (**const** *layer* *l*, *network* *net*)

void **correct_region_boxes** (*box* **boxes*, int *n*, int *w*, int *h*, int *netw*, int *neth*, int *relative*)

void **get_region_boxes** (*layer* *l*, int *w*, int *h*, int *netw*, int *neth*, float *thresh*, float ***probs*, *box* **boxes*, float ***masks*, int *only_objectness*, int **map*, float *tree_thresh*, int *relative*)

void **zero_objectness** (*layer* *l*)

file **region_layer.h**

#include "darknet.h"#include "layer.h"#include "network.h"

Functions

layer **make_region_layer** (int *batch*, int *h*, int *w*, int *n*, int *classes*, int *coords*)

void **forward_region_layer** (**const** *layer* *l*, *network* *net*)

void **backward_region_layer** (**const** *layer* *l*, *network* *net*)

void **resize_region_layer** (*layer* **l*, int *w*, int *h*)

file **reorg_layer.c**

#include "reorg_layer.h"#include "cuda.h"#include "blas.h"#include <stdio.h>

Functions

layer **make_reorg_layer** (int *batch*, int *w*, int *h*, int *c*, int *stride*, int *reverse*, int *flatten*, int *extra*)

void **resize_reorg_layer** (*layer* **l*, int *w*, int *h*)

void **forward_reorg_layer** (**const** *layer* *l*, *network* *net*)

void **backward_reorg_layer** (**const** *layer* *l*, *network* *net*)

file **reorg_layer.h**

#include "image.h"#include "cuda.h"#include "layer.h"#include "network.h"

Functions

layer **make_reorg_layer**(int *batch*, int *w*, int *h*, int *c*, int *stride*, int *reverse*, int *flatten*, int *extra*)

void **resize_reorg_layer**(*layer* **l*, int *w*, int *h*)

void **forward_reorg_layer**(**const** *layer l*, *network net*)

void **backward_reorg_layer**(**const** *layer l*, *network net*)

file **rnn_layer.c**

#include "rnn_layer.h"#include "connected_layer.h"#include "utils.h"#include "cuda.h"#include "blas.h"#include "gemm.h"#include <math.h>#include <stdio.h>#include <stdlib.h>#include <string.h>

Functions

static void **increment_layer**(*layer* **l*, int *steps*)

layer **make_rnn_layer**(int *batch*, int *inputs*, int *outputs*, int *steps*, *ACTIVATION activation*, int *batch_normalize*, int *adam*)

void **update_rnn_layer**(*layer l*, *update_args a*)

void **forward_rnn_layer**(*layer l*, *network net*)

void **backward_rnn_layer**(*layer l*, *network net*)

file **rnn_layer.h**

#include "activations.h"#include "layer.h"#include "network.h"

Defines

USET

Functions

layer **make_rnn_layer**(int *batch*, int *inputs*, int *outputs*, int *steps*, *ACTIVATION activation*, int *batch_normalize*, int *adam*)

void **forward_rnn_layer**(*layer l*, *network net*)

void **backward_rnn_layer**(*layer l*, *network net*)

void **update_rnn_layer**(*layer l*, *update_args a*)

file **route_layer.c**

#include "route_layer.h"#include "cuda.h"#include "blas.h"#include <stdio.h>

Functions

route_layer **make_route_layer**(int *batch*, int *n*, int **input_layers*, int **input_sizes*)

void **resize_route_layer**(*route_layer* **l*, *network* **net*)

void **forward_route_layer**(**const** *route_layer l*, *network net*)

void **backward_route_layer**(**const** *route_layer l*, *network net*) *file* **route_layer.h**

#include "network.h"#include "layer.h"

Typedefs

typedef *layer* **route_layer**

Functions

route_layer **make_route_layer** (int *batch*, int *n*, int **input_layers*, int **input_size*)

void **forward_route_layer** (**const** *route_layer l*, *network net*)

void **backward_route_layer** (**const** *route_layer l*, *network net*)

void **resize_route_layer** (*route_layer* **l*, *network* **net*)

file **shortcut_layer.c**

#include "shortcut_layer.h"#include "cuda.h"#include "blas.h"#include "activations.h"#include <stdio.h>#include <assert.h>

Functions

layer **make_shortcut_layer** (int *batch*, int *index*, int *w*, int *h*, int *c*, int *w2*, int *h2*, int *c2*)

void **forward_shortcut_layer** (**const** *layer l*, *network net*)

void **backward_shortcut_layer** (**const** *layer l*, *network net*)

file **shortcut_layer.h**

#include "layer.h"#include "network.h"

Functions

layer **make_shortcut_layer** (int *batch*, int *index*, int *w*, int *h*, int *c*, int *w2*, int *h2*, int *c2*)

void **forward_shortcut_layer** (**const** *layer l*, *network net*)

void **backward_shortcut_layer** (**const** *layer l*, *network net*)

file **softmax_layer.c**

#include "softmax_layer.h"#include "blas.h"#include "cuda.h"#include <float.h>#include <math.h>#include <stdlib.h>#include <stdio.h>#include <assert.h>

Functions

softmax_layer **make_softmax_layer** (int *batch*, int *inputs*, int *groups*)

void **forward_softmax_layer** (**const** *softmax_layer l*, *network net*)

void **backward_softmax_layer** (**const** *softmax_layer l*, *network net*)

file **softmax_layer.h**

#include "layer.h"#include "network.h"

Typedefs

typedef *layer* **softmax_layer**

Functions

void **softmax_array** (float **input*, int *n*, float *temp*, float **output*)

softmax_layer **make_softmax_layer** (int *batch*, int *inputs*, int *groups*)

void **forward_softmax_layer** (**const** *softmax_layer* *l*, *network* *net*)

void **backward_softmax_layer** (**const** *softmax_layer* *l*, *network* *net*)

file **stb_image.h**

#include <stdio.h>#include <stdarg.h>#include <stddef.h>#include <stdlib.h>#include <string.h>#include <math.h>#include <assert.h>#include <stdint.h>

Defines

STBI_VERSION

STBIDEF

Typedefs

typedef unsigned char **stbi_uc**

Enums

enum [anonymous]

Values:

STBI_default = 0

STBI_grey = 1

STBI_grey_alpha = 2

STBI_rgb = 3

STBI_rgb_alpha = 4

Functions

STBIDEF stbi_uc* stbi_load(char const * filename, int * x, int * y, int * comp, int re

STBIDEF stbi_uc* stbi_load_from_memory(stbi_uc const * buffer, int len, int * x, int *

STBIDEF stbi_uc* stbi_load_from_callbacks(stbi_io_callbacks const * clbk, void * user

STBIDEF stbi_uc* stbi_load_from_file(FILE * f, int * x, int * y, int * comp, int req_c

STBIDEF float* stbi_loadf(char const * filename, int * x, int * y, int * comp, int req

STBIDEF float* stbi_loadf_from_memory(stbi_uc const * buffer, int len, int * x, int *

```
STBIDEF float* stbi_loadf_from_callbacks(stbi_io_callbacks  const * clbk, void * user,
STBIDEF float* stbi_loadf_from_file(FILE * f, int * x, int * y, int * comp, int req_co
STBIDEF void stbi_hdr_to_ldr_gamma(float gamma)
STBIDEF void stbi_hdr_to_ldr_scale(float scale)
STBIDEF void stbi_ldr_to_hdr_gamma(float gamma)
STBIDEF void stbi_ldr_to_hdr_scale(float scale)
STBIDEF int stbi_is_hdr_from_callbacks(stbi_io_callbacks  const * clbk, void * user)
STBIDEF int stbi_is_hdr_from_memory(stbi_uc const * buffer, int len)
STBIDEF int stbi_is_hdr(char const * filename)
STBIDEF int stbi_is_hdr_from_file(FILE * f)
STBIDEF const char* stbi_failure_reason(void)
STBIDEF void stbi_image_free(void * retval_from_stbi_load)
STBIDEF int stbi_info_from_memory(stbi_uc const * buffer, int len, int * x, int * y, i
STBIDEF int stbi_info_from_callbacks(stbi_io_callbacks  const * clbk, void * user, int
STBIDEF int stbi_info(char const * filename, int * x, int * y, int * comp)
STBIDEF int stbi_info_from_file(FILE * f, int * x, int * y, int * comp)
STBIDEF void stbi_set_unpremultiply_on_load(int flag_true_if_should_unpremultiply)
STBIDEF void stbi_convert_iphone_png_to_rgb(int flag_true_if_should_convert)
STBIDEF void stbi_set_flip_vertically_on_load(int flag_true_if_should_flip)
STBIDEF char* stbi_zlib_decode_malloc_guesssize(const char * buffer, int len, int init
STBIDEF char* stbi_zlib_decode_malloc_guesssize_headerflag(const char * buffer, int le
STBIDEF char* stbi_zlib_decode_malloc(const char * buffer, int len, int * outlen)
STBIDEF int stbi_zlib_decode_buffer(char * obuffer, int olen, const char * ibuffer, in
STBIDEF char* stbi_zlib_decode_noheader_malloc(const char * buffer, int len, int * out
STBIDEF int stbi_zlib_decode_noheader_buffer(char * obuffer, int olen, const char * ib
```

file `stb_image_write.h`

#include <stdarg.h>#include <stdlib.h>#include <stdio.h>#include <string.h>#include <math.h>#include <assert.h>

Functions

int **`stbi_write_png`** (char **const** **filename*, int *w*, int *h*, int *comp*, **const** void **data*, int *stride_in_bytes*)

int **`stbi_write_bmp`** (char **const** **filename*, int *w*, int *h*, int *comp*, **const** void **data*)

int **`stbi_write_tga`** (char **const** **filename*, int *w*, int *h*, int *comp*, **const** void **data*)

int **`stbi_write_hdr`** (char **const** **filename*, int *w*, int *h*, int *comp*, **const** float **data*)

file `tree.c`

#include <stdio.h>#include <stdlib.h>#include “tree.h”#include “utils.h”#include “data.h”

Functions

void **change_leaves** (*tree* **t*, char **leaf_list*)

float **get_hierarchy_probability** (float **x*, *tree* **hier*, int *c*, int *stride*)

void **hierarchy_predictions** (float **predictions*, int *n*, *tree* **hier*, int *only_leaves*, int *stride*)

int **hierarchy_top_prediction** (float **predictions*, *tree* **hier*, float *thresh*, int *stride*)

tree ***read_tree** (char **filename*)

file **tree.h**

#include "darknet.h"

Functions

tree ***read_tree** (char **filename*)

int **hierarchy_top_prediction** (float **predictions*, *tree* **hier*, float *thresh*, int *stride*)

float **get_hierarchy_probability** (float **x*, *tree* **hier*, int *c*, int *stride*)

file **utils.c**

#include <stdio.h>#include <stdlib.h>#include <string.h>#include <math.h>#include <assert.h>#include <unistd.h>#include <float.h>#include <limits.h>#include <time.h>#include "utils.h"

Functions

double **what_time_is_it_now** ()

int ***read_intlist** (char **gpu_list*, int **ngpus*, int *d*)

int ***read_map** (char **filename*)

void **sorta_shuffle** (void **arr*, size_t *n*, size_t *size*, size_t *sections*)

void **shuffle** (void **arr*, size_t *n*, size_t *size*)

void **del_arg** (int *argc*, char ***argv*, int *index*)

int **find_arg** (int *argc*, char **argv*[], char **arg*)

int **find_int_arg** (int *argc*, char ***argv*, char **arg*, int *def*)

float **find_float_arg** (int *argc*, char ***argv*, char **arg*, float *def*)

char ***find_char_arg** (int *argc*, char ***argv*, char **arg*, char **def*)

char ***basecfg** (char **cfgfile*)

int **alphanum_to_int** (char *c*)

char **int_to_alphanum** (int *i*)

void **pm** (int *M*, int *N*, float **A*)

void **find_replace** (char **str*, char **orig*, char **rep*, char **output*)

float **sec** (clock_t *clocks*)

void **top_k** (float **a*, int *n*, int *k*, int **index*)

void **error** (**const** char **s*)

void **malloc_error**()

void **file_error**(char **s*)

list ***split_str**(char **s*, char *delim*)

void **strip**(char **s*)

void **strip_char**(char **s*, char *bad*)

void **free_ptrs**(void ***ptrs*, int *n*)

char ***fgetl**(FILE **fp*)

int **read_int**(int *fd*)

void **write_int**(int *fd*, int *n*)

int **read_all_fail**(int *fd*, char **buffer*, size_t *bytes*)

int **write_all_fail**(int *fd*, char **buffer*, size_t *bytes*)

void **read_all**(int *fd*, char **buffer*, size_t *bytes*)

void **write_all**(int *fd*, char **buffer*, size_t *bytes*)

char ***copy_string**(char **s*)

list ***parse_csv_line**(char **line*)

int **count_fields**(char **line*)

float ***parse_fields**(char **line*, int *n*)

float **sum_array**(float **a*, int *n*)

float **mean_array**(float **a*, int *n*)

void **mean_arrays**(float ***a*, int *n*, int *els*, float **avg*)

void **print_statistics**(float **a*, int *n*)

float **variance_array**(float **a*, int *n*)

int **constrain_int**(int *a*, int *min*, int *max*)

float **constrain**(float *min*, float *max*, float *a*)

float **dist_array**(float **a*, float **b*, int *n*, int *sub*)

float **mse_array**(float **a*, int *n*)

void **normalize_array**(float **a*, int *n*)

void **translate_array**(float **a*, int *n*, float *s*)

float **mag_array**(float **a*, int *n*)

void **scale_array**(float **a*, int *n*, float *s*)

int **sample_array**(float **a*, int *n*)

int **max_index**(float **a*, int *n*)

int **rand_int**(int *min*, int *max*)

float **rand_normal**()

size_t **rand_size_t**()

float **rand_uniform**(float *min*, float *max*) float **rand_scale** (float *s*)

float ****one_hot_encode** (float **a*, int *n*, int *k*)

file **utils.h**

#include <stdio.h>#include <time.h>#include "darknet.h"#include "list.h"

Defines

TWO_PI

Functions

double **what_time_is_it_now** ()

void **shuffle** (void **arr*, size_t *n*, size_t *size*)

void **sorta_shuffle** (void **arr*, size_t *n*, size_t *size*, size_t *sections*)

void **free_ptrs** (void ***ptrs*, int *n*)

int **alphanum_to_int** (char *c*)

char **int_to_alphanum** (int *i*)

int **read_int** (int *fd*)

void **write_int** (int *fd*, int *n*)

void **read_all** (int *fd*, char **buffer*, size_t *bytes*)

void **write_all** (int *fd*, char **buffer*, size_t *bytes*)

int **read_all_fail** (int *fd*, char **buffer*, size_t *bytes*)

int **write_all_fail** (int *fd*, char **buffer*, size_t *bytes*)

void **find_replace** (char **str*, char **orig*, char **rep*, char **output*)

void **malloc_error** ()

void **file_error** (char **s*)

void **strip** (char **s*)

void **strip_char** (char **s*, char *bad*)

list ***split_str** (char **s*, char *delim*)

char ***fgetl** (FILE **fp*)

list ***parse_csv_line** (char **line*)

char ***copy_string** (char **s*)

int **count_fields** (char **line*)

float ***parse_fields** (char **line*, int *n*)

void **scale_array** (float **a*, int *n*, float *s*)

void **translate_array** (float **a*, int *n*, float *s*)

float **constrain** (float *min*, float *max*, float *a*)

int **constrain_int** (int *a*, int *min*, int *max*) float **rand_uniform** (float *min*, float *max*)

float **rand_scale** (float *s*)

int **rand_int** (int *min*, int *max*)

float **sum_array** (float **a*, int *n*)

void **mean_arrays** (float ***a*, int *n*, int *els*, float **avg*)

float **dist_array** (float **a*, float **b*, int *n*, int *sub*)

float ****one_hot_encode** (float **a*, int *n*, int *k*)

float **sec** (clock_t *clocks*)

void **print_statistics** (float **a*, int *n*)

file **example.py**

file **libyolo.c**

#include <stdio.h>#include <string.h>#include <stdlib.h>#include <unistd.h>#include "option_list.h"#include "network.h"#include "parser.h"#include "region_layer.h"#include "utils.h"#include "libyolo.h"

Functions

void **get_detection_info** (*image im*, int *num*, float *thresh*, *box *boxes*, float ***probs*, int *classes*, char ***names*, *list *output*)

yolo_handle **yolo_init** (char **darknet_path*, char **datacfg*, char **cfgfile*, char **weightfile*)

void **yolo_cleanup** (*yolo_handle handle*)

detection_info ****yolo_detect** (*yolo_handle handle*, *image im*, float *thresh*, float *hier_thresh*, int **num*)

detection_info ****yolo_test** (*yolo_handle handle*, char **filename*, float *thresh*, float *hier_thresh*, int **num*)

file **libyolo.h**

#include "./darknet/src/image.h"

Typedefs

typedef void ***yolo_handle**

Functions

yolo_handle **yolo_init** (char **darknet_path*, char **datacfg*, char **cfgfile*, char **weightfile*)

void **yolo_cleanup** (*yolo_handle handle*)

detection_info ****yolo_detect** (*yolo_handle handle*, *image im*, float *thresh*, float *hier_thresh*, int **num*)

detection_info ****yolo_test** (*yolo_handle handle*, char **filename*, float *thresh*, float *hier_thresh*, int **num*)

file **module.c**

#include <Python.h>#include <numpy/arrayobject.h>#include <stdio.h>#include "libyolo.h"#include "./darknet/src/image.h"

Defines

NPY_NO_DEPRECATED_API

Functions

static PyObject ***pyyolo_init** (PyObject **self*, PyObject **args*)

static PyObject ***pyyolo_cleanup** (PyObject **self*, PyObject **args*)

static PyObject ***pyyolo_detect** (PyObject **self*, PyObject **args*)

static PyObject ***pyyolo_test** (PyObject **self*, PyObject **args*)

