

CM50109 Software engineering

Coursework 2 - Dungeon game

Team Brown

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Throughout this document members of the team are referred to as follows: Timothy Cooper is referred to as Tim, Binzhou Gu is referred to as Zhou and Zhanrui Liang is referred to as Ray.

Our code is available at <https://github.com/SE-Lab-Tim-Ray/dungeon-game> in the “delivery” branch

1 Sprint Zero

1.1 Process

1.1.1 Overview:

Overall, sprint zero consisted of brainstorming ideas, using a skills matrix (Figure 1.) to allocate roles and implementing agile techniques to our development process. Our first meeting was an informal brainstorm of ideas, Hajar mentioned the idea of a maths game targeted towards young children (section 1.2.2, story 1), Tim proposed a maze game (section 1.2.2, story 2) and Geetha suggested a combination of both games. As a group, we established two final ideas to present at our first customer meeting.

Figure 1. Team Skills Matrix

	H	G	R	Z	
Python	1	1	2	1	1
UK	0	2-3	2	0	3
C++	0	0	2	1	0
VBASIC	0	1	3	2	2
JAVA	0	0	1	0	0
JAVASCRIPT	0	0	2-3	0	2
HTML/CSS	0	0	2-3	0	3
ANDROID APP DESIGN	0	0	1-2	0	0
iOS	0	0	0	0	0
MANAGEMENT	0	1	1	2	3
NODEJS	0	0	2	1	0
DATABASE (SQL DESIGN)	1	1	1	0	1
PASCAL	0	0	0	1	1
GRAPHICS	0	0	0	0	3
3D	0	0	0	2	2
VIDEO	0	3	2	2	1
RESEARCH	2-3				

In short, the first game proposed to the customer was an escape room whereby the player must correctly answer a series of maths questions to escape the room and progress to another room with further puzzles(*section 1.2.2, see user stories Story 1*). Game 2 (*section 1.2.2, Story 2 Version 1*), a maze game against the clock, was a challenge against the clock to defeat rats and spiders all whilst trying to exit the maze (dungeon). Shortly after our first meeting (*refer to section 1.2.1*), our team brainstormed once more and agreed on an adapted version of game 2 (*section 1.2.2, Story 2 Version 2*).

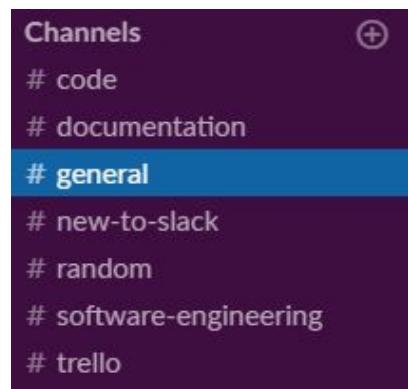
Once our idea was finalised, our team drew a skills matrix (*Figure.1*) to designate tasks according to the capabilities of each member. It was established Tim, Ray and Zhou had coding experience while Hajar and Geetha were experienced in research and academic writing. As a result, Hajar and Geetha were designated the role of maintaining and documenting the agile process. Scrum was chosen as our agile process framework as it provides the flexibility required for a complex project with students of varying skills. Geetha volunteered for the role of Scrum master and introduced Scrum meetings on “Slack” every few days to check the progress of every team member during each sprint.

Adopting the agile methodology, we focused on researching and developing a basic version of the functionality for our game. A moving character and a basic maze were developed (*section 1.1.3, sprint 0.18 sprint 0.21, Figure. 7 & Figure. 9*) and presented to our customers as the first increment of our maze game. Following the customers’ concern on the simplicity of our game (meeting date: 13/11/19), we redirected our focus on improving the functionality and playability of our prototype.

Sprint zero can be described as building the foundation for our game and process. The focus of the first two weeks was to informally brainstorm and establish roles within the group. The organisation of the group rapidly improved once the development team and scrum master were established, meetings became more frequent and well organised with the objectives of each meeting set beforehand. Our team was able to work well together and balance the workload when external factors interfered. Communication as a group also improved through sprint zero. With “Whatsapp” as our initial means of communication, transferring communication to “Slack” enabled better and more focused communication through different channels (*Figure 2.*). The development team were able to discuss programming issues on a separate channel while keeping the documentation team informed. Scrum meetings took place in the general channel and the Trello channel meant every team member would receive a notification when a task was moved from the “doing” column to the “done” column.

Figure 2. Slack channels

In a sprint review meeting on 18th November, we expressed our thoughts on the progress made in the sprint and how we thought we could improve. We agreed to continue Scrum meetings, organise our Trello backlogs and ensure our objectives are all up to date. We ranked the features of our game from high priority to low priority to help set objectives for sprint 1. The features we found of greatest importance were the timer (*section 1.2.2 user story 5, version 2*), as it determines



players score upon completing the game, the leaderboard (*section 1.2.2 user story 7, version 2*) and a start button.

1.1.2 Team Meeting Record

Table 1. Meetings held and attendees for Sprint Zero

Date	Attendance	Objectives	Outcome/Actions	Assignments
24/10/19	ALL	Brainstorming ideas and prepare the pitch for the customer	Two stories outlined, agreed on the viewpoint of each game	Hajar wrote user stories Geetha scribe Tim wrote scripts Zhou and Ray research on code implementation
29/10/19	ALL	Review prepared content for the customer meeting	Assign roles for the customer meeting	For customer meeting Geetha Scribe Hajar narrator Tim evil wizard -script and voice recording Ray interface Zhou cameraman, time-keeper
31/10/19	ALL	Brainstormed ideas	Narrowed ideas into one long story, crocodile stuff explain below and add Tim had childcare issues	Hajar wrote user stories for the new game Tim wrote narration of the revised game Ray and Zhou were reading a gamebook Geetha begin final document
05/11/19	No Geetha - Migraine	Review prepared content for the customer meeting	Practised pitch and reviewed Hajar's user stories and Tim's script (customer meeting with PhDs)	Hajar and Tim were assigned to pitch
07/11/19	ALL after customer meeting	Need to start coding	Decided to split into documentation and development team	Tim to make visuals of character and maze Ray and Zhou research Geetha and Hajar organise documentation collected thus far as sprint 0
08/11/19	ALL	Time management of tasks	Agreed on input levels for the week, Allow Zhou, Hajar and Geetha, time for	Tim maze generator Ray moving character

			cswk 1.	
13/11/19	ALL	Review of customer meeting	Functionality good, needs improving. Markdown files need to be created	Code team continue with functionality Geetha will complete markdown
18/11/19	ALL	Sprint review	Formed backlog for sprint 1 and had a review of sprint 0 functional testing sprint 0	Tim organise GitHub, make moving rat and graphics for character Tim, Ray and Zhou research for sprint 1 Zhou- leaderboard Ray-combine moving character and maze Tim- design maze Geetha and Hajar Documentation tasks as outlined in backlog for sprint 1 .

As aforementioned, meeting 1 was an informal brainstorm of ideas where two games were suggested. From the meeting, Hajar volunteered to write user stories for both pitches (*section 1.3, sprint 0.2*) and Tim volunteered to write up scripts for both pitches (*section 1.3, sprint 0.6*). A second meeting took place on 29th October to practice the scripts written by Tim before the client meeting.

Following our evaluation of the customer meeting, a second brainstorm produced the ideas presented in *Figure. 4 and Figure. 5*. Tim proposed we create a storyline behind the second game idea that would make the maze less generic (*section 1.21, a word used to describe the game in the customer meeting 30th October*). Hajar introduced the idea of having different characters and the option to choose a character and go on their own respective adventure. Zhou built on this and suggested a possible germ character with a maze designed based on the human body(*shown on the right of figure 5*). Hajar was assigned the task of writing new user stories for the adapted game(*section 1.2.2, final set version 2 story 2*) and Tim to write a second pitch(*section 1.1.3, sprint 0.9*).On 5th November, a short meeting occurred to practice the second pitch.

As discussed in section 1.2.1, the revised game idea was met well, however, the client stressed the need for a working prototype of a moving character and a simple maze (*section 1.1.3, sprint 0.18 & 0.21*). Our meeting on the 7th of November formed a development team (Tim, Ray and Zhou) and a documentation team (Hajar and Geetha), based on the skills matrix drawn in *Figure 1*. Coding details were discussed such as which language would be best (*section 1.1.3, sprint 0.0*) and Hajar and Geetha agreed to start formally documenting the agile process thus far.

On 8th November, a short meeting took place where Hajar, Geetha and Zhou mentioned they were finding it difficult to manage the work for their extension on coursework 1 and the game. Tim and Ray kindly agreed to take on our workload for a few days and complete the

basic prototype for the client (*section 1.1.3, sprint 0.18 and 0.21*).

We reviewed the client meeting on 13th November and planned the sprint 1 backlog (*section 2.1.3*). To conclude sprint zero, a meeting took place on 18th November (*discussed in the overview*) to review our SCRUM framework and help improve communication and organisation within our team.

1.1.3 Backlog

Figure 3. Backlog for sprint zero:

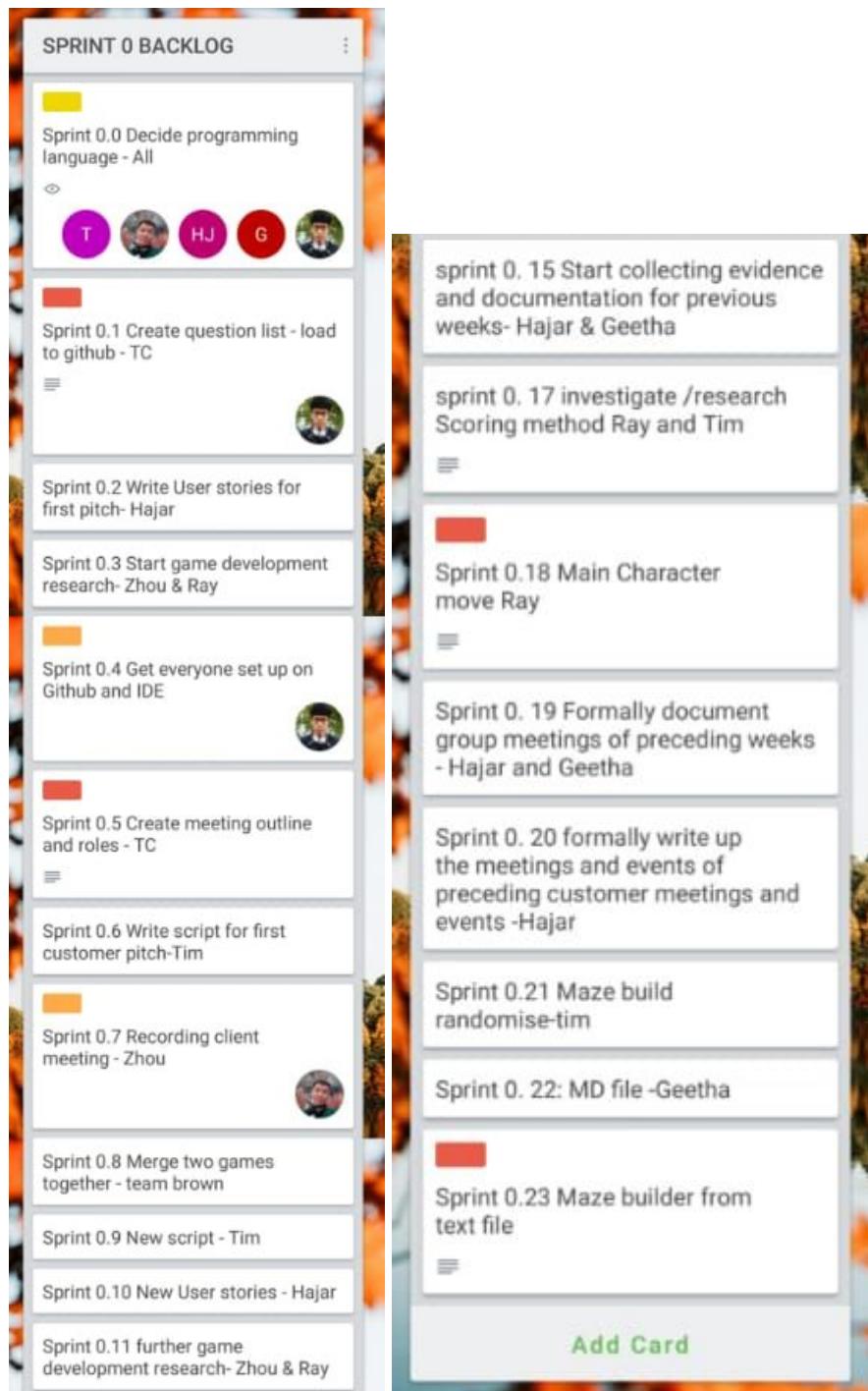
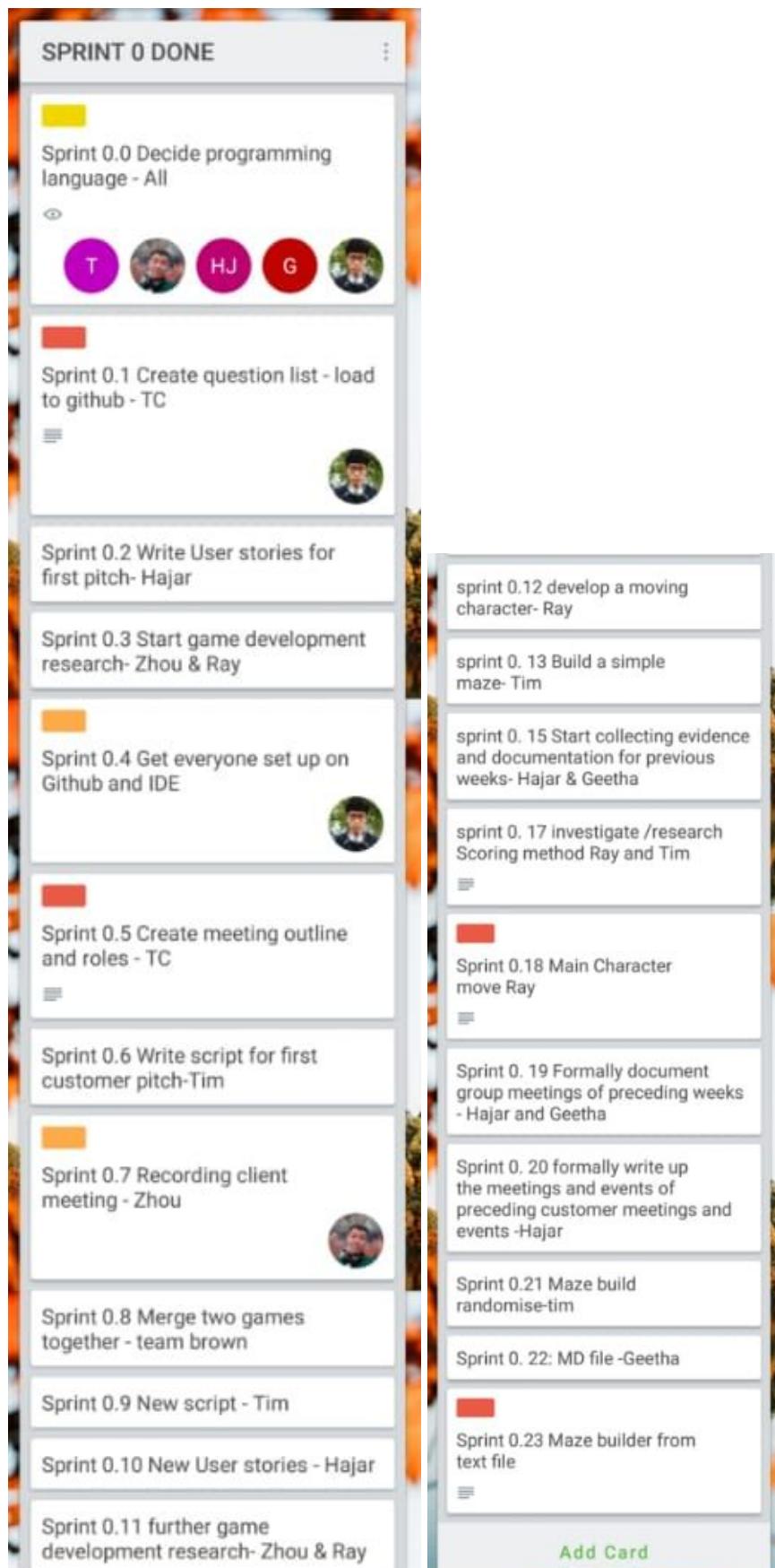


Figure 4. sprint zero completed tickets



New tasks for the next sprint:

1. Show maze
2. Build a logical map from a text file
3. Allow the character to be steered around the maze using arrow keys.
4. Show “win” screen when the maze is complete
5. Timer
6. Leaderboard
7. Start button
8. Input character name
9. UML diagram for sprint 1
10. Write up sprint 1 meetings
11. Write up customer meeting and analysis
12. Markdown (MD) file
13. Input all screenshots into all documents - MD and formal
14. Sprint 1 use cases
15. Sprint 1 user stories

1.1.4 Exception Handling

There were a few events that impacted our team. Firstly, due to an extension on coursework one for Hajar, Geetha and Zhou the additional workload impacted our contributions to the team’s progress in week 3 (07/11/19) and week 4 of the project. Tim and Ray understood the additional pressure at the time and agreed to balance the workload by taking on the coding customer requirement set on the meeting on 7th November.

1.2 Product

1.2.1 Customer interview and analysis

During our first meeting with the client on 30th October, our team presented two game concepts. Using a script, we demonstrated our first idea of a room game whereby the player would have to solve a series of maths problems to escape and proceed to the next room (*section 1.2.2, story 1*). The customer expressed his concern about the playability of the game and need a greater incentive to play the game again. He also mentioned that the first concept was generic and required more of a storyline. We then presented our second concept (*section 1.2.2, story 2 Version 1*) of a maze game including rats and spiders as obstacles. In the game, a player would have to find their way out of a maze in a race against time. The client responded positively to the second concept but asked questions on how we would vary the difficulty of the game each play. He proposed changing the viewpoint of the game to only give the player a partial view (*Figure 6.*) such that they would have to rely on memory or trial and error to navigate around the maze.

From the meeting, our team gathered that our ideas had to be developed further. We acknowledged the client’s preference for the second game and realised there needed to be

another team brainstorm of ideas with the aim of combining the positive aspects of both games.

Our second client meeting began by explaining the developments made by the team. We discussed the storyline of our revised maze game (*section 1.2.2 story 2 Version 2*); each character would have their own respective maze adventure to escape from to add some variation to the game. Spiders would build webs to increase the difficulty of the game and walls would disappear to reduce the difficulty of the game. After some confusion on how disappearing walls would increase the difficulty of the game, we established that walls would disappear less in later rounds of the game and spiders may build a web where the wall disappeared. This would slow the player down as they would then have to destroy the web. We mentioned that we would ideally like to add sound to the game to indicate to the player when a web was being built or a wall was disappearing. The customer asked if anything positive occurs in the game, we replied by explaining that the key to the next level is split into four versions and placed around the maze. Collecting each key adds to your score. We were asked to think about how long a maze game should last and the number of levels and to present some code in the next meeting.

We responded to the second meeting by first considering the positive response to our revised idea and prioritising the customers' request for a partial prototype. A meeting on how to best code the first steps were arranged.

On the third meeting, we were able to present the customer with a text file maze of 0s and 1s (*Figure 7. & Figure 8.*) where the rows could be of any length. A tile was then used in place of the 1s in the text file to complete the design of our basic maze. Ray proceeded to present a moving character that was blocked in the path if presented with a tile (*Figure 9.*). Tim proposed the idea of a randomly generated maze and mentioned it would be possible to integrate the prewritten code into our code. The customer received the idea for a randomly generated maze positively but expressed concerns for the difficulty in the game. We mentioned that the rats would be used to delay the player by blocking its path. The customer stressed the need to focus on the core functionality of the game moving forward.

We were pleased with the client's response to our first prototype and finalisation of the core idea of the game. This led us to start planning the first official sprint to develop the core functionality of the game.

On the last meeting of sprint zero, we explained the process undertaken to plan sprint one. We asked the customer if he would prefer a randomly generated maze to a fixed maze. He mentioned he would prefer a randomly generated such that there is variation in each play and ensured the code would not be too difficult to write to incorporate the randomisation. We then proceeded to question if the customer had a preference for the delivery of the product, he suggested we ensure a game is platform-independent. Towards the end of the meeting, the customer expressed concerns about the level of documentation of the process.

We then discussed the feasibility of the randomly generated maze and decided to adopt the agile technique of first developing a simple fixed maze (with no partial view) and later adapting the maze.

Table 2. Short Summary of customer meetings

Date	Attendance	Objectives	Discussion summary
30/10/19	ALL	Present our two game ideas to the customer	Two game ideas presented; an escape room and a maze game The customer expressed concern for the playability of game 1 and a lack of originality of game 2
06/11/19	ALL	Present our revised second game idea	Presented the storyline behind game 2 and details of the game Customer discussed how we would increase the difficulty of the game
13/11/19	ALL	Present our moving character and basic maze	The customer was pleased with the basic prototype and stressed a need to continue to develop the functionality of the game
20/11/19	No Tim	Discuss our pre sprint one planning process	The delivery of the game was discussed Should we use a randomly generated or a fixed maze Documentation levels were discussed

1.2.2 User stories

Story 1, Version 1:

1. As a player, I would like to see a story to begin my quest (set the scene)
2. As a player, I would like to see the progress of other players.
3. As a player, I would like to finish a room as quickly as possible to retain my sand (i.e. reward)
4. As a player I would like to see my progress throughout the levels, so I know how much further I need to go to finish the game
5. As a player, if I didn't have any progress within 5 mins, I should receive a hint from a "dobby" type character
6. As a player, I would like to see the evil wizard at the beginning of each challenge, explaining what I need to do escape.
7. As a player, I would like to choose my own character and choose who I am competing against
8. As a player, I would like to experience two end scenarios – one for if they don't complete the end game, the other if they win and escape.

Story 2, Version 1:

1. As a player, I would like to see a story to begin (set the scene)
2. As a player, I would like to see the progress of other players
3. As a player, I would like to see how much time I have remaining
4. As a player, I would like to experience two end scenarios – one for if they don't complete the end game, the other if they win and escape.
5. As a player, I would like to be provided with instructions on how to play the game.
6. As a player, I want to be able to move my character
7. As a player, I want to be able to view the maze I need to traverse
8. As a player, I want to be able to know when I have completed the maze

Final set: Story 2, Version 2:

1. As a player, I want to be able to move because I want to complete the maze
2. As a user, I want to see the intro screen and be told what to do
3. As a user, I want to input my character name
4. As a user, I want to press the start game button
5. As a user, I want to be able to see the time I have left (countdown)
6. As a player I want the game to be executable on windows
7. As a player after I finish the game, I want to see the leaderboard

1.2.3 Tests

In the review of sprint zero on 18th November, we tested the functionality of our moving character.

