

# 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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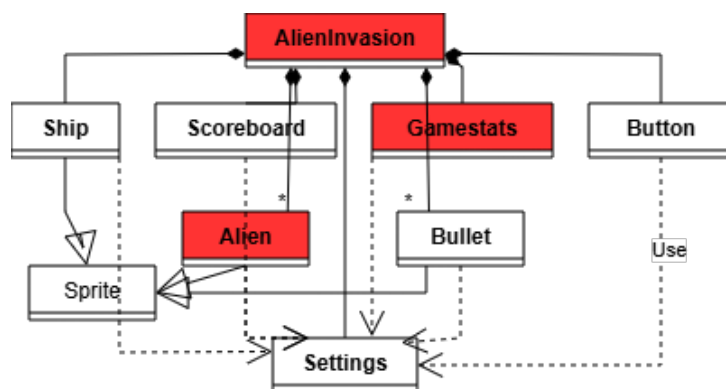


Figure 1: Game Architecture. The modules I modified are highlighted in **RED**. I fold the Class to make lines simple.

## 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 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 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)

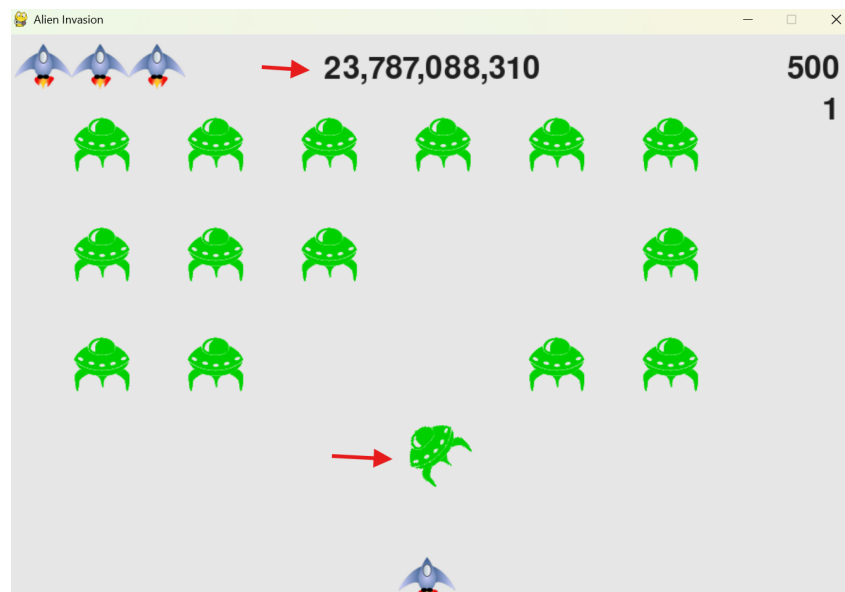


Figure 2: Screenshot: Alien spinning animation and high score.

## 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:

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- 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。