Taz Documentation

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Max Klingmann <KlingmannM@gmail.com>

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Contents

This project is to aid people in getting started with their own Python based game. Taz is a small library handling the switching of scenes and making sure your scenes get updated and rendered on every tick.

The scenes will be organised in a game stack, which will automatically be updated for all scenes whenever a new scene is registered with the Taz library. The user has the opportunity to force scene changes in pushing or popping from the game's stack. Whenever the user pops the last stacked scene the game will come to an end.

Taz works independent of any python based game library.

CHAPTER 1

Content:

1.1 Introduction

This section is to inform about the purpose of Taz and some basic concepts of game development.

1.1.1 What is a game loop?

Let's assume you are playing on of the many shooters out there. On each frame the game listens to your commands, like "move forward", "shoot", "jump". The game needs to capture these inputs and respond accordingly in letting your character do the respective thing and draw this to your screen. But even if you stand still the game keeps drawing the surroindings. There might be still movements in your screen, like trees bending in the wind or rain falling from the sky. So the game asks for information over and over again. This "asking for information" is called the game loop. Somewhere in your code there will be an pseudo-infinite loop which asks for these **updates** and **renders** them to your screen. Of course the game doesn't run for an infinite time, so somehow you would have to manage to tell the game-loop to stop at a certain point and exit the game, which why I called it **pseudo**-infinite. Following an example of such a game loop.

```
def mainloop():
    delta_time = 0
    while True:
        start_time = current_time()

        level1.update(delta_time)
        level1.render()

        end_time = current_time()
        delta_time = end_time - start_time
```

This is a very common way to define such a main-loop. In this example the time between each iteration is calculated and passed to the update-function. Why you should do that can be read here: https://www.scirra.com/tutorials/67/delta-time-and-framerate-independenc What exactly you put in the **update**- and **render**-function will be explained in the followeing pages. For now it is enough, that you understand the basic functionality about it.

1.1.2 What is a scene stack?

In the above code-block the game-loop always calls the **update**- and **render**-function of an object called level1, which most likely represents the first map of a game. But what if you want to have multiple maps or a title scene, with an awesome intro. You would only be able to show these when they are called from within your level1. But then level1 would not be responsible for just the first map, but also a lot of other things. To make sure you can show as much different levels and menus you want, we would have to alter the code-block to something like:

```
def mainloop():
    delta_time = 0
    while True:
        start_time = current_time()

        current_scene.update(delta_time)
        current_scene.render()

        end_time = current_time()
        delta_time = end_time - start_time
```

Basically, what we did is getting rid off the definite call of the "level1"'s functions and rather tell the game to update and draw whatever scene you want the game to currently draw. As for now we introduced the term "scene". But what is a scene exactly? Well, a scene is pretty much everything you can think of. It can be a title scene, where the mentioned intro is playing. It could also be the main menu, any level of your game or even the options menu. In each and every scene there are different functionalities, which must be coded and different inputs to be captured. In the title scene you might only allow "Press Esc to skip", whereas in the menu you probably wan't some buttons capturing clicks or you want your character to interact with objects in your level.

The problem however is to tell the game, which scene specifically to render. You would have to change the *current_scene*, when you want to switch the scenes and that is exactly what is done, when using a scene stack. The scene stack represents the currently loaded scenes such as level and an options menu. To decide which scene to **update** and **render** the game looks at the stack's top scene and calls its **update** and **render** function. This way the top pushed scene is always the active scene. When a scene is no longer needed, let's say for example when you close the options menu and want to get back to the level it gets popped from the stack and new top scene is now active again.

