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Programming project

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# Analysis

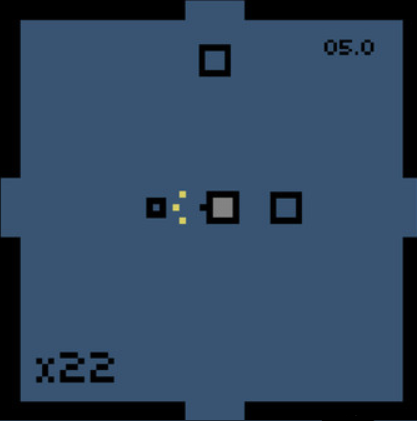
## Introduction

For my Python programming project, I decided to create a simple video game using the PyGame library. The idea I had was a short game involving shooting enemies. The player would be placed in the centre of the screen, and there would be four doors on each side of the screen. From these doors, enemies would spawn and travel towards the player. Each enemy would be coloured differently; red, blue, green, and purple. The colours would be selected randomly as well as the door at which the enemy would be instantiated at. The background of the game would also be changing colour every few seconds, also to either red, blue, green, or purple. The colour of the background would also be selected randomly. The player would be able to shoot projectiles in each of the four directions at the enemies. The object of the game would be to only shoot enemies of the same colour as the background and survive for 60 seconds.

## Requirements

* Player is able to shoot projectiles in four directions
* Enemies spawn randomly at each side of screen
* Enemies spawn of varying colours, randomly selected
* Enemies travel towards player
* Background of game changes colour randomly
* Player can only shoot enemies of the same colour ss background
* Player wins after 60 seconds
* Player is able to select between difficulty settings
* Player is able to restart game upon loss/victory
* Game includes main menu screen

## Similar Software

My game is inspired by and trying to replicate an already existing game called “64.0”. The object of that game is the same as the one I am trying to make: to shoot projectiles at enemies of the same colour as the background and survive for 64 seconds. This game however is more centred around its music, and the levels are not randomly generated. Rather they are predetermined to fit with the game’s soundtrack. My game will not Incorporate music.

# Design

## Structure and Modular Breakdown

The game will begin with a main menu screen. This will contain two buttons: play and exit. The exit button will quit the game, the play button will lead to the difficulty select screen. This will have 3 buttons: easy, medium, and hard. All 3 will begin the main game, but with increasing enemy speeds and spawn rates. When the game begins the background will be drawn and the player will be positioned on the screen. During the main loop enemies will spawn every x intervals and the player will be able to shoot unlimited projectiles in all four directions. The background will change colour every 10 seconds. At the end of the game, the player will be greeted with either a Win or Lose screen, which will both contain two buttons: retry and quit. The quit will exit the game, and the retry button will begin the main game again.

## Expected Inputs

|  |  |
| --- | --- |
| Input | Expected Output |
| Up Arrow | Instantiate Projectile and move upwards (+y) |
| Down Arrow | Instantiate projectile and move downwards (-y) |
| Left Arrow | Instantiate Projectile and move left (-x) |
| Right Arrow | Instantiate Projectile and move right (+x) |
| Left Mouse Button Click | Click on buttons in game menu screens and perform required actions |

## Class Diagrams



## User Interface Plans

[Title]

Play

Quit

You win!/lose

Restart

Quit

[message]

Select Difficulty

Easy

Medium

Hard

## Test Data

|  |  |
| --- | --- |
| What will be tested | Expected Output |
| Player can press quit button | Game exits |
| Player can press Start button | Goes to difficulty select screen |
| Player can press easy button | Starts game with easy difficulty |
| Player can press medium button | Starts game with medium difficulty |
| Player can press hard button | Starts game with hard difficulty |
| Player can press arrow keys to shoot | Instantiates projectile and moves it in direction of arrow |
| Enemies spawn randomly | Randomly coloured enemies will spawn at random entrances |
| Enemy movement | Enemies move towards player |
| Background changed colour | Background changes to a random colour every 10 seconds |
| Timer | Playtime in seconds displayed |
| Enemy collisions | If enemy of different colour of background touches player, enemy dies.  If enemy of same colour as background touches player, player dies.  If enemy of different colour of background touches projectile, player dies.  If enemy of same colour of background touches projectile, enemy dies. |
| Death screen | If player dies, death screen displayed |
| Victory screen | If player survives 60 seconds, victory screen displayed |
| Player can press retry button | Game reloaded on same difficulty |



