

# Tank War

A 2D AI Confrontation Game

Present by Xi Zhu



# Agenda

- Team Member Roles and Responsibilities
- Improvements made from Professor Feedback
- Problem Statement
- Project Description
- Team working agreement
- Personas
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- Algorithms
- Diagrams
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- Product Backlog
- Sprint 2 Backlog
- Metrics
- Retrospective
- Sprint 2
- Project Demo - Sprint 2 ( current sprint)
- Live Project Demo & GitHub link

# Team Member Roles and Responsibilities



**Xi Zhu**

Product Manager

## Responsibilities:

- Define the Product Vision and Strategy
- Create a Product Roadmap
- Prioritize Product Backlog
- Write and Test Codes
- Collect User Feedback
- Measure Product Success

# Improvements made from Professor Feedback

In the previous Sprint forgot the collection API and uploaded

Review project requirements more frequently to better accomplish tasks.

# Problem Statement

The problems of simple playability, uneven quality, and inoperability of traditional 2D Battle Games, it is difficult for players to obtain a satisfactory game experience.



# Project Description

Project Name:	Tank War
Team:	Xi Zhu
Project Description:	<p><b>For</b> players</p> <p><b>who</b> enjoy intense combat and customizable gameplay</p> <p><b>the</b> Tank War</p> <p><b>is a</b> 2D AI Confrontation Game(should be a Web App)</p> <p><b>that</b> introduces Machine Learning techniques to enhance gameplay and strategy</p> <p><b>unlike</b> traditional 2D Battle Games</p> <p><b>our application</b> offers a unique experience to players by allowing them to pick up in-game items, change their custom look, fight with escalating AI opponents, and develop different strategies against different levels.</p>
Benefit Outcomes:	<ol style="list-style-type: none"><li>1. Enhanced gameplay experience: The use of Machine Learning techniques in Tank War provides players with a unique and challenging gameplay experience. Players can develop different strategies to defeat increasingly difficult AI opponents, making the game more engaging and exciting.</li><li>2. Customizable gameplay: Tank War offers players the ability to customize their tank's appearance, which adds a personalized touch to the game. Players can choose from various tanks and maps, providing a diverse and unique gaming experience.</li><li>3. Improved player satisfaction: By addressing the issues of simple playability, uneven quality, and inoperability of traditional 2D Battle Games, Tank War is designed to provide a better and more satisfying gaming experience for players who seek challenging and exciting gameplay.</li></ol>
Github Link:	<a href="https://github.com/htmw/2023S-zhu/wiki">https://github.com/htmw/2023S-zhu/wiki</a>

# Team Working Agreement

- Communication
- Goals and Objectives
- Time Management
- Accountability
- Professionalism
- Confidentiality

## Team Working Agreement

Communication: I will keep a regular schedule for checking and responding to emails, and will communicate any changes to my availability or work priorities as necessary. I will also communicate progress updates on my work to any stakeholders as appropriate.

Goals and Objectives: I will establish clear goals and objectives for my work and keep them visible as a reminder of what I am working towards. I will regularly assess my progress towards these goals and adjust my approach as necessary.

Time Management: I will create a schedule that balances my work with my personal life and ensures that I am able to meet my deadlines. I will also prioritize my work effectively and avoid procrastination.

Accountability: I will hold myself accountable for meeting deadlines and completing high-quality work. I will seek feedback and support from others when needed, and be open to constructive criticism that helps me improve.

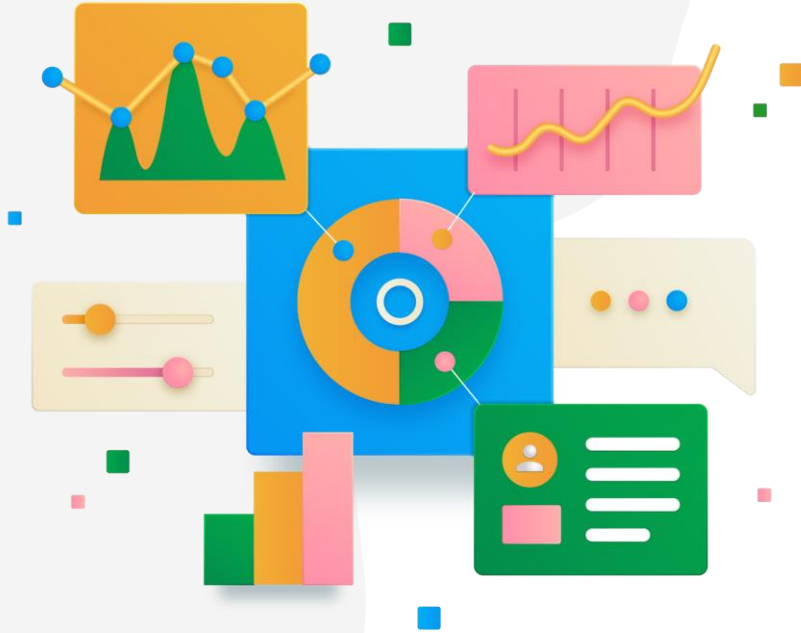
Professionalism: I will maintain a professional demeanor in all of my communications and interactions with others, and will represent myself and my work in a positive and respectful manner.

Confidentiality: I will maintain the confidentiality of any sensitive information or data related to my work, and will follow any relevant policies or guidelines related to data security and privacy.

By agreeing to these guidelines, I am committing to creating a productive and effective working environment for myself, and holding myself accountable for my work and its impact on others.

Signed

Xi Zhu U01697998 (xz79622p@pace.edu)



# Personas



# Persona 1 – Gaming Enthusiast Gary



Name: Gary Carlos

Age: 22

Job: College Student

## Profile:

Gary is a 22-year-old college student who is a passionate gamer. He spends most of his free time playing video games and loves games that offer a challenging and rewarding experience.

## Frustration and Goals:

Gary is frustrated with games that are too easy or lack replayability. He is always looking for new games that provide an engaging and immersive experience.

His goal is to find a game that he can play for hours on end and continue to enjoy.

# Persona 2 – Busy Bee Brianna



Name: Brianna Mary

Age: 32

Job: White-collar Employee

## Profile:

Brianna is a 32-year-old working professional who enjoys playing games in her downtime. She has a busy schedule and often finds herself with limited free time.

## Frustration and Goals:

Brianna is frustrated with games that require a lot of time commitment or are too complex to understand quickly.

Her goal is to find a game that she can pick up and play for short periods of time and still enjoy. She likes games that are easy to learn but still offer a challenge.

