Surface-To-Air Saviors: Tower Defense

Software Design Document

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03 May 2021

CS 225, Spring 2021

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INTRODUCTION:

This program is a 2-D tower defense game based off of the 1980 Atari game "Missile Command". The Player shall use three missile silos to defend four barracks from enemy airstrikes. Much like its inspiration, this program caters towards gamers that enjoy retro or tower defense games.

PROBLEM DESCRIPTION:

The game takes place in an unnamed military base. The base is under siege by enemy air forces and it is up to the Player, the Commander, to take charge of the base's defenses, three missile silos, to protect four barracks and the personnel inside them.

The game window is a 1280-pixel by 720-pixel rectangle.

The Player will have with three missile silos and four barracks to defend.

The left silo is controlled by the "1" key, the middle silo is controlled by the "2" key, and right silo is controlled by the "3" key.

The gameplay consists of an endless barrage of missiles that the Player must destroy. At the start of the game, a cluster of ten missiles rain down from the sky. After ten seconds that elapse, ten more missiles are added to each cluster that rain down. From this point on, the game launches a cluster of 20 missiles every ten seconds. Each cluster will have travel 30 pixels per second faster than the previous until a maximum velocity of 240 pixels per second is reached.

The game ends if all of the Player's barracks and or missile silos are destroyed.

Once the game ends, the game shall read the Player's XP. The game shall record the five highest scores in a file, sort them from highest to lowest, and update the file with new scores using file I/O.

Terms used:

Generic game terms:

- Crosshair: Replaces the Player's cursor. Crosshairs are used by Players to aim their weapons.
- DP: A shorthand for "damage points". It refers to the amount of damage something does in the game.
- HP: A shorthand for "health points". Refers to the amount of "health" something has before it is destroyed.
- Tower: A structure provided to the Player.
- Spawn: Refers to the creation of an object in the game.
- XP: A shorthand for "Experience Points". Refers to the points earned by the Player as the game progresses. They are earned based on how many Missiles that the Player destroys during the game and how efficiently the Player shoots P-Missiles.

Objects within the game:

- Missile: A type of projectile in the game. It explodes on contact and deals 50 DP to towers on a direct hit. It spawns from the sky (Y = 720) from a random X-coordinate and flies down at a default speed of 90 pixels per second.
- P-Missile: A shorthand for "Player Missile. The P-Missile travels at a speed of 2400 pixels per second. It explodes on contact or wherever the Player aimed it at with their crosshair.
- Barracks: A tower with a health of 200 HP. It is being defended by the Player.
- Missile Silo: A tower with a health of 150 HP. It is manually fired by the Player and aims wherever the Player's crosshair is located at the time of firing. It shoots a P-Missile with a cooldown of 0.5 seconds per shot.

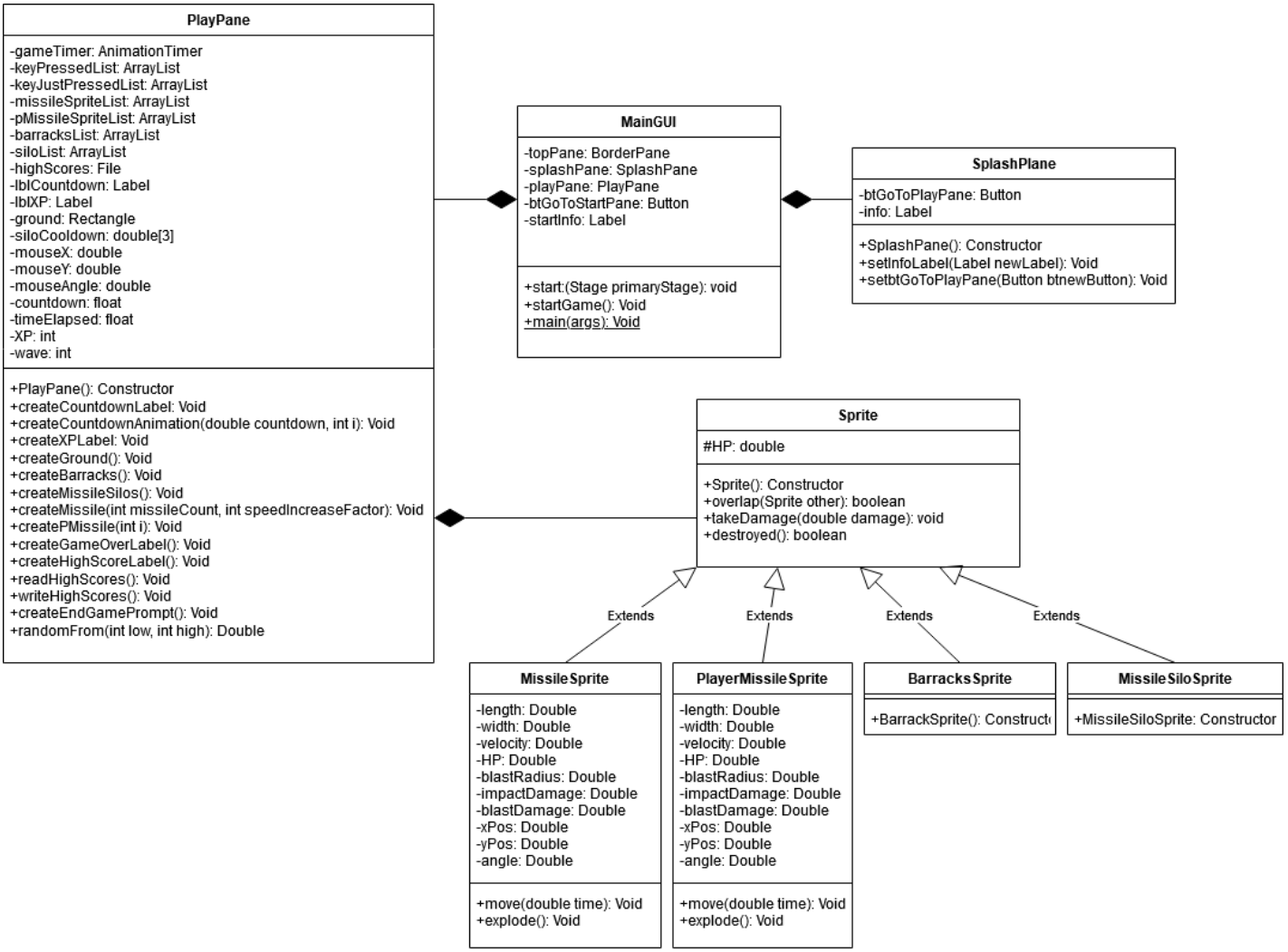
USER STORIES:

User Story ID	User Story	Completeness Criteria	Effort Estimate (hours)	Priority	Worked in Sprint (Estimated)
1.	As a developer, I want to able to test my software.	All classes shall exist with defined attributes and methods (in dummy form).	6	1.	1
2.	As a developer, I want to set ground level to be at or above Y = 0.	The game shall define ground level to be at or above Y = 0.	1	2.	1
3.	As a developer, I want to set ground level to be at or below Y = 60.	The game shall define ground level to be at or below Y = 60.	1	3.	1
4.	As a developer, I want to set the sky to be above Y = 60.	The game will define the sky to be above Y = 60.	1	4.	1
5.	As a developer, I want the GUI to display the Missile Silos.	The GUI shall display the Missile Silos, which are three grey rectangles.	1	5.	1
6.	As a developer, I want the GUI to display the Barracks.	The GUI shall display the Missile Silos, which are four brown rectangles.	1	6.	1
7.	As a developer, I want to be able to set the cursor to a crosshair.	The game shall set the cursor to a crosshair.	1	7.	1
8.	As a developer, I want the game to have a splash screen that displays instructions.	The game shall have a splash screen that displays instructions.	1	8.	2
9.	As a developer, I want the game to have keyboard controls.	The game shall have keyboard controls.	1	9.	2
10.	As a developer, I want to be able to move the crosshair around the screen.	The game shall allow the crosshair to be moved around the screen.	1	10.	2
11.	As a developer, I want the leftmost Missile Silo to be controlled via the “1” key.	The leftmost Missile Silo shall be controlled via the “1” key”.	1	11.	2

12.	As a developer, I want the middlemost Missile Silo to be controlled via the “2” key.	The middlemost Missile Silo shall be controlled via the “2” key”.	1	12.	2
13.	As a developer, I want the rightmost Missile Silo to be controlled via the “3” key.	The rightmost Missile Silo shall be controlled via the “3” key”.	1	13.	2
14.	As a developer, I want the leftmost Missile Silo to aim where the Player’s crosshair is pointing.	The leftmost Missile Silo shall aim where the Player’s crosshair is pointing.	2	14.	3
15.	As a developer, I want the leftmost Missile Silo to aim where the Player’s crosshair is pointing.	The leftmost Missile Silo shall aim where the Player’s crosshair is pointing.	2	15.	3
16.	As a developer, I want the middlemost Missile Silo to aim where the Player’s crosshair is pointing.	The middlemost Missile Silo shall aim where the Player’s crosshair is pointing.	2	16.	3
17.	As a developer, I want the rightmost Missile Silo to aim where the Player’s crosshair is pointing.	The rightmost Missile Silo shall aim where the Player’s crosshair is pointing.	2	17.	3
18.	As a developer, I want Missile Silos to have a 0.25 second cooldown after firing.	Missile Silos shall have a 0.5 second cooldown after shooting a missile.	2	18.	3
19.	As a developer, I want P-Missiles to travel at a speed of 2400 pixels per second.	P-Missiles shall travel at a speed of 2400 pixels per second.	1	19.	3
20.	As a developer, I want P-Missiles to explode when they reach the coordinates of the Player’s crosshair at the time of being launched.	P-Missiles shall explode when they reach the coordinates of the Player’s crosshair at the time of being launched.	1	20.	3

21.	As a developer, I want 10 Missiles to rain from the sky at time = 0.	10 Missiles shall rain from the sky at time = 0.	1	21.	3
22.	As a developer, I want 20 missiles to rain from the sky at time = 10.	20 Missiles shall rain from the sky at time = 10.	1	22.	4
23.	As developer, I want 20 missiles to rain every 10 seconds past time = 10.	20 Missiles shall rain from the sky every 10 seconds past time = 10.	2	23.	4
24.	As a developer, I want the sprites to have collision detection.	The sprites shall have collision detection.	2	24.	4
25.	As a developer, I want the game to record the Player's XP.	The game shall record the Player's XP.	2	25.	4
26.	As a developer, I want the game to prompt the Player when the game is over.	The game shall prompt the user when the game is over.	1	26.	4

PROBLEM SOLUTION:



The MainGUI class handles all of the GUI elements. It contains the SplashPane, and PlayPane classes.

The SplashPane class handles the splash pane.

The PlayPane class handles the visualization and behavior of the gameplay.

The Sprite class is a superclass that controls the behavior and visualization of sprites within the game.

The BarracksSprite subclass controls the behavior and visualization of Barracks.

The MissileSiloSprite subclass controls the behavior and visualization of Missile Silos.

The MissileSprite subclass controls the behavior and visualization of Missiles.

The PlayerMissileSprite subclass controls the behavior and visualization of Missiles.

REFERENCES:

HTTPS://WWW.ARCADE-HISTORY.COM/?N=MISSILE-COMMAND&PAGE=DETAIL&ID=1644

APPENDICES: