

# Asteroids Game - Developer Manual

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*Version 1.0*

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## Overview

### Purpose

The purpose of this game is to take advantage of the opportunity in the video game market while providing students with practical experience in game development.

### Functionality

In the game, you must defend the earth from incoming asteroids. You can do this by placing turrets to destroy asteroids or using the 3 special abilities.

You start with one normal turret and 10 Plutonium. Each asteroid drops 1 Plutonium when destroyed and has a chance to drop some Titaterarium. New turrets can be added on the available placement areas. A regular turret costs 5 Plutonium, a piercing turret costs 2 Titaterarium, and a fire or ice turret costs 5 Titaterarium.

Different asteroids will spawn when the game starts. This includes regular asteroids; brute asteroids, which spawn 2 regular asteroids after being destroyed; fire asteroids, which do fire damage to the earth over time; ice asteroids, which stun all turrets after hitting the earth; and parasite asteroids, which reduce a turret's fire rate when hitting a turret.

After 2 minutes, the Basic Earth Asteroid boss will appear. It slowly moves towards the earth while spawning regular asteroids. It has 500 health the first time, and the game will end if it hits the earth. After the boss is destroyed, all asteroid health is increased by x2.25.

Special abilities are available to use. The Shock Wave pushes back and stuns asteroids, costing 20 Plutonium to use. The Shield creates a shield around the earth for 20 seconds that blocks 20 points of damage, costing 25 Plutonium to use. The Black Hole destroys all asteroids and does 10% damage to bosses, costing 40 Plutonium to use.

### Development Environment

The game was developed in the Godot Game Engine using GDScript, and the 3D art was created using Blender. The game has been created to work on both mobile and desktop, specifically for Android and Windows, while being more optimized for desktop.

## **System Requirements**

### **Software Dependencies**

Software dependencies include Java 17 and Android SDK for exporting to Android.

### **Hardware Requirements**

For the OS, Android 16 and Windows 10 or higher are both acceptable. For the hardware, 4GB for RAM is recommended, 500MB of free storage space is required to install the game, and no dedicated GPU is required.

## Setup and Configuration

### Development Environment Setup

Download and install Godot 4.5 or later. Then open the project.godot file using the Godot Game Engine to view the game in the Godot IDE.

### Running the Game in Godot

Open the project.godot file using the Godot Game Engine, and then press the start button at the top right to start the build.

### Folder Structure

asteroids-game

- ⇒ builds
- ⇒ assets
  - ⇒ Audio
  - ⇒ Custom Assets
    - ⇒ Asteroids Use
    - ⇒ Turrets
    - ⇒ Projectile
  - ⇒ Moon
  - ⇒ music\_tracks
  - ⇒ pngs
    - ⇒ BlackHole
    - ⇒ PauseButton
    - ⇒ Shield
    - ⇒ Shockwave
  - ⇒ sound\_effects
    - ⇒ asteroids
    - ⇒ others
    - ⇒ projectiles
- ⇒ scenes
  - ⇒ asteroids
  - ⇒ bosses
  - ⇒ bullets
  - ⇒ earth
  - ⇒ game
  - ⇒ map
  - ⇒ turrets