# Persona 3 - Competitive Cam



Name: Cameron Nguyen

Age: 26

Job: Game Anchor

## Profile:

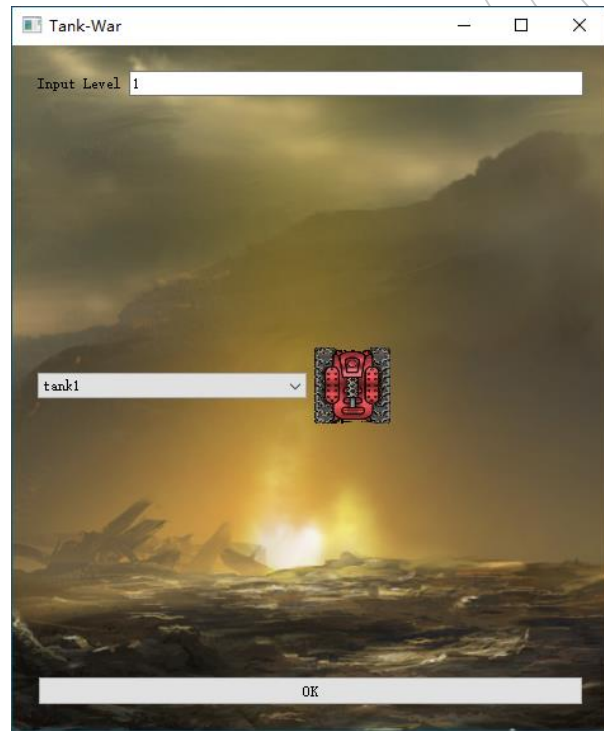
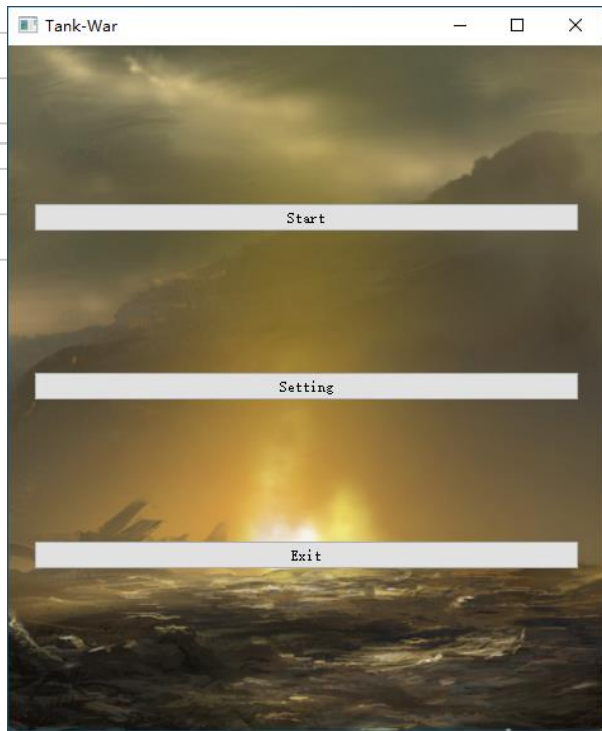
Cam is a 26-year-old gamer and game anchor who loves playing competitive games. He livestreams his games on YouTube everyday.

## Frustration and Goals:

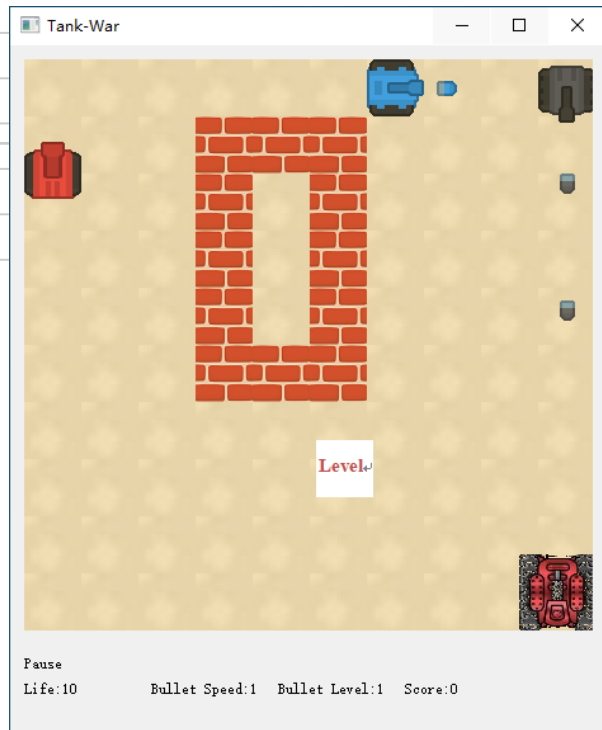
Cam is frustrated with games that don't offer a fair playing field or are too easy to win.

His goal is to find a game that he can compete in at a high level and feel challenged by. He likes games that have a competitive scene and allow him to measure his skills against other players.

# MVP (Minimal Viable Product)



# MVP (Minimal Viable Product)



# Technology Tools



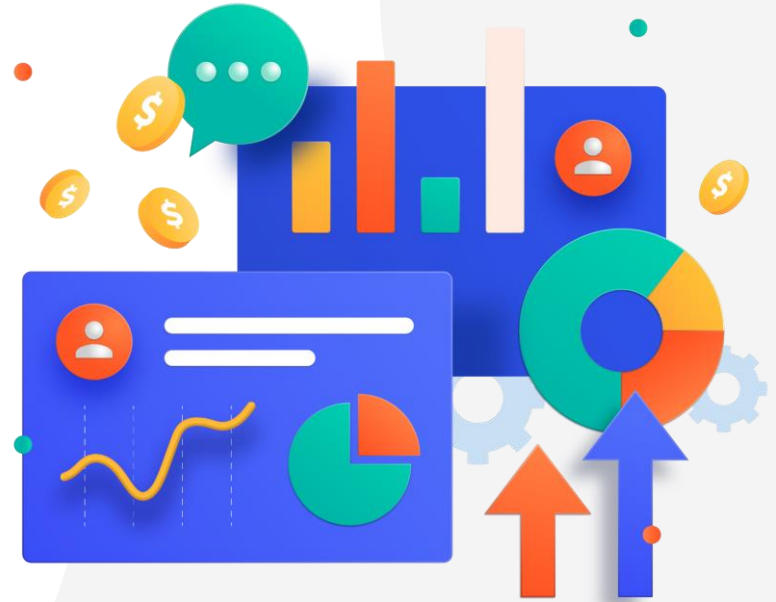
# Algorithm – Reinforcement Learning(RL)

## Define Actions:

In short, we define the actions that the AI agent can take in the game.

For example, in a tank game, the AI agent can **move the tank** left and right, **aim and shoot** at the player's tank, and even shoot at the player's tank from behind cover.

# Diagrams





```

+-----+
|               Game               |
+-----+
| +window: Window                    |
| +canvas: Canvas                    |
| +player_tank: Tank                 |
| +enemy_tanks: List[Tank]           |
| +player_bullets: List[Bullet]      |
| +enemy_bullets: List[Bullet]       |
+-----+
| +start() -> None                    |
| +game_over() -> None                |
| +create_enemy_tank() -> None        |
| +create_bullet(source: Union[Tank, Bullet]) -> None |
| +move_player_tank(dx: int, dy: int) -> None |
| +move_enemy_tank(tank: Tank) -> None |
| +move_bullets(bullets: List[Bullet]) -> None |
| +check_collisions() -> None        |
+-----+

+-----+ +-----+
|      Tank      | |      Bullet      |
+-----+ +-----+
| -x: int         | | -x: int         |
| -y: int         | | -y: int         |
| -direction: str | | -direction: str |
| -speed: int     | | -speed: int     |
+-----+ +-----+
| +move(dx: int, dy: int) | | +move() -> None |
+-----+ +-----+

```

# Conceptual Diagram

```

sequenceDiagram
    participant PlayerTank
    participant EnemyTank
    participant Bullet
    participant Game
    participant InputEvent
    participant GameState
    participant EventListener
    PlayerTank ->> Game:
        update()
    EnemyTank ->> Game:
        update()
    Bullet ->> Game: update()
    Game ->> GameState:
        update()
    Game ->> InputEvent:
        get_input()
    InputEvent ->> GameState:
        handle_input()
    GameState ->> PlayerTank:
        move()
    GameState ->> EnemyTank:
        move()
    GameState ->> Bullet:
        move()
    GameState ->>
    EventListener: check_events()
    EventListener -->>
    GameState: events
    GameState ->> Game:
        check_game_over()
    Game ->> PlayerTank:
        on_game_over()
    Game ->> EnemyTank:
        on_game_over()

```

```

GameState ->> EnemyTank: move()
GameState ->> Bullet: move()
GameState ->> EventListener:
    check_events()
EventListener -->> GameState: events
GameState ->> Game: check_game_over()
Game ->> PlayerTank: on_game_over()
Game ->> EnemyTank: on_game_over()

```

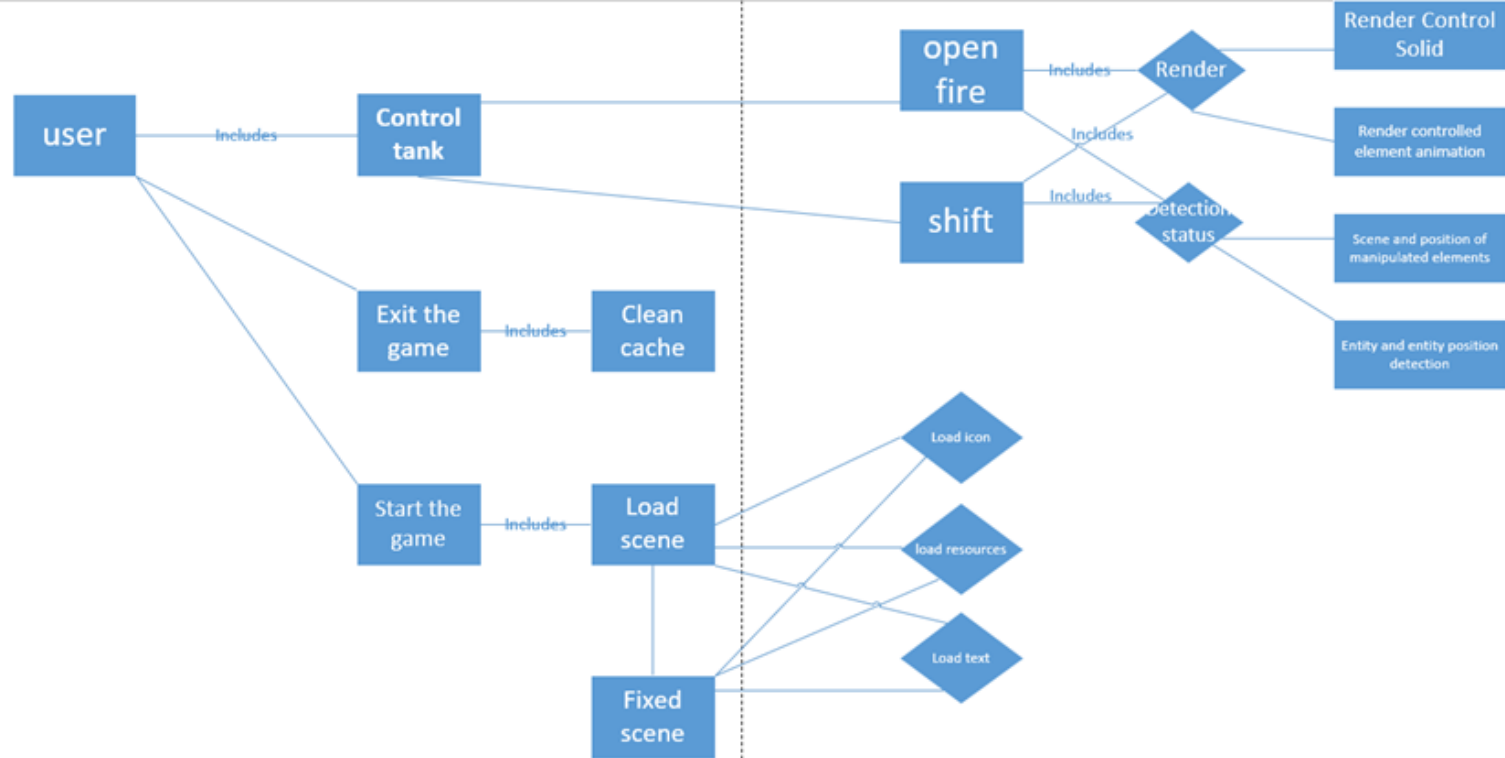
```

#draw_interface
# init_resourcesf
#init_text1
#init_logo
#int buttons
#main_loop
+ show0
+config0

```

# Sequence Diagram

# Use Case Diagram

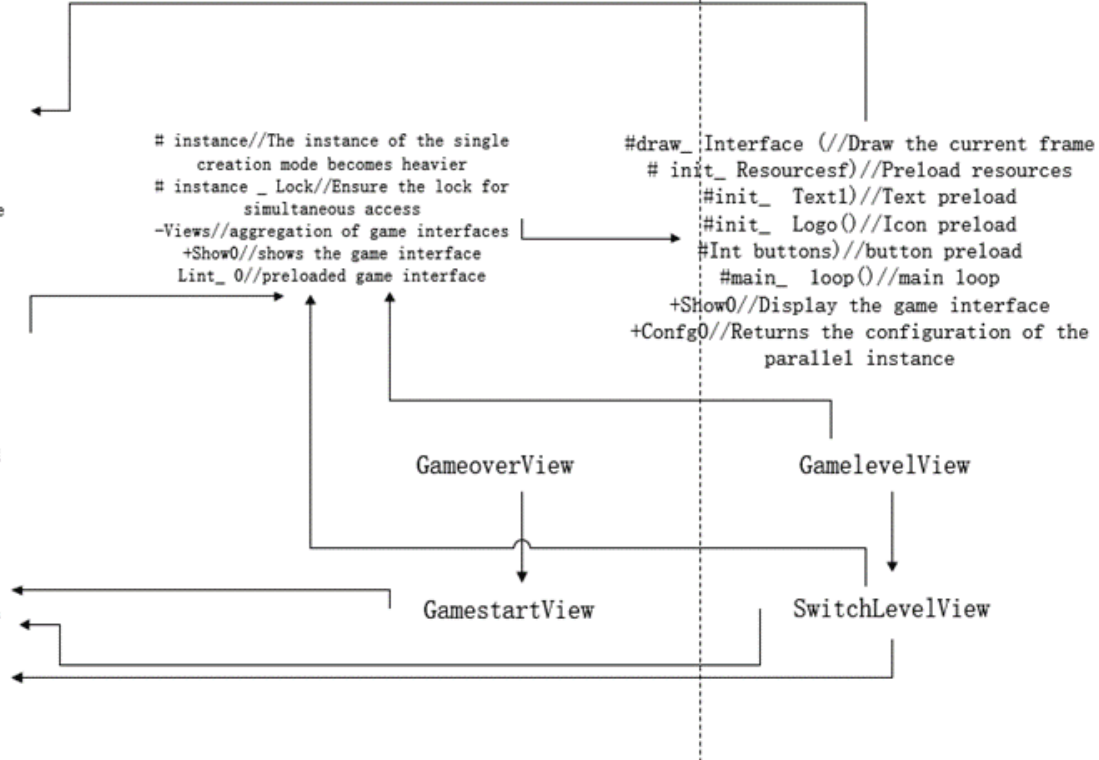


# Class Diagram

```
# instance//Instance variable
of single instance mode
#instance_Lock//lock to ensure
synchronous access
-Init tlag//Initialization
completion flag
+Sounds//getter
+Screen//game form instance
(Eetten)
+Config//game configuration
file (getter)
+Level//Current level (getter)
+Levelfield//Current level file
(eetter, return random level
file)
+auit game flag
1 Exit game flag (Eetter t
setter)
+ multiplayer_mode
1 Multiplayer game mode
(getter+setter)
+Is win//game victory sign
(getter t se tter)
-Starto/1 starts the game, and
calls
Init game()/Load game
-init_ Sounds0//Load audio
file
-Load Jevle templates0//Load
level template
-enter_ Loop0//Enter the main
loop
-_ Init0/volume
initialization+call start1
+Nit Beme windox/0//Load the
game form
```

```
# instance//The instance of the single
creation mode becomes heavier
# instance _ Lock//Ensure the lock for
simultaneous access
-VIEWS//aggregation of game interfaces
+Show0//shows the game interface
Lint_ 0//preloaded game interface
```

```
#draw_Interface (//Draw the current frame
# init_ Resourcesf)//Preload resources
#init_ Text1//Text preload
#init_ Logo()//Icon preload
#Int buttons)//button preload
#main_ loop()//main loop
+Show0//Display the game interface
+Config0//Returns the configuration of the
parallel instance
```



# Sprint 1 Recap

Sprint 1 Completed User Stories					
ID	As a	I want to	So that	Acceptance Criteria (format: use keywords Given, When, Then)	Status
US 1	Player/ Customer	control a tank with a keyboard	I can move around the battlefield and engage in combat with other tanks.	Scenario: Tank Movement Given: The player is on the game screen When: The player presses the arrow keys on the keyboard to control the tank's movement Then: The tank moves in the direction of the arrow key that was pressed	Completed
US 2	Player/ Customer	fire my tank's cannon	I can destroy enemies' tanks.	Scenario: Firing the Cannon Given: The player is on the game screen When: The player presses the spacebar on the keyboard to fire the cannon Then: The tank fires a shell in the direction it is facing	Completed
US 3	Player/ Customer	have a single-player mode	I can practice my skills and strategies against AI-controlled tanks.	Scenario: Single-player mode Given: The player is on the game screen When: The player selects the Game Start option Then: The game starts in single-player mode, with AI-controlled tanks as enemies and allies	Completed
US 5	Player/ Customer	have enemies and allies	I can experience different situations and have more fun	Scenario: Enemies and Allies Given: The player is on the game screen When: The game starts Then: Enemies and allies are present on the battlefield, and the player can differentiate between them	Completed
US 6	Player/ Customer	have a scoreboard that shows my score	I can see how many score I get.	Scenario: Scoreboard Given: The player is on the game screen When: The game is in progress Then: The scoreboard displays the player's score	Completed
US 7	Player/ Customer	have multiple lives	I'm not gonna let one mistake end the game	Scenario: Multiple Lives Given: The game is in progress When: The player's tank takes damage Then: The tank loses a life, and the player can continue playing with the remaining lives	Completed
US 12	Player/ Customer	have different kind of enemies	enrich my game experience	Scenario: Different Types of Enemies Given: The game is in progress When: The player encounters different types of enemy tanks Then: The player experiences a variety of gameplay challenges	Completed
US 15	Player/ Customer	see the lives status of my tank	I can know how much damage I can sustain	Scenario: Lives Status Given: The game is in progress When: The player's tank takes damage Then: The lives status of the tank is updated to reflect the remaining health	Completed
US 19	Player/ Customer	want enemies and friends to respawn constantly	I can constantly encounter new situations to enrich my experience	Scenario: Enemy Respawn Given: The player starts a game When: The player destroys an enemy tank Then: A new enemy tank immediately appears on the battlefield When: The player's ally tank is destroyed Then: A new ally tank immediately appears on the battlefield	Completed
US 10	Player/ Customer	play on different difficulty levels	I can challenge myself and get different experiences.	Scenario: Difficulty Levels Given: The player is on the game screen When: The player selects a difficulty level Then: The game's difficulty is changed, and the player experiences a different level of challenge	Not Completed
US 11	Player/ Customer	my shells to score differently when they hit friendly and enemy forces	affecting my strategy and scoring.	Scenario: Shell Scoring Given: The player's tank fires a shell When: The shell hits an enemy tank Then: The player scores points. If the shell hits a friendly tank, the player loses points	Not Completed

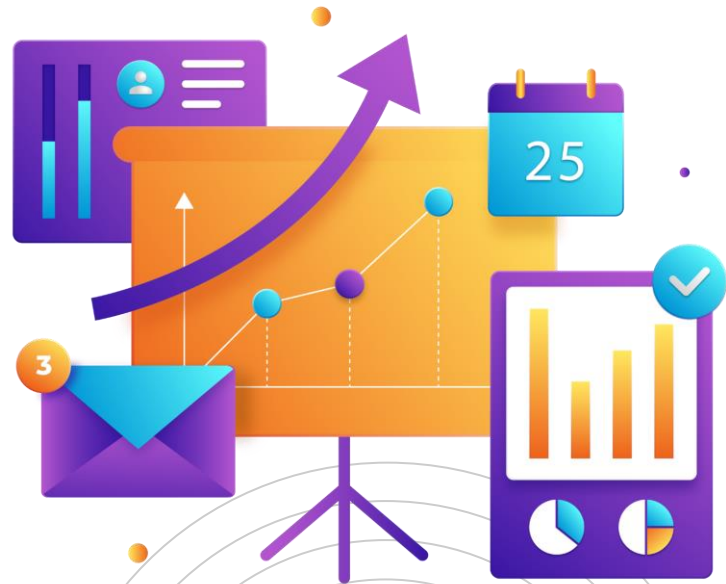
# Product Backlog

ID	As a	I want to	So that	Acceptance Criteria (format: use keywords Given, When, Then)	Status	Sprint
US 1	Player/ Customer	control a tank with a keyboard	I can move around the battlefield and engage in combat with other tanks.	Scenario: Tank Movement Given: The player is on the game screen When: The player presses the arrow keys on the keyboard to control the tank's movement Then: The tank moves in the direction of the arrow key that was pressed.	Done	1
US 2	Player/ Customer	fire my tank's cannon	I can destroy enemies' tanks.	Scenario: Firing the Cannon Given: The player is on the game screen When: The player presses the spacebar on the keyboard to fire the cannon Then: The tank fires a shell in the direction it is facing.	Done	1
US 3	Player/ Customer	have a single-player mode	I can practice my skills and strategies against AI-controlled tanks.	Scenario: Single-player mode Given: The player is on the game screen When: The player selects the Game Start option Then: The game starts in single-player mode, with AI-controlled tanks as enemies and allies.	Done	1
US 4	Player/ Customer	have a variety of maps to choose from	I can experience different terrains and battlefields.	Scenario: Choosing a Map Given: The player is on the game screen When: The player selects the map selection option Then: A list of available maps is displayed, and the player can select one to start the game on that map.	Done	2
US 5	Player/ Customer	have enemies and allies	I can experience different situations and have more fun	Scenario: Enemies and Allies Given: The player is on the game screen When: The game starts Then: Enemies and allies are present on the battlefield, and the player can differentiate between them.	Done	1
US 6	Player/ Customer	have a scoreboard that shows my score	I can see how many score I get.	Scenario: Scoreboard Given: The player is on the game screen When: The game is in progress Then: The scoreboard displays the player's score.	Done	1
US 7	Player/ Customer	have multiple lives	I'm not gonna let one mistake end the game	Scenario: Multiple Lives Given: The game is in progress When: The player's tank takes damage Then: The tank loses a life, and the player can continue playing with the remaining lives.	Done	1
US 8	Player/ Customer	have different language options	fit my language preferences.	Scenario: Language Options Given: The player is on the game screen When: The language selection option is available Then: The player can select a language preference, and the game's language will be changed accordingly.	Done	2
US 9	Player/ Customer	pause the game at any time	take a break or attend to other matters.	Scenario: Pausing the Game Given: The game is in progress When: The player presses the pause button Then: The game is paused, and the player can resume playing or exit the game.	Done	2
US 10	Player/ Customer	play on different difficulty levels	I can challenge myself and get different experiences.	Scenario: Difficulty Levels Given: The player is on the game screen When: The player selects a difficulty level Then: The game's difficulty is changed, and the player experiences a different level of challenge.	Done	2

# Product Backlog

US 11	Player/ Customer	my shells to score differently when they hit enemy forces	affecting my strategy and scoring.	Scenario: Shell Scoring Given: The player's tank fires a shell When: The shell hits an enemy tank Then: The player scores points. If the shell hits a friendly tank, the player loses points.	Done	2
US 12	Player/ Customer	have different kind of enemies	enrich my game experience	Scenario: Different Types of Enemies Given: The game is in progress When: The player encounters different types of enemy tanks Then: The player experiences a variety of gameplay challenges.	Done	1
US 13	Player/ Customer	customize my game's graphics, such as resolution and quality	I can get the best game experience	Scenario: Graphics Customization Given: The player is on the game screen When: The graphics customization option is available Then: The player can adjust the game's graphics settings, such as resolution and quality.	Not Done	2
US 14	Player/ Customer	collect power-ups such as health boosts, speed boosts	I can increase my chances of survival and progress through the game.	Scenario: Power-Ups Given: The player is on the game screen When: The player collects a power-up Then: The player's tank gains a benefit, such as increased health or speed.	Done	2
US 15	Player/ Customer	see the lives status of my tank	I can know how much damage I can sustain	Scenario: Lives Status Given: The game is in progress When: The player's tank takes damage Then: The lives status of the tank is updated to reflect the remaining health.	Done	1
US 16	Player/ Customer	be able to hide behind obstacles such as walls and rocks	I can avoid enemy fire and ambush them.	Scenario: Obstacle Hiding Given: The player's tank is near an obstacle, such as a wall or rock When: The player presses the hide button Then: The tank moves behind the obstacle and is hidden from enemy fire.	Done	2
US 17	Player/ Customer	be able to customize my tank's appearance with different skins and colors	I can personalize my gameplay experience.	Scenario: Tank Skin Customization Given: The user is on the main menu When: The user selects the "customize tank" option Then: The system displays the customization options, including skins and colors And: The user can select a skin and color And: The system applies the selected skin and color to the tank	Done	2
US 18	Player/ Customer	have access to different types of tanks with different stats, such as speed, health, and firepower	I can choose the one that suits my playstyle the best	Access to Different Types of Tanks Scenario: Tank Selection Given: The user is on the main menu When: The user selects the "choose tank" option Then: The system displays the tank options, including their stats such as speed, health, and firepower And: The user can select a tank that suits their playstyle the best And: The system applies the selected tank and its stats to the gameplay	Done	2
US 19	Player/ Customer	want enemies and friends to respawn constantly	I can constantly encounter new situations to enrich my experience	Scenario: Enemy respawn Given: The player starts a game When: The player destroys an enemy tank Then: A new enemy tank immediately appears on the battlefield When: The player's ally tank is destroyed Then: A new ally tank immediately appears on the battlefield	Done	1
US 20	Player/ Customer	have access to different sound effects for different actions, such as firing a cannon or collecting a power-up	enrich my game experience	Scenario: Sound Effect Customization Given: The user is on the main menu When: The user selects the "sound options" option Then: The system displays the sound options, including different sound effects for different actions And: The user can select a sound effect for each action And: The system applies the selected sound effects to the gameplay	Done	2