PyMODINIT_FUNC **initpyyolo** (void)

Variables

PyObject ***PyyoloError**

yolo_handle **g_handle** = NULL

PyMethodDef **pyyolo_methods**[] = { {"init", pyyolo_init, METH_VARARGS, "Initialize YOLO."}, {"cleanup", pyyolo_clea

file **setup.py**

file **setup_gpu.py**

file **RecogniseFace.py**

file **RoboyVision.py**

file **RosMsgUtil.py**

file **SpeakerDetect.py**

file **TransformCoordinates.py**

file **CMakeLists.txt**

Functions

cmake_minimum_required(VERSION 2.8. 3)

file **face_detection.py**

file **Visualizer.py**

file **Camera.hpp**
#include "sl/Core.hpp"#include "sl/Mesh.hpp"#include "sl/defines.hpp"#include <cuda.h>#include <opencv2/opencv.hpp>

file **Core.hpp**
#include <sl/types.hpp>

file **defines.hpp**
#include <cstdint>#include <cstring>#include <iostream>#include <vector>#include <limits>#include <unistd.h>

Defines

TOO_FAR

TOO_CLOSE

OCCLUSION_VALUE

isValidMeasure (v)

Variables

const int **ZED_SDK_MAJOR_VERSION** = 2

const int **ZED_SDK_MINOR_VERSION** = 0

const int **ZED_SDK_PATCH_VERSION** = 1

file **Mesh.hpp**

#include <vector>#include <string>#include <fstream>#include <sl/Core.hpp>

Defines

SL_EXPORT_DLL

file **types.hpp**

#include <algorithm>#include <chrono>#include <cmath>#include <cstdio>#include <cstdlib>#include <cstring>#include <ctime>#include <ctype.h>#include <fstream>#include <iomanip>#include <iostream>#include <memory.h>#include <mutex>#include <sstream>#include <thread>#include <vector>#include <cuda.h>#include <cuda_runtime.h>#include <cuda_runtime_api.h>#include <device_launch_parameters.h>#include <unistd.h>

Defines

__CUSTOM__PRETTY__FUNC__

__FILENAME__

_FCT_CPU_GPU_

IS_FINITE (x)

ZEDcudaSafeCall (err)

TIMING

INIT_TIMER

START_TIMER

DEF_START_TIMER

STOP_TIMER (name)

file **utils.hpp**

#include <cstdio>#include <cstring>#include <signal.h>#include <cstdlib>#include <chrono>#include <thread>#include <mutex>#include <sys/stat.h>#include <opencv2/opencv.hpp>#include <sl/Camera.hpp>

Functions

bool **testFileExist** (*std*::string &*filename*)

void **parse_args** (int *argc*, char ***argv*, *InfoOption* &*info*)

void **recordVideo** (*sl*::*Mat* &*image*)

void **recordImages** (*sl*::*Mat* &*image*)

void **initActions** (*sl*::*Camera* **zed*, *InfoOption* &*modes*)

void **manageActions** (*sl*::*Camera* **zed*, char &*key*, *InfoOption* &*modes*)

void **exitActions** ()

void **generateImageToRecord** (*sl*::*Camera* **zed*, *InfoOption* &*modes*, *sl*::*Mat* &*out*)

file **zed.cpp**

#include <iostream>#include <opencv2/core/core.hpp>#include <opencv2/highgui/highgui.hpp>#include <opencv2/imgproc/imgproc.hpp>#include <zed/Camera.hpp>

Functions

int **main** (int *argc*, char ***argv*)

Variables

char **keyboard** = ' '

file **zedRoboy.cpp**

#include <sl/Camera.hpp>#include "utils.hpp"

Functions

sl::*Camera* **InitCamera** ()

int **main** (int *argc*, char ***argv*)

file **zedRoboy.py**

group **Enumerations**

Enums

enum RESOLUTION

List the spatial mapping resolution presets.

Values:

RESOLUTION_HIGH

Create a detail geometry, requires lots of memory.

RESOLUTION_MEDIUM

Smalls variations in the geometry will disappear, useful for big object

RESOLUTION_LOW

Keeps only huge variations of the geometry , useful outdoor.

enum RANGE

List the spatial mapping depth range presets.

Values:

RANGE_NEAR

Only depth close to the camera will be used by the spatial mapping.

RANGE_MEDIUM

Medium depth range.

RANGE_FAR

Takes into account objects that are far, useful outdoor.

enum MEM

List available memory type.

Values:

MEM_CPU = 1

CPU Memory (Processor side).

MEM_GPU = 2

GPU Memory (Graphic card side).

enum COPY_TYPE

List available copy operation on *Mat*.

Values:

COPY_TYPE_CPU_CPU

copy data from CPU to CPU.

COPY_TYPE_CPU_GPU

copy data from CPU to GPU.

COPY_TYPE_GPU_GPU

copy data from GPU to GPU.

COPY_TYPE_GPU_CPU

copy data from GPU to CPU.

enum MAT_TYPE

List available *Mat* formats.

Values:

MAT_TYPE_32F_C1

float 1 channel.

MAT_TYPE_32F_C2

float 2 channels.

MAT_TYPE_32F_C3

float 3 channels.

MAT_TYPE_32F_C4

float 4 channels.

MAT_TYPE_8U_C1

unsigned char 1 channel.

MAT_TYPE_8U_C2

unsigned char 2 channels.

MAT_TYPE_8U_C3
unsigned char 3 channels.

MAT_TYPE_8U_C4
unsigned char 4 channels.

enum RESOLUTION
List available video resolutions.

Warning Since v1.0, VGA mode has been updated to WVGA (from 640*480 to 672*376) and requires a firmware update to function (>= 1142). Firmware can be updated in the ZED Explorer.

Warning NVIDIA Jetson boards do not support all ZED video resolutions and framerates. For more information, please read the on-line API documentation.

Values:

RESOLUTION_HD2K
2208*1242, available framerates: 15 fps.

RESOLUTION_HD1080
1920*1080, available framerates: 15, 30 fps.

RESOLUTION_HD720
1280*720, available framerates: 15, 30, 60 fps.

RESOLUTION_VGA
672*376, available framerates: 15, 30, 60, 100 fps.

RESOLUTION_LAST

enum CAMERA_SETTINGS
List available camera settings for the ZED camera (contrast, hue, saturation, gain...).

Each enum defines one of those settings.

Values:

CAMERA_SETTINGS_BRIGHTNESS
Defines the brightness control. Affected value should be between 0 and 8.

CAMERA_SETTINGS_CONTRAST
Defines the contrast control. Affected value should be between 0 and 8.

CAMERA_SETTINGS_HUE
Defines the hue control. Affected value should be between 0 and 11.

CAMERA_SETTINGS_SATURATION
Defines the saturation control. Affected value should be between 0 and 8.

CAMERA_SETTINGS_GAIN
Defines the gain control. Affected value should be between 0 and 100 for manual control. If ZED_EXPOSURE is set to -1, the gain is in auto mode too.

CAMERA_SETTINGS_EXPOSURE
Defines the exposure control. A -1 value enable the AutoExposure/AutoGain control,as the boolean parameter (default) does. Affected value should be between 0 and 100 for manual control.

CAMERA_SETTINGS_WHITEBALANCE
Defines the color temperature control. Affected value should be between 2800 and 6500 with a step of 100. A value of -1 set the AWB (auto white balance), as the boolean parameter (default) does.

CAMERA_SETTINGS_AUTO_WHITEBALANCE
Defines the status of white balance (automatic or manual). A value of 0 disable the AWB, while 1 activate it.

CAMERA_SETTINGS_LAST

enum SELF_CALIBRATION_STATE
Status for self calibration.

Since v0.9.3, self-calibration is done in background and start in the *sl::Camera::open* or Reset function. You can follow the current status for the self-calibration any time once ZED object has been construct.

Values:

SELF_CALIBRATION_STATE_NOT_STARTED
Self calibration has not run yet (no *sl::Camera::open* or *sl::Camera::resetSelfCalibration* called).

SELF_CALIBRATION_STATE_RUNNING
Self calibration is currently running.

SELF_CALIBRATION_STATE_FAILED
Self calibration has finished running but did not manage to get accurate values. Old parameters are taken instead.

SELF_CALIBRATION_STATE_SUCCESS
Self calibration has finished running and did manage to get accurate values. New parameters are set.

SELF_CALIBRATION_STATE_LAST

enum DEPTH_MODE
List available depth computation modes.

Values:

DEPTH_MODE_NONE
This mode does not compute any depth map. Only rectified stereo images will be available.

DEPTH_MODE_PERFORMANCE
Fastest mode for depth computation.

DEPTH_MODE_MEDIUM
Balanced quality mode. Depth map is robust in any environment and requires medium resources for computation.

DEPTH_MODE_QUALITY
Best quality mode. Requires more compute power.

DEPTH_MODE_LAST

enum SENSING_MODE
List available depth sensing modes.

Values:

SENSING_MODE_STANDARD
This mode outputs ZED standard depth map that preserves edges and depth accuracy. Applications example: Obstacle detection, Automated navigation, People detection, 3D reconstruction.

SENSING_MODE_FILL
This mode outputs a smooth and fully dense depth map. Applications example: AR/VR, Mixed-reality capture, Image post-processing.

SENSING_MODE_LAST

enum UNIT

Enumerate for available metric unit of the depth.

Values:

UNIT_MILLIMETER

UNIT_CENTIMETER

UNIT_METER

UNIT_INCH

UNIT_FOOT

UNIT_LAST

enum COORDINATE_SYSTEM

List available coordinates systems for positional tracking and points cloud representation.

Positional tracking is provided in the given coordinates system.

Values:

COORDINATE_SYSTEM_IMAGE

Standard coordinates system in computer vision. Used in OpenCV : see here : http://docs.opencv.org/2.4/modules/calib3d/doc/camera_calibration_and_3d_reconstruction.html

COORDINATE_SYSTEM_LEFT_HANDED_Y_UP

Left-Handed with Y up and Z forward. Used in Unity with DirectX.

COORDINATE_SYSTEM_RIGHT_HANDED_Y_UP

Right-Handed with Y pointing up and Z backward. Used in OpenGL.

COORDINATE_SYSTEM_RIGHT_HANDED_Z_UP

Right-Handed with Z pointing up and Y forward. Used in 3DSMax.

COORDINATE_SYSTEM_LEFT_HANDED_Z_UP

Left-Handed with Z axis pointing up and X forward. Used in Unreal Engine.

COORDINATE_SYSTEM_LAST

enum MEASURE

List retrievable measures.

Values:

MEASURE_DISPARITY

Disparity map, 1 channel, FLOAT.

MEASURE_DEPTH

Depth map, 1 channel, FLOAT.

MEASURE_CONFIDENCE

Certainty/confidence of the disparity map, 1 channel, FLOAT.

MEASURE_XYZ

Point cloud, 4 channels, FLOAT, channel 4 is empty.

MEASURE_XYZRGBA

Colored point cloud, 4 channels, FLOAT, channel 4 contains color in R-G-B-A order.

MEASURE_XYZBGRA

Colored point cloud, 4 channels, FLOAT, channel 4 contains color in B-G-R-A order.

MEASURE_XYZARGB
Colored point cloud, 4 channels, FLOAT, channel 4 contains color in A-R-G-B order.

MEASURE_XYZABGR
Colored point cloud, 4 channels, FLOAT, channel 4 contains color in A-B-G-R order.

MEASURE_LAST

enum VIEW
List available views.

Values:

VIEW_LEFT
Rectified left image.

VIEW_RIGHT
Rectified right image.

VIEW_LEFT_GRAY
Rectified left grayscale image.

VIEW_RIGHT_GRAY
Rectified right grayscale image.

VIEW_LEFT_UNRECTIFIED
Raw left image.

VIEW_RIGHT_UNRECTIFIED
Raw right image.

VIEW_LEFT_UNRECTIFIED_GRAY
Raw left grayscale image.

VIEW_RIGHT_UNRECTIFIED_GRAY
Raw right grayscale image.

VIEW_SIDE_BY_SIDE
Left and right image (the image width is therefore doubled).

VIEW_DEPTH
Normalized depth image.

VIEW_CONFIDENCE
Normalized confidence image.

VIEW_LAST

enum DEPTH_FORMAT
List available file formats for saving depth maps.

Values:

DEPTH_FORMAT_PNG
PNG image format in 16bits. 32bits depth is mapped to 16bits color image to preserve the consistency of the data range.

DEPTH_FORMAT_PFM
stream of bytes, graphic image file format.

DEPTH_FORMAT_PGM
gray-scale image format.

DEPTH_FORMAT_LAST

enum POINT_CLOUD_FORMAT

List available file formats for saving point clouds.

Stores the spatial coordinates (x,y,z) of each pixel and optionally its RGB color.

Values:

POINT_CLOUD_FORMAT_XYZ_ASCII
Generic point cloud file format, without color information.

POINT_CLOUD_FORMAT_PCD_ASCII
Point Cloud Data file, with color information.

POINT_CLOUD_FORMAT_PLY_ASCII
PoLYgon file format, with color information.

POINT_CLOUD_FORMAT_VTK_ASCII
Visualization ToolKit file, without color information.

POINT_CLOUD_FORMAT_LAST

enum TRACKING_STATE

List the different states of positional tracking.

Values:

TRACKING_STATE_SEARCHING
The camera is searching for a previously known position to locate itself.

TRACKING_STATE_OK
Positional tracking is working normally.

TRACKING_STATE_OFF
Positional tracking is not enabled.

TRACKING_STATE_FPS_TOO_LOW
Effective FPS is too low to give proper results for motion tracking. Consider using PERFORMANCES parameters (DEPTH_MODE_PERFORMANCE, low camera resolution (VGA,HD720))

TRACKING_STATE_LAST

enum AREA_EXPORT_STATE

List the different states of spatial memory area export.

Values:

AREA_EXPORT_STATE_SUCCESS
The spatial memory file has been successfully created.

AREA_EXPORT_STATE_RUNNING
The spatial memory is currently written.

AREA_EXPORT_STATE_NOT_STARTED
The spatial memory file exportation has not been called.

AREA_EXPORT_STATE_FILE_EMPTY
The spatial memory contains no data, the file is empty.

AREA_EXPORT_STATE_FILE_ERROR
The spatial memory file has not been written because of a wrong file name.

AREA_EXPORT_STATE_SPATIAL_MEMORY_DISABLED
The spatial memory learning is disable, no file can be created.

AREA_EXPORT_STATE_LAST

enum REFERENCE_FRAME

Define which type of position matrix is used to store camera path and pose.

Values:

REFERENCE_FRAME_WORLD

The transform of *sl::Pose* will contains the motion with reference to the world frame (previously called PATH).

REFERENCE_FRAME_CAMERA

The transform of *sl::Pose* will contains the motion with reference to the previous camera frame (previously called POSE).

REFERENCE_FRAME_LAST

enum SPATIAL_MAPPING_STATE

Gives the spatial mapping state.

Values:

SPATIAL_MAPPING_STATE_INITIALIZING

The spatial mapping is initializing.

SPATIAL_MAPPING_STATE_OK

The depth and tracking data were correctly integrated in the fusion algorithm.

SPATIAL_MAPPING_STATE_NOT_ENOUGH_MEMORY

The maximum memory dedicated to the scanning has been reach, the mesh will no longer be updated.

SPATIAL_MAPPING_STATE_NOT_ENABLED

Camera::enableSpatialMapping() wasn't called (or the scanning was stopped and not relaunched).

SPATIAL_MAPPING_STATE_FPS_TOO_LOW

Effective FPS is too low to give proper results for spatial mapping. Consider using PERFORMANCES parameters (DEPTH_MODE_PERFORMANCE, low camera resolution (VGA,HD720), spatial mapping low resolution)

SPATIAL_MAPPING_STATE_LAST

enum SVO_COMPRESSION_MODE

List available compression modes for SVO recording.

sl::SVO_COMPRESSION_MODE_LOSSLESS is an improvement of previous lossless compression (used in ZED Explorer), even if size may be bigger, compression time is much faster.

Values:

SVO_COMPRESSION_MODE_RAW

RAW images, no compression.

SVO_COMPRESSION_MODE_LOSSLESS

new Lossless, with PNG/ZSTD based compression : avg size = 42% of RAW).

SVO_COMPRESSION_MODE_LOSSY

new Lossy, with JPEG based compression : avg size = 22% of RAW).

SVO_COMPRESSION_MODE_LAST

enum ERROR_CODE

List error codes in the ZED SDK.

Values:

SUCCESS

Standard code for successful behavior.

ERROR_CODE_FAILURE
Standard code for unsuccessful behavior.

ERROR_CODE_NO_GPU_COMPATIBLE
No GPU found or CUDA capability of the device is not supported.

ERROR_CODE_NOT_ENOUGH_GPUMEM
Not enough GPU memory for this depth mode please try a faster mode (such as PERFORMANCE mode).

ERROR_CODE_CAMERA_NOT_DETECTED
The ZED camera is not plugged or detected.

ERROR_CODE_INVALID_RESOLUTION
For Jetson only, resolution not yet supported (USB3.0 bandwidth).

ERROR_CODE_LOW_USB_BANDWIDTH
This issue can occurs when you use multiple ZED or a USB 2.0 port (bandwidth issue).

ERROR_CODE_CALIBRATION_FILE_NOT_AVAILABLE
ZED calibration file is not found on the host machine. Use ZED Explorer or ZED Calibration to get one.

ERROR_CODE_INVALID_SVO_FILE
The provided SVO file is not valid.

ERROR_CODE_SVO_RECORDING_ERROR
An recorder related error occurred (not enough free storage, invalid file).

ERROR_CODE_INVALID_COORDINATE_SYSTEM
The requested coordinate system is not available.

ERROR_CODE_INVALID_FIRMWARE
The firmware of the ZED is out of date. Update to the latest version.