## Code Structure

### Main Scenes and Nodes

game\_menu.tscn – Start up menu scene

game.tscn – Game scene

hud.tscn – Game HUD scene

### Key GDScript Files

game.gd – Handles game functionality

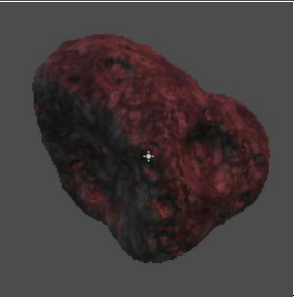
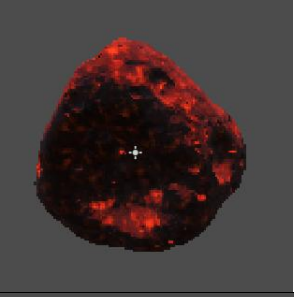
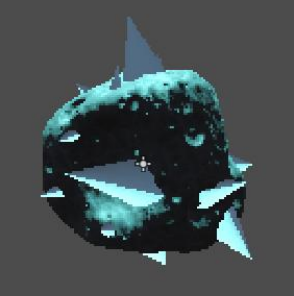
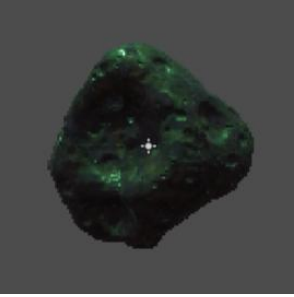
ui\_manager.gd – Handles game UI elements

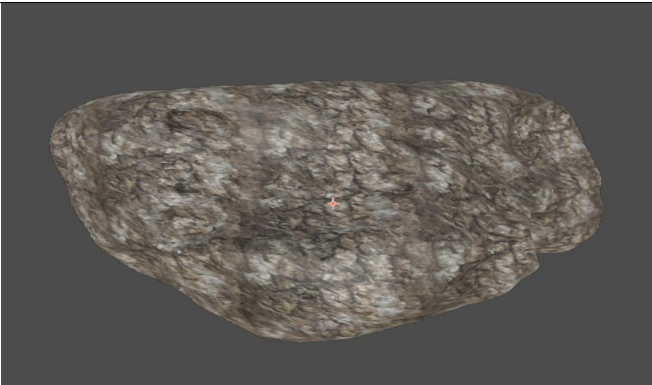
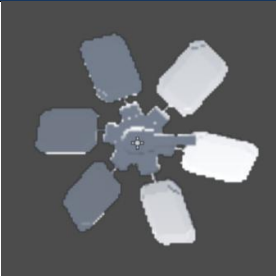
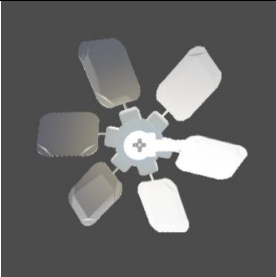
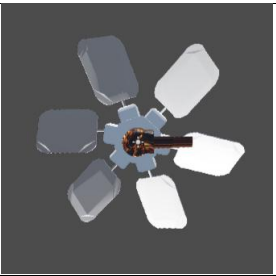
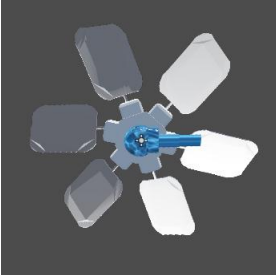
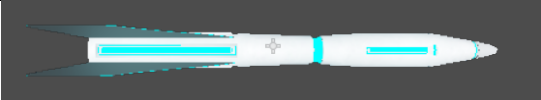
currency.gd – Handles in-game currency

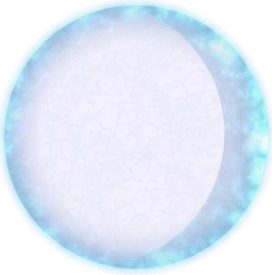
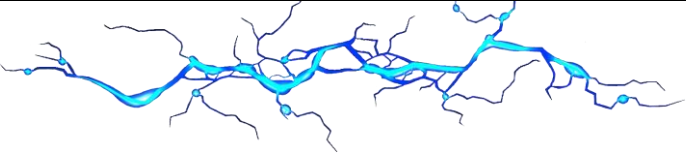
score.gd – Keeps score while game is running

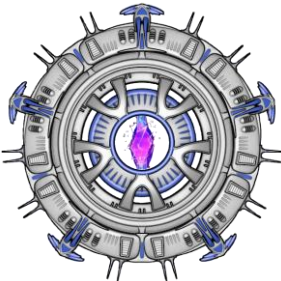
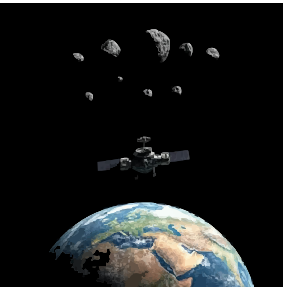
Assets and Resources

