

Computer Games Laboratory

# Custodian by Qoogle

## III Interim Demo

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### 3. Interim Results

#### 3.1 Code Structure

To have a clear construction of the code, better delineate the tasks of each team member, and unify the user interfaces, we first constructed a code structure:

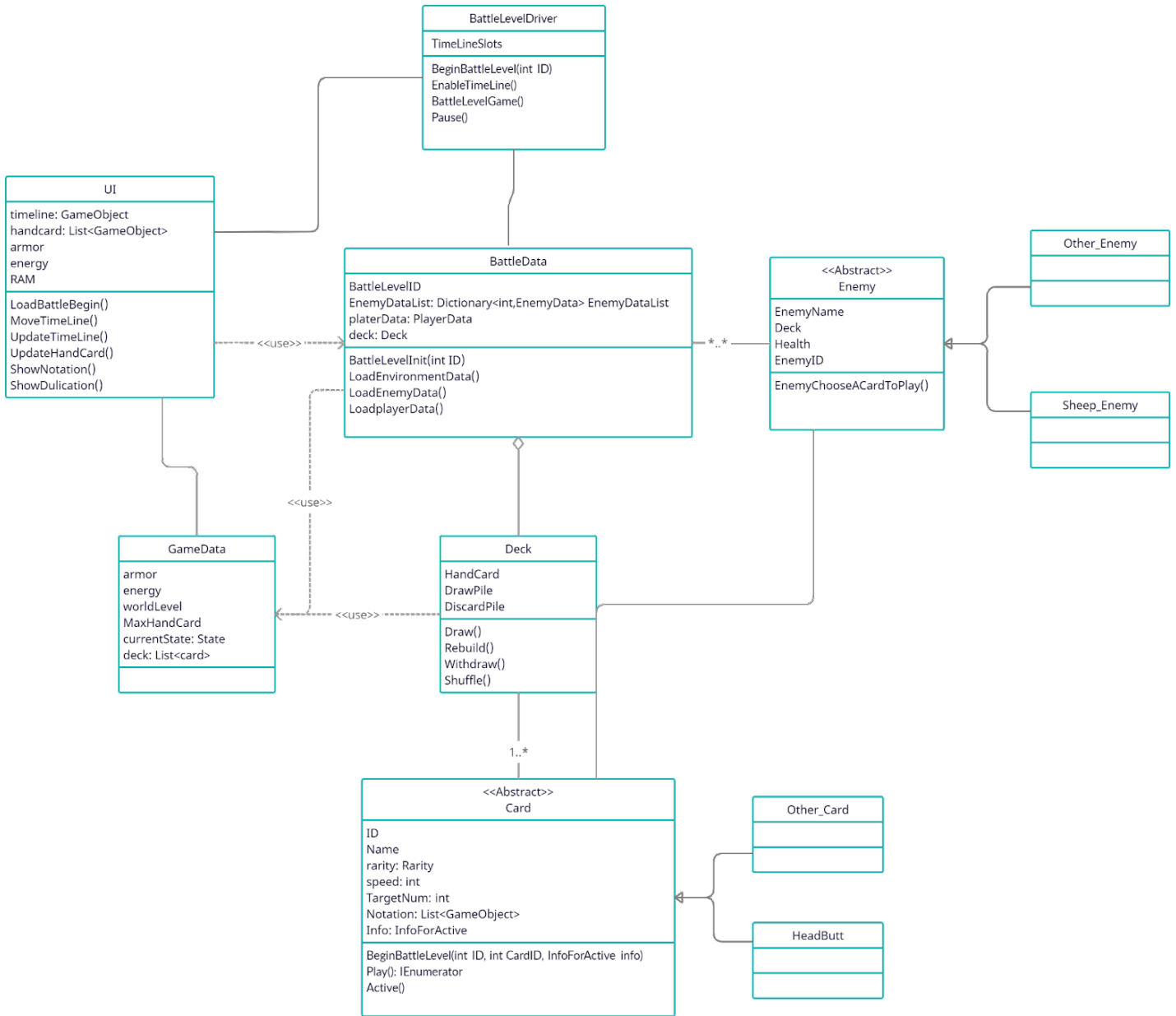


Figure: Code structure

### 3.2 Main Logic: Battle Level Driver

As shown in the diagram, BattleLevelDriver is the initial point of the game and controls the game workflow. The main logic is as followings:

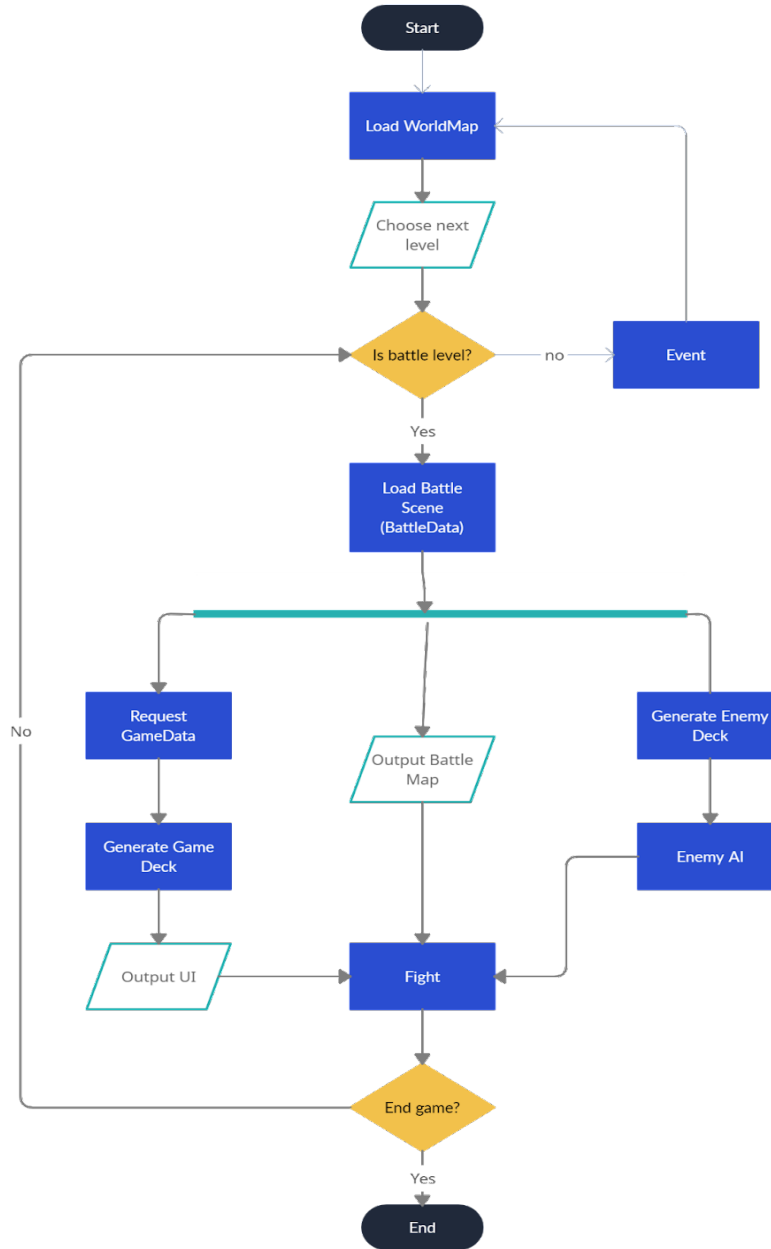


Figure: Main logic

### **3.3 Data Storage: BattleData and GameData**

BattleData stores and loads all battlefield-related information in each battle scene, such as environmental information like obstacles, enemy lists, etc. The enemy AI can also access the BattleData to assist AI in decision making.