				Options Scene			
			Level 1 Scene	Level 1 Scene	Level 1 Scene		
Stack:	<Stack is Empty>	Main Menu Scene	Main Menu Scene	Main Menu Scene	Main Menu Scene	Main Menu Scene	<Stack is Empty>
Function:	*Start Game*	push Menu	push Level	push Options	pop Options	pop Level	pop Menu
Use Case:	*Start Game*	Show Menu	Start Playing Level	Change Name	Play Level	Finish Level	Quit Game

With that in mind the code-block can be altered once more to the following:

```
def mainloop(self):
    delta_time = 0
    while True:
        start_time = current_time()

        self.get_top_scene_of_stack().update(delta_time)
        self.get_top_scene_of_stack().render()

        end_time = current_time()
        delta_time = end_time - start_time
```

1.1.3 What is Taz?

Taz is a small library handling the switching of scenes and making sure your scenes get updated and rendered on every tick.

The scenes will be organised in a game stack, which will automatically be updated for all scenes whenever a new scene is registered with the Taz library. The user has the opportunity to force scene changes in pushing or popping from the game's stack. Whenever you pop the last stacked scene the game will come to an end.

1.1.4 How can Taz help me organizing my game code?

Usually when starting from scratch you have to setup the backend of your game first, before you can go and implement whatever features your game should have, which means you would have to setup the game's main-loop and the scene-stack to get going. With Taz you have the opportunity to import this backend, so you won't have to think about it. All you can do is setting up your scenes and get going with the awesome features you have planned. Taz provides you with the main-loop and makes sure your scenes are updated on each tick. With the library there is a set of just a few functions you will to have worry about. These functions include pushing to and popping from the stack as well as registering your scene with the game and of course everything to get your scene going. You will be provided with a scene base class and all you have to do is implement some abstract methods, such as "initialize", "tear_down", "update", "render". What these methods are for is shown on the next few pages to get you going with your very own "Taz"-based game. Need another reason: Taz is working independent of any python based library, so whatever you are using, be it PyGame, PyOgre, PyOpenGL, Taz will be ready for use after setting up a few things.

1.2 Using the "Game" class

This sections is to present the Game class and its functionalities

1.2.1 What is the Game class

The Game class is responsible for managing the scene stack and running the game's main-loop. It is responsible for calling the update- and render-functions of a scene and shuts down the game if the last scene has been popped from the scene stack.

1.2.2 Instancing the Game class

To getting started with Taz you first have to create an object of this class. The constructor takes two parameters, which are the update_context and the render_context. The game passes these contexts to the respective update- and render-function on each tick. The contexts are represented as dictionaries holding specific items you want every update- or render-function of your scenes to get on each tick. You might be using the update_context to pass in the delta time or input events for example. To see an example let's look at the following code block:

```
from taz import Game

if __name__ == "__main__":
    update_context = {
        "input_fob" : sys.stdin
    }

    render_context = {
        "output_fob" : sys.stdout
    }
```

```
game = Game(update_context, render_context)
example_scene = ExampleScene("ExampleScene")
game.register_new_scene(example_sccene)
game.push_scene_on_stack("ExampleScene")
game.enter_mainloop()
```

In this case the update and render context just hold the information which input and output to use. This method is used in the integrationtest, which is represented as text-based adventure. So in this particular example the render-function always writes to sys.stdout, while the update-function reads form sys.stdin. You can setup these contexts to whatever needs you have in your application and access them directly through the Game instance.

1.2.3 Registering scenes with the game

Whenever a scene is created the game needs to know about it, thus is needs to be registered with the game. The

function gives you the possibility to register your scene object. The registration of scenes needs to be done before the scene gets pushed to the stack, otherwise a **Game.NoRegisteredSceneWithThisIDError** is raised.

1.2.4 Using the scene stack

Using the scene stack is fairly simple. To push a scene on the you use the

with the scene's identifier. Whenever a scene is pushed on the stack its **initialize**- function is called. When you push a scene on top another this scene gets paused. To pop a scene you use

Whenever you pop a scene, which is on top of another scene that scene's **resume**-function is called in order to re-initiate this scene.

When last scene of the stack is popped the game is closed.