# Testing

## Testing Table

|  |  |  |  |
| --- | --- | --- | --- |
| Test Data | Expected Output | Actual Output | Evidence |
| Quit Button | Exits Game | Exits game, however displays error. Error seems to have no effect. |  |
| Start Button | Goes to difficulty select | Goes to difficulty select screen |  |
| Easy Button | Begins game with chosen difficulty | Begins game with chosen difficulty. Difficulty fed into parameters and selected from list |  |
| Medium Button |
| Hard Button |
| Arrow Keys | Instantiates projectile and moves it in direction | Instantiates projectiles and moves in direction of arrow key |  |
| Enemy Spawn | Instantiate enemy randomly | Instantiates enemy of random colour in random spawnpoint |  |
| Enemy Movement | Move enemy towards player | Moves enemy towards player |
| Background Colour | Change background colour randomly | Change background colour randomly, every ten seconds | (See above screenshots) |
| Timer | Count and display total seconds of playtime | Displays total playtime in seconds | (See above screenshots) |
| Collisions | Kills either enemy or player | Kills player if player shoots incorrect enemy colour, or correct enemy colour collides with player  Kills enemy if player shopts correct enemy colour or incorrect enemy colour collides with player | (Requires video evidence) |
| Death screen | Shows upon player death | Shows upon player death |  |
| Victory Screen | Shows upon victory | Shows upon victory (surviving 60 seconds) |  |
| Retry button | Restarts game | Restart the game |  |

# Evaluation

## Changes made during development

One change I made to my original design during the development of the code was to add in a new Button class. This was because of the limitations of the library I was using, PyGame, as the ability to create UI elements was lacking. I found using the tools given to create functional buttons frustrating, and added in a Buttons class, which used a white rectangle image I created and placed it in the given x and y coordinates and placed given text on top. It also detected if the mouse cursor was in the button coordinates and returned a True Boolean if the left mouse button was clicked while inside.

## What was successful

My goals for this project were as follows:

* Player is able to shoot projectiles in four directions
* Enemies spawn randomly at each side of screen
* Enemies spawn of varying colours, randomly selected
* Enemies travel towards player
* Background of game changes colour randomly
* Player can only shoot enemies of the same colour as background
* Player wins after 60 seconds
* Player is able to select between difficulty settings
* Player is able to restart game upon loss/victory
* Game includes main menu screen

Overall, my program met all these goals. Projectiles can be shot using arrow keys. Randomly coloured enemies spawn at randomly selected spawnpoints, which ravel towards the player. The background will change to a random colour every 10 seconds. The player is greeted with an end screen if they shoot an enemy of a different colour to the background or if an enemy of the same colour collides with the player. They are greeted with a victory screen if the timer reaches 60 seconds. There is sufficient basic UI, such as the main menu screen, incorporating buttons. The player can interact with the buttons to make decisions such as selecting the difficulty at the beginning or restarting the game at the end.

During the testing of the final code, all tests were successful and by the end, there were no major bugs or issues that rendered the game unplayable or crashed it.

## Improvements to be made

One minor bug I encountered was that the console returned an error message whenever the game was exited. There were different error messages for if the game was exited using the “red X” or using the in-game button. After researching this error, I could not figure out how to fix this. However, this was a very minor error and had no noticeable impact on the game. This may be fixed given more time for more thorough research.

I could have made the game more fleshed out by adding more features, such as a scoreboard or music. These would have improved the game and increased its complexity. I would have implemented the scoreboard using file handling, saving and reading scores from a local text document.

Another improvement to be made could be to increase the spawn rate of enemies the same colour as the background, as in the current state of the program, it is possible to go long periods without needing to shoot any enemies, making the game sometimes boring.