ERROR_CODE_NOT_A_NEW_FRAME
in grab() only, the current call return the same frame as last call. Not a new frame.

ERROR_CODE_CUDA_ERROR
in grab() only, a CUDA error has been detected in the process. Activate verbose in *sl::Camera::open* for more info.

ERROR_CODE_CAMERA_NOT_INITIALIZED
in grab() only, ZED SDK is not initialized. Probably a missing call to *sl::Camera::open*.

ERROR_CODE_NVIDIA_DRIVER_OUT_OF_DATE
your NVIDIA driver is too old and not compatible with your current CUDA version.

ERROR_CODE_INVALID_FUNCTION_CALL
the call of the function is not valid in the current context. Could be a missing call of *sl::Camera::open*.

ERROR_CODE_CORRUPTED_SDK_INSTALLATION
The SDK wasn't able to load its dependencies, the installer should be launched.

ERROR_CODE_LAST

page **md__home_docs_checkouts_readthedocs.org_user_builds_roboyvision_checkouts_latest_src_py**

doxyxml/darknet-black-small.png

#Darknet# Darknet is an open source neural network framework written in C and CUDA. It is fast, easy to install, and supports CPU and GPU computation.

For more information see the Darknet project website.

For questions or issues please use the Google Group.

page **md__home_docs_checkouts_readthedocs.org_user_builds_roboyvision_checkouts_latest_src_py**

pyyolo is a simple wrapper for YOLO.

Building

1.git clone recursive https://github.com/thomaspark-pkj/pyyolo.git

2.(optional) Set GPU=1 and CUDNN=1 in Makefile to use GPU.

3.make

4.rm -rf build

5.python setup.py build (use setup_gpu.py for GPU)

6.sudo python setup.py install (use setup_gpu.py for GPU)

Test

Edit parameters in example.py

```
python example.py
```

Result

```
{'right': 194, 'bottom': 353, 'top': 264, 'class': 'dog', 'prob': 0.
↪8198755383491516, 'left': 71}
{'right': 594, 'bottom': 338, 'top': 109, 'class': 'horse', 'prob': 0.
↪6106302738189697, 'left': 411}
{'right': 274, 'bottom': 381, 'top': 101, 'class': 'person', 'prob': 0.
↪702547550201416, 'left': 184}
{'right': 583, 'bottom': 347, 'top': 137, 'class': 'sheep', 'prob': 0.
↪7186083197593689, 'left': 387}
```

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dir **/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src/data**

dir **/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src/pyyolo**

dir **/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src/pyyolo**

dir **/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src/data/l**

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dir **/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src/pyyolo**

dir **/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src**

dir **/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src/vision** *dir* **`/home/docs/checkouts/readthedocs.org/user_builds/roboyvision/checkouts/latest/src/zed`**

About arc42

This information should stay in every repository as per their license: http://www.arc42.de/template/licence.html

arc42, the Template for documentation of software and system architecture.

By Dr. Gernot Starke, Dr. Peter Hruschka and contributors.

Template Revision: 6.5 EN (based on asciidoc), Juni 2014

Note

This version of the template contains some help and explanations. It is used for familiarization with arc42 and the understanding of the concepts. For documentation of your own system you use better the *plain* version.

Literature and references

Starke-2014 Gernot Starke: Effektive Softwarearchitekturen - Ein praktischer Leitfaden. Carl Hanser Verlag, 6, Auflage 2014.

Starke-Hruschka-2011 Gernot Starke und Peter Hruschka: Softwarearchitektur kompakt. Springer Akademischer Verlag, 2. Auflage 2011.

Zörner-2013 Softwarearchitekturen dokumentieren und kommunizieren, Carl Hanser Verlag, 2012

Examples

- HTML Sanity Checker
- DocChess (german)
- Gradle (german)
- MaMa CRM (german)
- Financial Data Migration (german)

Acknowledgements and collaborations

arc42 originally envisioned by Dr. Peter Hruschka and Dr. Gernot Starke.

Sources We maintain arc42 in *asciidoc* format at the moment, hosted in GitHub under the aim42-Organisation.

Issues We maintain a list of open topics and bugs.

We are looking forward to your corrections and clarifications! Please fork the repository mentioned over this lines and send us a *pull request*!

Collaborators

We are very thankful and acknowledge the support and help provided by all active and former collaborators, uncountable (anonymous) advisors, bug finders and users of this method.

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Index

Symbols

_FCT_CPU_GPU_ (C macro), 145
__CUSTOM__PRETTY__FUNC__ (C macro), 145
__FILENAME__ (C macro), 145
__anonymous0 (C++ type), 138

A

abs_mean (C++ function), 95
activate (C++ function), 105, 106
activate_array (C++ function), 105, 106
ACTIVATION (C++ type), 99
ACTIVE (C++ class), 99
add_bias (C++ function), 112, 113
add_pixel (C++ function), 125, 126
alphanum_to_int (C++ function), 140, 142
args (FreezeModel attribute), 73
args (RoboyVision attribute), 77
argtypes (darknet attribute), 67
argtypes (FaceDetect attribute), 72
argtypes (ObjectRecognition attribute), 75
augment_args (C++ class), 14
augment_args::aspect (C++ member), 14
augment_args::dx (C++ member), 14
augment_args::dy (C++ member), 14
augment_args::h (C++ member), 14
augment_args::rad (C++ member), 14
augment_args::scale (C++ member), 14
augment_args::w (C++ member), 14
average (C++ function), 93
AVGPOOL (C++ class), 99
avgpool_layer (C++ type), 107
axpy_cpu (C++ function), 101, 108

B

backward_activation_layer (C++ function), 105
backward_avgpool_layer (C++ function), 107
backward_batchnorm_layer (C++ function), 107, 108
backward_bias (C++ function), 112, 113, 128
backward_connected_layer (C++ function), 111, 112
backward_convolutional_layer (C++ function), 112, 113
backward_cost_layer (C++ function), 114
backward_crnn_layer (C++ function), 114, 115
backward_crop_layer (C++ function), 115
backward_crop_layer_gpu (C++ function), 115
backward_deconvolutional_layer (C++ function), 119
backward_detection_layer (C++ function), 120
backward_dropout_layer (C++ function), 120, 121
backward_gru_layer (C++ function), 122
backward_local_layer (C++ function), 127, 128
backward_lstm_layer (C++ function), 128
backward_maxpool_layer (C++ function), 129, 130
backward_network (C++ function), 101, 130
backward_normalization_layer (C++ function), 132
backward_region_layer (C++ function), 135
backward_reorg_layer (C++ function), 135, 136
backward_rnn_layer (C++ function), 136
backward_route_layer (C++ function), 136, 137
backward_scale_cpu (C++ function), 107, 109
backward_shortcut_layer (C++ function), 137
backward_softmax_layer (C++ function), 137, 138
basecfg (C++ function), 104, 140
BATCHNORM (C++ class), 100
BattleRoyaleWithCheese (C++ function), 111
bbox_comparator (C++ function), 111
bbox_fight (C++ function), 111
bbox_update (C++ function), 111
best_3d_shift (C++ function), 124
best_3d_shift_r (C++ function), 101, 124
bias_output (C++ function), 128
bilinear_interpolate (C++ function), 125, 126
binarize_cpu (C++ function), 112
binarize_image (C++ function), 124
binarize_input (C++ function), 112
binarize_weights (C++ function), 112, 113
binarize_weights2 (C++ function), 113
BLANK (C++ class), 100
blend_image (C++ function), 124
board_to_string (C++ function), 94
border_image (C++ function), 123

bound_image (C++ function), 116
box (C++ class), 14
box::h (C++ member), 14
box::w (C++ member), 14
box::x (C++ member), 14
box::y (C++ member), 14
box_intersection (C++ function), 110
box_iou (C++ function), 103, 110
box_label (C++ class), 14
box_label::bottom (C++ member), 15
box_label::h (C++ member), 15
box_label::id (C++ member), 15
box_label::left (C++ member), 15
box_label::right (C++ member), 15
box_label::top (C++ member), 15
box_label::w (C++ member), 15
box_label::x (C++ member), 15
box_label::y (C++ member), 15
box_rmse (C++ function), 110
box_union (C++ function), 110

C

c (example attribute), 68
c (face_detection attribute), 71
calc_network_cost (C++ function), 130, 131
calculate_liberties (C++ function), 94
calculate_loss (C++ function), 95
cam (example attribute), 68
CameraQueue (RoboyVision attribute), 77
CAPTCHA_DATA (C++ class), 100
center_crop_image (C++ function), 124, 125
change_leaves (C++ function), 104, 140
ckpt_file (face_detection attribute), 71
CLASSIFICATION_DATA (C++ class), 100
clf (face_detection attribute), 71
coco_classes (C++ member), 92
coco_ids (C++ member), 92, 94
col2im_add_pixel (C++ function), 111
col2im_cpu (C++ function), 111
collapse_image_layers (C++ function), 123, 126
collapse_images_horz (C++ function), 125, 126
collapse_images_vert (C++ function), 125, 126
colors (C++ member), 125
COMPARE_DATA (C++ class), 100
compare_networks (C++ function), 131
composite_3d (C++ function), 103, 124
composite_image (C++ function), 123
concat_data (C++ function), 101, 117
concat_datas (C++ function), 117, 119
concat_matrix (C++ function), 117
CONNECTED (C++ class), 99
const_cpu (C++ function), 108, 109
CONSTANT (C++ class), 100
constrain (C++ function), 141, 142
constrain_gpu (C++ function), 109
constrain_image (C++ function), 103, 123
constrain_int (C++ function), 141, 142
CONVOLUTIONAL (C++ class), 99
convolutional_layer (C++ type), 113
convolutional_out_height (C++ function), 112, 113
convolutional_out_width (C++ function), 112, 113
copy_cpu (C++ function), 101, 108
copy_data (C++ function), 101, 118
copy_image (C++ function), 103, 123
copy_image_into (C++ function), 123, 126
copy_matrix (C++ function), 129
copy_string (C++ function), 141, 142
correct_boxes (C++ function), 116
correct_region_boxes (C++ function), 135
COST (C++ class), 99
cost_layer (C++ type), 114
COST_TYPE (C++ type), 100
count_fields (C++ function), 141, 142
CRNN (C++ class), 99
CROP (C++ class), 99
crop_image (C++ function), 102, 124
crop_layer (C++ type), 115
csv_to_matrix (C++ function), 102, 129
ctypes (built-in class), 67
current_class (C++ member), 111

D

d_img (face_detection attribute), 71
darknet (built-in class), 67
darknet.classify() (built-in function), 67
darknet.detect() (built-in function), 67
darknet.IMAGE (built-in class), 25
darknet.letterbox_img() (built-in function), 67
darknet.load_img() (built-in function), 67
darknet.load_meta() (built-in function), 67
darknet.load_net() (built-in function), 67
darknet.METADATA (built-in class), 51
darknet.predict() (built-in function), 67
data (C++ class), 24
data (example attribute), 68
data::boxes (C++ member), 25
data::h (C++ member), 24
data::num_boxes (C++ member), 25
data::shallow (C++ member), 24
data::w (C++ member), 24
data::X (C++ member), 24
data::y (C++ member), 24
data_type (C++ type), 100
dbox (C++ class), 25
dbox::dh (C++ member), 25
dbox::dw (C++ member), 25
dbox::dx (C++ member), 25
dbox::dy (C++ member), 25

dcgan_batch (C++ function), 95
decode_box (C++ function), 110
DECONVOLUTIONAL (C++ class), 99
DEF_START_TIMER (C macro), 145
deinter_cpu (C++ function), 108, 109
del_arg (C++ function), 140
delta_region_box (C++ function), 135
delta_region_class (C++ function), 135
delta_region_mask (C++ function), 135
DEMO (C macro), 119
demo (C++ function), 102, 120
demo_art (C++ function), 90
demo_classifier (C++ function), 91
demo_regressor (C++ function), 96
demo_segmenter (C++ function), 97
denormalize_connected_layer (C++ function), 102, 112
denormalize_convolutional_layer (C++ function), 102, 112
denormalize_deconvolutional_layer (C++ function), 119
denormalize_net (C++ function), 93
derivative (C++ function), 110
DescribeSceneSrv (built-in class), 67
DescribeSceneSrv.service_callback() (built-in function), 67
description (setup attribute), 78
description (setup_gpu attribute), 78
DET_DATA (C++ class), 100
detect (FaceDetect attribute), 72
detect (ObjectRecognition attribute), 75
detectFaceProc (multiprocess attribute), 74
detectFaceProc (RoboyVision attribute), 77
detectFaces (RoboyVision attribute), 77
DETECTION (C++ class), 99
DETECTION_DATA (C++ class), 100
detection_info (C++ class), 25
detection_info::bottom (C++ member), 25
detection_info::left (C++ member), 25
detection_info::name (C++ member), 25
detection_info::prob (C++ member), 25
detection_info::right (C++ member), 25
detection_info::top (C++ member), 25
detection_layer (C++ type), 120
dev (face_detection attribute), 71
dice_labels (C++ member), 94
dintersect (C++ function), 110
diou (C++ function), 110
dir (FreezeModel attribute), 73
dist_array (C++ function), 141, 143
distance_from_edge (C++ function), 118
distort_image (C++ function), 124, 126
do_nms (C++ function), 103, 110
do_nms_obj (C++ function), 104, 110
do_nms_sort (C++ function), 104, 110
dot_cpu (C++ function), 108, 109
draw (face_detection attribute), 71
draw_bbox (C++ function), 123, 125
draw_box (C++ function), 123, 125
draw_box_width (C++ function), 103, 123
draw_detections (C++ function), 103, 123
draw_label (C++ function), 123, 125
DROPOUT (C++ class), 99
dropout_layer (C++ type), 121
dunion (C++ function), 110

E

elo_comparator (C++ function), 111
ELU (C++ class), 99
elu_activate (C++ function), 106
elu_gradient (C++ function), 106
embed_image (C++ function), 123, 126
embeddings (face_detection attribute), 71
encode_box (C++ function), 110
engine_go (C++ function), 95
entry_index (C++ function), 135
Enumerations::AREA_EXPORT_STATE (C++ type), 152
Enumerations::AREA_EXPORT_STATE_FILE_EMPTY (C++ class), 152
Enumerations::AREA_EXPORT_STATE_FILE_ERROR (C++ class), 152
Enumerations::AREA_EXPORT_STATE_LAST (C++ class), 152
Enumerations::AREA_EXPORT_STATE_NOT_STARTED (C++ class), 152
Enumerations::AREA_EXPORT_STATE_RUNNING (C++ class), 152
Enumerations::AREA_EXPORT_STATE_SPATIAL_MEMORY_DISABL (C++ class), 152
Enumerations::AREA_EXPORT_STATE_SUCCESS (C++ class), 152
Enumerations::CAMERA_SETTINGS (C++ type), 148
Enumerations::CAMERA_SETTINGS_AUTO_WHITEBALANCE (C++ class), 148
Enumerations::CAMERA_SETTINGS_BRIGHTNESS (C++ class), 148
Enumerations::CAMERA_SETTINGS_CONTRAST (C++ class), 148
Enumerations::CAMERA_SETTINGS_EXPOSURE (C++ class), 148
Enumerations::CAMERA_SETTINGS_GAIN (C++ class), 148
Enumerations::CAMERA_SETTINGS_HUE (C++ class), 148
Enumerations::CAMERA_SETTINGS_LAST (C++ class), 149
Enumerations::CAMERA_SETTINGS_SATURATION (C++ class), 148

Enumerations::CAMERA_SETTINGS_WHITEBALANCE (C++ class), 148
Enumerations::COORDINATE_SYSTEM (C++ type), 150
Enumerations::COORDINATE_SYSTEM_IMAGE (C++ class), 150
Enumerations::COORDINATE_SYSTEM_LAST (C++ class), 150
Enumerations::COORDINATE_SYSTEM_LEFT_HANDED_Y_UP (C++ class), 150
Enumerations::COORDINATE_SYSTEM_LEFT_HANDED_Z_UP (C++ class), 150
Enumerations::COORDINATE_SYSTEM_RIGHT_HANDED_Y_UP (C++ class), 150
Enumerations::COORDINATE_SYSTEM_RIGHT_HANDED_Z_UP (C++ class), 150
Enumerations::COPY_TYPE (C++ type), 147
Enumerations::COPY_TYPE_CPU_CPU (C++ class), 147
Enumerations::COPY_TYPE_CPU_GPU (C++ class), 147
Enumerations::COPY_TYPE_GPU_CPU (C++ class), 147
Enumerations::COPY_TYPE_GPU_GPU (C++ class), 147
Enumerations::DEPTH_FORMAT (C++ type), 151
Enumerations::DEPTH_FORMAT_LAST (C++ class), 151
Enumerations::DEPTH_FORMAT_PFM (C++ class), 151
Enumerations::DEPTH_FORMAT_PGM (C++ class), 151
Enumerations::DEPTH_FORMAT_PNG (C++ class), 151
Enumerations::DEPTH_MODE (C++ type), 149
Enumerations::DEPTH_MODE_LAST (C++ class), 149
Enumerations::DEPTH_MODE_MEDIUM (C++ class), 149
Enumerations::DEPTH_MODE_NONE (C++ class), 149
Enumerations::DEPTH_MODE_PERFORMANCE (C++ class), 149
Enumerations::DEPTH_MODE_QUALITY (C++ class), 149
Enumerations::ERROR_CODE (C++ type), 153
Enumerations::ERROR_CODE_CALIBRATION_FILE_NOT_AVAILABLE (C++ class), 154
Enumerations::ERROR_CODE_CAMERA_NOT_DETECTED (C++ class), 154
Enumerations::ERROR_CODE_CAMERA_NOT_INITIALIZED (C++ class), 154
Enumerations::ERROR_CODE_CORRUPTED_SDK_INSTALLATION (C++ class), 154
Enumerations::ERROR_CODE_CUDA_ERROR (C++ class), 154
Enumerations::ERROR_CODE_FAILURE (C++ class), 153
Enumerations::ERROR_CODE_INVALID_COORDINATE_SYSTEM (C++ class), 154
Enumerations::ERROR_CODE_INVALID_FIRMWARE (C++ class), 154
Enumerations::ERROR_CODE_INVALID_FUNCTION_CALL (C++ class), 154
Enumerations::ERROR_CODE_INVALID_RESOLUTION (C++ class), 154
Enumerations::ERROR_CODE_INVALID_SVO_FILE (C++ class), 154
Enumerations::ERROR_CODE_LAST (C++ class), 154
Enumerations::ERROR_CODE_LOW_USB_BANDWIDTH (C++ class), 154
Enumerations::ERROR_CODE_NO_GPU_COMPATIBLE (C++ class), 154
Enumerations::ERROR_CODE_NOT_A_NEW_FRAME (C++ class), 154
Enumerations::ERROR_CODE_NOT_ENOUGH_GPUMEM (C++ class), 154
Enumerations::ERROR_CODE_NVIDIA_DRIVER_OUT_OF_DATE (C++ class), 154
Enumerations::ERROR_CODE_SVO_RECORDING_ERROR (C++ class), 154
Enumerations::MAT_TYPE (C++ type), 147
Enumerations::MAT_TYPE_32F_C1 (C++ class), 147
Enumerations::MAT_TYPE_32F_C2 (C++ class), 147
Enumerations::MAT_TYPE_32F_C3 (C++ class), 147
Enumerations::MAT_TYPE_32F_C4 (C++ class), 147
Enumerations::MAT_TYPE_8U_C1 (C++ class), 147
Enumerations::MAT_TYPE_8U_C2 (C++ class), 147
Enumerations::MAT_TYPE_8U_C3 (C++ class), 147
Enumerations::MAT_TYPE_8U_C4 (C++ class), 148
Enumerations::MEASURE (C++ type), 150
Enumerations::MEASURE_CONFIDENCE (C++ class), 150
Enumerations::MEASURE_DEPTH (C++ class), 150
Enumerations::MEASURE_DISPARITY (C++ class), 150
Enumerations::MEASURE_LAST (C++ class), 151
Enumerations::MEASURE_XYZ (C++ class), 150
Enumerations::MEASURE_XYZABGR (C++ class), 151
Enumerations::MEASURE_XYZARGB (C++ class), 150
Enumerations::MEASURE_XYZBGRA (C++ class), 150
Enumerations::MEASURE_XYZRGBA (C++ class), 150
Enumerations::MEM (C++ type), 147
Enumerations::MEM_CPU (C++ class), 147
Enumerations::MEM_GPU (C++ class), 147
Enumerations::POINT_CLOUD_FORMAT (C++ type), 151
Enumerations::POINT_CLOUD_FORMAT_LAST (C++ class), 152
Enumerations::POINT_CLOUD_FORMAT_PCD_ASCII

(C++ class), 152
Enumerations::POINT_CLOUD_FORMAT_PLY_ASCII (C++ class), 152
Enumerations::POINT_CLOUD_FORMAT_VTK_ASCII (C++ class), 152
Enumerations::POINT_CLOUD_FORMAT_XYZ_ASCII (C++ class), 152
Enumerations::RANGE (C++ type), 147
Enumerations::RANGE_FAR (C++ class), 147
Enumerations::RANGE_MEDIUM (C++ class), 147
Enumerations::RANGE_NEAR (C++ class), 147
Enumerations::REFERENCE_FRAME (C++ type), 152
Enumerations::REFERENCE_FRAME_CAMERA (C++ class), 153
Enumerations::REFERENCE_FRAME_LAST (C++ class), 153
Enumerations::REFERENCE_FRAME_WORLD (C++ class), 153
Enumerations::RESOLUTION (C++ type), 146, 148
Enumerations::RESOLUTION_HD1080 (C++ class), 148
Enumerations::RESOLUTION_HD2K (C++ class), 148
Enumerations::RESOLUTION_HD720 (C++ class), 148
Enumerations::RESOLUTION_HIGH (C++ class), 146
Enumerations::RESOLUTION_LAST (C++ class), 148
Enumerations::RESOLUTION_LOW (C++ class), 146
Enumerations::RESOLUTION_MEDIUM (C++ class), 146
Enumerations::RESOLUTION_VGA (C++ class), 148
Enumerations::SELF_CALIBRATION_STATE (C++ type), 149
Enumerations::SELF_CALIBRATION_STATE_FAILED (C++ class), 149
Enumerations::SELF_CALIBRATION_STATE_LAST (C++ class), 149
Enumerations::SELF_CALIBRATION_STATE_NOT_STARTED (C++ class), 149
Enumerations::SELF_CALIBRATION_STATE_RUNNING (C++ class), 149
Enumerations::SELF_CALIBRATION_STATE_SUCCESS (C++ class), 149
Enumerations::SENSING_MODE (C++ type), 149
Enumerations::SENSING_MODE_FILL (C++ class), 149
Enumerations::SENSING_MODE_LAST (C++ class), 149
Enumerations::SENSING_MODE_STANDARD (C++ class), 149
Enumerations::SPATIAL_MAPPING_STATE (C++ type), 153
Enumerations::SPATIAL_MAPPING_STATE_FPS_TOO_LOW (C++ class), 153
Enumerations::SPATIAL_MAPPING_STATE_INITIALIZING (C++ class), 153
Enumerations::SPATIAL_MAPPING_STATE_LAST (C++ class), 153
Enumerations::SPATIAL_MAPPING_STATE_NOT_ENABLED (C++ class), 153
Enumerations::SPATIAL_MAPPING_STATE_NOT_ENOUGH_MEMORY (C++ class), 153
Enumerations::SPATIAL_MAPPING_STATE_OK (C++ class), 153
Enumerations::SUCCESS (C++ class), 153
Enumerations::SVO_COMPRESSION_MODE (C++ type), 153
Enumerations::SVO_COMPRESSION_MODE_LAST (C++ class), 153
Enumerations::SVO_COMPRESSION_MODE_LOSSLESS (C++ class), 153
Enumerations::SVO_COMPRESSION_MODE_LOSSY (C++ class), 153
Enumerations::SVO_COMPRESSION_MODE_RAW (C++ class), 153
Enumerations::TRACKING_STATE (C++ type), 152
Enumerations::TRACKING_STATE_FPS_TOO_LOW (C++ class), 152
Enumerations::TRACKING_STATE_LAST (C++ class), 152
Enumerations::TRACKING_STATE_OFF (C++ class), 152
Enumerations::TRACKING_STATE_OK (C++ class), 152
Enumerations::TRACKING_STATE_SEARCHING (C++ class), 152
Enumerations::UNIT (C++ type), 149
Enumerations::UNIT_CENTIMETER (C++ class), 150
Enumerations::UNIT_FOOT (C++ class), 150
Enumerations::UNIT_INCH (C++ class), 150
Enumerations::UNIT_LAST (C++ class), 150
Enumerations::UNIT_METER (C++ class), 150
Enumerations::UNIT_MILLIMETER (C++ class), 150
Enumerations::VIEW (C++ type), 151
Enumerations::VIEW_CONFIDENCE (C++ class), 151
Enumerations::VIEW_DEPTH (C++ class), 151
Enumerations::VIEW_LAST (C++ class), 151
Enumerations::VIEW_LEFT (C++ class), 151
Enumerations::VIEW_LEFT_GRAY (C++ class), 151
Enumerations::VIEW_LEFT_UNRECTIFIED (C++ class), 151
Enumerations::VIEW_LEFT_UNRECTIFIED_GRAY (C++ class), 151
Enumerations::VIEW_RIGHT (C++ class), 151
Enumerations::VIEW_RIGHT_GRAY (C++ class), 151
Enumerations::VIEW_RIGHT_UNRECTIFIED (C++ class), 151
Enumerations::VIEW_RIGHT_UNRECTIFIED_GRAY (C++ class), 151
Enumerations::VIEW_SIDE_BY_SIDE (C++ class), 151

error (C++ function), 104, 140
eval_cifar_csv (C++ function), 91
example (built-in class), 67
exclusive_image (C++ function), 116
exitActions (C++ function), 146
EXP (C++ class), 100
exposure_image (C++ function), 124, 126
ext_modules (setup attribute), 78
ext_modules (setup_gpu attribute), 78
extract_cifar (C++ function), 91
extract_voxel (C++ function), 97

F

face_detection (built-in class), 68
face_detection.align_face_mtcnn() (built-in function), 69
face_detection.detect_face_and_landmarks_mtcnn() (built-in function), 69
face_detection.draw_landmarks() (built-in function), 69
face_detection.draw_rects() (built-in function), 69
face_detection.face_detected() (built-in function), 70
face_detection.get_closest_face() (built-in function), 69
face_detection.get_model_filenames() (built-in function), 70
face_detection.load_model() (built-in function), 70
face_detection.recognize_face() (built-in function), 70
FaceDetect (built-in class), 71
FaceDetect.BOX (built-in class), 14
FaceDetect.c_array() (built-in function), 72
FaceDetect.detect() (built-in function), 72
FaceDetect.detectObjects() (built-in function), 72
FaceDetect.draw_results() (built-in function), 72
FaceDetect.IMAGE (built-in class), 25
FaceDetect.Initialize() (built-in function), 72
FaceDetect.METADATA (built-in class), 50
FaceDetect.sample() (built-in function), 72
FaceDetect.StartDetection() (built-in function), 72
FacePointQueue (RoboyVision attribute), 77
fgetgo (C++ function), 94
fgetl (C++ function), 104, 141, 142
file_error (C++ function), 141, 142
fill_cpu (C++ function), 108, 109
fill_hierarchy (C++ function), 116
fill_image (C++ function), 103, 124
fill_truth (C++ function), 116, 119
fill_truth_captcha (C++ function), 116
fill_truth_detection (C++ function), 116
fill_truth_iseg (C++ function), 116
fill_truth_region (C++ function), 116
fill_truth_swag (C++ function), 116
find_arg (C++ function), 104, 140
find_char_arg (C++ function), 104, 140
find_float_arg (C++ function), 104, 140
find_int_arg (C++ function), 104, 140
find_replace (C++ function), 104, 140, 142
find_replace_paths (C++ function), 116
FindObjectSrv (built-in class), 72
FindObjectSrv.service_callback() (built-in function), 73
fix_data_captcha (C++ function), 90
flatten (C++ function), 108, 109
flip_board (C++ function), 94
flip_image (C++ function), 103, 123
float_pair (C++ class), 25
float_pair::x (C++ member), 25
float_pair::y (C++ member), 25
float_to_box (C++ function), 103, 110
float_to_image (C++ function), 103, 123
forward_activation_layer (C++ function), 105
forward_avgpool_layer (C++ function), 107
forward_batchnorm_layer (C++ function), 107, 108
forward_connected_layer (C++ function), 111, 112
forward_convolutional_layer (C++ function), 112, 113
forward_cost_layer (C++ function), 114
forward_crnn_layer (C++ function), 114, 115
forward_crop_layer (C++ function), 115
forward_deconvolutional_layer (C++ function), 119
forward_detection_layer (C++ function), 120
forward_dropout_layer (C++ function), 120, 121
forward_gru_layer (C++ function), 122
forward_local_layer (C++ function), 127, 128
forward_lstm_layer (C++ function), 128
forward_maxpool_layer (C++ function), 129, 130
forward_network (C++ function), 101, 130
forward_normalization_layer (C++ function), 132
forward_region_layer (C++ function), 135
forward_reorg_layer (C++ function), 135, 136
forward_rnn_layer (C++ function), 136
forward_route_layer (C++ function), 136, 137
forward_shortcut_layer (C++ function), 137
forward_softmax_layer (C++ function), 137, 138
FoundObjects (FindObjectSrv attribute), 73
fourcc (example attribute), 68
frame (example attribute), 68
FrameQueue (multiprocess attribute), 74
FrameQueue (RoboyVision attribute), 77
free_data (C++ function), 101, 117
free_image (C++ function), 104, 125
free_image (FaceDetect attribute), 72
free_image (ObjectRecognition attribute), 75
free_layer (C++ function), 101, 127
free_list (C++ function), 104, 127
free_list_contents (C++ function), 127
free_matrix (C++ function), 102, 129
free_network (C++ function), 102, 131
free_node (C++ function), 127
free_ptrs (C++ function), 104, 141, 142
free_ptrs (FaceDetect attribute), 72
free_ptrs (ObjectRecognition attribute), 75
free_section (C++ function), 133

FreezeModel (built-in class), 73
FreezeModel.freeze_graph() (built-in function), 73

G

g_handle (C++ member), 144
gemm (C++ function), 121
gemm_bin (C++ function), 121
gemm_cpu (C++ function), 121
gemm_nn (C++ function), 121
gemm_nt (C++ function), 121
gemm_tn (C++ function), 121
gemm_tt (C++ function), 121
generate_move (C++ function), 94
generateImageToRecord (C++ function), 146
get_activation (C++ function), 105, 106
get_activation_string (C++ function), 105, 106
get_avgpool_image (C++ function), 107
get_base_args (C++ function), 101, 130
get_coco_image_id (C++ function), 92, 93
get_color (C++ function), 123, 125
get_convolutional_delta (C++ function), 112, 113
get_convolutional_image (C++ function), 112, 113
get_convolutional_weight (C++ function), 112, 113
get_cost_string (C++ function), 114
get_cost_type (C++ function), 114
get_crop_image (C++ function), 115
get_current_batch (C++ function), 103, 130
get_current_rate (C++ function), 103, 130
get_data_part (C++ function), 118
get_detection_boxes (C++ function), 102, 120
get_detection_info (C++ function), 143
get_hierarchy_probability (C++ function), 140
get_image_layer (C++ function), 125, 126
get_label (C++ function), 123
get_labels (C++ function), 104, 117
get_layer_string (C++ function), 130, 131
get_maxpool_delta (C++ function), 129
get_maxpool_image (C++ function), 129, 130
get_metadata (C++ function), 101, 132
get_network_detection_layer (C++ function), 130
get_network_image (C++ function), 103, 131
get_network_image_layer (C++ function), 103, 131
get_network_output_layer (C++ function), 103, 131
get_next_batch (C++ function), 101, 117
get_paths (C++ function), 104, 116
get_pixel (C++ function), 125, 126
get_pixel_extend (C++ function), 125, 126
get_policy (C++ function), 134
get_predicted_class_network (C++ function), 130, 131
get_random_batch (C++ function), 117, 118
get_random_data (C++ function), 118
get_random_paths (C++ function), 116
get_region_box (C++ function), 135
get_region_boxes (C++ function), 102, 135
get_regression_values (C++ function), 91
get_rnn_data (C++ function), 96
get_rnn_token_data (C++ function), 96
get_segmentation_image (C++ function), 117
get_segmentation_image2 (C++ function), 117
get_weights (C++ function), 102, 113
get_workspace_size (C++ function), 112, 119
ghost_image (C++ function), 103, 123
gpu_index (C++ member), 105, 115
gradient (C++ function), 105, 106
gradient_array (C++ function), 105, 106
graph (face_detection attribute), 71
grayscale_image (C++ function), 103, 124
grayscale_image_3c (C++ function), 101, 124
GRU (C++ class), 99
gun_classifier (C++ function), 91

H

h (example attribute), 68
HARDTAN (C++ class), 99
hardtan_activate (C++ function), 106
hardtan_gradient (C++ function), 106
help (FreezeModel attribute), 73
hierarchy_predictions (C++ function), 104, 140
hierarchy_top_prediction (C++ function), 140
hold_out_matrix (C++ function), 129
hsv_to_rgb (C++ function), 124, 126
hue_image (C++ function), 124

I

im (darknet attribute), 67
im (zedRoboy attribute), 90
im2col_cpu (C++ function), 122
im2col_get_pixel (C++ function), 122
image (C++ class), 26
image::c (C++ member), 26
image::data (C++ member), 26
image::h (C++ member), 26
image::w (C++ member), 26
image_batch (face_detection attribute), 71
IMAGE_DATA (C++ class), 100
image_distance (C++ function), 123, 125
image_ids (voc_label attribute), 89
image_paths (RecogniseFace.ImageClass attribute), 26
img (example attribute), 68
img (face_detection attribute), 71
increment_layer (C++ function), 114, 122, 128, 136
InfoOption (C++ class), 26
InfoOption::computeDisparity (C++ member), 26
InfoOption::output_path (C++ member), 26
InfoOption::recordingMode (C++ member), 26
InfoOption::svo_path (C++ member), 26
InfoOption::videoMode (C++ member), 26
INIT_TIMER (C macro), 145

initActions (C++ function), 146
InitCamera (C++ function), 146
initpyyolo (C++ function), 144
INSTANCE_DATA (C++ class), 101
int_to_alphanum (C++ function), 140, 142
inter_cpu (C++ function), 108, 109
inverted (C++ member), 95
IS_FINITE (C macro), 145
is_network (C++ function), 134
isValidMeasure (C macro), 145

K

keyboard (C++ member), 146
kvp (C++ class), 28
kvp::key (C++ member), 29
kvp::used (C++ member), 29
kvp::val (C++ member), 29