Sprites

| Asteroids:        |                                                                                     |  |
|-------------------|-------------------------------------------------------------------------------------|--|
| Regular asteroid  |    |  |
| Brute asteroid    |    |  |
| Fire asteroid     |   |  |
| Ice asteroid      |  |  |
| Parasite asteroid |  |  |

|                      |                                                                                      |  |
|----------------------|--------------------------------------------------------------------------------------|--|
| Basic earth asteroid |    |  |
| Turrets:             |                                                                                      |  |
| Normal turret        |     |  |
| Piercing turret      |    |  |
| Fire turret          |   |  |
| Ice turret           |   |  |
| Projectiles:         |                                                                                      |  |
| Normal bullet        |  |  |

|                    |                                                                                      |  |
|--------------------|--------------------------------------------------------------------------------------|--|
| Piercing bullet    |    |  |
| Fire bullet        |    |  |
| Ice bullet         |    |  |
| Earth:             |                                                                                      |  |
| Earth              |   |  |
| Special abilities: |                                                                                      |  |
| Black hole         |   |  |
| Shield             |   |  |
| Shock wave         |  |  |

| Other:            |                                                                                     |
|-------------------|-------------------------------------------------------------------------------------|
| Health bar        |   |
| Menu background   |   |
| Game background   |   |
| Plutonium icon    |   |
| Titaterarium icon |  |
| Game icon         |  |

## Testing and Debugging

### Testing Approach

When a new feature is added, it is tested by the developer to see if it works as intended. When the project was finished, the game was tested for remaining bugs and balancing issues.

### Debugging Tools in Godot

Godot lets you set breakpoints in the code to pause the execution. Along with this is the debugger panel that shows the current state, stack trace, and local variables. There is also the `print()` statement that shows messages in the Output panel.

## Deployment

### Exporting the Game

Exporting to Windows:

1. At the top right, make sure the project is in *Forward+* mode.
2. Go to *Editor -> Manage Export Templates*, and select *Download and Install* to install the latest template.
3. Close that window and go to *Project -> Export*.
4. Select *Add -> Windows Desktop*.
5. Set the *Export Path* to the desired location, set the *Icon* and *Product Name* if applicable, and set any other desired settings.
6. Click *Export Project*, select *Export With Debug* and click *Save*.

Exporting to Android:

1. At the top right, make sure the project is in *Mobile* mode.
2. Go to *Editor -> Manage Export Templates*, and select *Download and Install* to install the latest template.
3. Close that window.
4. Using any web browser, download and install *Java JDK 17*.
5. Using any web browser, download and install *Android Studio*.
6. Run *Android Studio* and go to *More Actions -> SDK Manager*.
7. Make sure the desired Android version is installed.
8. Click on the *SDK Tools* tab and make sure *Android SDK Build-Tools*, *Android Emulator*, and *Android SDK Platform-Tools* are installed.
9. Click *OK* and close *Android Studio*.
10. In *Godot*, go to *Editor -> Editor Settings -> Android*.
11. If the *Debug Keystore* is not set to the default, set it using the file path `C:/Users/<your_username>/.android/debug.keystore`.
12. Set the *Java SDK Path* to where *Java JDK 17* was installed, e.g., `C:/Program Files/Java/jdk-17`.
13. Set the *Android SDK Path* to `C:/Users/<your_username>/AppData/Local/Android/Sdk`.
14. Close that window and go to *Project -> Export*.
15. Select *Add -> Android*.
16. Set the *Export Path* to the desired location, set the *Export Format* to *Export APK*, set the *Name* if applicable, and set any other desired settings.
17. Click *Export Project*, select *Export With Debug* and click *Save*.

### Version Control

GitHub was utilized for merging builds and managing version control.