# Sprint 2 Backlog





# Sprint 2 Backlog – Completed & Uncompleted US

ID	As a	I want to	So that	Acceptance Criteria (format: use keywords Given, When, Then)	Status	Sprint
US 4	Player/ Customer	have a variety of maps to choose from	I can experience different terrains and battlefields.	Scenario: Choosing a Map Given: The player is on the game screen When: The player selects the map selection option Then: A list of available maps is displayed and the player can select one to start the game on that map	Done	2
US 8	Player/ Customer	have different language options	fit my language preferences.	Scenario: Language Options Given: The player is on the game screen When: The language selection option is available Then: The player can select a language preference, and the game's language will be changed accordingly.	Done	2
US 9	Player/ Customer	pause the game at any time	take a break or attend to other matters.	Scenario: Pausing the Game Given: The game is in progress When: The player presses the pause button Then: The game is paused, and the player can resume playing or exit the game.	Done	2
US 10	Player/ Customer	play on different difficulty levels	I can challenge myself and get different experiences.	Scenario: Difficulty Levels Given: The player is on the game screen When: The player selects a difficulty level Then: The game's difficulty is changed, and the player experiences a different level of challenge.	Done	2
US 11	Player/ Customer	my shells to score differently when they hit enemy forces	affecting my strategy and scoring.	Scenario: Shell Scoring Given: The player's tank fires a shell When: The shell hits an enemy tank Then: The player scores points. If the shell hits a friendly tank, the player loses points.	Done	2
US 13	Player/ Customer	customize my game's graphics, such as resolution and quality	I can get the best game experience	Scenario: Graphics Customization Given: The player is on the game screen When: The graphics customization option is available Then: The player can adjust the game's graphics settings, such as resolution and quality.	Not Done	2
US 14	Player/ Customer	collect power-ups such as health boosts, speed boosts	I can increase my chances of survival and progress through the game.	Scenario: Power-Ups Given: The player is on the game screen When: The player collects a power-up Then: The player's tank gains a benefit, such as increased health or speed.	Done	2
US 16	Player/ Customer	be able to hide behind obstacles such as walls and rocks	I can avoid enemy fire and ambush them.	Scenario: Obstacle Hiding Given: The player's tank is near an obstacle, such as a wall or rock When: The player presses the hide button Then: The tank moves behind the obstacle and is hidden from enemy fire.	Done	2
US 17	Player/ Customer	be able to customize my tank's appearance with different skins and colors	I can personalize my gameplay experience.	Scenario: Tank Skin Customization Given: The user is on the main menu When: The user selects the "customize tank" option Then: The system displays the customization options, including skins and colors And: The user can select a skin and color And: The system applies the selected skin and color to the tank.	Done	2
US 18	Player/ Customer	have access to different types of tanks with different stats, such as speed, health, and firepower	I can choose the one that suits my playstyle the best	Access to Different Types of Tanks Scenario: Tank Selection Given: The user is on the main menu When: The user selects the "choose tank" option Then: The system displays the tank options, including their stats such as speed, health, and firepower And: The user can select a tank that suits their playstyle the best And: The system applies the selected tank and its stats to the gameplay	Done	2
US 20	Player/ Customer	have access to different sound effects for different actions, such as firing a cannon or collecting a power-up	enrich my game experience	Scenario: Sound Effect Customization Given: The user is on the main menu When: The user selects the "sound options" option Then: The system displays the sound options, including different sound effects for different actions And: The user can select a sound effect for each action And: The system applies the selected sound effects to the gameplay	Done	2

# Sprint 2 Backlog – Test Cases

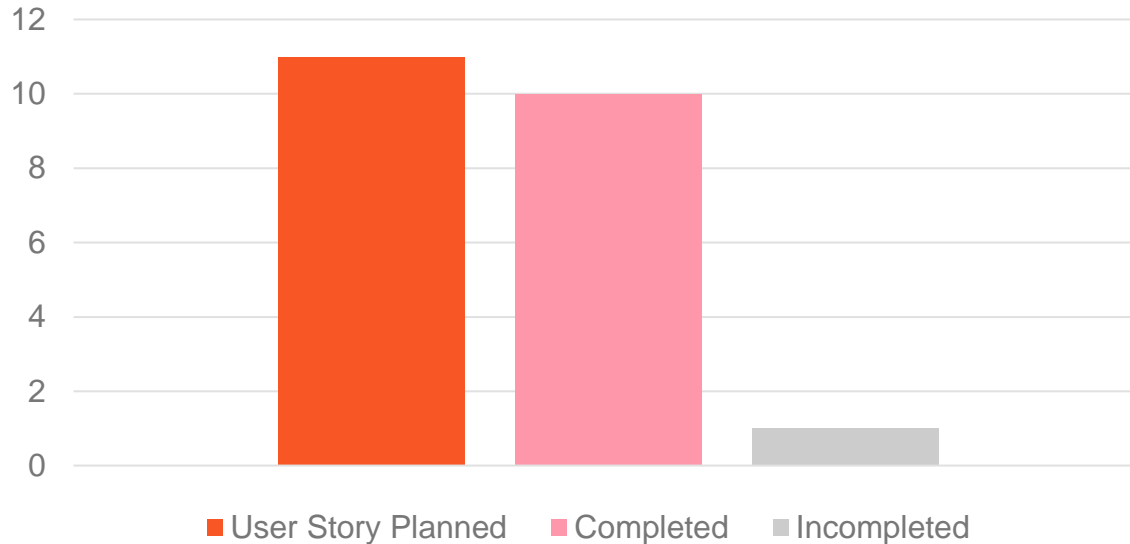
Test Cases						
User Story ID	Test Description	Assumptions	Action	Actual Output	Test Result (Pass/Failed)	Comments
4	Have different maps	The player can type in the map number to choose a map	Type in the map number	Different maps occurs	Pass	
14	Power Up Tools	The player can pick up power-ups to level up, high speed, etc.	Collect power-ups when running the game	The power-ups did not occurs	Failed	
14	Power Up Tools	The player can pick up power-ups to level up, high speed, etc.	Collect power-ups when running the game	The power-ups occurs in the war so that the player cannot pick it up	Failed	
14	Power Up Tools	The player can pick up power-ups to level up, high speed, etc.	Collect power-ups when running the game	The power-ups successfully occurs in the map, also not occurs in the wall	Pass	
20	Sound	There are sound effects when tanks fire and when bullets hit enemies	Control player's tank to fire and hit an enemy tank	Tank successfully fire the cannon but there is no sound when firing	Failed	
20	Sound	There are sound effects when tanks fire and when bullets hit enemies	Control player's tank to fire and hit an enemy tank	There is sound effect when firing, but not hitting an enemy	Failed	
20	Sound	There are sound effects when tanks fire and when bullets hit enemies	Control player's tank to fire and hit an enemy tank	The sound effects successfully occurred when tanks fire and when bullets hit enemies	Pass	