L

L1 (C++ class), 100
l1_cpu (C++ function), 108, 109
l2_cpu (C++ function), 108, 109
label_classifier (C++ function), 91
layer (C++ class), 29
layer (C++ type), 98
layer::absolute (C++ member), 31
layer::activation (C++ member), 29
layer::alpha (C++ member), 31
layer::angle (C++ member), 30
layer::background (C++ member), 30
layer::backward (C++ member), 29
layer::backward_gpu (C++ member), 29
layer::batch (C++ member), 29
layer::batch_normalize (C++ member), 29
layer::beta (C++ member), 31
layer::bias_m (C++ member), 32
layer::bias_match (C++ member), 31
layer::bias_updates (C++ member), 32
layer::bias_v (C++ member), 32
layer::biases (C++ member), 32
layer::binary (C++ member), 30
layer::binary_input (C++ member), 33
layer::binary_weights (C++ member), 32
layer::c (C++ member), 29
layer::c_cpu (C++ member), 33
layer::cell_cpu (C++ member), 33
layer::class_scale (C++ member), 31
layer::classes (C++ member), 30
layer::classfix (C++ member), 31
layer::combine_cpu (C++ member), 31
layer::combine_delta_cpu (C++ member), 31
layer::concat (C++ member), 31
layer::concat_delta (C++ member), 31
layer::coord_scale (C++ member), 31
layer::coords (C++ member), 30
layer::cost (C++ member), 31
layer::cost_type (C++ member), 29
layer::cweights (C++ member), 31
layer::dc_cpu (C++ member), 33
layer::delta (C++ member), 32
layer::dh_cpu (C++ member), 32
layer::does_cost (C++ member), 30
layer::dontload (C++ member), 31
layer::dontloadscales (C++ member), 31
layer::dot (C++ member), 30
layer::exposure (C++ member), 30
layer::extra (C++ member), 29
layer::f_cpu (C++ member), 33
layer::flatten (C++ member), 30
layer::flip (C++ member), 30
layer::flipped (C++ member), 29
layer::forced (C++ member), 29
layer::forgot_delta (C++ member), 31
layer::forgot_state (C++ member), 31
layer::forward (C++ member), 29
layer::forward_gpu (C++ member), 29
layer::g_cpu (C++ member), 33
layer::groups (C++ member), 29
layer::h (C++ member), 29
layer::h_cpu (C++ member), 32
layer::hh_cpu (C++ member), 32
layer::hidden (C++ member), 30
layer::i_cpu (C++ member), 33
layer::index (C++ member), 30
layer::indexes (C++ member), 31
layer::input_gate_layer (C++ member), 33
layer::input_h_layer (C++ member), 33
layer::input_layer (C++ member), 33
layer::input_layers (C++ member), 31
layer::input_r_layer (C++ member), 33
layer::input_save_layer (C++ member), 33
layer::input_sizes (C++ member), 31
layer::input_state_layer (C++ member), 33
layer::input_z_layer (C++ member), 33
layer::inputs (C++ member), 29
layer::jitter (C++ member), 30
layer::joint (C++ member), 30
layer::kappa (C++ member), 31
layer::learning_rate_scale (C++ member), 30
layer::log (C++ member), 30
layer::m (C++ member), 32
layer::map (C++ member), 31
layer::mask_scale (C++ member), 31
layer::max_boxes (C++ member), 29
layer::mean (C++ member), 32
layer::mean_delta (C++ member), 32
layer::n (C++ member), 29
layer::nbiases (C++ member), 29

layer::noadjust (C++ member), 30
layer::noobject_scale (C++ member), 31
layer::norms (C++ member), 32
layer::nweights (C++ member), 29
layer::o_cpu (C++ member), 33
layer::object_scale (C++ member), 31
layer::objectness (C++ member), 30
layer::onlyforward (C++ member), 31
layer::out_c (C++ member), 29
layer::out_h (C++ member), 29
layer::out_w (C++ member), 29
layer::output (C++ member), 32
layer::output_layer (C++ member), 33
layer::outputs (C++ member), 29
layer::pad (C++ member), 30
layer::prev_cell_cpu (C++ member), 32
layer::prev_state (C++ member), 31
layer::prev_state_cpu (C++ member), 32
layer::probability (C++ member), 31
layer::r_cpu (C++ member), 32
layer::rand (C++ member), 31
layer::random (C++ member), 31
layer::ratio (C++ member), 30
layer::reorg (C++ member), 30
layer::rescore (C++ member), 30
layer::reset_layer (C++ member), 33
layer::reverse (C++ member), 30
layer::rolling_mean (C++ member), 32
layer::rolling_variance (C++ member), 32
layer::saturation (C++ member), 30
layer::scale (C++ member), 31
layer::scale_m (C++ member), 32
layer::scale_updates (C++ member), 32
layer::scale_v (C++ member), 32
layer::scales (C++ member), 32
layer::self_layer (C++ member), 33
layer::shift (C++ member), 30
layer::shortcut (C++ member), 29
layer::side (C++ member), 30
layer::size (C++ member), 30
layer::smooth (C++ member), 30
layer::softmax (C++ member), 30
layer::softmax_tree (C++ member), 34
layer::spatial (C++ member), 30
layer::spatial_mean (C++ member), 32
layer::sqrt (C++ member), 30
layer::squared (C++ member), 32
layer::state (C++ member), 31
layer::state_delta (C++ member), 31
layer::state_gate_layer (C++ member), 33
layer::state_h_layer (C++ member), 33
layer::state_layer (C++ member), 33
layer::state_r_layer (C++ member), 33
layer::state_save_layer (C++ member), 33
layer::state_state_layer (C++ member), 33
layer::state_z_layer (C++ member), 33
layer::steps (C++ member), 30
layer::stopbackward (C++ member), 31
layer::stride (C++ member), 30
layer::tanh (C++ member), 30
layer::temp2_cpu (C++ member), 32
layer::temp3_cpu (C++ member), 32
layer::temp_cpu (C++ member), 32
layer::temperature (C++ member), 31
layer::thresh (C++ member), 31
layer::truth (C++ member), 30
layer::truths (C++ member), 29
layer::type (C++ member), 29
layer::uf (C++ member), 33
layer::ug (C++ member), 34
layer::uh (C++ member), 33
layer::ui (C++ member), 34
layer::uo (C++ member), 33
layer::update (C++ member), 29
layer::update_gpu (C++ member), 29
layer::update_layer (C++ member), 33
layer::ur (C++ member), 33
layer::uz (C++ member), 33
layer::v (C++ member), 32
layer::variance (C++ member), 32
layer::variance_delta (C++ member), 32
layer::w (C++ member), 29
layer::weight_updates (C++ member), 32
layer::weights (C++ member), 32
layer::wf (C++ member), 33
layer::wg (C++ member), 34
layer::wh (C++ member), 33
layer::wi (C++ member), 34
layer::wo (C++ member), 33
layer::workspace_size (C++ member), 34
layer::wr (C++ member), 33
layer::wz (C++ member), 33
layer::x (C++ member), 32
layer::x_norm (C++ member), 32
layer::xnor (C++ member), 30
layer::z_cpu (C++ member), 32
LAYER_TYPE (C++ type), 99
LEAKY (C++ class), 99
leaky_activate (C++ function), 106
leaky_gradient (C++ function), 106
learning_rate_policy (C++ type), 100
legal_go (C++ function), 94
LETTERBOX_DATA (C++ class), 101
letterbox_image (C++ function), 102, 124
letterbox_image (FaceDetect attribute), 72
letterbox_image (ObjectRecognition attribute), 75
letterbox_image_into (C++ function), 124, 126
level (FindObjectSrv attribute), 73

LHTAN (C++ class), 99
lhtan_activate (C++ function), 106
lhtan_gradient (C++ function), 106
lib (darknet attribute), 67
lib (FaceDetect attribute), 72
lib (ObjectRecognition attribute), 75
lib (zedRoboy attribute), 90
LINEAR (C++ class), 99
linear_activate (C++ function), 106
linear_gradient (C++ function), 106
list (C++ class), 34
list (C++ type), 98
list::back (C++ member), 34
list::front (C++ member), 34
list::size (C++ member), 34
list_file (voc_label attribute), 89
list_find (C++ function), 127
list_insert (C++ function), 127
list_pop (C++ function), 127
list_to_array (C++ function), 104, 127
load_all_cifar10 (C++ function), 103, 117
load_alphabet (C++ function), 103, 123
load_args (C++ class), 34
load_args (C++ type), 98
load_args::angle (C++ member), 35
load_args::aspect (C++ member), 35
load_args::background (C++ member), 34
load_args::center (C++ member), 34
load_args::classes (C++ member), 34
load_args::coords (C++ member), 35
load_args::d (C++ member), 35
load_args::exposure (C++ member), 35
load_args::h (C++ member), 34
load_args::hierarchy (C++ member), 35
load_args::hue (C++ member), 35
load_args::im (C++ member), 35
load_args::jitter (C++ member), 35
load_args::labels (C++ member), 34
load_args::m (C++ member), 34
load_args::max (C++ member), 34
load_args::min (C++ member), 34
load_args::n (C++ member), 34
load_args::nh (C++ member), 34
load_args::num_boxes (C++ member), 34
load_args::nw (C++ member), 34
load_args::out_h (C++ member), 34
load_args::out_w (C++ member), 34
load_args::path (C++ member), 34
load_args::paths (C++ member), 34
load_args::resized (C++ member), 35
load_args::saturation (C++ member), 35
load_args::scale (C++ member), 34
load_args::size (C++ member), 34
load_args::threads (C++ member), 34
load_args::type (C++ member), 35
load_args::w (C++ member), 34
load_batchnorm_weights (C++ function), 134
load_categorical_data_csv (C++ function), 117, 118
load_cifar10_data (C++ function), 101, 117
load_connected_weights (C++ function), 134
load_convolutional_weights (C++ function), 134
load_convolutional_weights_binary (C++ function), 134
load_data (C++ function), 101, 117
load_data_augment (C++ function), 117, 118
load_data_blocking (C++ function), 104, 117, 118
load_data_captcha (C++ function), 116, 118
load_data_captcha_encode (C++ function), 116, 118
load_data_compare (C++ function), 117
load_data_detection (C++ function), 117, 118
load_data_in_thread (C++ function), 104, 117
load_data_iseg (C++ function), 117
load_data_old (C++ function), 103, 117
load_data_region (C++ function), 117
load_data_regression (C++ function), 117, 118
load_data_seg (C++ function), 117
load_data_super (C++ function), 117, 118
load_data_swag (C++ function), 117
load_data_tag (C++ function), 117, 118
load_data_writing (C++ function), 117, 118
load_go (C++ function), 117, 118
load_go_moves (C++ function), 94
load_image (C++ function), 102, 125
load_image (FaceDetect attribute), 72
load_image (ObjectRecognition attribute), 75
load_image_augment_paths (C++ function), 116, 118
load_image_color (C++ function), 102, 125
load_image_paths (C++ function), 116
load_image_paths_gray (C++ function), 116
load_image_stb (C++ function), 125
load_labels_paths (C++ function), 116
load_meta (FaceDetect attribute), 72
load_meta (ObjectRecognition attribute), 75
load_net (FaceDetect attribute), 72
load_net (ObjectRecognition attribute), 75
load_network (C++ function), 101, 130
load_network_p (C++ function), 101, 130
load_regression_labels_paths (C++ function), 116
load_rle (C++ function), 116
load_tags_paths (C++ function), 116
load_thread (C++ function), 117
load_threads (C++ function), 117
load_weights (C++ function), 102, 134
load_weights_upto (C++ function), 102, 134
LOCAL (C++ class), 99
local_layer (C++ type), 128
local_out_height (C++ function), 127
local_out_width (C++ function), 127
LOGGY (C++ class), 99

loggy_activate (C++ function), 106
loggy_gradient (C++ function), 106
LOGISTIC (C++ class), 99
logistic_activate (C++ function), 106
logistic_gradient (C++ function), 106
logit (C++ function), 135
LSTM (C++ class), 99

M

mag_array (C++ function), 104, 141
main (C++ function), 93, 146
make_activation_layer (C++ function), 105
make_avgpool_layer (C++ function), 107
make_batchnorm_layer (C++ function), 107, 108
make_boxes (FaceDetect attribute), 72
make_boxes (ObjectRecognition attribute), 75
make_connected_layer (C++ function), 111, 112
make_convolutional_layer (C++ function), 112, 113
make_cost_layer (C++ function), 114
make_crnn_layer (C++ function), 114, 115
make_crop_layer (C++ function), 115
make_deconvolutional_layer (C++ function), 119
make_detection_layer (C++ function), 120
make_dropout_layer (C++ function), 120, 121
make_empty_image (C++ function), 123, 126
make_gru_layer (C++ function), 122
make_image (C++ function), 102, 123
make_labels (built-in class), 73
make_labels.make_labels() (built-in function), 73
make_list (C++ function), 127
make_local_layer (C++ function), 127, 128
make_lstm_layer (C++ function), 128
make_matrix (C++ function), 104, 129
make_maxpool_layer (C++ function), 129, 130
make_network (C++ function), 130, 131
make_normalization_layer (C++ function), 132
make_probs (FaceDetect attribute), 72
make_probs (ObjectRecognition attribute), 75
make_random_image (C++ function), 102, 123
make_region_layer (C++ function), 135
make_reorg_layer (C++ function), 135, 136
make_rnn_layer (C++ function), 136
make_route_layer (C++ function), 136, 137
make_shortcut_layer (C++ function), 137
make_softmax_layer (C++ function), 137, 138
makes_safe_go (C++ function), 94
malloc_error (C++ function), 140, 142
manageActions (C++ function), 146
mask_to_rgb (C++ function), 102, 123
MASKED (C++ class), 100
matrix (C++ class), 42
matrix (C++ type), 98
matrix::cols (C++ member), 42
matrix::rows (C++ member), 42
matrix::vals (C++ member), 42
matrix_add_matrix (C++ function), 101, 129
matrix_to_csv (C++ function), 101, 129
matrix_topk_accuracy (C++ function), 101, 129
max_index (C++ function), 104, 141
MAXPOOL (C++ class), 99
maxpool_layer (C++ type), 130
mean_array (C++ function), 104, 141
mean_arrays (C++ function), 141, 143
mean_cpu (C++ function), 108, 109
mean_delta_cpu (C++ function), 107, 109
meta (darknet attribute), 67
meta (zedRoboy attribute), 90
meta_file (face_detection attribute), 71
metadata (C++ class), 50
metadata::classes (C++ member), 50
metadata::names (C++ member), 50
mkimg (C++ function), 93
module (setup attribute), 78
module (setup_gpu attribute), 78
move_go (C++ function), 94
moves (C++ class), 51
moves::data (C++ member), 51
moves::n (C++ member), 51
mse_array (C++ function), 104, 141
mul_cpu (C++ function), 108, 109
mult_add_into_cpu (C++ function), 108, 109
multiprocess (built-in class), 73
multiprocess.detectFaces() (built-in function), 74
multiprocess.TestProcess() (built-in function), 74
multiprocess.tracking() (built-in function), 74
Multitracking (built-in class), 74
Multitracking.StartTracking() (built-in function), 74
mutex (C++ member), 118

N

name (RecogniseFace.ImageClass attribute), 26
name (setup attribute), 78
name (setup_gpu attribute), 78
net (darknet attribute), 67
net (zedRoboy attribute), 90
NETWORK (C++ class), 100
network (C++ class), 51
network (C++ type), 98
network::adam (C++ member), 52
network::angle (C++ member), 52
network::aspect (C++ member), 52
network::B1 (C++ member), 52
network::B2 (C++ member), 52
network::batch (C++ member), 51
network::burn_in (C++ member), 52
network::c (C++ member), 52
network::center (C++ member), 52
network::cost (C++ member), 52

network::decay (C++ member), 51
network::delta (C++ member), 52
network::epoch (C++ member), 51
network::eps (C++ member), 52
network::exposure (C++ member), 52
network::gamma (C++ member), 51
network::gpu_index (C++ member), 52
network::h (C++ member), 52
network::hierarchy (C++ member), 52
network::hue (C++ member), 52
network::index (C++ member), 52
network::input (C++ member), 52
network::inputs (C++ member), 52
network::layers (C++ member), 51
network::learning_rate (C++ member), 51
network::max_batches (C++ member), 51
network::max_crop (C++ member), 52
network::min_crop (C++ member), 52
network::momentum (C++ member), 51
network::n (C++ member), 51
network::notruth (C++ member), 52
network::num_steps (C++ member), 51
network::output (C++ member), 51
network::outputs (C++ member), 52
network::policy (C++ member), 51
network::power (C++ member), 51
network::saturation (C++ member), 52
network::scale (C++ member), 51
network::scales (C++ member), 51
network::seen (C++ member), 51
network::step (C++ member), 51
network::steps (C++ member), 51
network::subdivisions (C++ member), 51
network::t (C++ member), 51
network::time_steps (C++ member), 51
network::train (C++ member), 52
network::truth (C++ member), 52
network::truths (C++ member), 52
network::w (C++ member), 52
network::workspace (C++ member), 52
network_accuracies (C++ function), 102, 131
network_accuracy (C++ function), 103, 131
network_accuracy_multi (C++ function), 131
network_detect (FaceDetect attribute), 72
network_detect (ObjectRecognition attribute), 75
network_height (C++ function), 104, 131
network_inputs (C++ function), 131
network_output (C++ function), 131
network_output_layer (C++ function), 131
network_outputs (C++ function), 131
network_predict (C++ function), 103, 131
network_predict_data (C++ function), 103, 131
network_predict_data_multi (C++ function), 131
network_predict_image (C++ function), 104, 131
network_predict_p (C++ function), 103, 131
network_width (C++ function), 104, 131
NewFacialFeaturesMsg (built-in class), 74
NewFacialFeaturesMsg.service_callback() (built-in function), 74
nind (C++ member), 95
nms_comparator (C++ function), 110
node (C++ class), 52
node (C++ type), 98
node::next (C++ member), 52
node::prev (C++ member), 52
node::val (C++ member), 52
noi (C++ member), 95
NORMALIZATION (C++ class), 99
normalize_array (C++ function), 104, 141
normalize_cpu (C++ function), 101, 108
normalize_data_rows (C++ function), 118
normalize_delta_cpu (C++ function), 107, 109
normalize_image (C++ function), 101, 123
normalize_image2 (C++ function), 123
normalize_layer (C++ function), 93
normalize_net (C++ function), 93
NPY_NO_DEPRECATED_API (C macro), 144
num_boxes (FaceDetect attribute), 72
num_boxes (ObjectRecognition attribute), 75
NUMCHARS (C macro), 116

O

ObjectRecognition (built-in class), 74
ObjectRecognition.BOX (built-in class), 14
ObjectRecognition.c_array() (built-in function), 74
ObjectRecognition.detect() (built-in function), 74
ObjectRecognition.detectObjects() (built-in function), 75
ObjectRecognition.draw_results() (built-in function), 74
ObjectRecognition.IMAGE (built-in class), 25
ObjectRecognition.Initialize() (built-in function), 74
ObjectRecognition.METADATA (built-in class), 50
ObjectRecognition.sample() (built-in function), 74
ObjectsQueue (RoboyVision attribute), 77
OCCLUSION_VALUE (C macro), 145
ok (example attribute), 68
OLD_CLASSIFICATION_DATA (C++ class), 100
one_hot_encode (C++ function), 142, 143
oneoff (C++ function), 93
oneoff2 (C++ function), 93
onet (face_detection attribute), 71
operations (C++ function), 93
optimize_picture (C++ function), 95
option_find (C++ function), 132, 133
option_find_float (C++ function), 132, 133
option_find_float_quiet (C++ function), 132, 133
option_find_int (C++ function), 102, 132
option_find_int_quiet (C++ function), 132, 133
option_find_str (C++ function), 102, 132

option_insert (C++ function), 132, 133
option_unused (C++ function), 132, 133
or_image (C++ function), 116
outputs (example attribute), 68
outVideo (example attribute), 68
overlap (C++ function), 110

P

parse_activation (C++ function), 134
parse_args (C++ function), 146
parse_avgpool (C++ function), 134
parse_batchnorm (C++ function), 134
parse_connected (C++ function), 133
parse_convolutional (C++ function), 133
parse_cost (C++ function), 133
parse_crnn (C++ function), 133
parse_crop (C++ function), 134
parse_csv_line (C++ function), 141, 142
parse_data (C++ function), 133
parse_deconvolutional (C++ function), 133
parse_detection (C++ function), 133
parse_dropout (C++ function), 134
parse_fields (C++ function), 141, 142
parse_gru (C++ function), 133
parse_local (C++ function), 133
parse_lstm (C++ function), 133
parse_maxpool (C++ function), 134
parse_net_options (C++ function), 134
parse_network_cfg (C++ function), 102, 134
parse_normalization (C++ function), 134
parse_region (C++ function), 133
parse_reorg (C++ function), 134
parse_rnn (C++ function), 133
parse_route (C++ function), 134
parse_shortcut (C++ function), 134
parse_softmax (C++ function), 133
parser (FreezeModel attribute), 73
partial (C++ function), 93
phase_train_placeholder (face_detection attribute), 71
place_image (C++ function), 123, 126
PLSE (C++ class), 99
plse_activate (C++ function), 106
plse_gradient (C++ function), 106
pm (C++ function), 109, 140
pnet (face_detection attribute), 71
points (face_detection attribute), 71
POLY (C++ class), 100
pop_column (C++ function), 129
pow_cpu (C++ function), 108, 109
predict (FaceDetect attribute), 72
predict (ObjectRecognition attribute), 75
predict_classifier (C++ function), 91, 92
predict_image (FaceDetect attribute), 72
predict_image (ObjectRecognition attribute), 75
predict_move (C++ function), 94
predict_regressor (C++ function), 96
predict_segmenter (C++ function), 97
print_board (C++ function), 94
print_cocos (C++ function), 92, 93
print_detector_detections (C++ function), 93
print_game (C++ function), 94
print_image (C++ function), 125, 126
print_imagenet_detections (C++ function), 93
print_letters (C++ function), 116, 118
print_matrix (C++ function), 129
print_network (C++ function), 131
print_statistics (C++ function), 141, 143
print_symbol (C++ function), 96
print_yolo_detections (C++ function), 98
propagate_liberty (C++ function), 94
pyyolo_cleanup (C++ function), 144
pyyolo_detect (C++ function), 144
pyyolo_init (C++ function), 144
pyyolo_methods (C++ member), 144
pyyolo_test (C++ function), 144
PyyoloError (C++ member), 144

R

r (darknet attribute), 67
r (zedRoboy attribute), 90
RAMP (C++ class), 99
ramp_activate (C++ function), 106
ramp_gradient (C++ function), 106
rand_int (C++ function), 141, 143
rand_normal (C++ function), 105, 141
rand_scale (C++ function), 141, 143
rand_size_t (C++ function), 105, 141
rand_uniform (C++ function), 141, 142
RANDOM (C++ class), 100
random_augment_args (C++ function), 124, 126
random_augment_image (C++ function), 124, 126
random_crop_image (C++ function), 124, 125
random_distort_image (C++ function), 103, 124
random_go_moves (C++ function), 94
random_matrix (C++ function), 109, 121
randomize_boxes (C++ function), 116
randomize_data (C++ function), 118, 119
read_all (C++ function), 141, 142
read_all_fail (C++ function), 141, 142
read_boxes (C++ function), 103, 116
read_cfg (C++ function), 101, 133
read_data_cfg (C++ function), 101, 132
read_int (C++ function), 141, 142
read_intlist (C++ function), 104, 140
read_map (C++ function), 104, 140
read_option (C++ function), 132, 133
read_tokenized_data (C++ function), 96
read_tokens (C++ function), 96

read_tree (C++ function), 140
RecogniseFace (built-in class), 75
RecogniseFace.align_face_dlib() (built-in function), 75
RecogniseFace.crop() (built-in function), 76
RecogniseFace.flip() (built-in function), 76
RecogniseFace.get_dataset() (built-in function), 76
RecogniseFace.get_image_paths() (built-in function), 76
RecogniseFace.get_image_paths_and_labels() (built-in function), 76
RecogniseFace.get_model_filenames() (built-in function), 76
RecogniseFace.ImageClass (built-in class), 26
RecogniseFace.ImageClass.__init__() (built-in function), 26
RecogniseFace.ImageClass.__len__() (built-in function), 26
RecogniseFace.ImageClass.__str__() (built-in function), 26
RecogniseFace.load_data() (built-in function), 76
RecogniseFace.load_model() (built-in function), 75
RecogniseFace.prewhiten() (built-in function), 76
RecogniseFace.processImage() (built-in function), 76
RecogniseFace.recogniseFace() (built-in function), 75
RecogniseFace.to_rgb() (built-in function), 76
RecogniseFace.train() (built-in function), 76
reconstruct_picture (C++ function), 95
recordImages (C++ function), 146
recordVideo (C++ function), 146
RectQueue (multiprocess attribute), 74
RectQueue (RoboyVision attribute), 77
REGION (C++ class), 100
REGION_DATA (C++ class), 100
REGRESSION_DATA (C++ class), 101
RELIE (C++ class), 99
relie_activate (C++ function), 106
relie_gradient (C++ function), 106
RELU (C++ class), 99
relu_activate (C++ function), 106
relu_gradient (C++ function), 106
remove_connected (C++ function), 94
REORG (C++ class), 100
reorg_cpu (C++ function), 108, 109
request (FindObjectSrv attribute), 73
rescale_net (C++ function), 93
rescale_weights (C++ function), 102, 113
reset_momentum (C++ function), 130
reset_normalize_net (C++ function), 93
reset_rnn (FaceDetect attribute), 72
reset_rnn (ObjectRecognition attribute), 75
reset_rnn_state (C++ function), 96
resize_avgpool_layer (C++ function), 107
resize_batchnorm_layer (C++ function), 107
resize_convolutional_layer (C++ function), 112, 113
resize_cost_layer (C++ function), 114
resize_crop_layer (C++ function), 115
resize_deconvolutional_layer (C++ function), 119
resize_dropout_layer (C++ function), 120, 121
resize_image (C++ function), 102, 125
resize_matrix (C++ function), 129
resize_max (C++ function), 124, 126
resize_maxpool_layer (C++ function), 129, 130
resize_min (C++ function), 102, 124
resize_network (C++ function), 102, 130, 131
resize_normalization_layer (C++ function), 132
resize_region_layer (C++ function), 135
resize_reorg_layer (C++ function), 135, 136
resize_route_layer (C++ function), 136, 137
restype (darknet attribute), 67
restype (FaceDetect attribute), 72
restype (ObjectRecognition attribute), 75
ret_val (example attribute), 68
rgb_to_hsv (C++ function), 124, 126
rgb_to_yuv (C++ function), 124, 126
rgbgr_image (C++ function), 101, 123
rgbgr_net (C++ function), 93
rgbgr_weights (C++ function), 102, 113
rnet (face_detection attribute), 71
RNN (C++ class), 99
RoboyVision (built-in class), 76
RoboyVision.detectFaces() (built-in function), 76
RoboyVision.ObjectRecognise() (built-in function), 77
RoboyVision.recogniseFace() (built-in function), 77
RoboyVision.speakerDetect() (built-in function), 76
RoboyVision.tracking() (built-in function), 76
RoboyVision.visualizer() (built-in function), 77
RosMsgUtil (built-in class), 77
RosMsgUtil.AdvertiseContinously() (built-in function), 77
RosMsgUtil.AdvertiseDescribeScene() (built-in function), 77
RosMsgUtil.AdvertiseFaceCoordinates() (built-in function), 77
RosMsgUtil.AdvertiseFindObject() (built-in function), 77
RosMsgUtil.AdvertiseLookAtSpeaker() (built-in function), 77
RosMsgUtil.AdvertiseNewFacialFeatures() (built-in function), 77
RosMsgUtil.DescribeScene() (built-in function), 77
RosMsgUtil.FindObject() (built-in function), 77
RosMsgUtil.LookAtSpeaker() (built-in function), 77
RosMsgUtil.ReceiveServiceRequests() (built-in function), 78
RosMsgUtil.SendFaceCoordinates() (built-in function), 77
RosMsgUtil.SendNewFacialFeatures() (built-in function), 77
rotate_crop_image (C++ function), 124, 125
rotate_image (C++ function), 103, 124

rotate_image_cw (C++ function), 103, 123
ROUTE (C++ class), 99
route_layer (C++ type), 137
run_art (C++ function), 90, 93
run_captcha (C++ function), 90, 92
run_char_rnn (C++ function), 92, 96
run_cifar (C++ function), 91, 92
run_classifier (C++ function), 91, 92
run_coco (C++ function), 92
run_compare (C++ function), 92, 111
run_detector (C++ function), 92, 93
run_dice (C++ function), 92, 94
run_go (C++ function), 92, 95
run_lsd (C++ function), 93, 95
run_nightmare (C++ function), 92, 95
run_regressor (C++ function), 92, 96
run_segmenter (C++ function), 92, 97
run_super (C++ function), 93, 97
run_swag (C++ function), 97
run_tag (C++ function), 92, 97
run_vid_rnn (C++ function), 92, 96
run_voxel (C++ function), 92, 97
run_writing (C++ function), 92, 98
run_yolo (C++ function), 92, 98

S

sample_array (C++ function), 104, 141
saturate_exposure_image (C++ function), 125, 126
saturate_image (C++ function), 124, 126
save_batchnorm_weights (C++ function), 134
save_connected_weights (C++ function), 134
save_convolutional_weights (C++ function), 134
save_convolutional_weights_binary (C++ function), 134
save_image (C++ function), 103, 123
save_image_png (C++ function), 101, 123
save_network (C++ function), 134
save_weights (C++ function), 102, 134
save_weights_double (C++ function), 134
save_weights_upto (C++ function), 102, 134
scal_cpu (C++ function), 101, 108
scale_array (C++ function), 141, 142
scale_bias (C++ function), 109, 112
scale_data_rows (C++ function), 118, 119
scale_image (C++ function), 124, 125
scale_image_channel (C++ function), 124
scale_matrix (C++ function), 101, 129
score_game (C++ function), 95
sec (C++ function), 104, 140, 143
SECRET_NUM (C macro), 98
section (C++ class), 58
section::options (C++ member), 58
section::type (C++ member), 58
SEG (C++ class), 100
SEGMENTATION_DATA (C++ class), 101
self_go (C++ function), 95
sess (face_detection attribute), 71
session (face_detection attribute), 71
set_batch_network (C++ function), 102, 130
set_pixel (C++ function), 125, 126
setup (built-in class), 78
setup_gpu (built-in class), 78
SHORTCUT (C++ class), 99
shortcut_cpu (C++ function), 108, 109
show_image (C++ function), 103, 123
show_image_collapsed (C++ function), 123, 126
show_image_layers (C++ function), 123, 126
show_image_normalized (C++ function), 125, 126
show_images (C++ function), 125, 126
shuffle (C++ function), 140, 142
SIG (C++ class), 100
size_params (C++ class), 58
size_params (C++ type), 133
size_params::batch (C++ member), 59
size_params::c (C++ member), 59
size_params::h (C++ member), 59
size_params::index (C++ member), 59
size_params::inputs (C++ member), 59
size_params::net (C++ member), 59
size_params::time_steps (C++ member), 59
size_params::w (C++ member), 59
sl (C++ type), 78
sl::__cudaSafeCall (C++ function), 88
sl::AREA_EXPORT_STATE (C++ type), 84
sl::AREA_EXPORT_STATE_FILE_EMPTY (C++ class), 85
sl::AREA_EXPORT_STATE_FILE_ERROR (C++ class), 85
sl::AREA_EXPORT_STATE_LAST (C++ class), 85
sl::AREA_EXPORT_STATE_NOT_STARTED (C++ class), 85
sl::AREA_EXPORT_STATE_RUNNING (C++ class), 84
sl::AREA_EXPORT_STATE_SPATIAL_MEMORY_DISABLED (C++ class), 85
sl::AREA_EXPORT_STATE_SUCCESS (C++ class), 84
sl::CalibrationParameters (C++ class), 15
sl::CalibrationParameters::left_cam (C++ member), 15
sl::CalibrationParameters::R (C++ member), 15
sl::CalibrationParameters::right_cam (C++ member), 15
sl::CalibrationParameters::T (C++ member), 15
sl::Camera (C++ class), 15
sl::Camera::~Camera (C++ function), 20
sl::Camera::Camera (C++ function), 20
sl::Camera::close (C++ function), 20
sl::Camera::disableRecording (C++ function), 20
sl::Camera::disableSpatialMapping (C++ function), 20
sl::Camera::disableTracking (C++ function), 18
sl::Camera::enableRecording (C++ function), 20

sl::Camera::enableSpatialMapping (C++ function), 18
sl::Camera::enableTracking (C++ function), 17
sl::Camera::extractWholeMesh (C++ function), 19
sl::Camera::getAreaExportState (C++ function), 18
sl::Camera::getCameraFPS (C++ function), 16
sl::Camera::getCameraInformation (C++ function), 17
sl::Camera::getCameraSettings (C++ function), 16
sl::Camera::getCameraTimestamp (C++ function), 17
sl::Camera::getConfidenceThreshold (C++ function), 22
sl::Camera::getCUDAContext (C++ function), 22
sl::Camera::getCurrentFPS (C++ function), 16
sl::Camera::getCurrentTimestamp (C++ function), 17
sl::Camera::getDepthMaxRangeValue (C++ function), 22
sl::Camera::getDepthMinRangeValue (C++ function), 22
sl::Camera::getFrameDroppedCount (C++ function), 17
sl::Camera::getMeshRequestStatusAsync (C++ function), 19
sl::Camera::getPosition (C++ function), 18
sl::Camera::getResolution (C++ function), 22
sl::Camera::getSDKVersion (C++ function), 22
sl::Camera::getSelfCalibrationState (C++ function), 17
sl::Camera::getSpatialMappingState (C++ function), 19
sl::Camera::getSVONumberOfFrames (C++ function), 16
sl::Camera::getSVOPosition (C++ function), 16
sl::Camera::grab (C++ function), 21
sl::Camera::h (C++ member), 23
sl::Camera::initMemory (C++ function), 23
sl::Camera::initRectifier (C++ function), 23
sl::Camera::isOpened (C++ function), 21
sl::Camera::isZEDconnected (C++ function), 22
sl::Camera::nextImage (C++ function), 23
sl::Camera::open (C++ function), 20
sl::Camera::openCamera (C++ function), 23
sl::Camera::opened (C++ member), 23
sl::Camera::pauseSpatialMapping (C++ function), 19
sl::Camera::record (C++ function), 20
sl::Camera::requestMeshAsync (C++ function), 19
sl::Camera::resetSelfCalibration (C++ function), 17
sl::Camera::resetTracking (C++ function), 18
sl::Camera::retrieveImage (C++ function), 21
sl::Camera::retrieveMeasure (C++ function), 21
sl::Camera::retrieveMeshAsync (C++ function), 19
sl::Camera::setCameraFPS (C++ function), 16
sl::Camera::setCameraSettings (C++ function), 16
sl::Camera::setConfidenceThreshold (C++ function), 21
sl::Camera::setDepthMaxRangeValue (C++ function), 22
sl::Camera::setSVOPosition (C++ function), 15
sl::Camera::sticktoCPUCore (C++ function), 23
sl::CAMERA_SETTINGS (C++ type), 80
sl::CAMERA_SETTINGS_AUTO_WHITEBALANCE (C++ class), 81
sl::CAMERA_SETTINGS_BRIGHTNESS (C++ class), 80
sl::CAMERA_SETTINGS_CONTRAST (C++ class), 80
sl::CAMERA_SETTINGS_EXPOSURE (C++ class), 81
sl::CAMERA_SETTINGS_GAIN (C++ class), 81
sl::CAMERA_SETTINGS_HUE (C++ class), 81
sl::CAMERA_SETTINGS_LAST (C++ class), 81
sl::CAMERA_SETTINGS_SATURATION (C++ class), 81
sl::CAMERA_SETTINGS_WHITEBALANCE (C++ class), 81
sl::CameraInformation (C++ class), 23
sl::CameraInformation::calibration_parameters (C++ member), 23
sl::CameraInformation::calibration_parameters_raw (C++ member), 23
sl::CameraInformation::firmware_version (C++ member), 23
sl::CameraInformation::serial_number (C++ member), 23
sl::CameraParameters (C++ class), 23
sl::CameraParameters::cx (C++ member), 24
sl::CameraParameters::cy (C++ member), 24
sl::CameraParameters::d_fov (C++ member), 24
sl::CameraParameters::disto (C++ member), 24
sl::CameraParameters::fx (C++ member), 24
sl::CameraParameters::fy (C++ member), 24
sl::CameraParameters::h_fov (C++ member), 24
sl::CameraParameters::image_size (C++ member), 24
sl::CameraParameters::SetUp (C++ function), 24
sl::CameraParameters::v_fov (C++ member), 24
sl::cameraResolution (C++ member), 88
sl::COORDINATE_SYSTEM (C++ type), 82
sl::COORDINATE_SYSTEM_IMAGE (C++ class), 82
sl::COORDINATE_SYSTEM_LAST (C++ class), 82
sl::COORDINATE_SYSTEM_LEFT_HANDED_Y_UP (C++ class), 82
sl::COORDINATE_SYSTEM_LEFT_HANDED_Z_UP (C++ class), 82
sl::COORDINATE_SYSTEM_RIGHT_HANDED_Y_UP (C++ class), 82
sl::COORDINATE_SYSTEM_RIGHT_HANDED_Z_UP (C++ class), 82
sl::COPY_TYPE (C++ type), 79
sl::COPY_TYPE_CPU_CPU (C++ class), 79
sl::COPY_TYPE_CPU_GPU (C++ class), 79
sl::COPY_TYPE_GPU_CPU (C++ class), 79
sl::COPY_TYPE_GPU_GPU (C++ class), 79
sl::DEPTH_FORMAT (C++ type), 83
sl::DEPTH_FORMAT_LAST (C++ class), 84
sl::DEPTH_FORMAT_PFM (C++ class), 84
sl::DEPTH_FORMAT_PGM (C++ class), 84
sl::DEPTH_FORMAT_PNG (C++ class), 84
sl::DEPTH_MODE (C++ type), 81
sl::DEPTH_MODE_LAST (C++ class), 82
sl::DEPTH_MODE_MEDIUM (C++ class), 81
sl::DEPTH_MODE_NONE (C++ class), 81
sl::DEPTH_MODE_PERFORMANCE (C++ class), 81