1.2.5 Sharing data between all scenes

TODO

1.3 Inheriting the "Scene" class

This section is describe how to inherit from the Scene class and how to use its methods. For an example please scroll down to the end of this section.

1.3.1 Instancing the Scene class

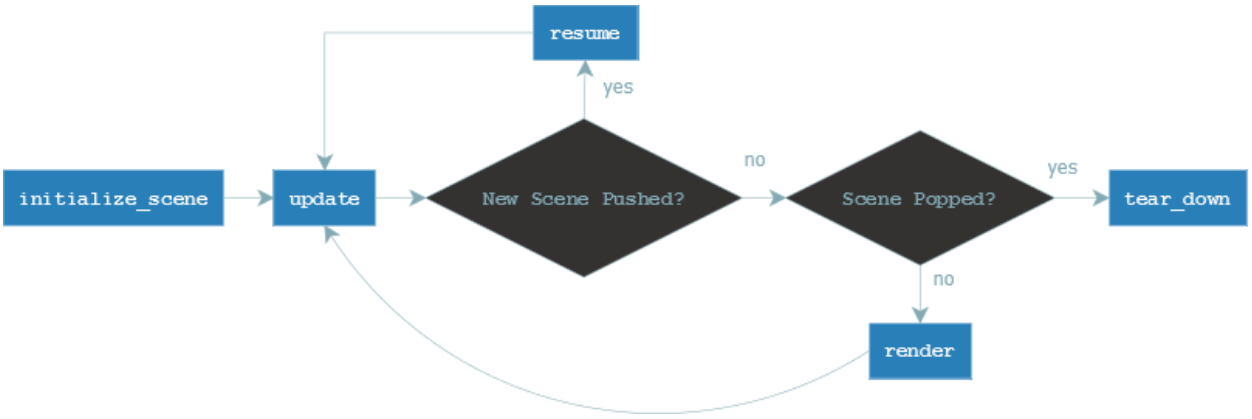
After you've setup a game instance, you need some scenes to start your game. The scene class gives you basic functionality to start with. First of all you need to create a sub-class of Taz' Scene class and implement all its abstract methods. The method names of these abstract methods should already give you the idea of their purpose. Even if not, the explanation ffor each and every one of these follows in this section. However, when you create an object of your sub-scene you need to provide a unique identifier for each scene you create. This identifier is used to find this particular scene in the game's registered scenes as well as to push it on the scene's stack. In order to not break the code's functionality you need to call the super constructor, if you intend to override the scene's __init__ method. Too see how this is done see the following code-block of an example sub-class:

```
from taz.game import Game, Scene

class MyScene(Scene):
    def __init__(self, identifier)
        super(MyScene, self).__init__(identifier)

    def initialize(self):
        self.player = 0
        self.screen = 0
```

1.3.2 A Scene's life cycle



What to put in "initialize"

This function is called whenever a scene is pushed on top of the game's scene stack and should build up a certain scene. In here you might build up a level or a main menu and its buttons. Everything that needs to be done when calling the scene should be put in here.

```
from taz import Game, Scene

class MyScene(Scene):
    def __init__(self, identifier)
        super(MyScene, self).__init__(identifier)
        self.player = 0
        self.screen = 0

    def initialize_scene(self):
        self.player = Player()
        self.screen = Screen()
        self.create_nice_map()
```

The scenes event cycle

In the game's main-loop the scene, which is on top of the scene stack is always the active one and its **update**- and **render**-methods are called on each and every tick. Why are there two functions when you call them right after another you ask? You will get an answer n the followeng sub-sections.

