# Project Report

Shriram

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## Contents

# 1 Modules

The external modules used in this project are:

**pygame-ce:** This was used to create the game environment and its various objects and functions.

**random:** This was used to choose the Angry Bird type and block type at random.

**sys:** This was used to exit the game window.

# 2 Directory Structure

**images** This folder stored the images of the various objects involved in the game.

**objects.py** Defined classes for birds and blocks, and their attributes and functions

**interface.py** Defined a class for creating buttons, which was an integral part of the GUI of the main menu.

**main.py** Contained the main Game class, which controlled all aspects of the gameplay, and is the file which runs the game.[1]

# 3 Instructions

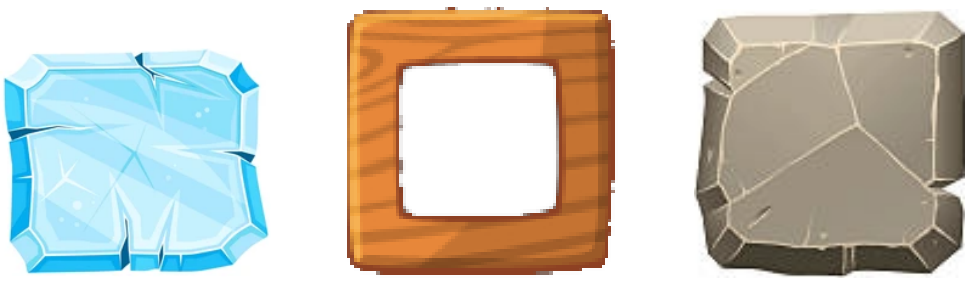
This is a turn-based 1v1 game in which the player's goal is to destroy all the blocks of his opponents. Each player is allowed to use one Angry Bird per turn. The player who first destroys the opponent's entire fortress wins.

## 3.1 Launching the Angry Bird

Drag back with the mouse and release to launch the Angry Bird.

## 3.2 The Blocks

Each block has an initial health of 100. Each block is affected differently by each of the Angry Birds. When a block's health reaches 0, it disappears.



(a) Ice (b) Wood (c) Stone

Figure 1: Block Types

### 3.3 The Angry Birds

There are four types of Angry Birds:

- Red
- Chuck
- Blue
- Bomb

(a) Red (b) Chuck (c) Blue (d) Bomb

Figure 2: Bird Types

Each Angry Bird has a different effect on different blocks they collide with -

**Red:** Does uniform damage to all kinds of blocks.

**Chuck:** Does more damage to Wood blocks and lesser damage to other blocks.

**Blue:** Does more damage to Ice blocks and lesser damage to other blocks.

**Bomb:** Does more damage to Stone blocks and lesser damage to other blocks.

## 4 Features

### 4.1 Main Menu

This served as a user interface for the game. This was accomplished by creating multiple game loops, one for each of the options in the menu.[2]

### 4.2 Slingshot Launch Mechanism

Slingshot mechanism was implemented with the help of `pygame.math.Vector2` and `pygame.draw.line` attributes of `pygame` module. The position of the bird was tracked using the mouse position, and a line was drawn from the slingshot to the bird, which simulated a slingshot.[4] In addition, the motion of the bird was predicted in advance in real time and circles were drawn at regular intervals using the `pygame.draw.circle` function. Refer Figure 3.

### 4.3 Projectile Motion

Projectile motion of the birds was implemented with the help of `pygame.math.Vector2`, which helped simulate real-life forces like gravity and the velocity and position of the bird, and by moving the `pygame.sprite.Sprite` objects i.e. the birds using these parameters. Refer Figure 4.

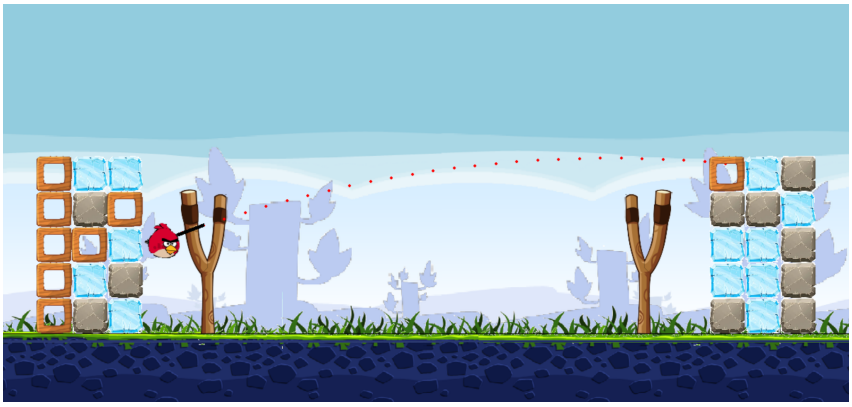


Figure 3: Slingshot Launch Mechanism

Figure 4: Projectile Motion

### 4.4 Destructible Blocks

Each block is assigned an initial health, which reduces on collision with a bird. These collisions were simulated with the help of the functions `pygame.sprite.Sprite` and `pygame.sprite.Group`, and each set of bird-block collisions resulted in a particular damage to the block, depending on the bird. When the block's health became zero, it was removed from its Group, thus disappearing from the screen.[3]

## 5 Project Journey

This project was a very enjoyable experience for me, and I got my first glimpse into the world of game design. I had some difficulties understanding the terminologies and mechanics of the `pygame` module, one of them being how the `Rect` and `Sprite` objects worked and interacted with each other. I used the oficial pygame documentation, and a few videos on game design using `pygame` to familiarise myself with the project. In the end, I was introduced to the basics of video game design, and learnt how to collect data before a project, how to modularise my code, and how to streamline my thought process when working on an extensive project like this.

## References

[1] URL: https://www.youtube.com/watch?v=2gABYM5M0ww&t=1987s.

[2] URL: https://www.youtube.com/watch?v=GMBqjxcKogA.

[3] URL: https://www.pygame.org/docs/index.html.

[4] ChatGPT.