sl::DEPTH_MODE_QUALITY (C++ class), 81
sl::depthMode2str (C++ function), 78
sl::double1 (C++ type), 79
sl::double2 (C++ type), 79
sl::double3 (C++ type), 79
sl::double4 (C++ type), 79
sl::ERROR_CODE (C++ type), 86
sl::ERROR_CODE_CALIBRATION_FILE_NOT_AVAILABLE (C++ class), 86
sl::ERROR_CODE_CAMERA_NOT_DETECTED (C++ class), 86
sl::ERROR_CODE_CAMERA_NOT_INITIALIZED (C++ class), 87
sl::ERROR_CODE_CORRUPTED_SDK_INSTALLATION (C++ class), 87
sl::ERROR_CODE_CUDA_ERROR (C++ class), 87
sl::ERROR_CODE_FAILURE (C++ class), 86
sl::ERROR_CODE_INVALID_COORDINATE_SYSTEM (C++ class), 87
sl::ERROR_CODE_INVALID_FIRMWARE (C++ class), 87
sl::ERROR_CODE_INVALID_FUNCTION_CALL (C++ class), 87
sl::ERROR_CODE_INVALID_RESOLUTION (C++ class), 86
sl::ERROR_CODE_INVALID_SVO_FILE (C++ class), 86
sl::ERROR_CODE_LAST (C++ class), 87
sl::ERROR_CODE_LOW_USB_BANDWIDTH (C++ class), 86
sl::ERROR_CODE_NO_GPU_COMPATIBLE (C++ class), 86
sl::ERROR_CODE_NOT_A_NEW_FRAME (C++ class), 87
sl::ERROR_CODE_NOT_ENOUGH_GPUMEM (C++ class), 86
sl::ERROR_CODE_NVIDIA_DRIVER_OUT_OF_DATE (C++ class), 87
sl::ERROR_CODE_SVO_RECORDING_ERROR (C++ class), 87
sl::errorCode2str (C++ function), 88
sl::float1 (C++ type), 79
sl::float2 (C++ type), 79
sl::float3 (C++ type), 79
sl::float4 (C++ type), 79
sl::InitParameters (C++ class), 27
sl::InitParameters::camera_buffer_count_linux (C++ member), 28
sl::InitParameters::camera_disable_self_calib (C++ member), 28
sl::InitParameters::camera_fps (C++ member), 27
sl::InitParameters::camera_image_flip (C++ member), 28
sl::InitParameters::camera_linux_id (C++ member), 27
sl::InitParameters::camera_resolution (C++ member), 27
sl::InitParameters::coordinate_system (C++ member), 28
sl::InitParameters::coordinate_units (C++ member), 28
sl::InitParameters::depth_minimum_distance (C++ member), 28
sl::InitParameters::depth_mode (C++ member), 28
sl::InitParameters::InitParameters (C++ function), 27
sl::InitParameters::load (C++ function), 27
sl::InitParameters::save (C++ function), 27
sl::InitParameters::sdk_gpu_id (C++ member), 28
sl::InitParameters::sdk_verbose (C++ member), 28
sl::InitParameters::svo_input_filename (C++ member), 27
sl::InitParameters::svo_real_time_mode (C++ member), 27
sl::Mat (C++ class), 35
sl::Mat::~Mat (C++ function), 37
sl::Mat::alloc (C++ function), 37
sl::Mat::channels (C++ member), 42
sl::Mat::clone (C++ function), 41
sl::Mat::copyTo (C++ function), 38
sl::Mat::data_type (C++ member), 42
sl::Mat::free (C++ function), 37
sl::Mat::getChannels (C++ function), 40
sl::Mat::getDataType (C++ function), 40
sl::Mat::getHeight (C++ function), 40
sl::Mat::getInfos (C++ function), 41
sl::Mat::getMemoryType (C++ function), 40
sl::Mat::getPixelBytes (C++ function), 41
sl::Mat::getPtr (C++ function), 40
sl::Mat::getResolution (C++ function), 40
sl::Mat::getStep (C++ function), 41
sl::Mat::getStepBytes (C++ function), 40
sl::Mat::getValue (C++ function), 39
sl::Mat::getWidth (C++ function), 40
sl::Mat::getWidthBytes (C++ function), 41
sl::Mat::init (C++ member), 42
sl::Mat::isInit (C++ function), 41
sl::Mat::isMemoryOwner (C++ function), 41
sl::Mat::Mat (C++ function), 35–37
sl::Mat::mem_type (C++ member), 42
sl::Mat::memory_owner (C++ member), 42
sl::Mat::name (C++ member), 41
sl::Mat::operator= (C++ function), 38
sl::Mat::pixel_bytes (C++ member), 42
sl::Mat::ptr_cpu (C++ member), 42
sl::Mat::ptr_gpu (C++ member), 42
sl::Mat::ptr_internal (C++ member), 42
sl::Mat::read (C++ function), 38
sl::Mat::setFrom (C++ function), 38
sl::Mat::setTo (C++ function), 39
sl::Mat::setValue (C++ function), 39
sl::Mat::size (C++ member), 42
sl::Mat::step_cpu (C++ member), 42
sl::Mat::step_gpu (C++ member), 42

sl::Mat::updateCPUfromGPU (C++ function), 38
sl::Mat::updateGPUfromCPU (C++ function), 38
sl::Mat::verbose (C++ member), 41
sl::Mat::write (C++ function), 39
sl::MAT_TYPE (C++ type), 80
sl::MAT_TYPE_32F_C1 (C++ class), 80
sl::MAT_TYPE_32F_C2 (C++ class), 80
sl::MAT_TYPE_32F_C3 (C++ class), 80
sl::MAT_TYPE_32F_C4 (C++ class), 80
sl::MAT_TYPE_8U_C1 (C++ class), 80
sl::MAT_TYPE_8U_C2 (C++ class), 80
sl::MAT_TYPE_8U_C3 (C++ class), 80
sl::MAT_TYPE_8U_C4 (C++ class), 80
sl::Matrix3f (C++ class), 42
sl::Matrix3f::getInfos (C++ function), 43
sl::Matrix3f::identity (C++ function), 44
sl::Matrix3f::inverse (C++ function), 43, 44
sl::Matrix3f::Matrix3f (C++ function), 42
sl::Matrix3f::matrix_name (C++ member), 43
sl::Matrix3f::nbElem (C++ member), 44
sl::Matrix3f::operator
= (C++ function), 43
sl::Matrix3f::operator() (C++ function), 43
sl::Matrix3f::operator* (C++ function), 42, 43
sl::Matrix3f::operator== (C++ function), 43
sl::Matrix3f::r (C++ member), 43
sl::Matrix3f::r00 (C++ member), 43
sl::Matrix3f::r01 (C++ member), 43
sl::Matrix3f::r02 (C++ member), 43
sl::Matrix3f::r10 (C++ member), 43
sl::Matrix3f::r11 (C++ member), 43
sl::Matrix3f::r12 (C++ member), 43
sl::Matrix3f::r20 (C++ member), 43
sl::Matrix3f::r21 (C++ member), 43
sl::Matrix3f::r22 (C++ member), 43
sl::Matrix3f::setIdentity (C++ function), 43
sl::Matrix3f::setZeros (C++ function), 43
sl::Matrix3f::transpose (C++ function), 43, 44
sl::Matrix3f::zeros (C++ function), 44
sl::Matrix4f (C++ class), 44
sl::Matrix4f::getInfos (C++ function), 46
sl::Matrix4f::identity (C++ function), 47
sl::Matrix4f::inverse (C++ function), 45, 47
sl::Matrix4f::m (C++ member), 47
sl::Matrix4f::m30 (C++ member), 46
sl::Matrix4f::m31 (C++ member), 46
sl::Matrix4f::m32 (C++ member), 46
sl::Matrix4f::m33 (C++ member), 47
sl::Matrix4f::Matrix4f (C++ function), 44, 45
sl::Matrix4f::matrix_name (C++ member), 47
sl::Matrix4f::nbElem (C++ member), 47
sl::Matrix4f::operator
= (C++ function), 45
sl::Matrix4f::operator() (C++ function), 45
sl::Matrix4f::operator* (C++ function), 45
sl::Matrix4f::operator== (C++ function), 45
sl::Matrix4f::r00 (C++ member), 46
sl::Matrix4f::r01 (C++ member), 46
sl::Matrix4f::r02 (C++ member), 46
sl::Matrix4f::r10 (C++ member), 46
sl::Matrix4f::r11 (C++ member), 46
sl::Matrix4f::r12 (C++ member), 46
sl::Matrix4f::r20 (C++ member), 46
sl::Matrix4f::r21 (C++ member), 46
sl::Matrix4f::r22 (C++ member), 46
sl::Matrix4f::setIdentity (C++ function), 45
sl::Matrix4f::setSubMatrix3f (C++ function), 45
sl::Matrix4f::setSubVector3f (C++ function), 45
sl::Matrix4f::setSubVector4f (C++ function), 46
sl::Matrix4f::setZeros (C++ function), 45
sl::Matrix4f::transpose (C++ function), 45, 47
sl::Matrix4f::tx (C++ member), 46
sl::Matrix4f::ty (C++ member), 46
sl::Matrix4f::tz (C++ member), 46
sl::Matrix4f::zeros (C++ function), 47
sl::MEASURE (C++ type), 82
sl::MEASURE_CONFIDENCE (C++ class), 83
sl::MEASURE_DEPTH (C++ class), 83
sl::MEASURE_DISPARITY (C++ class), 82
sl::MEASURE_LAST (C++ class), 83
sl::MEASURE_XYZ (C++ class), 83
sl::MEASURE_XYZABGR (C++ class), 83
sl::MEASURE_XYZARGB (C++ class), 83
sl::MEASURE_XYZBGRA (C++ class), 83
sl::MEASURE_XYZRGBA (C++ class), 83
sl::MEM (C++ type), 79
sl::MEM_CPU (C++ class), 79
sl::MEM_GPU (C++ class), 79
sl::Mesh (C++ class), 47
sl::Mesh::~Mesh (C++ function), 47
sl::Mesh::applyTexture (C++ function), 48
sl::Mesh::cam_param (C++ member), 49
sl::Mesh::clear (C++ function), 48
sl::Mesh::filter (C++ function), 48
sl::Mesh::im_pool (C++ member), 49
sl::Mesh::Indice (C++ class), 26
sl::Mesh::Indice::uv_ind (C++ member), 26
sl::Mesh::Indice::v_vn_ind (C++ member), 26
sl::Mesh::load (C++ function), 48
sl::Mesh::material_indices (C++ member), 49
sl::Mesh::max_d (C++ member), 49
sl::Mesh::memory (C++ member), 49
sl::Mesh::Mesh (C++ function), 47
sl::Mesh::min_d (C++ member), 49
sl::Mesh::normals (C++ member), 49
sl::Mesh::save (C++ function), 48
sl::Mesh::Texture (C++ class), 62
sl::Mesh::Texture::indice_gl (C++ member), 62

sl::Mesh::Texture::name (C++ member), 62
sl::Mesh::Texture::texture (C++ member), 62
sl::Mesh::textures (C++ member), 49
sl::Mesh::triangles (C++ member), 48
sl::Mesh::uv (C++ member), 49
sl::Mesh::vertices (C++ member), 48
sl::Mesh::welded (C++ member), 49
sl::MESH_FILE_FORMAT (C++ type), 86
sl::MESH_FILE_LAST (C++ class), 86
sl::MESH_FILE_OBJ (C++ class), 86
sl::MESH_FILE_PLY (C++ class), 86
sl::MESH_FILE_PLY_BIN (C++ class), 86
sl::MESH_TEXTURE_FORMAT (C++ type), 86
sl::MESH_TEXTURE_LAST (C++ class), 86
sl::MESH_TEXTURE_RGB (C++ class), 86
sl::MESH_TEXTURE_RGBA (C++ class), 86
sl::MeshFilterParameters (C++ class), 49
sl::MeshFilterParameters::FILTER (C++ type), 49
sl::MeshFilterParameters::FILTER_HIGH (C++ class), 49
sl::MeshFilterParameters::FILTER_LOW (C++ class), 49
sl::MeshFilterParameters::FILTER_MEDIUM (C++ class), 49
sl::MeshFilterParameters::filtering (C++ member), 50
sl::MeshFilterParameters::load (C++ function), 50
sl::MeshFilterParameters::MeshFilterParameters (C++ function), 50
sl::MeshFilterParameters::save (C++ function), 50
sl::MeshFilterParameters::set (C++ function), 50
sl::operator| (C++ function), 88
sl::operator<< (C++ function), 88
sl::Orientation (C++ class), 52
sl::Orientation (C++ member), 88
sl::Orientation::getRotation (C++ function), 54
sl::Orientation::identity (C++ function), 54
sl::Orientation::normalise (C++ function), 54
sl::Orientation::operator() (C++ function), 53
sl::Orientation::operator* (C++ function), 53
sl::Orientation::Orientation (C++ function), 53
sl::Orientation::setIdentity (C++ function), 54
sl::Orientation::setRotation (C++ function), 53
sl::Orientation::setZeros (C++ function), 54
sl::Orientation::zeros (C++ function), 54
sl::POINT_CLOUD_FORMAT (C++ type), 84
sl::POINT_CLOUD_FORMAT_LAST (C++ class), 84
sl::POINT_CLOUD_FORMAT_PCD_ASCII (C++ class), 84
sl::POINT_CLOUD_FORMAT_PLY_ASCII (C++ class), 84
sl::POINT_CLOUD_FORMAT_VTK_ASCII (C++ class), 84
sl::POINT_CLOUD_FORMAT_XYZ_ASCII (C++ class), 84
sl::Pose (C++ class), 54
sl::Pose::~Pose (C++ function), 55
sl::Pose::getOrientation (C++ function), 55
sl::Pose::getRotation (C++ function), 55
sl::Pose::getRotationVector (C++ function), 55
sl::Pose::getTranslation (C++ function), 55
sl::Pose::Pose (C++ function), 54
sl::Pose::pose_confidence (C++ member), 55
sl::Pose::pose_data (C++ member), 55
sl::Pose::timestamp (C++ member), 55
sl::Pose::valid (C++ member), 55
sl::RecordingState (C++ class), 55
sl::RecordingState::average_compression_ratio (C++ member), 56
sl::RecordingState::average_compression_time (C++ member), 55
sl::RecordingState::current_compression_ratio (C++ member), 55
sl::RecordingState::current_compression_time (C++ member), 55
sl::RecordingState::status (C++ member), 55
sl::REFERENCE_FRAME (C++ type), 85
sl::REFERENCE_FRAME_CAMERA (C++ class), 85
sl::REFERENCE_FRAME_LAST (C++ class), 85
sl::REFERENCE_FRAME_WORLD (C++ class), 85
sl::Resolution (C++ class), 56
sl::RESOLUTION (C++ type), 80
sl::resolution2str (C++ function), 78
sl::Resolution::area (C++ function), 56
sl::Resolution::height (C++ member), 56
sl::Resolution::operator
= (C++ function), 56
sl::Resolution::operator== (C++ function), 56
sl::Resolution::Resolution (C++ function), 56
sl::Resolution::width (C++ member), 56
sl::RESOLUTION_HD1080 (C++ class), 80
sl::RESOLUTION_HD2K (C++ class), 80
sl::RESOLUTION_HD720 (C++ class), 80
sl::RESOLUTION_LAST (C++ class), 80
sl::RESOLUTION_VGA (C++ class), 80
sl::Rotation (C++ class), 56
sl::Rotation (C++ member), 88
sl::Rotation::getOrientation (C++ function), 57
sl::Rotation::getRotationVector (C++ function), 57
sl::Rotation::Rotation (C++ function), 56, 57
sl::Rotation::setOrientation (C++ function), 57
sl::Rotation::setRotationVector (C++ function), 57
sl::RuntimeParameters (C++ class), 57
sl::RuntimeParameters::enable_depth (C++ member), 58
sl::RuntimeParameters::enable_point_cloud (C++ member), 58
sl::RuntimeParameters::load (C++ function), 58
sl::RuntimeParameters::move_point_cloud_to_world_frame (C++ member), 58