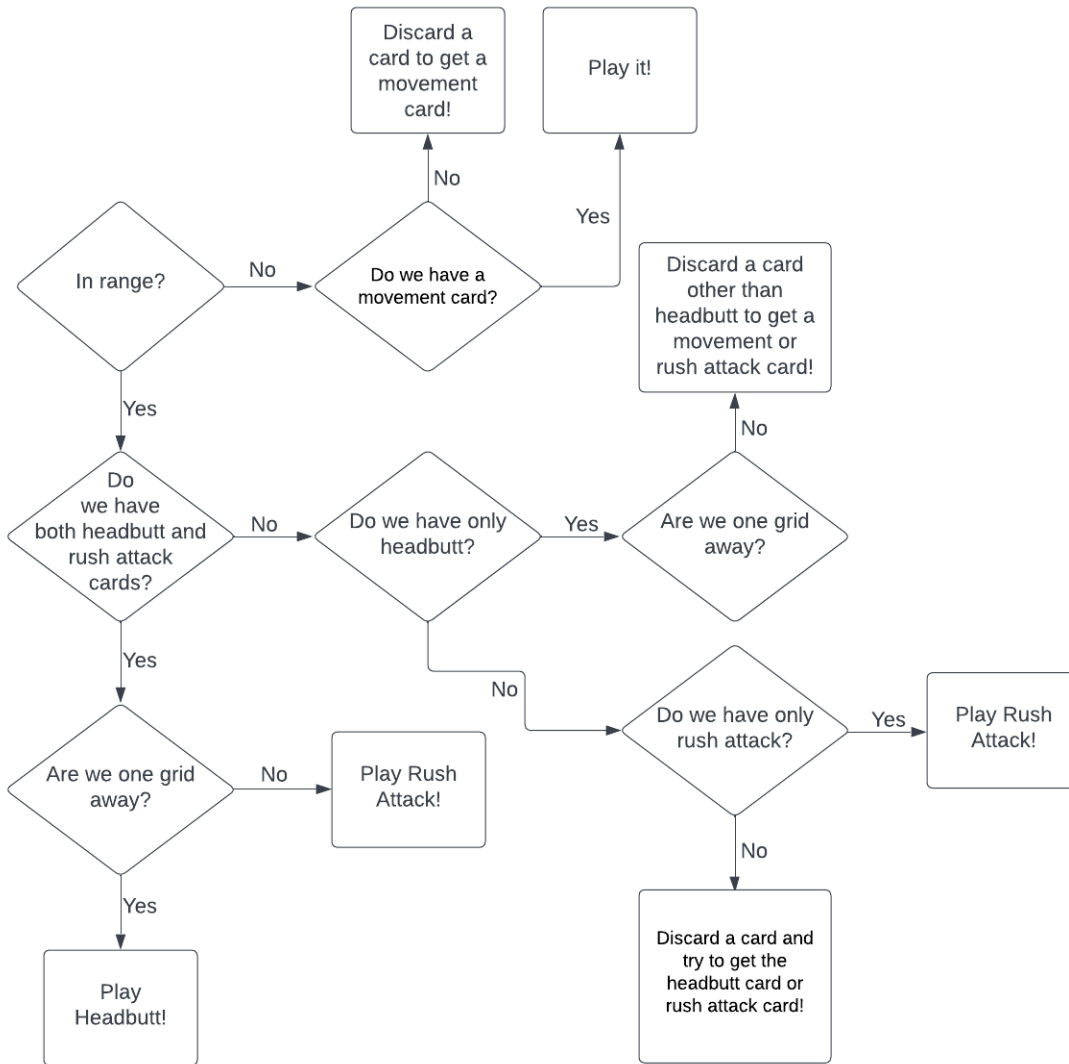
The GameData stores information about the custodian, like armor and energy. A deck will be initialized in random order once a battle level is loaded. Besides, players can also check and build their deck off the battle.

Independent storage of data is easy maintenance and extend, it can also avoid some game cheating.

### **3.4 Enemy AI**

Currently, there are two AIs for two different enemies. First of these enemies is the tree that our Custodian encounters in the tutorial level. The AI script for this tree is simple because the only actions it can take is to use its photosynthesis skill to restore 1 health and 2 energy. It has no movement abilities. So, the tree uses this card whenever it becomes available.

Second of these enemies is the sheep which has 5 movement cards and 2 attack cards. Therefore, the AI script for the sheep is much more complex.



The AI script follows the logic detailed below:

- Is the sheep in range to attack?
  - If yes, does it have the headbutt attack card or rush attack?
    - It has both.
      - If it is 1 grid away from the player, use the headbutt card. Otherwise, use the rush attack.
    - It has the headbutt attack card.
      - If it is 1 grid away, use the card.