# Metrics



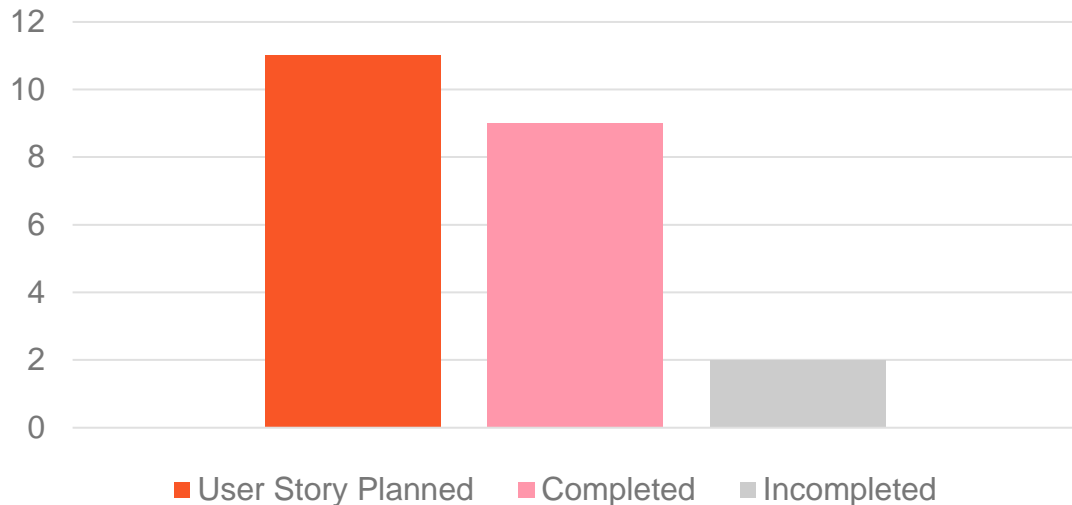
# Team velocity – this sprint

Team Velocity(Mar 10,2023 – May  
08,2023)

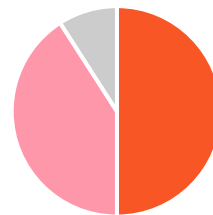


# Team's historical velocity (average)

Team Velocity(Jan 23,2023 – Mar 10,2023)