sl::RuntimeParameters::RuntimeParameters (C++ function), 58
sl::RuntimeParameters::save (C++ function), 58
sl::RuntimeParameters::sensing_mode (C++ member), 58
sl::SELF_CALIBRATION_STATE (C++ type), 81
sl::SELF_CALIBRATION_STATE_FAILED (C++ class), 81
sl::SELF_CALIBRATION_STATE_LAST (C++ class), 81
sl::SELF_CALIBRATION_STATE_NOT_STARTED (C++ class), 81
sl::SELF_CALIBRATION_STATE_RUNNING (C++ class), 81
sl::SELF_CALIBRATION_STATE_SUCCESS (C++ class), 81
sl::SENSING_MODE (C++ type), 82
sl::SENSING_MODE_FILL (C++ class), 82
sl::SENSING_MODE_LAST (C++ class), 82
sl::SENSING_MODE_STANDARD (C++ class), 82
sl::sensingMode2str (C++ function), 78
sl::sleep_ms (C++ function), 88
sl::SPATIAL_MAPPING_STATE (C++ type), 85
sl::SPATIAL_MAPPING_STATE_FPS_TOO_LOW (C++ class), 85
sl::SPATIAL_MAPPING_STATE_INITIALIZING (C++ class), 85
sl::SPATIAL_MAPPING_STATE_LAST (C++ class), 85
sl::SPATIAL_MAPPING_STATE_NOT_ENABLED (C++ class), 85
sl::SPATIAL_MAPPING_STATE_NOT_ENOUGH_MEMORY (C++ class), 85
sl::SPATIAL_MAPPING_STATE_OK (C++ class), 85
sl::SpatialMappingParameters (C++ class), 59
sl::SpatialMappingParameters::allowed_max (C++ member), 61
sl::SpatialMappingParameters::allowed_min (C++ member), 61
sl::SpatialMappingParameters::allowed_resolution (C++ member), 61
sl::SpatialMappingParameters::get (C++ function), 61
sl::SpatialMappingParameters::interval (C++ type), 60
sl::SpatialMappingParameters::load (C++ function), 60
sl::SpatialMappingParameters::max_memory_usage (C++ member), 61
sl::SpatialMappingParameters::RANGE (C++ type), 60
sl::SpatialMappingParameters::RANGE_FAR (C++ class), 60
sl::SpatialMappingParameters::RANGE_MEDIUM (C++ class), 60
sl::SpatialMappingParameters::range_meter (C++ member), 61
sl::SpatialMappingParameters::RANGE_NEAR (C++ class), 60
sl::SpatialMappingParameters::RESOLUTION (C++ type), 59
sl::SpatialMappingParameters::RESOLUTION_HIGH (C++ class), 59
sl::SpatialMappingParameters::RESOLUTION_LOW (C++ class), 59
sl::SpatialMappingParameters::RESOLUTION_MEDIUM (C++ class), 59
sl::SpatialMappingParameters::resolution_meter (C++ member), 61
sl::SpatialMappingParameters::save (C++ function), 60
sl::SpatialMappingParameters::save_texture (C++ member), 61
sl::SpatialMappingParameters::set (C++ function), 60
sl::SpatialMappingParameters::SpatialMappingParameters (C++ function), 60
sl::spatialMappingState2str (C++ function), 78
sl::statusCode2str (C++ function), 78
sl::str2mode (C++ function), 78
sl::str2unit (C++ function), 78
sl::SUCCESS (C++ class), 86
sl::SVO_COMPRESSION_MODE (C++ type), 85
sl::SVO_COMPRESSION_MODE_LAST (C++ class), 86
sl::SVO_COMPRESSION_MODE_LOSSLESS (C++ class), 86
sl::SVO_COMPRESSION_MODE_LOSSY (C++ class), 86
sl::SVO_COMPRESSION_MODE_RAW (C++ class), 85
sl::TRACKING_STATE (C++ type), 84
sl::TRACKING_STATE_FPS_TOO_LOW (C++ class), 84
sl::TRACKING_STATE_LAST (C++ class), 84
sl::TRACKING_STATE_OFF (C++ class), 84
sl::TRACKING_STATE_OK (C++ class), 84
sl::TRACKING_STATE_SEARCHING (C++ class), 84
sl::TrackingParameters (C++ class), 62
sl::TrackingParameters::area_file_path (C++ member), 63
sl::TrackingParameters::enable_spatial_memory (C++ member), 62
sl::TrackingParameters::initial_world_transform (C++ member), 62
sl::TrackingParameters::load (C++ function), 62
sl::TrackingParameters::save (C++ function), 62
sl::TrackingParameters::TrackingParameters (C++ function), 62
sl::trackingState2str (C++ function), 78
sl::Transform (C++ class), 63
sl::Transform (C++ member), 88
sl::Transform::getOrientation (C++ function), 64
sl::Transform::getRotation (C++ function), 64
sl::Transform::getRotationVector (C++ function), 64
sl::Transform::getTranslation (C++ function), 64

sl::Transform::setOrientation (C++ function), 64
sl::Transform::setRotation (C++ function), 64
sl::Transform::setRotationVector (C++ function), 64
sl::Transform::setTranslation (C++ function), 64
sl::Transform::Transform (C++ function), 63
sl::Translation (C++ class), 65
sl::Translation (C++ member), 88
sl::Translation::normalize (C++ function), 65, 66
sl::Translation::operator() (C++ function), 65
sl::Translation::operator* (C++ function), 65
sl::Translation::Translation (C++ function), 65
sl::uchar1 (C++ type), 79
sl::uchar2 (C++ type), 79
sl::uchar3 (C++ type), 79
sl::uchar4 (C++ type), 79
sl::uint1 (C++ type), 79
sl::uint2 (C++ type), 79
sl::uint3 (C++ type), 79
sl::uint4 (C++ type), 79
sl::UNIT (C++ type), 82
sl::unit2str (C++ function), 78
sl::UNIT_CENTIMETER (C++ class), 82
sl::UNIT_FOOT (C++ class), 82
sl::UNIT_INCH (C++ class), 82
sl::UNIT_LAST (C++ class), 82
sl::UNIT_METER (C++ class), 82
sl::UNIT_MILLIMETER (C++ class), 82
sl::VIEW (C++ type), 83
sl::VIEW_CONFIDENCE (C++ class), 83
sl::VIEW_DEPTH (C++ class), 83
sl::VIEW_LAST (C++ class), 83
sl::VIEW_LEFT (C++ class), 83
sl::VIEW_LEFT_GRAY (C++ class), 83
sl::VIEW_LEFT_UNRECTIFIED (C++ class), 83
sl::VIEW_LEFT_UNRECTIFIED_GRAY (C++ class), 83
sl::VIEW_RIGHT (C++ class), 83
sl::VIEW_RIGHT_GRAY (C++ class), 83
sl::VIEW_RIGHT_UNRECTIFIED (C++ class), 83
sl::VIEW_RIGHT_UNRECTIFIED_GRAY (C++ class), 83
sl::VIEW_SIDE_BY_SIDE (C++ class), 83
SL_EXPORT_DLL (C macro), 145
SMOOTH (C++ class), 100
smooth (C++ function), 95
smooth_data (C++ function), 117
smooth_l1_cpu (C++ function), 108, 109
SOFTMAX (C++ class), 99
softmax (C++ function), 108, 109
softmax_array (C++ function), 138
softmax_cpu (C++ function), 108, 109
softmax_layer (C++ type), 138
sorta_shuffle (C++ function), 140, 142
sortable_bbox (C++ class), 59
sortable_bbox::classes (C++ member), 59
sortable_bbox::elo (C++ member), 59
sortable_bbox::elos (C++ member), 59
sortable_bbox::filename (C++ member), 59
sortable_bbox::index (C++ member), 59
sortable_bbox::net (C++ member), 59
sortable_bbox::probs (C++ member), 59
SortMaster3000 (C++ function), 111
SpeakerDetect (built-in class), 88
speakerDetect (RoboyVision attribute), 77
SpeakerDetect.DetectSpeaker() (built-in function), 88
SpeakerProc (RoboyVision attribute), 77
SpeakerQueue (RoboyVision attribute), 77
speed (C++ function), 93
split_data (C++ function), 118, 119
split_str (C++ function), 141, 142
SSE (C++ class), 100
STAIR (C++ class), 99
stair_activate (C++ function), 106
stair_gradient (C++ function), 106
start_recognize_face (face_detection attribute), 71
START_TIMER (C macro), 145
statistics_connected_layer (C++ function), 102, 112
statistics_net (C++ function), 93
STB_IMAGE_IMPLEMENTATION (C macro), 122
STB_IMAGE_WRITE_IMPLEMENTATION (C macro), 122
STBI_default (C++ class), 138
STBI_grey (C++ class), 138
STBI_grey_alpha (C++ class), 138
stbi_io_callbacks (C++ class), 61
stbi_io_callbacks::eof (C++ member), 61
stbi_io_callbacks::read (C++ member), 61
stbi_io_callbacks::skip (C++ member), 61
STBI_rgb (C++ class), 138
STBI_rgb_alpha (C++ class), 138
stbi_uc (C++ type), 138
STBI_VERSION (C macro), 138
stbi_write_bmp (C++ function), 139
stbi_write_hdr (C++ function), 139
stbi_write_png (C++ function), 139
stbi_write_tga (C++ function), 139
STBIDEF (C macro), 138
std (C++ type), 88
STEP (C++ class), 100
STEPS (C++ class), 100
STOP_TIMER (C macro), 145
str (FreezeModel attribute), 73
string_to_board (C++ function), 94
string_to_layer_type (C++ function), 133
strip (C++ function), 104, 141, 142
strip_char (C++ function), 141, 142
STUDY_DATA (C++ class), 100
suicide_go (C++ function), 94

sum_array (C++ function), 141, 143
SUPER_DATA (C++ class), 100
SWAG_DATA (C++ class), 100
swap_binary (C++ function), 112, 113

T

TAG_DATA (C++ class), 100
TANH (C++ class), 99
tanh_activate (C++ function), 106
tanh_gradient (C++ function), 106
target (RoboyVision attribute), 77
test_blas (C++ function), 109
test_box (C++ function), 110
test_captcha (C++ function), 90
test_char_rnn (C++ function), 96
test_cifar (C++ function), 91
test_cifar_csv (C++ function), 91
test_cifar_csvtrain (C++ function), 91
test_cifar_multi (C++ function), 91
test_classifier (C++ function), 91
test_coco (C++ function), 92
test_dcgan (C++ function), 95
test_detector (C++ function), 92, 93
test_dice (C++ function), 94
test_dintersect (C++ function), 110
test_dunion (C++ function), 110
test_go (C++ function), 95
test_gpu_blas (C++ function), 109
test_lsd (C++ function), 95
test_resize (C++ function), 103, 125
test_super (C++ function), 97
test_tactic_rnn (C++ function), 96
test_tactic_rnn_multi (C++ function), 96
test_tag (C++ function), 97
test_voxel (C++ function), 97
test_writing (C++ function), 98
test_yolo (C++ function), 98
testFileExist (C++ function), 146
threat_classifier (C++ function), 91
three_way_max (C++ function), 124
three_way_min (C++ function), 124
threshold_image (C++ function), 102, 124
tile_images (C++ function), 123
time_random_matrix (C++ function), 109, 121
TIMING (C macro), 145
tisnan (C++ function), 135
TOO_CLOSE (C macro), 145
TOO_FAR (C macro), 145
top_k (C++ function), 104, 140
top_predictions (C++ function), 103, 131
total_boxes (face_detection attribute), 71
total_compares (C++ member), 111
trackProc (multiprocess attribute), 74
TrackQueue (multiprocess attribute), 74
TrackQueue (RoboyVision attribute), 77
train_captcha (C++ function), 90
train_char_rnn (C++ function), 96
train_cifar (C++ function), 91
train_cifar_distill (C++ function), 91
train_classifier (C++ function), 91
train_coco (C++ function), 92
train_colorizer (C++ function), 95
train_compare (C++ function), 111
train_dcgan (C++ function), 95
train_detector (C++ function), 93
train_dice (C++ function), 94
train_go (C++ function), 94
train_network (C++ function), 104, 130
train_network_datum (C++ function), 102, 130
train_network_sgd (C++ function), 101, 130
train_regressor (C++ function), 96
train_segmenter (C++ function), 97
train_super (C++ function), 97
train_swag (C++ function), 97
train_tag (C++ function), 97
train_voxel (C++ function), 97
train_writing (C++ function), 98
train_yolo (C++ function), 98
TransformCoordinates (built-in class), 88
TransformCoordinates.coordinate_transform() (built-in function), 89
translate_array (C++ function), 141, 142
translate_data_rows (C++ function), 118, 119
translate_image (C++ function), 124, 126
translate_image_channel (C++ function), 124
transpose_image (C++ function), 123
transpose_matrix (C++ function), 134
tree (C++ class), 66
tree::child (C++ member), 66
tree::group (C++ member), 66
tree::group_offset (C++ member), 66
tree::group_size (C++ member), 66
tree::groups (C++ member), 66
tree::leaf (C++ member), 66
tree::n (C++ member), 66
tree::name (C++ member), 66
tree::parent (C++ member), 66
try_classifier (C++ function), 91
TWO_PI (C macro), 142
type (FindObjectSrv attribute), 73
type (FreezeModel attribute), 73

U

update_args (C++ class), 66
update_args::adam (C++ member), 66
update_args::B1 (C++ member), 66
update_args::B2 (C++ member), 66
update_args::batch (C++ member), 66

update_args::decay (C++ member), 66
update_args::eps (C++ member), 66
update_args::learning_rate (C++ member), 66
update_args::momentum (C++ member), 66
update_args::t (C++ member), 66
update_connected_layer (C++ function), 111, 112
update_convolutional_layer (C++ function), 112, 113
update_crnn_layer (C++ function), 114, 115
update_deconvolutional_layer (C++ function), 119
update_gru_layer (C++ function), 122
update_local_layer (C++ function), 127, 128
update_lstm_layer (C++ function), 128
update_network (C++ function), 101, 130
update_rnn_layer (C++ function), 136
USET (C macro), 128, 136

V

valid_captcha (C++ function), 90
valid_char_rnn (C++ function), 96
valid_go (C++ function), 94
valid_tactic_rnn (C++ function), 96
validate_classifier_10 (C++ function), 91
validate_classifier_crop (C++ function), 91
validate_classifier_full (C++ function), 91
validate_classifier_multi (C++ function), 91
validate_classifier_single (C++ function), 91
validate_coco (C++ function), 92
validate_coco_recall (C++ function), 92
validate_compare (C++ function), 111
validate_detector (C++ function), 93
validate_detector_flip (C++ function), 93
validate_detector_recall (C++ function), 93
validate_dice (C++ function), 94
validate_yolo (C++ function), 98
validate_yolo_recall (C++ function), 98
variance_array (C++ function), 104, 141
variance_cpu (C++ function), 108, 109
variance_delta_cpu (C++ function), 107, 109
vec_char_rnn (C++ function), 96
version (setup attribute), 78
version (setup_gpu attribute), 78
visualize (C++ function), 93
visualize_convolutional_layer (C++ function), 113
visualize_network (C++ function), 103, 131
visualize_normalization_layer (C++ function), 132
Visualizer (built-in class), 89
Visualizer.StartVisualization() (built-in function), 89
VisualQueue (RoboyVision attribute), 77
voc_label (built-in class), 89
voc_label.convert() (built-in function), 89
voc_label.convert_annotation() (built-in function), 89
voc_names (C++ member), 98

W

w (example attribute), 68
wd (voc_label attribute), 89
weighted_delta_cpu (C++ function), 108, 109
weighted_sum_cpu (C++ function), 108, 109
what_time_is_it_now (C++ function), 103, 140, 142
windows (C++ member), 125
write_all (C++ function), 141, 142
write_all_fail (C++ function), 141, 142
write_int (C++ function), 141, 142
write_label (C++ function), 125
WRITING_DATA (C++ class), 100
ws (RosMsgUtil attribute), 78

X

XNOR (C++ class), 100

Y

yolo_cleanup (C++ function), 143
yolo_detect (C++ function), 143
yolo_handle (C++ type), 143
yolo_init (C++ function), 143
yolo_obj (C++ class), 66
yolo_obj::boxes (C++ member), 67
yolo_obj::darknet_path (C++ member), 67
yolo_obj::names (C++ member), 67
yolo_obj::net (C++ member), 67
yolo_obj::nms (C++ member), 67
yolo_obj::probs (C++ member), 67
yolo_test (C++ function), 143
yuv_to_rgb (C++ function), 124, 126

Z

ZED_SDK_MAJOR_VERSION (C++ member), 145
ZED_SDK_MINOR_VERSION (C++ member), 145
ZED_SDK_PATCH_VERSION (C++ member), 145
ZEDcudaSafeCall (C macro), 145
zedRoboy (built-in class), 89
zedRoboy.classify() (built-in function), 89
zedRoboy.detect() (built-in function), 89
zedRoboy.letterbox_img() (built-in function), 89
zedRoboy.load_img() (built-in function), 89
zedRoboy.load_meta() (built-in function), 89
zedRoboy.load_net() (built-in function), 89
zedRoboy.predict() (built-in function), 89
zero_objectness (C++ function), 102, 135