Table 3. Functional tests for sprint zero

User story	Pass or Fail
8. As a player, I want to be able to move because I want to complete the maze	Pass

1.2.4 User interface design

Figure 4. Character and storyboard graphics story 2 version 2

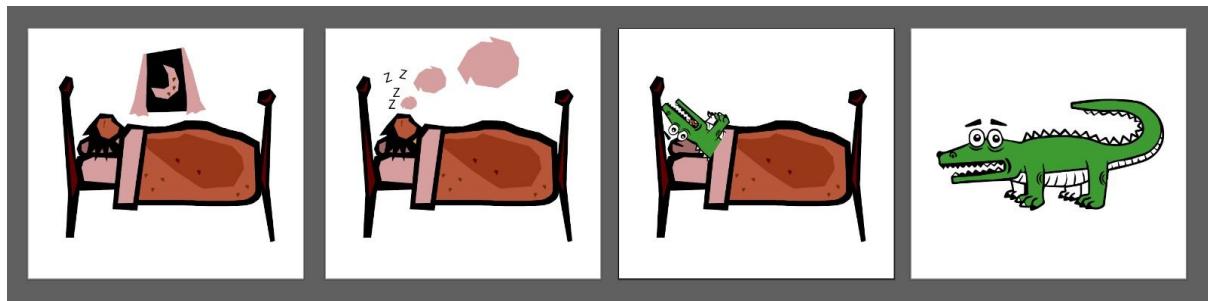
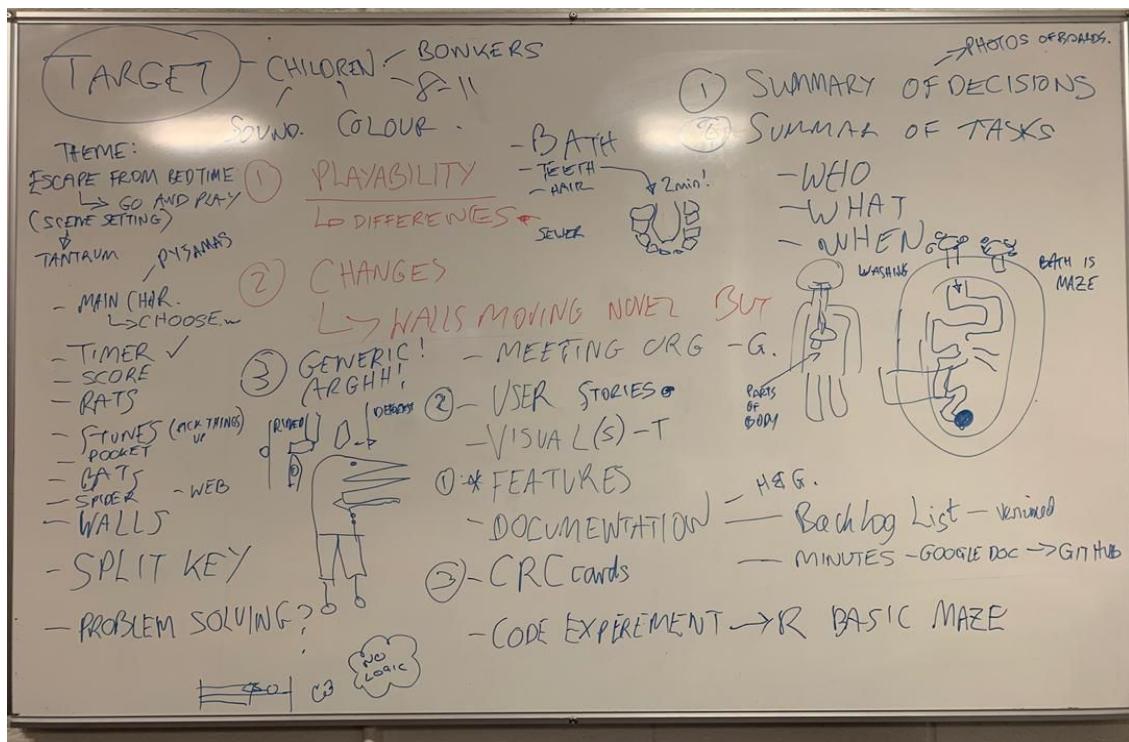
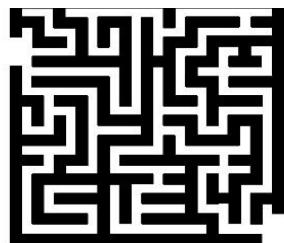


Figure 4. demonstrates a graphic version of our brainstorm for the revised story 2. The client meeting on 30th October mentioned the game may be generic. This led to us designing a version of the game that included the story of a child falling asleep and imaging an evil wizard turning the child into a crocodile and trapping the child into a maze dungeon. In the first level, the character would be a crocodile trapped in the maze. If the player proceeded to

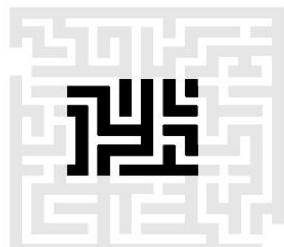
level two, the option to pick a character would appear (Figure 5). Each character would have their own adventure maze; such as a germ in a maze of the body or a rubber duck in a bathtub maze.

Figure 5. brainstorm of story 2

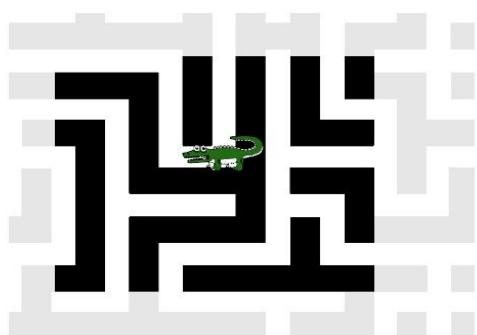




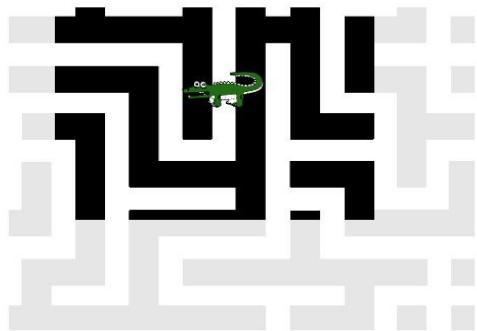
Maze



Displayed on screen



Character stays
in centre
of screen



↑
player presses
up key
(maze moves down)

Figure 6. presents the idea of a partial view mentioned by the client on 30th October. We discussed this idea to increase the difficulty of the game. A user would first be able to see the entire map of the maze but at a later stage only a partial view of the maze. This would mean a player would have to depend on their memory or trial and error to complete the maze.

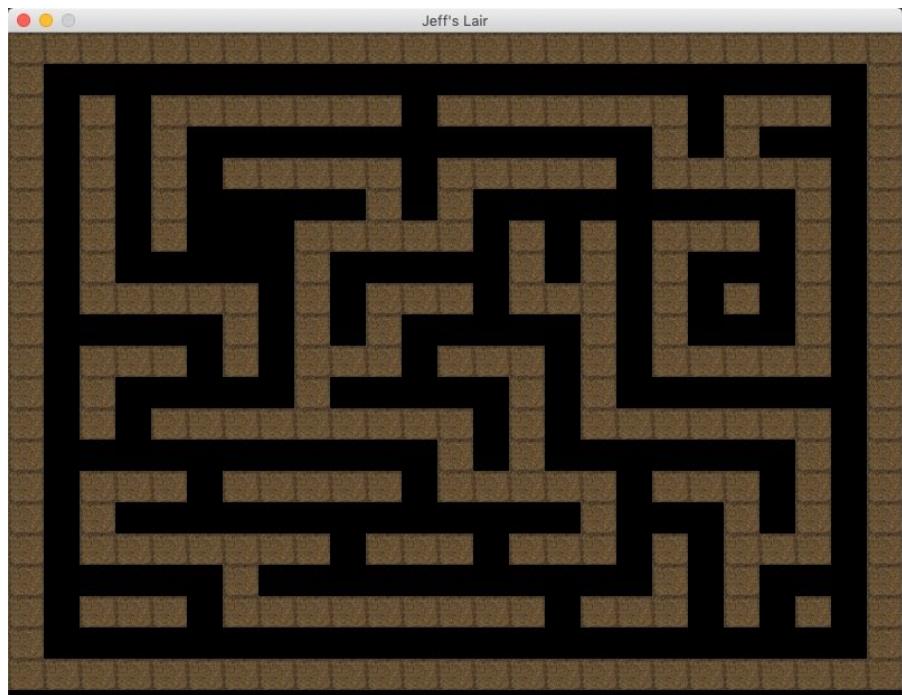


Figure 7. shows what a user would see when starting the game, above is a simple version of the maze.

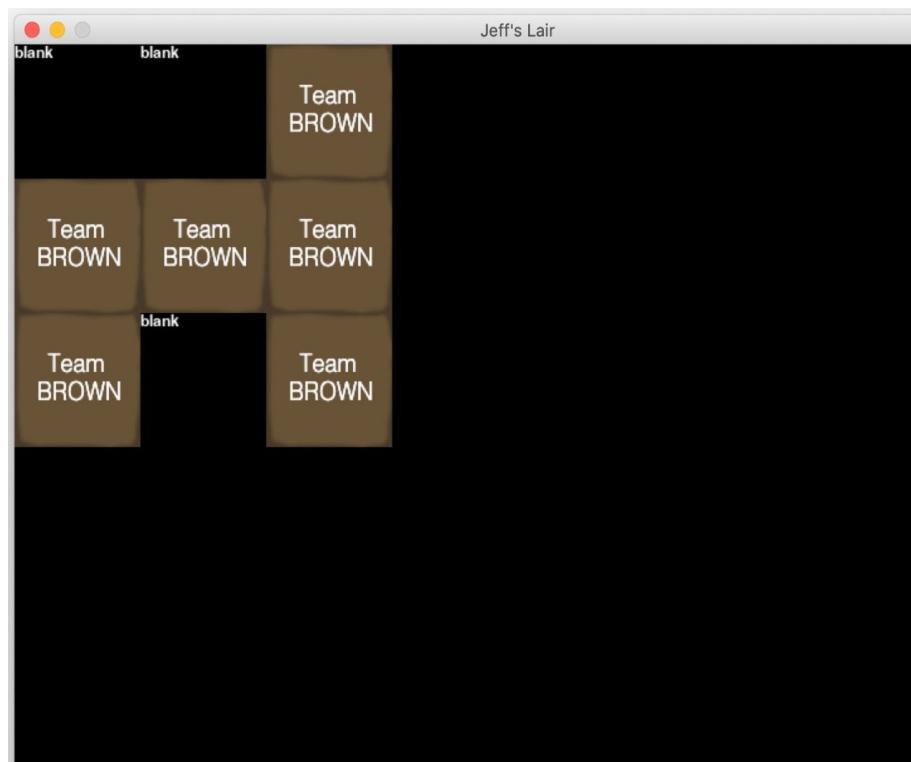


Figure 8. txt file with block images used to design the map shown in Figure 7.

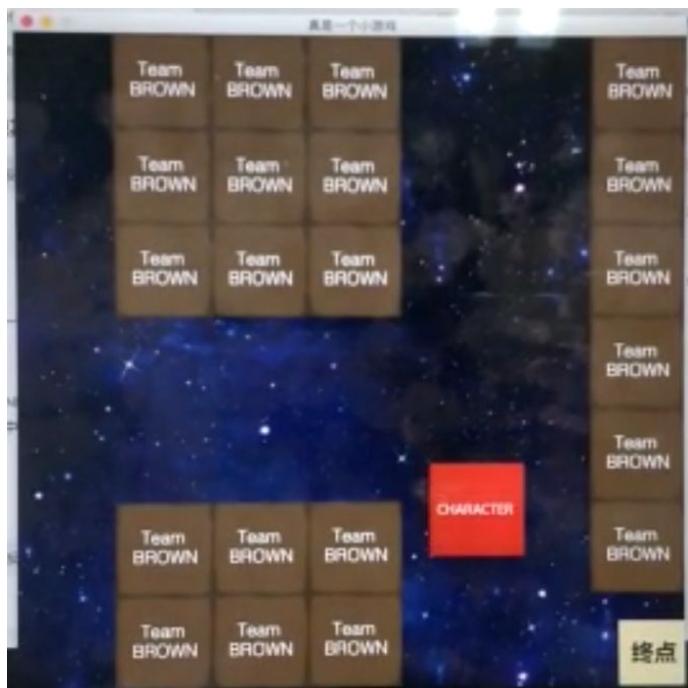


Figure 9. presents a screenshot image of the moving character, the 'CHARACTER' tile recognises when it hits a 'Team BROWN' tile and is directed using arrow keys.

2 Sprint One

2.1 Process

2.1.1 Overview

The objectives of the first sprint were established in a meeting on 20th November. It was decided the basic functionality of the game would be our priority. This included a maze design, a moving graphically designed character (*Figure 15.*), a timer on the screen, a leaderboard for the players' score. These functionalities were divided between Tim, Ray and Zhou. Ray agreed to work on combining the prototype for the moving character with Tim's maze design and character design. Tim further developed the maze prototype shown to the customer and Zhou volunteered to work on the leaderboard.

The meetings that took place to complete the spring can be summarised as follows. A meeting on the 20th of November took place between Ray and Zhou such that they could plan the structure of their code. On the 21st of November, the group hashed out the details for the sprint, such as details for the size of the maze (800 x600 pixels).

During the first official sprint, a lot of private research was done by Tim, Ray and Zhou on how best to take several functionality segments and combine them into one working game. Tim was able to complete his objectives of designing the main character (graphically) and creating a set maze. Ray was able to combine his moving character, with Tim's graphics and maze design. However, Ray was unable to incorporate the timer in the game but managed

to get a working countdown. Zhou also managed to separately code a leaderboard function but could not link the start of the game code (i.e. start screen) with the rest of the game.

A meeting took place on Wednesday 27th November to review the progress of the first sprint. As a team, our individual progress was discussed, and any concerns addressed. We highlighted the need to start documenting the descriptions and maintenance manual for the game and reflected on our first sprint. Tim and Ray expressed a lack of communication between them slowed down the coding process, Tim's maze code had to be readjusted by Ray as it did not fit his structure. Pseudo code ought to have been used to avoid misalignment, and we agreed to add pseudocode to our pre sprint planning structure. Furthermore, the need for pair programming was stressed in this meeting as it would ease the programming process and allow Tim, Ray and Zhou to learn from one another. Upon further reflection, we realised the objectives set for the first sprint were too ambitious for the agreed deadline. To avoid this, it was established that we first research the feasibility of completing any proposed objectives in the sprint.

All objectives that weren't complete (incorporating the timer and leader board into the working game) were pushed into the second sprint taking the feedback from the first sprint into consideration.

2.1.2 Team Meeting Record

Table 4. Meetings held and attendees for Sprint One

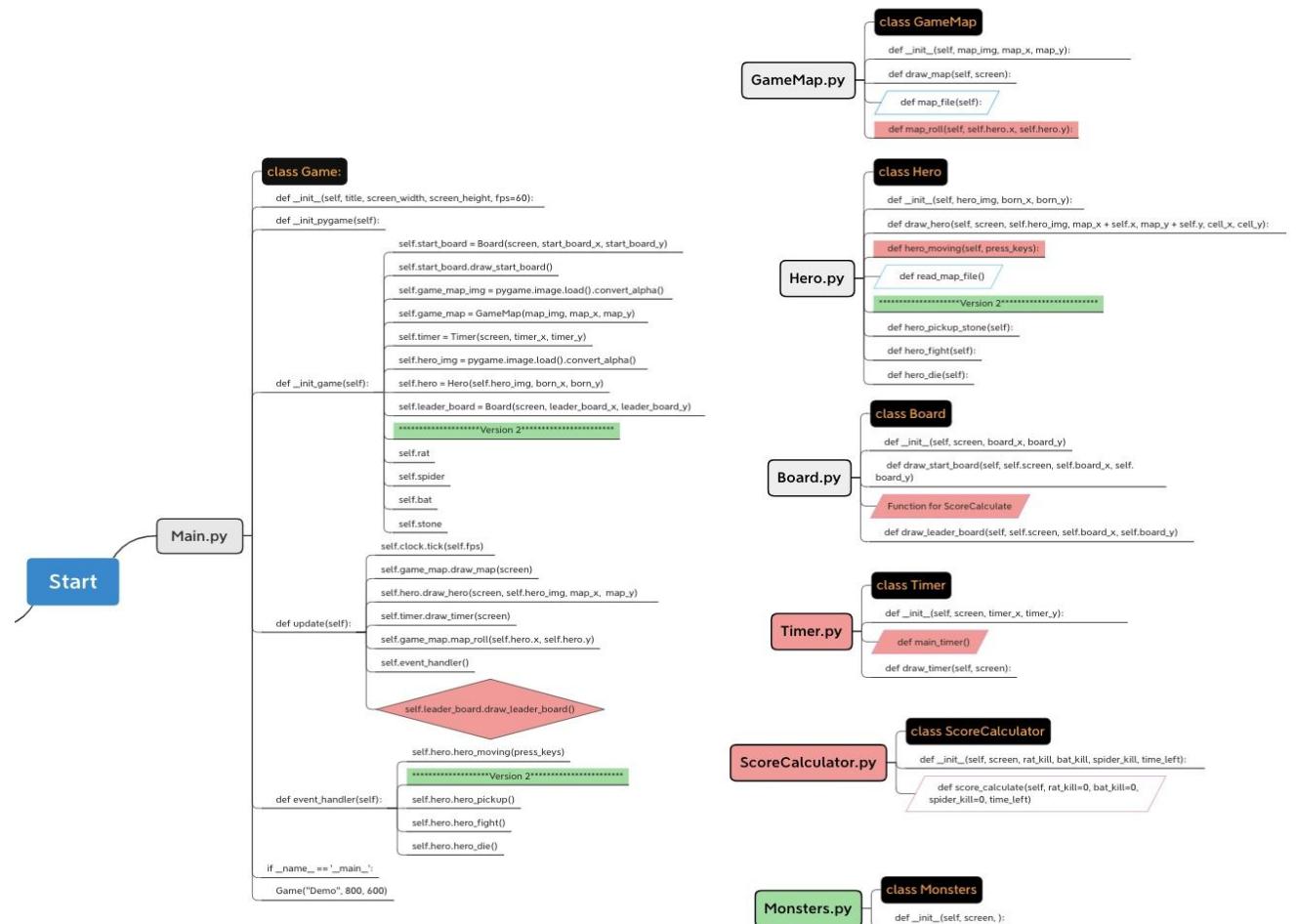
Date	Attendance	Objectives	Outcome/Actions	Assignments
20/11/19	No Tim - Childcare issues	Reflect on the customer meeting	Align sprint 1 objectives with customers specific requests	Geetha and Hajar, formalise documentation so far Ray and Zhou discuss code and its issues that need to be agreed on with Tim to move forward.
20/11/19	Zhou and Ray	Code structure planning	Rough structure discussed	Ray creates a detailed plan of code structure.
21/11/19	ALL	Delegating coding roles	Fixed maze and only moving the character around 800x600 single png Character 32x32 25 tiles across and 18 down Fixed start	Tim designs the first maze with a "win square" Geetha and Hajar, formalise documentation for sprint zero. Ray will make a movable character Zhou Board and Timer

24/11/19	ALL	SCRUM on Slack	New objectives set after review of completed tasks	Geetha create meeting records with cross-referencing images Hajar start compiling the rest of the documentation requirements for sprint 0 Tim code maze builder Ray code Hero.py (including moving in the map) Zhou complete leaderboard and timer
26/11/19	Zhou and Ray	Short meeting regarding merging of code and fixing of timer	Issues with timer: self counting timer affect the main program due to two while loops so these are going to be moved to sprint 2, also tried to merge the two while loops into one, call a function to count time get the result and add the result to score calculator	Ray and Zhou will pair programme with Tim to resolve the issue with the timer
27/11/19	ALL	Prepare for customer meetings and review progress	Functional testing sprint 1 Overestimated feasibility of sprint 1 objectives. Timer and leaderboard do not complete so pushed to sprint 2	Ray, Tim and zhou: pair programme on timer and leaderboard Geetha: team meeting record, use cases, testing, user stories testing and cleaning MD file for both sprints Hajar: backlog, exception handling, sprint 1 formal documentation

The first meeting of sprint 1 took place following our customer meeting on 20/11/19, we reflected on the customers' concern for our level of documentation and the functionality of our game. We decided to arrange another meeting such that Tim could be present to discuss allocations for the sprint.

The meeting on 21st November Ray and Zhou presented a detailed diagram of the structure of the game. *Figure 10.* presents how the game would split into different functionalities and the structure for transferring code on to Github. From this diagram, small decisions were made; the timer would be a countdown timer which would then be used to calculate a game score, the size of the maze was decided (800 x600 pixels) and roles were allocated according to preference and experience. Tim offered to tackle the design of the maze (*section 2.2.2 user story 1*), Ray agreed to work on combining his moving character with the maze design (*section 2.2.2 user story 1*) and work on the countdown timer (*section 2.2.2 user story 5*) and Zhou offered to produce a start button and leaderboard (*section 2.2.2 user stories 3, 4 and 7*). Documentation was discussed between Hajar and Geetha as they planned how to best formalise the documentation for sprint zero. Hajar volunteered to type up the details and evaluation of each customer meeting and Geetha to complete the MD file.

Figure 10. code structure plan



On 24th November, a Scrum meeting led by Geetha took place on slack. We communicated the objectives for documentation of sprint zero and had completed the following:

1. A detailed account of what happened in each meeting
2. Analysis of what happened in the customer meeting

3. How we responded to anything in the meetings (what direction did we take after the meeting)

4. A detailed account of any meetings we had; who attended what was said any images or tasks assigned

Tim declared his objective of creating the game map was met. Ray completed the structure of the game and combining the moving character (*Figure 14.*) with the map as well as tested its functionality. Zhou tested and completed the box used to input a players' names and the start button, but failed to connect the start button to the game. The code for the leaderboard was also completed by the Scrum meeting. Several tasks remained to complete the sprint's objectives: to link the start button with the game, to include the timer into the game and to link the leaderboard with the end of the game.

A short meeting took place between Ray and Zhou to discuss and pair programme the remaining objectives on 26th November. The following day, a review of the sprint was led by Hajar (discussed in the overview).

2.1.3 Backlog

Original tasks:

1. Show maze
2. Build a logical map from a text file
3. Allow the character to be steered around the maze using arrow keys.
4. Show "win" screen when the maze is complete
5. Timer
6. Leaderboard
7. Start button
8. Input character name
9. Write up sprint 1 meetings
10. Write up customer meeting and analysis
11. Markdown (MD) file
12. Input all screenshots into all documents - MD and formal
13. Sprint 1 use cases
14. Sprint 1 user stories

Completed tasks:

1. Show maze
2. Build a logical map from a text file
3. Allow the character to be steered around the maze using arrow keys.
4. Show "win" screen when the maze is complete
5. Write up sprint 1 meetings
6. Write up customer meeting and analysis
7. Markdown (MD) file
8. Input all screenshots into all documents - MD and formal
9. Sprint 1 use cases

10. Sprint 1 user stories

New tasks:

1. Count-down Timer
2. Leaderboard
3. Input character name
4. Start button
5. Write up sprint 2 meetings
6. Write up customer meeting and analysis
7. Markdown (MD) file
8. Input all screenshots into all documents - MD and formal
9. Sprint 2 use cases
10. Sprint 2 user stories

Figure 11. (left) sprint 1 backlog tickets and (right) sprint 1 completed tickets

The image displays two side-by-side views of a digital Kanban board, likely from a tool like Trello or Asana.