- If it is more than 1 grid away, discard a card other than the headbutt card and try to get a movement card or the rush attack card.
  - It has the rush attack card.
    - Use the card.
  - It has neither.
    - Discard a card and try to get the headbutt card or rush attack card.
- If no, try to move into range
  - Does it have a movement card?
    - If yes, play it!
    - If not, discard one of the cards at hand to get a movement card.

The sheep initially tries to get into range to be able to attack and then it tries to attack. However, it can only have 3 cards at most on its hand. Therefore, sometimes it needs to sacrifice time (1 timestep to be exact) by discarding a card to get the card it needs.

When it gets into range, the sheep tries to attack by either using the headbutt card or rush attack card.

## 3.5 UI

### 3.5.1 Timeline

UI is mainly responsible for interacting with users and delivering information. The most important part of UI in our game is the timeline. A clear and concise layout helps players to better analyze and decide the next step. After testing different versions, we have adopted the following layout:



Figure: Illustration of timeline

As previously described, a played (initialized but not activated) card will be shown on the timeline according to its speed, and moves left in every time slot until the card effect is performed (timeslot 0). Meanwhile, the custodian can predict the enemy's action upto three time steps away. So, all of the cards within three time steps will be shown (custodian's cards are placed above the timeline, enemies' below). Only the custodian's cards and duplication process will be displayed beyond the third time step.

### 3.5.2 Pause Button and Other Components

Because this game is a real-time strategy game, players may want to pause to check card information and think about their next step, a pause button is needed. In addition to that, when the game is paused, players can see a list of all the enemy's cards detected as played, and choose which card to duplicate. The card that is being duplicated and its progress will also be shown on the timeline (see 3.5.1 Timeline).

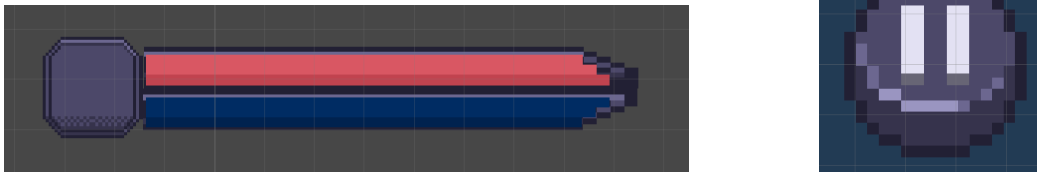


Figure: Illustration of UI components

As for other components like armor (health) and energy bar, they are so common in games that we decided it is not necessary to introduce and explain them here.

### 3.5.3 The Overall UI Layout

After completing these components, the layout of the entire UI has basically been formed. What is to be noticed is that the hand cards are shown at the bottom of the screen.



Figure: Illustration of UI layout

## 3.6 Battle Map and Camera Movement

### 3.6.1 Battle Map and Grid

Since this game is a 2D pixel game, we design and draw the battle map as a tile map and palette. Of course, each cell is a single grid in the BattleData, so that the unit of character movement distance, attack range, and other card parameters can be unified and better implemented.

Additionally, when choosing a card, its scope of action will be displayed, some cards also have a target, which will be highlighted with a notation or an arrow. A unified grid can help players to discriminate and choose clearly.

### 3.6.2 Camera Movement

If we fix the camera position, all objects will become small, resulting in a bad game experiment. So our camera focuses on the part of the game and can be moved if the mouse touches the edge of the screen. Also, there are boards for the camera to make sure the camera display will not be out of bounds.



Figure: Illustration of UI battle map



### 3.7 Card and Other Prefabs

We have implemented basic card scripts and their prefabs. The card will only have a favicon and parameters to avoid unnecessary confusion and information overload. If the players want to learn more about the card, they can use their mouse to hover over one, and a detailed description will be shown. However, this is a desired function that has yet not been implemented.

