

Team flashover - Kevin Cai, Matthew Chan, and David Lupea
SoftDev1 pd9
P#05 -- Fin
2020-6-1

Tanks by Team flashover

Project Objective:

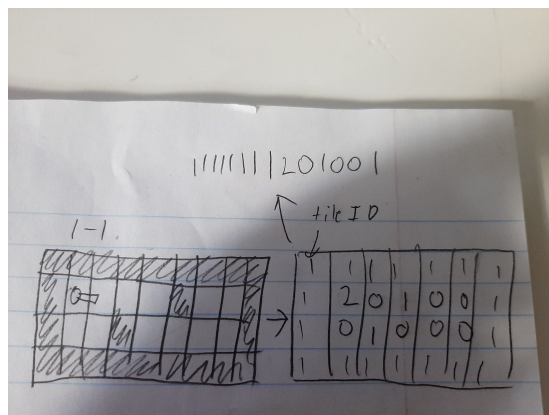
The overall goal of the project is to create a fun and addictive game based on the *Tanks!* game from Wii Play, with options for a level editor, like Super Mario Maker.



Maps:

- Levels are grid-based maps that will be stored within an array of tile IDs. Each tile ID can represent a tank, open space, or wall tile. This data is stored as part of the Maps model in MongoDB. All level data should be the same length, as all maps have the same dimensions.
- Levels are stored like this:

```
_id: ObjectId // Primary Key  
name: String // "L1-1"  
data: [Integer] // 111111111100000000001200000111111100000 ..  
Image for reference:
```



Physics:

- Collision:

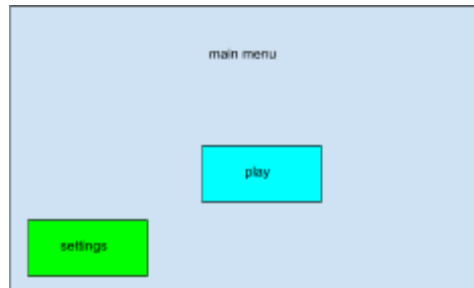
- For bullet-tank, bomb-tank, tank-tank, bullet-bullet collision, we should be using the separating Axis Theorem. This is a good article on it:
<https://gamedevelopment.tutsplus.com/tutorials/collision-detection-using-the-separating-axis-theorem--gamedev-169>
- For bomb explosion - tank, bomb - bullet collision, we will simply calculate the distance from the bomb to the center of the tank.

- Collision Response:

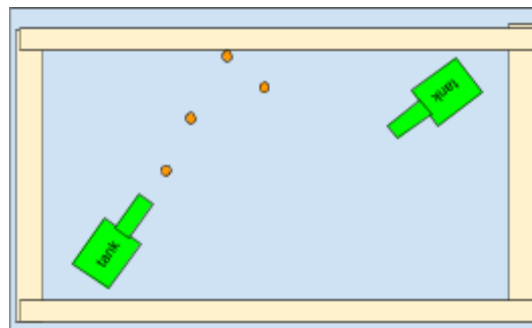
- For tank-tank collisions, the tanks will stay in place until they make a valid input. **(4)**
- Tanks that are hit by a bullet or blasted by a bomb is considered destroyed and will disappear. **(2)**
- bomb-explosion collisions result in the 2nd bomb exploding. **(6)**
- bullet-bullet collisions cause both bullets to disappear. **(5)**
- bullet-bomb collisions cause the bomb to explode, and the bullet disappears. **(3)**
- **Bullet - wall Collision: (1)**
 - Depending on where the bullet hits the wall, it's new trajectory angle could be $\pi - \theta$, or $3 * \pi - \theta$ if $\theta > \pi$.
 - If it's the bullet bounced > 3 times, then the bullet disappears.

General Game System:

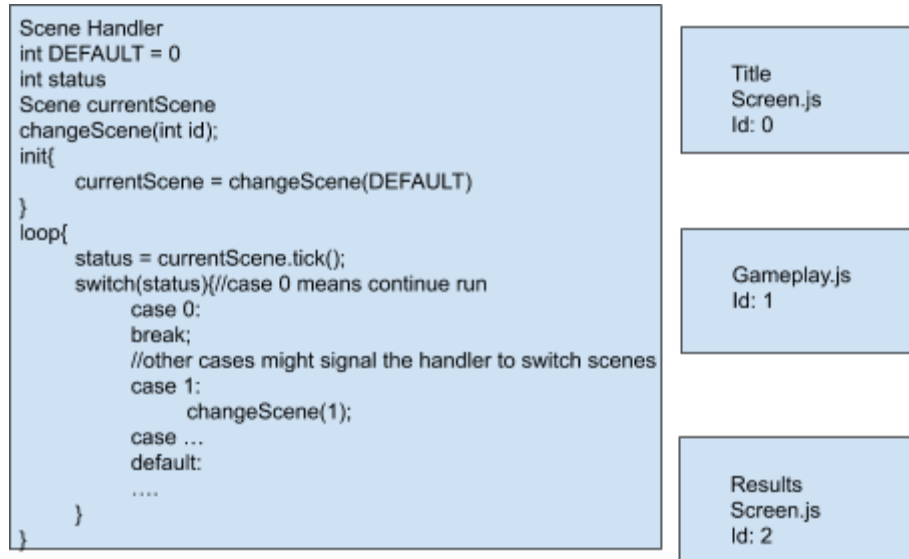
- In our game, there will be some kind of main loop. However, having all logic within a single file is going to get too cluttered. Therefore, we made a system to handle the state of the game. This system allows us to easily add new features to the game if we want to. The entire game is enclosed within a JS Canvas.
 - In order to do this, we made a "scene" system. Each "scene" is its own self-contained environment. Each scene is kept as its own JS file.
 - An example of a scene would be the main menu. In the main menu scene, there would be the play button, settings button, etc...



- Another example of a scene would be the actual game levels:



- In order to switch between scenes, a "scene handler" object will be used. This object will change game logic at the highest level. It can handle transitions between the main menu scene and the actual level scene where gameplay happens. In both the main menu and the gameplay scene, everything is self-contained. This makes organization easier as we add more to the project. If we have to edit some code that relates to each level, we don't have to scroll through code for the main menu.



- Scenes themselves will be like their own, self-contained programs.

Controls:

- A/D: turn left/right
- W/S: forward/backward
- Click: shoot
- space: plant bomb

AI:

- Pathing Algorithm
 - Use to move toward the player optimally
- Vision Cone
 - Use to choose when to shoot the player
- *Optional Features:*
 - Variable difficulty
 - Bullet bouncing calculations
 - Leading bullet calculations (player movement prediction)
 - Bullet dodging

List of Required Program Components:

- Main Menu
 - The main menu contains:
 - Button to start the main campaign
 - Text box to input level as a string to play a user-created level.

- Level Player:
 - Have the ability to load up Levels and play them.
- Results Page:
 - Shows how much of each tank the player managed to defeat.

Optional Components:

- Randomly generated levels
- More types of tanks/bullets

Delegations:

- Kevin Cai: PM, Physics/Game system manager
- Matthew Chan: AI and Data Manager
- David Lupea: Map designer, Art