Using the Update method

The update method is responsible for updating (who would've thought of it) the game's or scene's status. This function should listen and respond to input events, calculate new positions of players, basically doing most of the things that happen within a certain scene.

```
from taz import Game, Scene

class MyScene(Scene):
    def __init__(self, identifier)
        super(MyScene, self).__init__(identifier)
        self.player = 0
        self.screen = 0

    def initialize_scene(self):
        self.player = Player()
        self.screen = Screen()
        self.create_nice_map()

    def update(self):
        key = self.capture_input()
        self.player.move_player(self.game.update_context["deltatime"], key)
```

Using the Render method

The render method is the function to get your game to life. It is responsible for and just for drawing/printing everything to your screen. It is NOT responsible for any calculations, as this is update's job.

```
from taz import Game, Scene

class MyScene(Scene):
    def __init__(self, identifier)
        super(MyScene, self).__init__(identifier)
        self.player = 0
        self.screen = 0

    def initialize_scene(self):
        self.player = Player()
        self.screen = Screen()
        self.create_nice_map()

    def update(self):
        key = self.capture_input()
        self.player.move_player(self.game.update_context["deltatime"], key)

    def render(self):
        self.screen.draw(self.player)
```

What to put in tear_down and resume

When leaving a scene there might still be some things to clean up before you can destroy the scene. Everything you need to be cleaned up before popping a scene should be put inside the tear_down function.

In some cases you might want to store your current status of a level, e.g. when switching to an options menu. When returning back to the game you most likely don't want to start over the level but instead keep on playing where you left

of. In fact Taz implementation allows you to push a scene on top another. When this top scene is then popped again the scene following is re-activated and the new top scene. When this happens the resume-function of that scene below the popped one is called, so you can put everything in here, which should get re-initiated.

```
from taz import Game, Scene

class MyScene(Scene):
    def __init__(self, identifier)
        super(MyScene, self).__init__(identifier)
        self.player = 0
        self.screen = 0

    def initialize_scene(self):
        self.player = Player()
        self.screen = Screen()
        self.create_nice_map()

    def update(self):
        key = self.capture_input()
        self.player.move_player(self.game.update_context["deltatime"], key)

    def render(self):
        self.screen.draw(self.player)
```

1.3.3 Adding data to a single scene

TODO

1.4 Examples

1.4.1 Example Usage with PyGame

In the following example two scenes are registered and the scene filling the background with the color red is pushed first. Upon pressing the "Return"-Key on the keyboard the "Green-Scene" is pushed to the game-stack and from then on its render and update methods are called. When Return is pressed again the scene pops itself from the stack. An example Use Case for this scenario would be the opening of an Options menu.

```
from taz.game import Game, Scene
import pygame

class MyScene(Scene):
    def __init__(self, identifier, color):
        super(MyScene, self).__init__(identifier)

        self.color = color
        self.screen = None

    def initialize(self):
        self.screen = self.game.render_context["screen"]

    def update(self):
        self.handle_inputs()

    def render(self):
```

```
        pygame.display.flip()

        self.screen.fill(self.color)

    def handle_inputs(self):
        for event in pygame.event.get():
            if event.type == pygame.QUIT:
               raise Game.GameExitException
            if event.type == pygame.KEYDOWN:
                if event.key == pygame.K_RETURN:
                    if "Green" in self.identifier:
                        game.pop_scene_from_stack()
                    else:
                        game.push_scene_on_stack("Green-Scene")


if __name__ == "__main__":
    pygame.init()

    update_context = {}

    render_context = {
            "screen": pygame.display.set_mode((800, 600))
    }

    game = Game(update_context, render_context)

    scene_one = MyScene("Red-Scene", pygame.Color("red"))
    scene_two = MyScene("Green-Scene", pygame.Color("green"))
    game.register_new_scene(scene_one)
    game.register_new_scene(scene_two)

    game.push_scene_on_stack("Red-Scene")
    game.enter_mainloop()
```

CHAPTER 2

Contact:

2.1 Contact

If you have problems or suggestions please contact <KlingmannM@gmail.com> or visit us at irc.freenode.net#pygame2

CHAPTER 3

Taz API Documentation

3.1 Taz API Documentation

CHAPTER 4

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