Sprint 1 Backlog:

- Sprint 1.0 : A moving rat- Tim
- Sprint 1.1 Organize github branches-Tim
- SPRINT 1.2 write overview formally for sprint 0-Hajar
- Sprint 1. 3 Formalise the documentation for Sprint 1- Hajar
- Sprint 1.4 Research for sprint 1 - Tim, Ray and Zhou
- sprint 1. 5 graphics for character-Tim
- Sprint 1. 6 UML diagram sprint 1 - Geetha
- Sprint 1.7 write up sprint 1 meetings- Hajar
- Sprint 1.8 formally write up customer meeting analysis-Hajar
- sprint 1. 9 md file sprint 1 - hajar and geetha
- SPRINT 1.10 input all screenshots into all documents - md and formal- Geetha
- Sprint 1.11 Sprint 1 use cases - Geetha
- SPRINT 1.12 use case UML sprint 1
- SPRINT 1.13 user stories for sprint 1 - Geetha
- Sprint 1.14 Display "time remaining" on maze (counting down)
- Sprint 1.15 Add screen so user enters name before start
- Sprint 1.16 Display user name and time remaining (score) when maze completed

Add Card

Sprint 1 DONE:

- Sprint 1.0 : A moving rat- Tim
- Sprint 1.1 Organize github branches-Tim
- SPRINT 1.2 write overview formally for sprint 0-Hajar
- Sprint 1. 3 Formalise the documentation for Sprint 1- Hajar
- Sprint 1.4 Research for sprint 2 - Tim, Ray and Zhou
- sprint 1. 5 graphics for character-Tim
- Sprint 1. 6 UML diagram sprint 1 - Geetha
- Sprint 1.7 write up sprint 1 meetings- Hajar
- Sprint 1.8 formally write up customer meeting analysis-Hajar
- sprint 1. 9 md file sprint 1 - hajar and geetha
- SPRINT 1.10 input all screenshots into all documents - md and formal- Geetha
- Sprint 1.11 Sprint 1 use cases - Geetha
- SPRINT 1.12 use case UML sprint 1
- SPRINT 1.13 user stories for sprint 1 - Geetha

Add Card

2.1.4 Exception Handling

As aforementioned, we underestimated the difficulty of tackling the functionality of the game. We dealt with this by moving all uncompleted tasks into sprint 2 and ensuring we first analyse the feasibility of each objective.

2.2 Product

2.2.1 Customer interview and analysis

Whilst there was no official customer meeting, the review of the first sprint led us to discuss what should be set as the objectives for the second sprint. At first, we decided to focus on the timer as the main objective for a shorter sprint consisting of just three days since the timer is crucial to the playability of the game. In our design, the timer alongside finding parts of the key is what determines a players score. However, shortly after this meeting Ray, Tim and Zhou began pair programming and soon completed the sprint's objective. We were able to get some guidance from the PhD tutors who stressed the importance of having another moving character in the game for our main sprint. Thus, the sprint goals were revised to include a second moving character to chase the first and increase the playability of the game (*section 2.1.3 backlog*).

2.2.2 User stories

Original list of user stories for sprint 1 (Version 2):

- As a player, I want to be able to move because I want to complete the maze
- As a user, I want to see the intro screen and be told what to do
- As a user, I want to input my character name
- As a user, I want to press the start game button
- As a user, I want to be able to see the time I have left (countdown)
- As a player I want the game to be executable on windows
- As a player after I finish the game, I want to see the leaderboard

Revised list of user stories for sprint 1 (Version 3):

- As a player, I want to input my character name
- As a player, I want to press the start game button
- As a player, I want to be able to see the time I have left (countdown)
- As a player, after I finish the game, I want to see the leaderboard
- As a player, I want to be able to move my character
- As a player, I want to be able to view the maze I need to traverse
- As a player, I want to be able to know when I have completed the maze

New user stories for next sprint:

1. As a user, I want to input my character name
2. As a user, I want to press the start game button
3. As a user, I want to be able to see the time I have left (countdown)

- As a player after I finish the game, I want to see the leaderboard

2.2.3 Tests

In the review of sprint 1 on 27th November, Hajar and Geetha tested the functionality of the features the development team aimed to complete by the sprint (*section 2.1.3*).

Table 5. Functional tests for sprint one

User Stories	Pass or fail
1. As a player, I want to input my character name	Pass
2. As a player, I want to press the start game button	Fail
3. As a player, I want to be able to see the time I have left (countdown)	Fail
4. As a player, after I finish the game, I want to see the leaderboard	Fail
5. As a player, after I finish the game, I want to see the leaderboard	Fail
6. As a player, I want to be able to move my character	Pass
7. As a player, I want to be able to view the maze I need to traverse	Pass
8. As a player, I want to be able to know when I have completed the maze	Pass

2.2.4 Use Cases

- Introduction Screen
 - Connected to the following user stories:
 - 1. As a player, I want to input my character name
 - 2. As a player, I want to press the start game button
- QWERTY keyboard input
 - Connected to the following user stories:
 - 1. As a player, I want to input my character name
 - 5. As a player, I want to be able to move my character
- Mouse input
 - Connected to the following user stories:
 - 2. As a player, I want to press the start game button
- Move character - arrow keys/ASDW
 - Connected to the following user stories:

- 5. As a player, I want to be able to move my character
- 6. As a player, I want to be able to view the maze I need to traverse

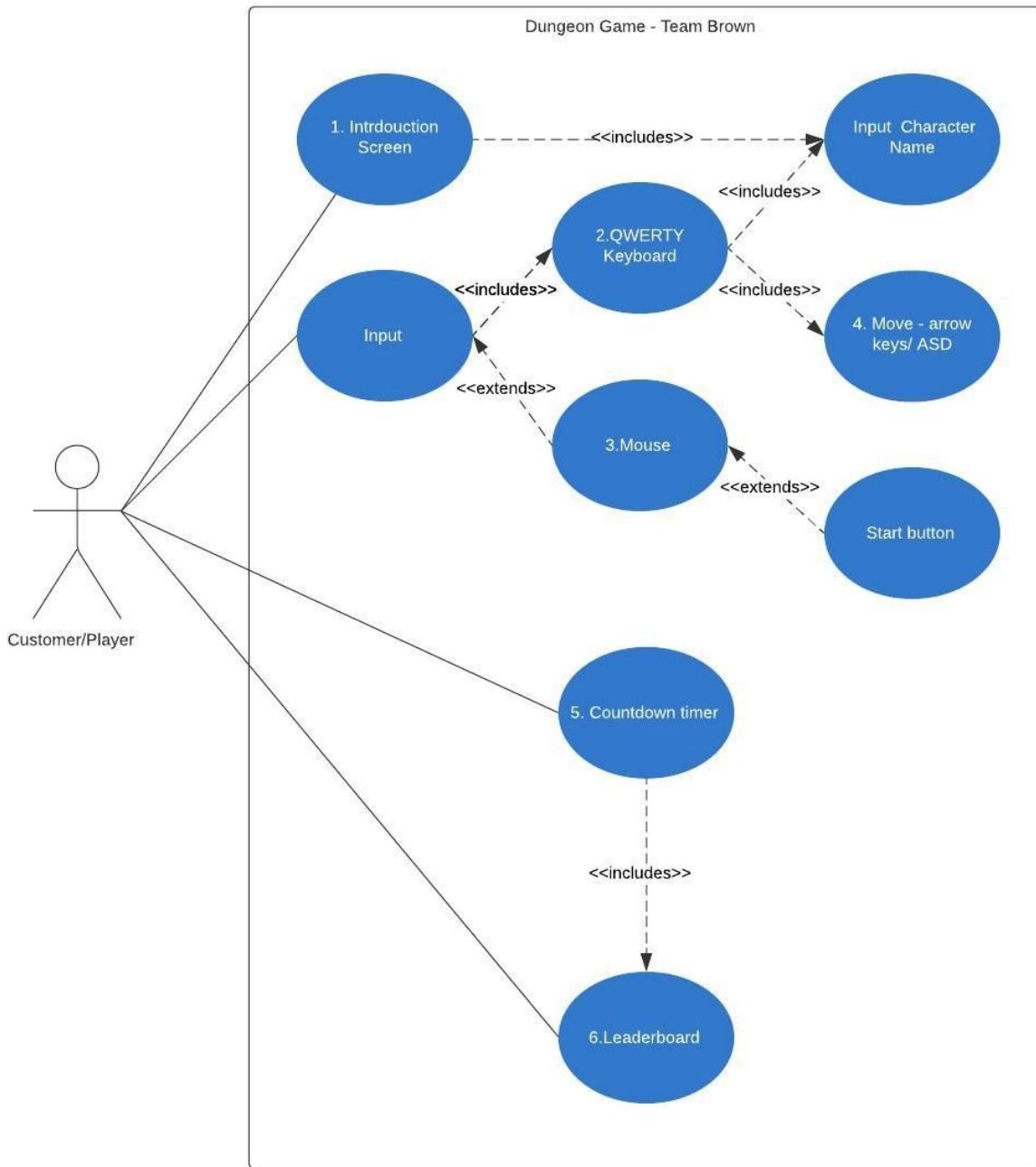
5. Countdown timer

- Connected to the following user stories:
 - 3. As a player, I want to be able to see the time I have left (countdown)
 - 4. As a player, after I finish the game, I want to see the leaderboard
 - 7. As a player, I want to be able to know when I have completed the maze

6. Leaderboard

- Connected to the following user stories:
 - 1. As a player, I want to input my character name
 - 3. As a player, I want to be able to see the time I have left (countdown)
 - 4. As a player, after I finish the game, I want to see the leaderboard
 - 7. As a player, I want to be able to know when I have completed the maze

Figure 12. UML for use cases in Sprint one



2.2.6 Software design documentation (CRC cards)

Module: Pygame

Pygame	
Lots of standard functionality from this free module	GameMap Main Hero

Module: Main

Game	
Initialises Pygame (screen, clock) Updates itself (main game loop) Draws to screen Checks to see if you've won the game Checks to see if you've quit the game Updates timer	Pygame Hero GameMap

Connects back to the following user stories:

- 1. As a player, I want to input my character name
- 2. As a player, I want to press the start game button
- 3. As a player, I want to be able to see the time I have left (countdown)
- 4. As a player, after I finish the game, I want to see the leaderboard
- 5. As a player, I want to be able to move my character
- 7. As a player, I want to be able to know when I have completed the maze

Module: Hero

Hero	
Draws itself Moves itself within walls	Pygame Game GameMap

Connects back to the following user stories:

- 5. As a player, I want to be able to move my character
- 6. As a player, I want to be able to view the maze I need to traverse
- 7. As a player, I want to be able to know when I have completed the maze

Module: GameMap

Block	
(rectangle describing position of a wall block)	GameMap

GameMap	
Load the logical map from file Draw the map image to the screen Make a list of the wall blocks	Pygame Block

Connects back to the following user stories

- 5. As a player, I want to be able to move my character
- 6. As a player, I want to be able to view the maze I need to traverse
- 7. As a player, I want to be able to know when I have completed the maze