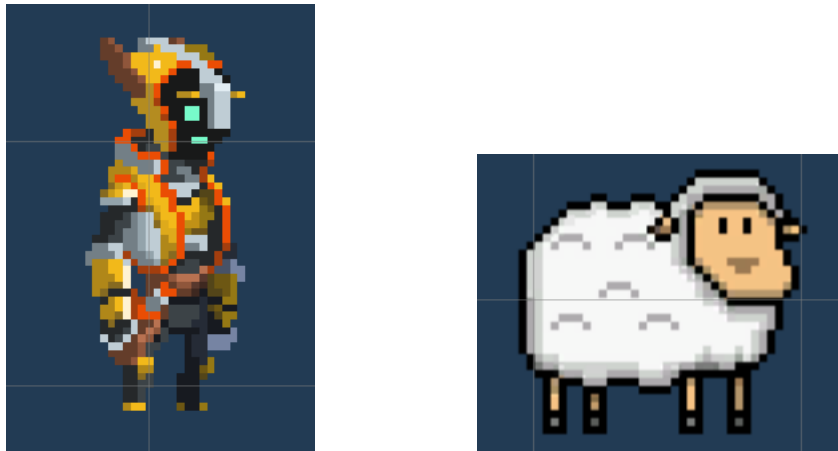


Figure: Illustration of custodian and sheep enemy

As for other game objects such as the custodian, enemies (currently a sheep and tree enemies), and obstacles, we have found some good assets and finished their prefabs. If different states are needed, we also created their animator and corresponding animation like breath, run, and attack. More animations and visual effects will be added according to the new cards in future versions.

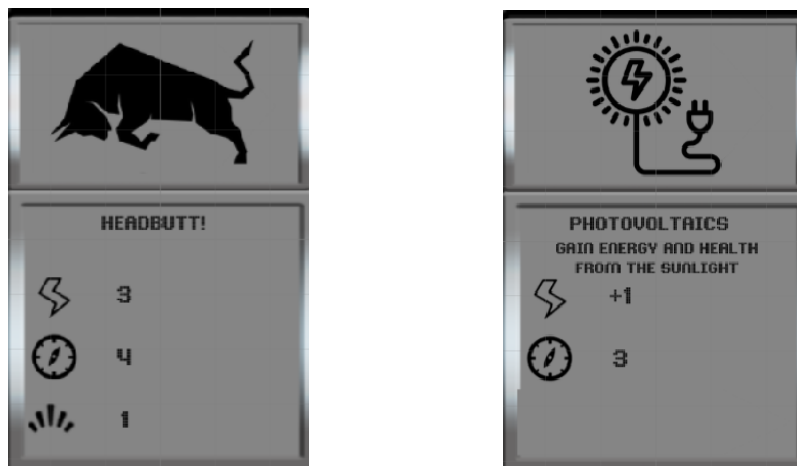


Figure: Illustration of card

## 3.8 Problems and Difficult Points

### 3.8.1 Card Resolution

When a card is instantiated whether in the UI hand card or on the timeline, the favicons and descriptions become unclear and hard to read. We tried to prevent compression, change the filter mode and reduce the pixels per unit, but it still doesn't work. We are finding ways to make favicons and words (primarily) clear no matter how we scale the card.

### 3.8.2 Enemy AI with

About the enemy AI we have written about 700 lines of code, but it still doesn't work perfectly and is difficult to test. In the future versions, more kinds and numbers of enemies will be added, it is a big challenge to make the enemies "smart". We are considering utilizing machine learning to train our enemies, such as Unity machine learning agents. This is still an unknown case because we have not used this before.

## 3.9 Progress Overview and Future work

### 3.9.1 Low Target

- Main game logic
- Battle map
- Battle scene UI
- Basic Card implementation
- Card and other prefabs like custodian and enemies
- Basic enemy
- Deck
- World map
- Tutorial level
- Duplication

### 3.9.2 Desired Target

- More cards
- More enemy
- More battle level
- Audio
- Event Level
- Main menu
- Setting menu

