

Angry Birds using Pygame-ce

CS-104 PROJECT

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Abstract

This report is about the game "**Angry Birds**", a 2-player physics-based game. It details the game's mechanics, implementation, levels, characters, and the challenges encountered during development using `pygame-ce`.

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1 Introduction to the Game

This 2-player game is inspired by the original Angry Birds. The primary goal is to destroy the opponent's fortress faster and more efficiently using physics-based bird launching.

2 Modules

External Python modules used:

- `pygame-ce` – Core game library (Community Edition of Pygame)
- `time` – For delays and animations
- `math` – For calculations of angles and velocity
- `random` – For unbiased bird and block generation

3 Directory Structure

The directory structure is:

```
Resources/
    audio/
    images/
    fonts/
ssl_report/
main.py/
functions.py/
initialization.py/
characters.py/
ui.py/
```

- `main.py` – Main game loop and physics
- `Resources.py/` – Stores images, fonts, and audio
- `initialization.py` – Contains many variables initializatin
- `characters.py` – contains Classes of birds,blocks
- `functions.py` – contains few fuctions (which are repeatedly used)
- `ui.py` – completely handles the starting page

4 Running Instructions

4.1 Prerequisites

- Python 3.7+ must be installed.
- Install Pygame-CE:

```
pip install pygame-ce
```

- If default pygame is installed:

```
pip uninstall pygame
pip install pygame-ce
```

- Run the game:

```
python3 main.py
```

4.2 Game Navigation and Gameplay

The game is sequential and turn-based. Once a bird is launched, it cannot be reused. To replay, restart the program.

4.2.1 Starting Page (Name Input)

- Click in white fields to enter player names
- Max 10 characters; fields cannot be empty
- Click "Select Levels" to proceed



Figure 1: Starting Page

4.2.2 Choose Level

Three levels are available:

- Easy – 4 spaced blocks, visible trajectory
- Medium – More gravity, reduced projection, Moving Targets
- Customized – CS-shaped fortress, no guide



Figure 2: Starting Page

4.2.3 Game Instructions

Level-specific instructions are shown on hover.

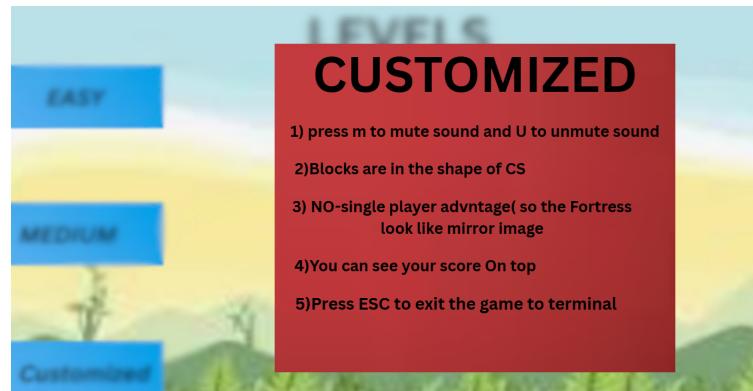


Figure 3: Starting Page

4.2.4 The Game

- Player names shown at the top
- Left player always starts
- Right player takes the final shot

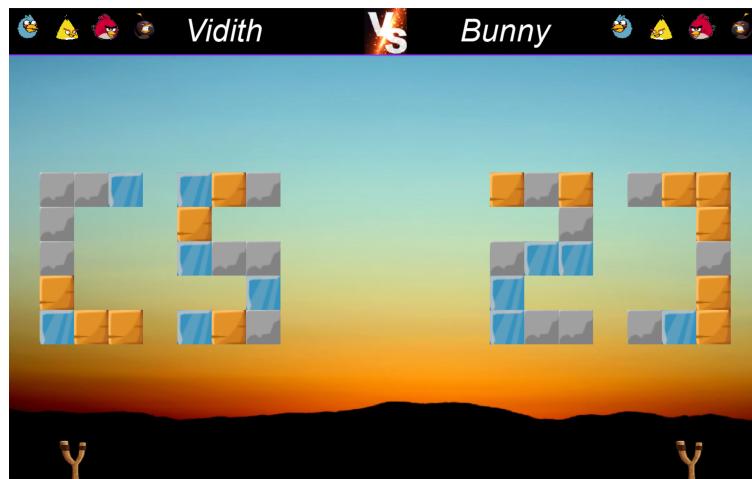


Figure 4: Gameplay Screen

4.2.5 Game Over

The player who destroys the opponent's fortress wins. The game ends and must be restarted to play again.



Figure 5: Game Over Screen

5 Game Characters

5.1 Birds

- **Red** – General purpose
- **Chuck** – Strong against wood
- **Blue** – Strong against ice
- **Bomb** – Strong against stone

Birds are removed after low velocity or multiple bounces.

5.2 Blocks

All blocks have 100 HP:

- Stone
- Wood
- Ice

5.3 Sling

The slingshot mechanism to launch birds.

5.4 Damage System

- Red – Up to 125 damage
- Chuck – 150 vs wood, 75 others
- Blue – 150 vs ice, 75 others
- Bomb – 150 vs stone, 75 others

6 Implementation Details

6.1 Motion Under Gravity

Birds follow realistic projectile motion:

$$\begin{aligned} dy &= V_y \cdot dt \\ dx &= V_x \cdot dt \end{aligned}$$

6.2 Maintaining Fairness

- Players get equal opportunities
- Birds and blocks generated randomly
- Customized level uses a mirror fortress

6.3 CS Fortress Creation

Manual grid alignment was used to design the fortress in a "CS" shape.

7 Difficulties Faced

7.1 Trajectory Calculation

Complex projections were simplified to improve speed and accuracy.

7.2 Scaling Issues

Adapting coordinates and power for multiple screen sizes was challenging.

8 Special Features

- Background music
- Custom CS-shaped fortress
- Collision engine supports multi-block hits
- Jackpot bonuses for combo damage
- Moving Targets have are there in medium level

9 References

1. Pygame-CE Documentation
2. Pygame Tutorial (YouTube)
3. GeeksforGeeks Pygame Guide