2.2.7 User interface design

Figure 13. Start box and name of character input V1

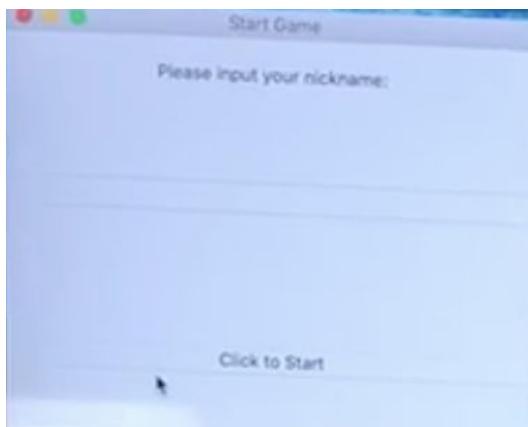


Figure 14. Character in the maze

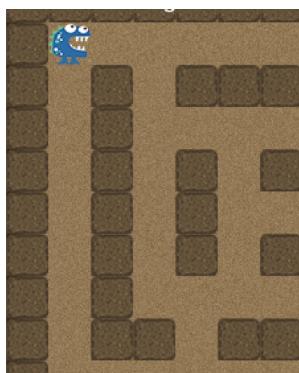


Figure 15. Tim's creation of the character



Figure 16. Tim's animation of the character

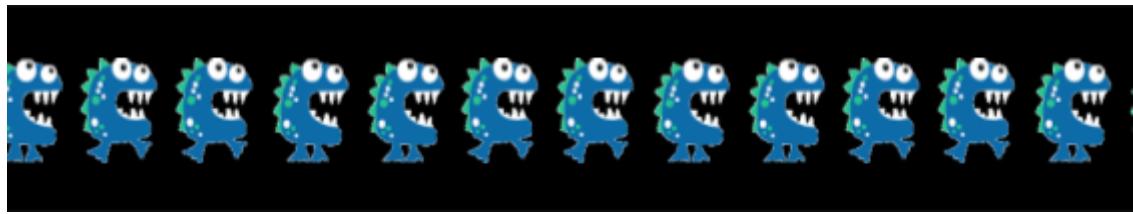
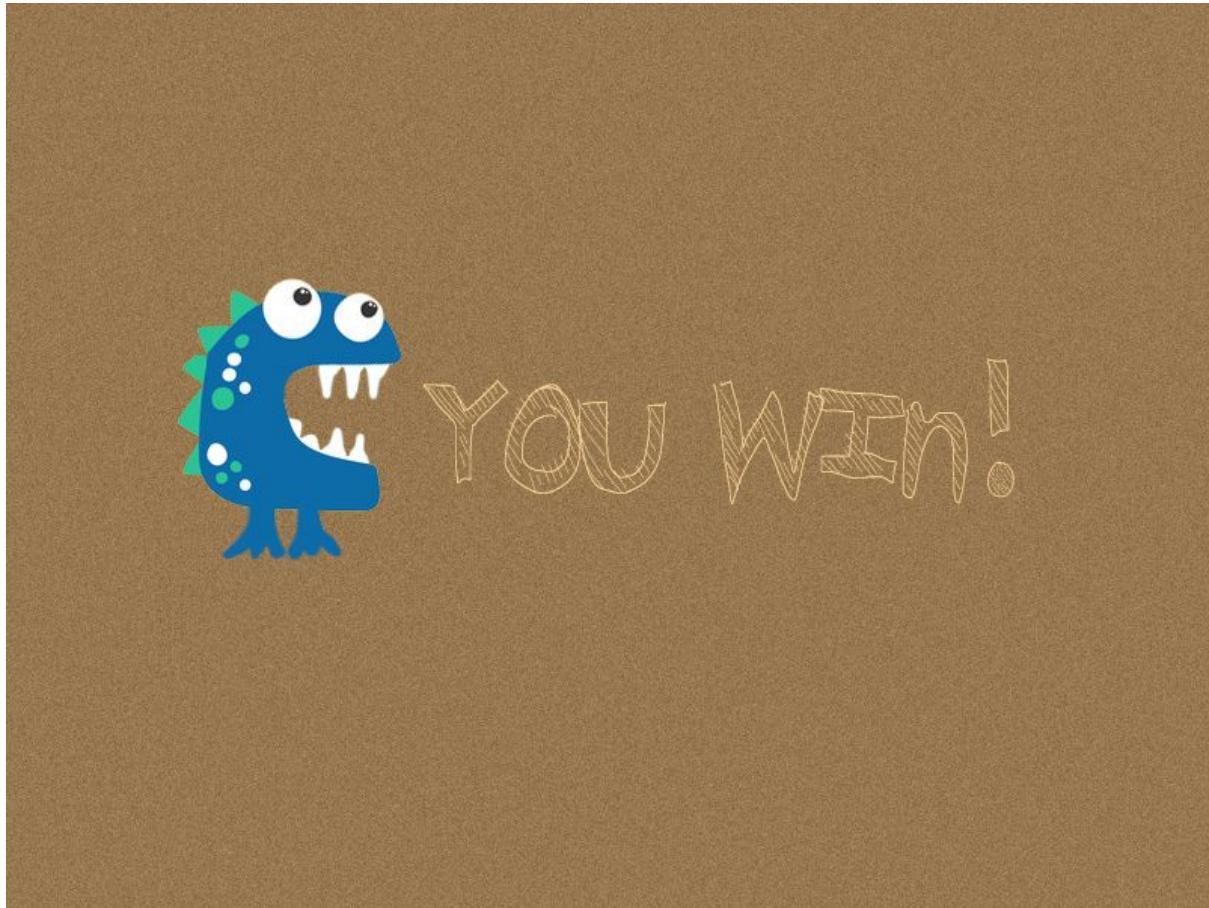


Figure 17. Win screen



Sprint one resulted in great progress for our user interface design. Tim developed the blue crocodile (*Figure 15.*) and was able to design the animation but not link the animated version to the code written by Ray. *Figure 16.* shows the crocodile in the maze and presents the merging of both Tim and Ray's code (backlog). As shown by *Figure 13.*, the start box with the option to input a nickname was developed by Zhou, however, this start box was not linked to the beginning of the game.

3 Sprint Two

3.1 Process:

3.1.1 Overview

Our second sprint was dedicated to improving the organisation, communication within the team and setting more feasible targets. A few details of the functionality of the game were not completed in the first sprint (see 2.2.3) and we're set as a priority for the second sprint in addition to developing a second moving character to chase the player. The importance of pair programming became evident and Tim and Ray agreed to improve their cooperation by communication throughout each sprint on slack. Pair programming improved the efficiency of the group and increased the feasibility of each sprint objective.

The sprint was successful as all objectives were achieved (see 3.2.3.); a second moving character was developed (*Figure 22.*), the timer was fixed (*Figure 21.*) and incorporated into the game and leaderboard. During the sprint several meetings took place.

Communication between Tim, Ray and Zhou was constant on Slack on our “code” branch, a scrum meeting took place on Sunday 1st December, Hajar and Geetha met on Monday 2nd December to discuss documentation and finally, a sprint review was conducted on 3rd December.

Overall, the organisation was improved in this sprint, our backlog on Trello became clear showing the objectives for previous and upcoming sprints.

3.1.2 Team Meeting Record

Table 6. Meetings held and attendees for Sprint two

Date	Attendance	Objectives	Outcome/Actions	Assignments
27/11/19	ALL	Plan sprint 2	The feasibility of our objectives was discussed and tasks assigned	Tim writes all product documents To create a second moving character -Tim Show lose screen if rat hits player-Zhou Display time remaining on screen-Ray

1/12/19	ALL	Progress review of the sprint on SLACK	The objective of this meeting was to ensure we were on the track of delivering a prototype to our customer	all sprint objectives were complete
2/12/19	Hajar and Geetha	Document action planning and objective	The organisation of documentation was stressed	Geetha was assigned the task of completing the MD sprint files with all cross-referencing and Hajar the task of formally writing the process of each sprint
3/12/19	ALL	Sprint review	Functional testing sprint 2 Reviewed the sprint, discussed the progress of the project in relation to the deadline	No assignments were made.

The team meetings for the second sprint were concise and well organised. On 27th November the feasibility of adding another moving character to chase the main character was discussed. A short meeting took place on slack to discuss the progress of each individual on their task assignments discussed in the previous meeting (*section 3.1.3*). On 2nd December, Hajar and Geetha met to discuss the level of documentation thus far and assigned Geetha to complete the sprint MD file and Hajar to formally write sprint 2. On 3rd December, Hajar led a meeting to review the progress made by the sprint. We were pleased with our individual and team progress made as all objectives were met and tests passed (*section 3.2.3*). No tasks were assigned as we had arranged a sprint planning meeting on 4th December.

3.1.3 Backlog

Completed tasks:

1. Add screen so the user enters a name before start
2. Display “Time remaining” on the maze (counting down)
3. Create rat that follows the player. Show “lose” screen if rat hits the player
4. Display user name and time remaining (score) when maze completed
5. Document 1: User Manual: Scenario-driven explanation of how to use the product
6. Document 2: Installation Guide: Simple, self-explanatory, written in the user’s language

7. Document 3: Maintenance guide: detailed sign-posting of how to navigate the code and where and how to make extensions
8. Write up sprint 2 meetings
9. Write up customer meeting and analysis
10. Markdown (MD) file
11. Input all screenshots into all documents - MD and formal
12. Sprint 2 use cases
13. Sprint 2 user stories

Figure 18. (left) Sprint two backlog tickets and (right) Sprint two done tickets

Sprint 2 Backlog	Sprint 2 DONE
Sprint 2.0 Timer functionality for game- Tim, Ray and Zhou	Sprint 2.0 Timer functionality for game- Tim, Ray and Zhou
SPRINT2.1: Add screen so user enters name before start	SPRINT2.1: Add screen so user enters name before start
SPRINT2.2: Display "time remaining" on maze (counting down)	SPRINT2.2: Display "time remaining" on maze (counting down)
SPRINT2.3: Create Rat that follows player. Show "lose" screen if rat hits player	SPRINT2.3: Create Rat that follows player. Show "lose" screen if rat hits player
SPRINT2.4: Display user name and time remaining (score) when maze completed	SPRINT2.4: Display user name and time remaining (score) when maze completed
SPRINT2.5 Document 1: User Manual: scenario-driven explanation of how to use the product -Tim	SPRINT2.5 Document 1: User Manual: scenario-driven explanation of how to use the product -Tim
SPRINT2.6 Document 2: Installation Guide: simple, self-explanatory, written in user's language	SPRINT2.6 Document 2: Installation Guide: simple, self-explanatory, written in user's language
SPRINT2.7 Document 3: Maintenance Guide: detailed sign-posting of how to navigate the code and where and how to make extensions.	SPRINT2.7 Document 3: Maintenance Guide: detailed sign-posting of how to navigate the code and where and how to make extensions.
SPRINT 2.8 Input all screenshots into documents - Geetha	SPRINT 2.8 Input all screenshots into documents - md and formal -Geetha
SPRINT 2.9 sprint 2 use cases - Geetha	SPRINT 2.9 sprint 2 use cases - Geetha
SPRINT 2.10 Use Case UML sprint 2 -Geetha	SPRINT 2.10 Use Case UML sprint 2 -Geetha
SPRINT 2.11 User stories Geetha for sprint 2	SPRINT 2.11 User stories Geetha for sprint 2
SPRINT 2.12 MD -GEETHA	SPRINT 2.12 MD -GEETHA
Sprint 2.13 : Formally write up the meetings and link to product for sprint 2-Hajar	Sprint 2.13 : Formally write up the meetings and link to product for sprint 2-Hajar
Sprint 2.14: Analyse customer meeting for sprint 2 -Hajar	Sprint 2.14: Analyse customer meeting for sprint 2 -Hajar
Sprint 2.15 lead team review -Hajar	Sprint 2.15 lead team review -Hajar
Add Card	Add Card

New tasks for the next sprint:

1. Display leaderboard after win or lose screen with “time remaining” score and name
2. Add another rat
3. Modify maze to make more playable with more breaks in walls
4. Add better commenting on files
5. Finish product documentation
6. Unit testing
7. Functional testing
8. Appearing walls
9. Merge to master
10. Write up sprint 3 meetings
11. Write up customer meeting and analysis
12. Markdown (MD) file
13. Input all screenshots into all documents - MD and formal
14. Sprint 3 use cases
15. Sprint 3 user stories

3.1.4 Exception Handling

There were no unexpected events in this sprint.