### 3.10 Task Timeline (updated)

|   | Kick-off |       |       | Milestone1: Game Design |           | Milestone2: Prototype |                 |                 | Milestone3: Interim demo |            |            | Milestone 4: Alpha release |       | Milestone5: Playtesting |      |     |
|---|----------|-------|-------|-------------------------|-----------|-----------------------|-----------------|-----------------|--------------------------|------------|------------|----------------------------|-------|-------------------------|------|-----|
| Timeline                                | 19.10    | 26.10 | 2.11  | 9.11                    | 16.11     | 23.11                 | 30.11           | 07.12           | 14.12                    | 21.12      | 28.12      | 4.1                        | 11.1  | 18.1                    | 25.1 | 1.2 |
| Brainstorming                           | [Green]  |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Game description                        | [Green]  |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Time schedule                           | [Green]  |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Assessment                              | [Green]  |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Presentation slides                     |          |       | Tatev |                         |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Cards prototype                         |          |       |       | Tatev                   |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Character prototype                     |          |       |       | Wang                    |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Map prototype                           |          |       |       | Anil                    |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| UI prototype                            |          |       |       | Li                      |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Assets preparation                      |          |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Presentation slides                     |          |       |       |                         | Wang/Anil |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| Show case scenario                      |          |       |       | All                     | All       |                       |                 |                 |                          |            |            |                            |       |                         |      |     |
| World map                               |          |       |       |                         |           |                       |                 | Tatev           |                          |            |            |                            |       |                         |      |     |
| Cards design                            |          |       |       |                         |           | Wang                  |                 |                 |                          |            |            |                            |       |                         |      |     |
| Battle scene game logic                 |          |       |       |                         |           | Wang                  | Wang            |                 |                          |            |            |                            |       |                         |      |     |
| Battle scene UI                         |          |       |       |                         |           | Li                    | Li              | Li              |                          |            |            |                            |       |                         |      |     |
| Basic card implementation               |          |       |       |                         |           | Tatev                 | Tatev           |                 |                          |            |            |                            |       |                         |      |     |
| Basic enemy                             |          |       |       |                         |           | Anil                  | Anil            | Anil            |                          |            |            |                            |       |                         |      |     |
| Deck                                    |          |       |       |                         |           | Li                    |                 |                 |                          |            |            |                            |       |                         |      |     |
| Battle map                              |          |       |       |                         |           | Tatev                 | Tatev           |                 |                          |            |            |                            |       |                         |      |     |
| Prefabs                                 |          |       |       |                         |           | Tatev                 | Tatev           | Tatev/Wang/Li   |                          |            |            |                            |       |                         |      |     |
| Testing & debugging                     |          |       |       |                         |           |                       | Wang            | Wang            |                          |            |            |                            |       |                         |      |     |
| Function Complementation                |          |       |       |                         |           | Wang                  | Wang            | Wang            |                          |            |            |                            |       |                         |      |     |
| Tutorial level                          |          |       |       |                         |           | Behind Schedule       | Behind Schedule | Behind Schedule |                          |            |            |                            |       |                         |      |     |
| Presentation slides                     |          |       |       |                         |           |                       |                 | Li              |                          |            |            |                            |       |                         |      |     |
| Audio                                   |          |       |       |                         |           |                       |                 |                 | Anil/Tatev               | Anil/Tatev | Anil/Tatev | Anil/Tatev                 |       |                         |      |     |
| More cards                              |          |       |       |                         |           |                       |                 |                 | Wang                     | Wang       | Wang       | Wang                       |       |                         |      |     |
| More enemy                              |          |       |       |                         |           |                       |                 |                 | Tatev                    | Tatev      | Tatev      | Tatev                      |       |                         |      |     |
| More battle levels(common, elite, boss) |          |       |       |                         |           |                       |                 |                 | Anil                     | Anil       | Anil       | Anil                       |       |                         |      |     |
| Event level                             |          |       |       |                         |           |                       |                 |                 | Anil                     | Anil       | Anil       | Anil                       |       |                         |      |     |
| Main menu                               |          |       |       |                         |           |                       |                 |                 | Li                       | Li         |            |                            |       |                         |      |     |
| Settings menu                           |          |       |       |                         |           |                       |                 |                 |                          |            | Li         | Li                         |       |                         |      |     |
| Presentation slides                     |          |       |       |                         |           |                       |                 |                 |                          |            |            |                            | All   |                         |      |     |
| Questionary                             |          |       |       |                         |           |                       |                 |                 |                          |            |            |                            | All   |                         |      |     |
| Build executable                        |          |       |       |                         |           |                       |                 |                 |                          |            |            |                            | Unity |                         |      |     |
| Analytics                               |          |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       | All                     |      |     |
| Presentation slides                     |          |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       | All                     |      |     |
| Final presentation                      |          |       |       |                         |           |                       |                 |                 |                          |            |            |                            |       |                         | All  | All |