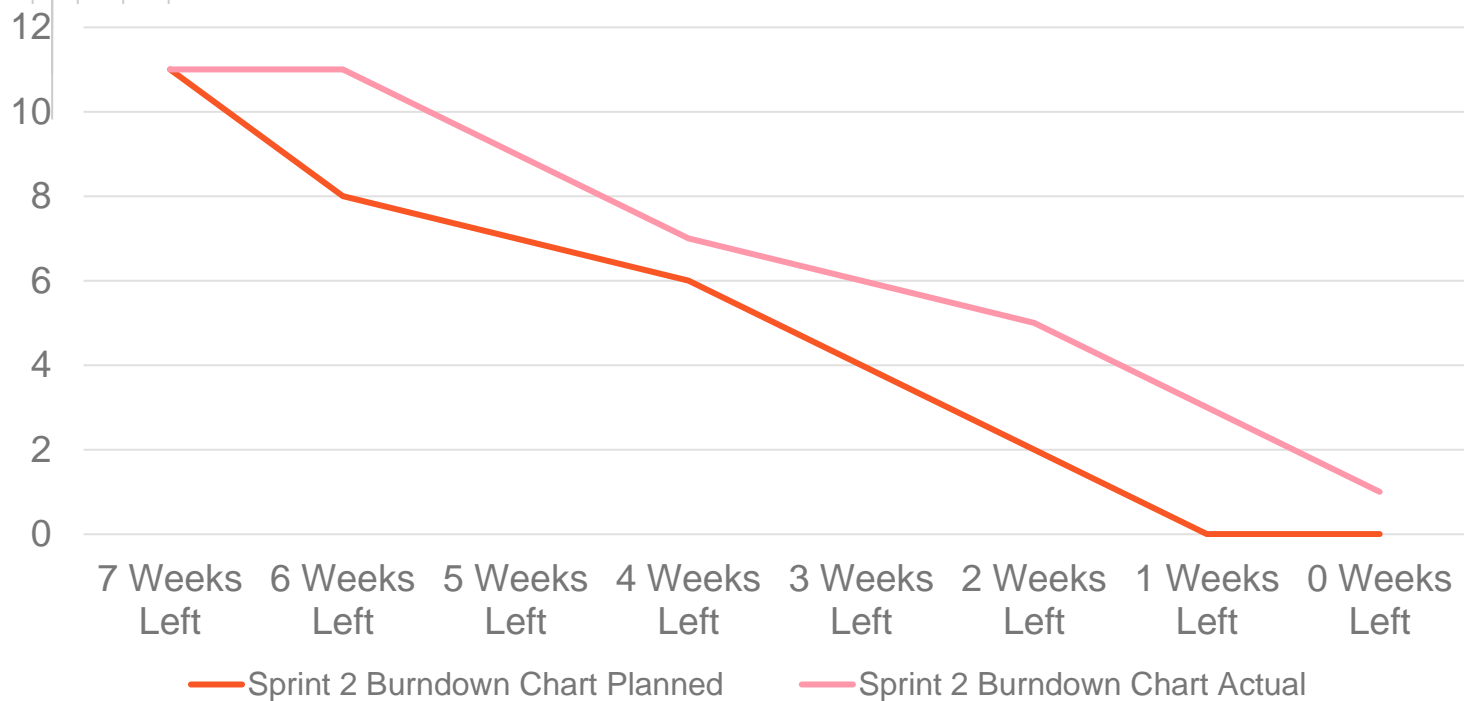
Sprint 1



■ Committed ■ Completed  
■ Incompleted

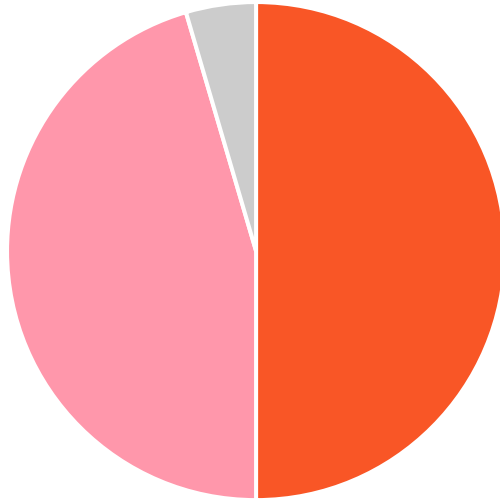
$$\frac{9}{11} = 0.818$$

## Sprint 2 Burndown Chart



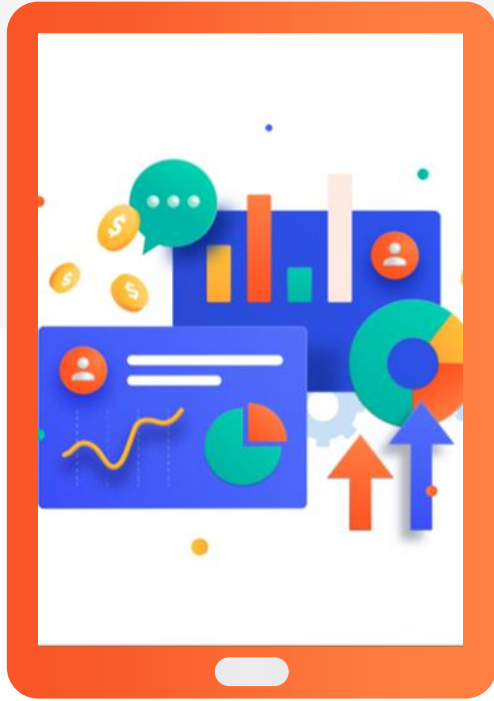
# Committed/Completed Ratio

Sprint 2



■ Committed ■ Completed ■ Incompleted

$$\frac{10}{11} = 0.909$$



# Retrospective



# What Went Well

- 90.9% of the planned tasks Completed
- The roadmap for this sprint was created and executed successfully
- The core functions have been successfully implemented

# What can be improved?

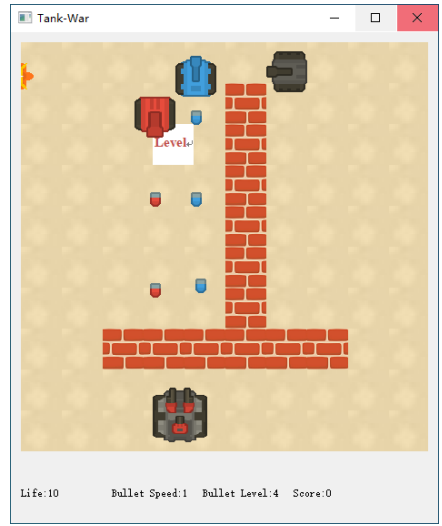
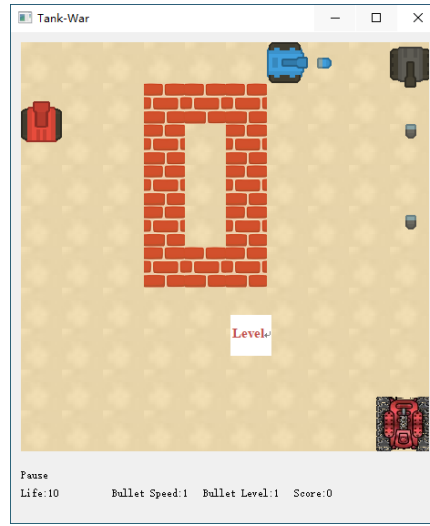
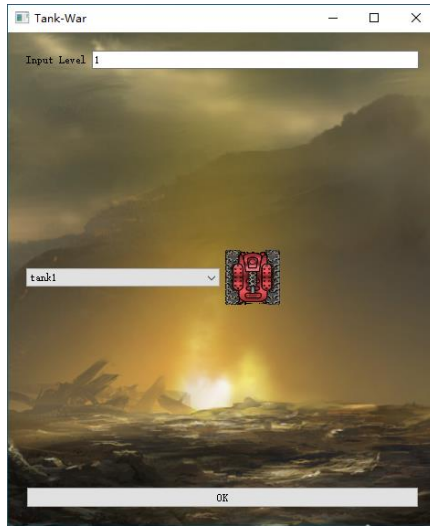
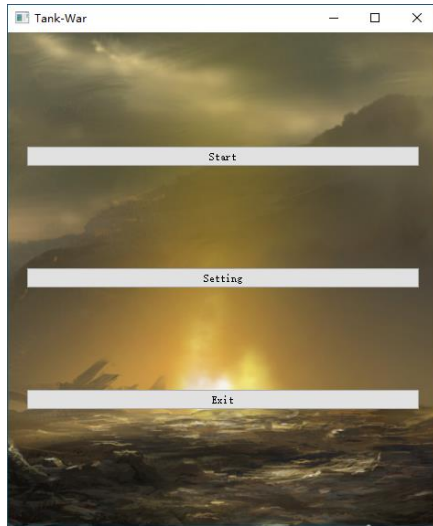
- The commitment to completing all the planned tasks needs to be increased, as the 10% of tasks that were not completed may have caused delays in future sprints.
- We need to improve our time management skills, as some tasks took longer than expected, which may have impacted other tasks in the sprint.
- We need to measure our ability before we plan, and we can't plan what our team can't do. Because of this reason, one goal of the whole project has not been completed.



# Live Project Demo

(Sprint 2 – Current Sprint)

# Slides App Screenshot



# Slides for API

API lists:

- pytorch
- soundfile
- pyaudio
- numpy
- opencv2
- random

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# Thanks

**GitHub link: <https://github.com/htmw/2023S-zhu/wiki>**

**Live Application Demo: <https://youtu.be/RFxMyKje3K0>**