3.2 Product

3.2.1 Customer interview and analysis

Like the previous week, there was no customer interview. We were able to present our second moving character to a PhD student and discussed final objectives as we approached the deadline.

3.2.2 User stories

Original set:

1. As a user, I want to input my character name
2. As a user, I want to press the start game button
3. As a user, I want to be able to see the time I have left (countdown)
4. As a player after I finish the game, I want to see the leaderboard

Final set:

1. As a player, I would like to be able to name my character
2. As a player, I would like to see the amount of time I have left to complete the maze
3. As a player, I would like to see a character that chases me, making the game harder
4. As a player, I would like to see my final score on a leaderboard
5. As a user, I would like to know how to install the game
6. As a user, I would like to have instructions on how to start playing the game

3.2.3 Tests.

During the sprint review meeting on 3/12/19, we tested the functionality of the game.

Table 7. Functional tests for sprint two

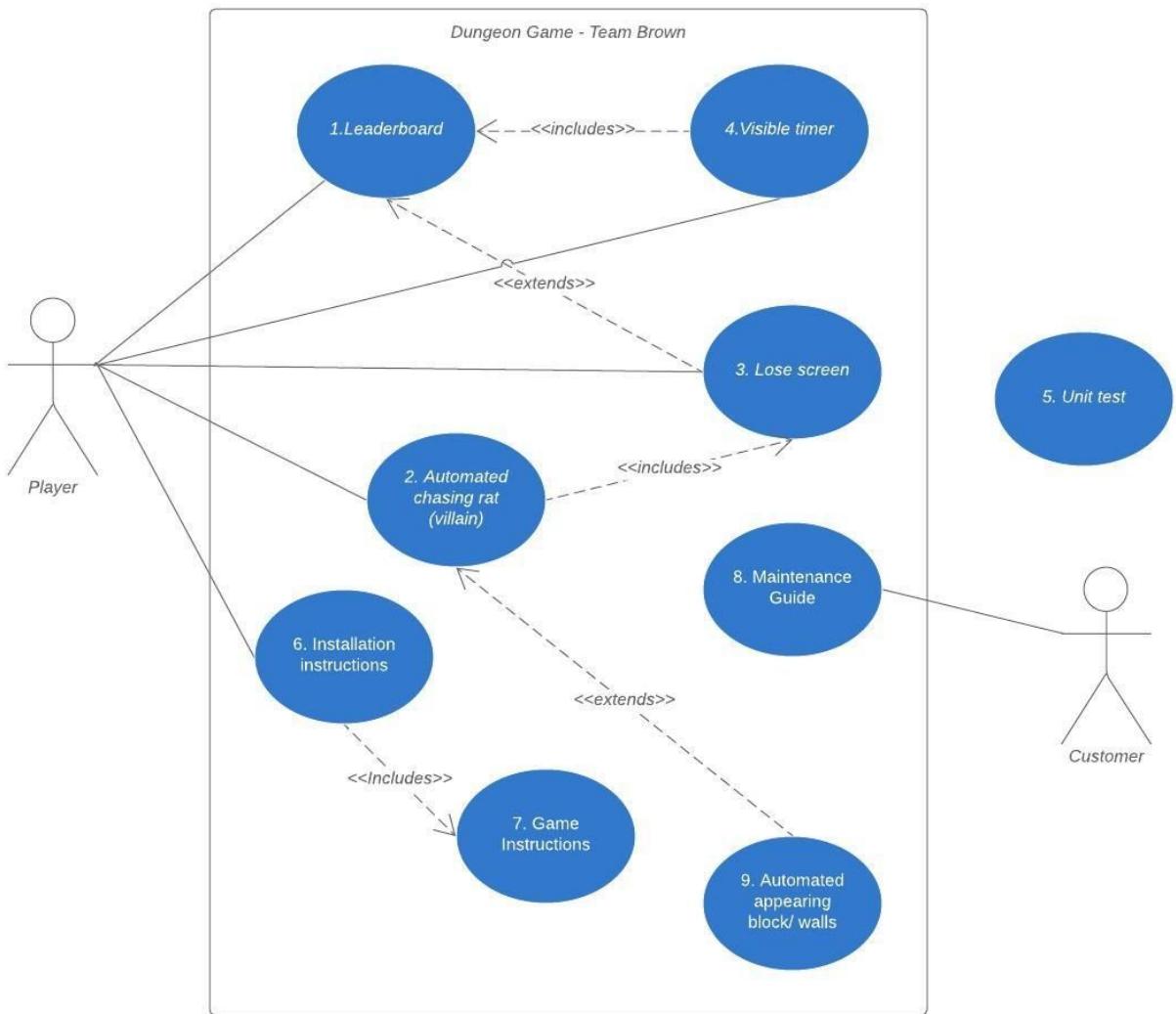
User Stories	Pass or Fail
1. As a player, I would like to be able to name my character	Pass
2. As a player, I would like to see the amount of time I have left to complete the maze	Pass
3. As a player, I would like to see a character that chases me, making the game harder	Pass
4. As a player, I would like to see my final score on a leaderboard	Pass
5. As a user, I would like to know how to install the game	Fail
6. As a user, I would like to have instructions on how to start playing the game	Fail

3.2.4 Use Cases

1. Leaderboard
 - Connected to the following user stories:
 - 1. As a player, I would like to be able to name my character
 - 2. As a player, I would like to see the amount of time I have left to complete the maze
 - 4. As a player, I would like to see my final score on a leaderboard
2. Automated chasing rat (Villain)
 - Connected to the following user story:
 - 3. As a player, I would like to see a character that chases me, making the game harder
3. Lose screen
 - Connected to the following user stories:
 - 3. As a player, I would like to see a character that chases me, making the game harder
 - 4. As a player, I would like to see my final score on a leaderboard
4. Visible timer
 - Connected to the following user stories:
 - 2. As a player, I would like to see the amount of time I have left to complete the maze
 - 4. As a player, I would like to see my final score on a leaderboard

5. Unit test
6. Installation instructions
 - Connected to the following user stories:
 - 5. As a user, I would like to know how to install the game
7. Game instructions
 - Connected to the following user stories:
 - 1. As a player, I would like to be able to name my character
 - 6. As a user, I would like to have instructions on how to start playing the game
8. Maintenance guide
9. Automated appearing blocks/ walls
 - Connected to the following user stories:
 - 3. As a player, I would like to see a character that chases me, making the game harder
 - 6. As a user, I would like to have instructions on how to start playing the game

Figure 19. UML for use cases in Sprint Two



3.2.5 User interface design

Figure 20. Leaderboard - shows the graphical development made in the leaderboard of the game, a user would be able to see their score against their nickname ranked in descending order.



Figure 21. Visible timer and character in maze

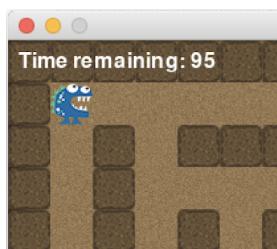


Figure 22. Rat - Following the advice given by a PhD student in a meeting on 27th November, a second moving character was added to the maze. The rat shown in the txt file appears to move towards the crocodile, although, the rat often got stuck between tiles. From this, it was decided to redesign the maze such that the moving rat would find it easier to navigate towards the crocodile.



Figure 23. Lose screen

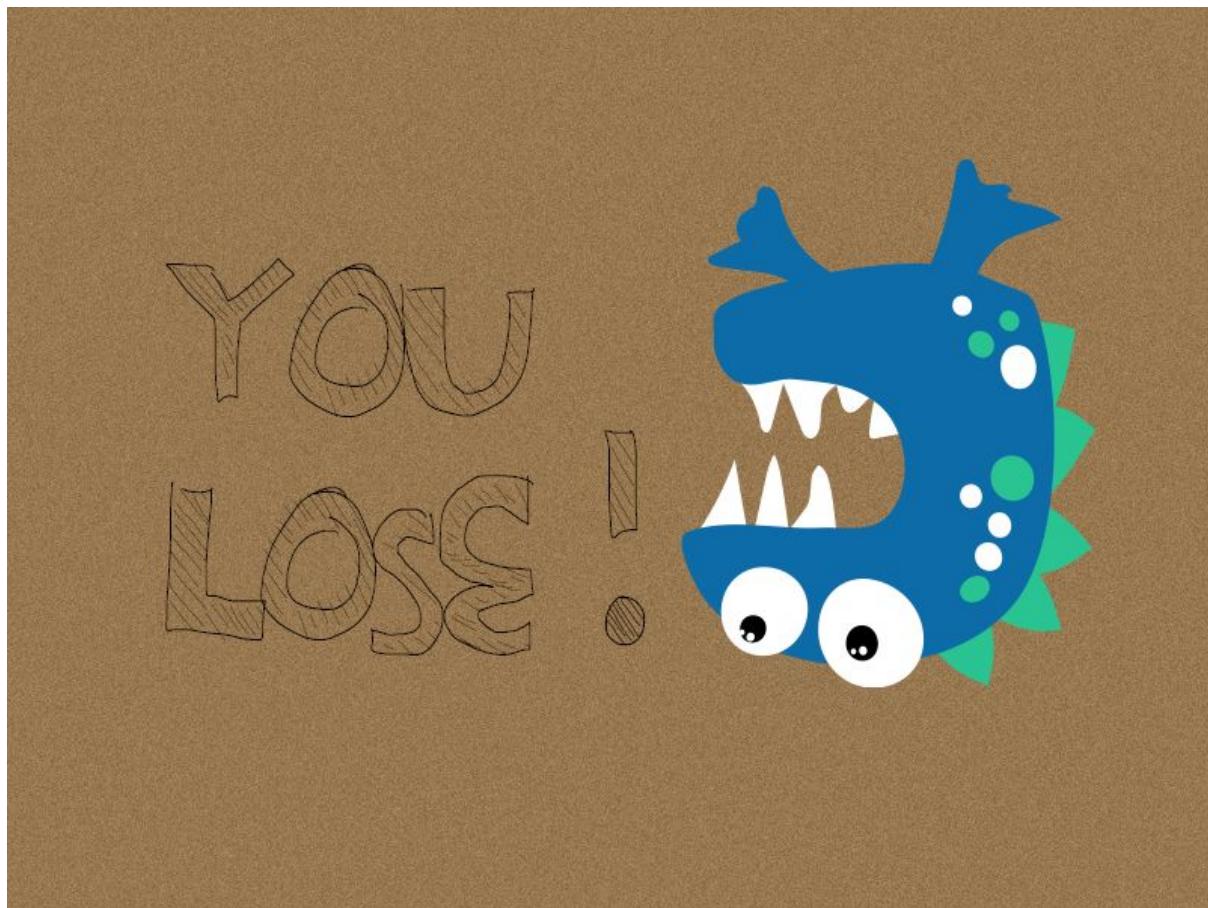
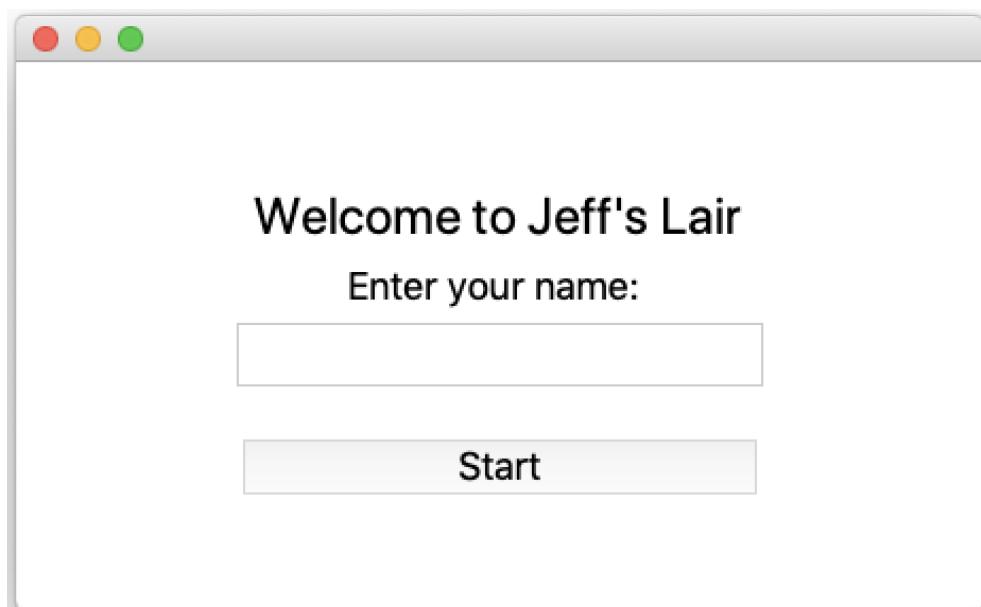


Figure 24. Start button and input character name v2 - shows the start button linked to the start of the game as was completed by Zhou



4 Sprint Three

4.1 Process

4.1.1 Overview:

Sprint three concluded the development of our dungeon game. We set objectives for the sprint on 4th December, by discussing the progress made thus far and discussing the feasibility of each task on the sprint 3 and sprint 4 backlog (*section 4.1.3*). We decided the appearing walls were crucial to increase the difficulty of the game (*section 4.2.6, Figure 28.*) and the collection of keys would increase the playability of our game.

