

Introduction to Programming, Group 1167

The Ultimate Space Invaders

Project overview:

This assignment focuses on the design, implementation and running of Python code to generate a Space Invaders type game. It uses the module “pygame”, an open-source python library that facilitates the creation of real-time games in Python with multiple features such as an interface on which games are implemented, the possibility to click on the interface (e.g., on a main menu), and many other technicalities.

Project specifications:

Space Invaders is a *shoot them up* type game in which one has to shoot at aliens coming down towards the player spaceship. The code includes the following:

- Loading files to use for player, alien and background icons.
- Creating a background against which the game is played.
- Creating the classes *Laser*, *Ship*, *Player(Ship)*, and *Enemy(Ship)*.
- In each class, creating specific functions in order to determine the properties of the different objects.
- Defining a function *collide* which determines what happens if a laser touches an enemy ship
- Defining the main game loop through the function *main()*, determining the exact process of the game, making use of the different classes created beforehand as well as modules such as *time*.
- Defining the function *main_menu()* through which the game is launched.

Detailed information is included in comments directly in the code.

Project process:

From the very beginning, we decided that we were going to program a game for our group project. We figured that Space Invaders would be a perfect challenge, as a basic version of the game is not complex to produce, and a lot of sources are available online to get started. However, the process was not straightforward.

The first issue we had was finding a platform on which we could simultaneously work on our project through a common notebook. Google Collab was not ideal, as it is difficult to import modules such as turtle or pygame on it. The solution we found was to code on a shared *Deepnote* notebook and running the code on individual *Jupyter Lab* notebooks in order to load files and modules individually.

In terms of the program itself, we first tried to code our game using the turtle library. We followed a 13-video tutorial¹ on YouTube by the user *TokyoEdtech* in order to get our basic version started. We were able to produce a good basic version of the game, but had many difficulties trying to improve and customize the code. Creating a main menu, changing the icons of the different objects in the game and changing the background were, hard to do with turtle. Especially because each object had to be drawn by the turtle, the game would lose fluidity and the framerate dropped because of an overload of tasks to accomplish.

Therefore, we looked for another solution and found *Tech With Tim's Pygame Tutorial*². There, a clear explanation on how to download the Pygame module was provided, as well as a generic example of Space Invaders code. Our end product is therefore based on this source. We added a main menu based on BaralTech's model³, added a credits page and changed the overall design features of the game.

The challenges of this process thus were to understand how the pygame extension and the mechanics behind coding such a game work. In addition, the main difficulty was to source different parts of the code and try to assemble them and modify their grammar such that all the parts would interact and work together as wished.

¹ <https://www.youtube.com/playlist?list=PLIEgNdBJEO-lqvqL5nNNZC6KoRdSrhQwK>

² <https://www.youtube.com/watch?v=Q-8Xw9KTM>

³ <https://www.youtube.com/watch?v=GMBqjxcKogA&t=230s>

Rules and how to play the game:

The game is very straightforward. In a square space, the player controls a spaceship able to shoot lasers.

This ship is situated in the bottom half of the square and is controlled by using the “WASD” keys to move up, left, right, down, as well as the space bar to shoot lasers.

From the top part of the square, enemy ships come down towards the player shooting laser beams.

The goal is for the player to avoid all enemy laser beams, destroy enemy ships using its laser.

The player has a life bar which decreases if he is touched by an enemy ship or is shot at with a laser. Additionally, the player has 5 lives, which are subtracted every time an enemy reaches the bottom of the screen.

How to run the code:

In order to run our Space Invaders game, one must:

- Have the pygame module preinstalled on your computer. (if not done yet, open your computer terminal and type in “pip install pygame”), the download should launch.
- From Github, download the “assets” folder provided above, as well as the ultimatespaceinvaders.py file with the actual game code.
- Keep the “assets” folder as well as the .py file in a common folder on your desktop (let’s name the folder “spaceshooter”).
- Open the computer’s terminal and go to your desktop through it (type “cd desktop” in the terminal)
- Then open the “spaceshooter” folder (type “cd spaceshooter” in the terminal)
- Then to launch the game (type “ python3 ultimatespaceshooter.py in the terminal)
- Have fun
- You can also run the code through any other platform (jupyterLab or Pycharm) as long as they recognize pygame, and the assets are recognized.

Technologies used:

- Python 3.8
- *Deepnote* collaborative platform⁴
- *Jupyter Lab*⁵
- Libraries: pygame, os, time, random

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⁴ <https://deepnote.com/home>

⁵ <https://jupyter.org/install>