

# 深圳大学实验报告

课程名称: Python 程序设计

项目名称: Alien Invasion Expansion

学 院: 人工智能学院

专 业: 计算机科学与技术

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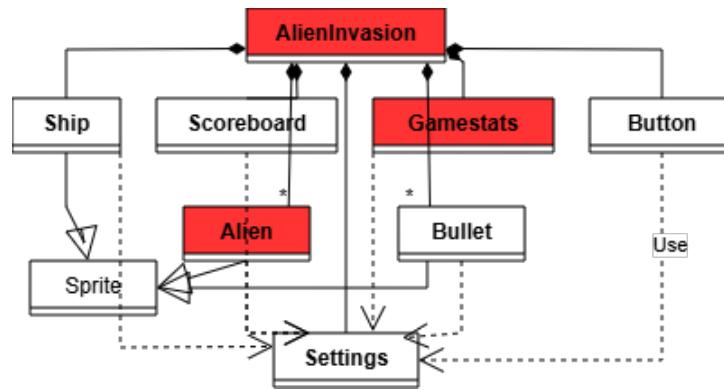


Figure 1: Game Architecture. The modules I modified are highlighted in **RED**. I fold the Class to make lines simple.

## 1 Objectives

The goal of this experiment is to extend the "Alien Invasion" game based on the text book. The specific objectives are:

- Implement **High Score Persistence**
- Add **Sound Effects**
- Make Aliens **Spin and Fall** when Hit

## 2 Overview

As shown in Figure 1, the red modules represent the custom logic added to the original framework:

1. **High Score Persistence**: Added I/O operations to read/write high scores.
2. **Sound Effect**: Integrated audio files for trigger events.
3. **Alien Animation**: Modified the update method to handle rotation animation.

## 3 Implementations

In this section, I will demonstrate the key code segments corresponding to the new features.

### 3.1 1. High Score Persistence (File I/O)

To ensure the high score is saved after the game closes, I used Python's built-in file operations to write the score to a json file.

```
# in alien_invasion.py
def _close_game(self):
    """Save high score and exit."""
    path = Path('high_score.json') # 用 python 自带的模块存储最高分
    contents = json.dumps(self.stats.high_score)
```

```
    path.write_text(contents)
    sys.exit()
def _check_keydown_events(self, event):
    ...#若按q退出，也保留最高分
    elif event.key == pygame.K_q:
        self._close_game()

# In game_stats.py
def get_saved_high_score(self):#加载最高分，没有就为0
    """Get high score from file, if it exists."""
    path = Path('high_score.json')
    try:
        contents = path.read_text()
        return json.loads(contents)
    except FileNotFoundError:
        return 0
```

## 3.2 Sound Effects Implementation

I used the `pygame.mixer` module to add audio feedback.

```
#In alien_invasion.py
def _fire_bullet(self):
    """Create a new bullet and add it to the bullets group."""
    ...
    self.bullet_sound.play()#sound effect
def _check_bullet_alien_collisions(self):
    """Respond to bullet-alien collisions."""
    ...
    if collisions:
        self.alien_sound.play()
```

## 3.3 Spinning Alien Animation

I added a rotation logic in the `Alien` class to make the alien spin after being hit.

```
# In alien.py
def update(self):
    """Move the alien."""
    if not self.dying:# 如果还活着：正常横向移动
        self.x += (self.settings.alien_speed *
                   self.settings.fleet_direction)
        self.rect.x = self.x
        self.y = float(self.rect.y)
    else:# 被打中后：旋转并下落
        self._spin_fall()
```

## 4 Results

The game runs successfully. As is shown in Figure 2, the high score is saved, and aliens spin when hit. If you want to hear the sound, you can run the code in the Github.

- GitHub Repository: [https://github.com/ruihaoGitHub/alien\\_invasion\\_practice](https://github.com/ruihaoGitHub/alien_invasion_practice)

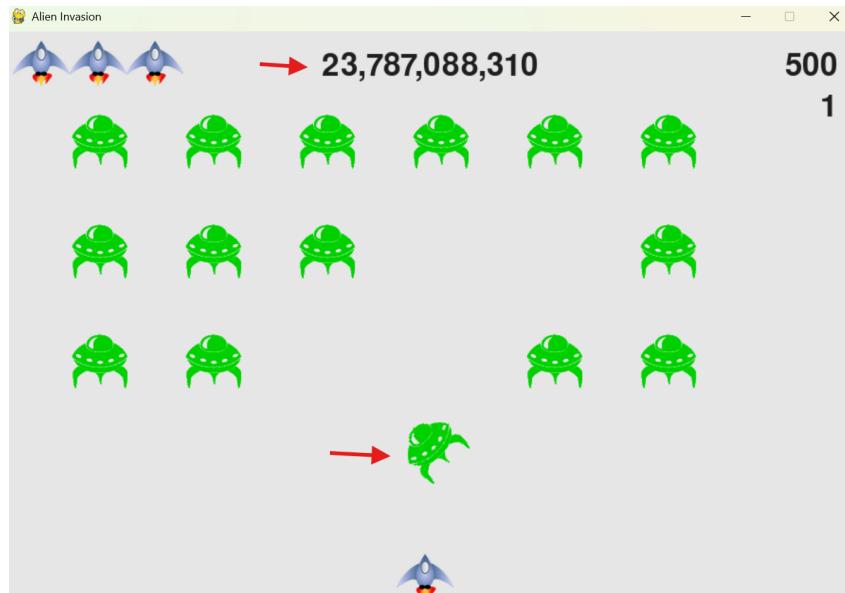


Figure 2: Screenshot: Alien spinning animation and high score.

## 5 Discussion

The project successfully expanded the Alien Invasion game. One challenge was ensuring the **spinning animation** didn't negatively impact the frame rate. I solved this by rotating the original image surface to avoid pixel degradation. Future improvements could include adding background music and different alien types.

**指导教师批阅意见:**

**成绩评定:**

**指导教师签字:**

**备注:**

- 报告内的项目或内容设置，可根据实际情况加以调整和补充。
- 教师批改学生实验报告时间应在学生提交实验报告时间后 10 日内。