The customer meeting on 6th December redirected the team's focus to the packaging of the game. The client expressed the importance of ensuring the game was easy to access and run to a standard user. Leading from this, Zhou and Ray volunteered to research and implement the packaging of the game (*section 4.1.2, sprint 3.10*).

The difficulty of packaging the game became clear, Ray and Zhou realised that the virtual environment configuration causes a conflict with the package and results in a hard crash of the computer used. They investigated the issue for several days and during the team meeting on 11th December, yet, were unable to make the virtual environments work and be distributable. This resulted in the delivery of a manual process relying on a high skill level of the user.

Overall, the objectives set for the sprint were optimistic as we did not consider the impact of other deadlines on the feasibility of each task. Both Hajar and Geetha struggled with deadlines from other units (due to health issues) and resulted in requesting an extension on other units. On the other hand, the improvement of the user interface design was apparent by the end of sprint 3. An introductory screen with instructions for the game and audio was added (*section 4.1.3, sprint 3.11*), further rats were added (*section 4.1.3, sprint 3.2*) and keys were designed and implemented into the game (*section 4.1.3, sprint 3.2*). The progress made by the group were discussed in a final meeting on 12th December and we reflected on our use of the agile framework. We highlighted how we would have liked to improve the game (*section 4.1.3, Figure 26.*) and added the remaining ideas established in sprint zero to a sprint four backlog.

In the review of the entire development process, we found researching and evaluating the feasibility of each task crucial to ensure on-time delivery of the product and aligning customer needs to the final product. The end product of our process was fairly difficult, yet, playable maze with a leaderboard, graphics and moving characters. Whilst not all the features of the game designed in sprint 0 (*section 1.2.2, Final set: Story 2, Version 2*) were included in the final product, we were pleased with the development of our game and our use of Scrum techniques such as the use of sprints, sprint reviews and Scrum meetings. Our

communication as a group improved through the sprints, discussions became focused and organised on Slack. We adopted the agile technique of beginning with a simple functioning game and developing its' quality with time, this technique allowed the technical progression of the development team.

4.1.2 Team Meeting Record:

Table 8. Meetings held and attendees for Sprint Three

Date	Attendance	Objectives	Actions	Assignments
04/12/19	ALL	Plan sprint 3	The objectives of the meeting was to assign tasks for the sprint	Tim- design instruction graphics, finish manual and maintenance documentation and add appearing walls Ray- implement the keys around the maze Zhou- research and work on the delivery package Hajar- finish documentation write up for sprint 2 and 3 Geetha- MD files for sprint 2 and 3
06/12/19	No Hajar No Geetha	Final customer meeting, present prototype and ask final questions	The outcome of the customer meeting was to redirect our focus on the delivery of the game	Ray and Zhou to research delivery Tim to work on adding keys
08/12/19	ALL	Progress review of sprint	The objective of this meeting was to review the progress made in the sprint	Packaging was incomplete by the meeting, assigned to Ray and Zhou till the next meeting Keys yet to be added to the maze
11/12/19	ALL	Finish missing items for hand in	Ensure we were ready for submission on friday and complete group questionnaire	Hajar and Geetha - finalise all documentation Tim - add keys to the maze Ray and Zhou - Complete installation instructions

12/12/19	ALL	Final review	Functional and unit testing sprint 3 Review of sprint 3	Hajar and Geetha finish documentation for sprint 3
----------	-----	--------------	--	--

In summary of the team meetings, the sprint was planned on 4th December, we set the objectives by referring back to the user stories of sprint 0 (*section 1.2.2*) and ranked them in order of priority. As aforementioned, the final customer meeting redirected our focus to the packaging of the game and prompted the new tasks of the backlog (*section 4.1.3*), progress on this task was reviewed in a scrum meeting on 8th December. Zhou and Ray agreed to continue research on the packaging process and Tim volunteered to finish adding the keys to the maze.

4.1.3 Backlog

Completed tasks:

1. Scene setting
2. Display leaderboard after win or lose screen with “time remaining” score and name
3. Add another rat
4. Modify maze to make more playable with more breaks in walls
5. Key in 4 pieces
6. Add better commenting on files
7. Finish product documentation
8. Unit testing
9. Functional testing
10. Appearing walls
11. Merge to master
12. Write up sprint 3 meetings
13. Write up customer meeting and analysis
14. Markdown (MD) file
15. Input all screenshots into all documents - MD and formal
16. Sprint 3 use cases
17. Sprint 3 user stories

Figure 25. Sprint three backlog tickets (left) and Sprint three done tickets (right)

The image displays two vertical lists of tasks, each consisting of a header and a list of items. The left list is titled "Sprint 3 Backlog" and the right list is titled "Sprint 3 DONE". Both lists have a header with three dots at the top right and a "Add Card" button at the bottom.

Sprint 3 Backlog:

- SPRINT3.1: Display leader board after win or lose screen with "time remaining" score and name (TIM)
- SPRINT3.2: add another rat (TIM)
- SPRINT3.3 Modify maze to make more playable with more breaks in walls (TIM)
- SPRINT3.4: Add better commenting on all files (TIM)
- SPRINT3.5: Finish product documentation (TIM)
- SPRINT3.6 Unit testing (ALL)
- SPRINT3.7: Functional testing (HAJAR/GHEETHA)
- SPRINT3.8 appearing walls (TIM)
- SPRINT3.9 merge to master (TIM)
- SPRINT3.10 Delivery method (possibly Jupiter)
- SPRINT3.11 Scene setting (TIM)
- SPTINT3.12 Key in 4 peices(RAY)
- SPRINT3.13: Finish product documentation (TIM)
- SPRINT3.14 merge to master (TIM)
- SPRINT 3.15 CRC CARDS
- SPRINT 3.16 write up sprint 3 overview -Hajar
- Sprint 3.17 write up sprint 3 meetings formally -Hajar
- Sprint 3.18 write up the review of sprint 2-Hajar
- SPRINT 3.19 MD File - geetha
- Sprint 3.20 User stories for sprint 3 - Geetha
- Sprint 3.21 Use case UML sprint 3 - Geetha
- Sprint 3.22 use cases for sprint 3 - geetha
- Sprint 3.23 input all screenshots into documents - md and formal - geetha

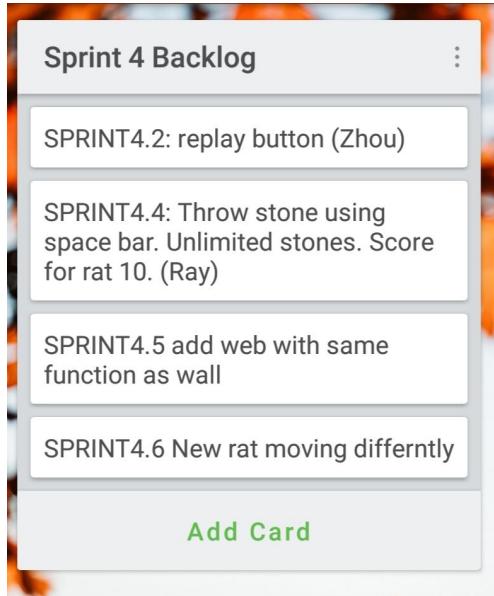
Sprint 3 DONE:

- SPRINT3.1: Display leader board after win or lose screen with "time remaining" score and name (TIM)
- SPRINT3.2: add another rat (TIM)
- SPRINT3.3 Modify maze to make more playable with more breaks in walls (TIM)
- SPRINT3.4: Add better commenting on all files (TIM)
- SPRINT3.5: Finish product documentation (TIM)
- SPRINT3.6 Unit testing (ALL)
- SPRINT3.7: Functional testing (HAJAR/GHEETHA)
- SPRINT3.8 appearing walls (TIM)
- SPRINT3.9 merge to master (TIM)
- SPRINT3.10 Delivery method (possibly Jupiter)
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New tasks:

1. Replay button
2. Throw stone using space bar. Unlimited stones. Score for rat 10
3. Add web with same function as wall
4. New rat moving differently
5. Delivery method (possibly jupyter)
6. Finish product documentation
7. Merge to master

Figure 26. planned sprint 4 backlog



4.1.4 Exception Handling

Achieving the objectives of this sprint and maintaining team organisation was particularly difficult to balance alongside deadlines from other units. Hajar and Geetha both struggled to cope with the workload due to personal issues and contacted Marina to receive extensions on other work. This affected the timeline for documentation completion and the organisation of team meetings.

4.2 Product

4.2.1 Customer interview and analysis:

The customer meeting on the 6th of december we presented our working game and asked the customer for their preference on features. We realised we would not have the time to complete both the option to throw stones at rats and finding all four keys to escape. The customer expressed his preference for finding the keys to escape as it would increase the difficulty of the game. The customer also expressed the importance of the delivery of the game.

4.2.2 User stories

Final set:

1. As a player, I would like to view my score on the leaderboard, each time I finish playing
2. As a player, I would like the game to be made more difficult
3. As a player, I would like to be given some context and instructions on how to play the game

4.2.3 Tests

Functionality testing took place on 12th December by Hajar and Geetha of the final version of the game.

Table 9. Functional tests for sprint three

User stories	Pass or Fail
1. As a player, I would like to view my score on the leaderboard, each time I finish playing	Pass
2 . As a player, I would like the game to be made more difficult	Pass
3. As a player, I would like to be given some context and instructions on how to play the game	Pass

Table 10. Shows unit testing carried out and their github location

Unit test and location	Pass or Fail
Unit test: Start box: Github(Code/testing/test_StartBox.py)	Fail
Unit test: Game Map: Github(Code/testing/test_gameMap.py)	Pass
Unit test: Hero: Github(Code/testing/test_hero.py)	Pass
Unit test: run_jeff : Github(Code/testing/test_run_jeff.py)	Pass

4.2.4 Use Cases

1. Leaderboard
 - Connected to the following user stories:
 - 1. As a player, I would like to view my score on the leaderboard, each time I finish playing
2. “Time remaining” score
 - Connected to the following user stories:

- 1. As a player, I would like to view my score on the leaderboard, each time I finish playing

3. Name

- Connected to the following user stories:
 - 1. As a player, I would like to view my score on the leaderboard, each time I finish playing

4. Obstacles

- Connected to the following user stories:
 - 2. As a player, I would like the game to be made more difficult

5. Disappearing/ Appearing walls

- Connected to the following user stories:
 - 2. As a player, I would like the game to be made more difficult

6. More rats

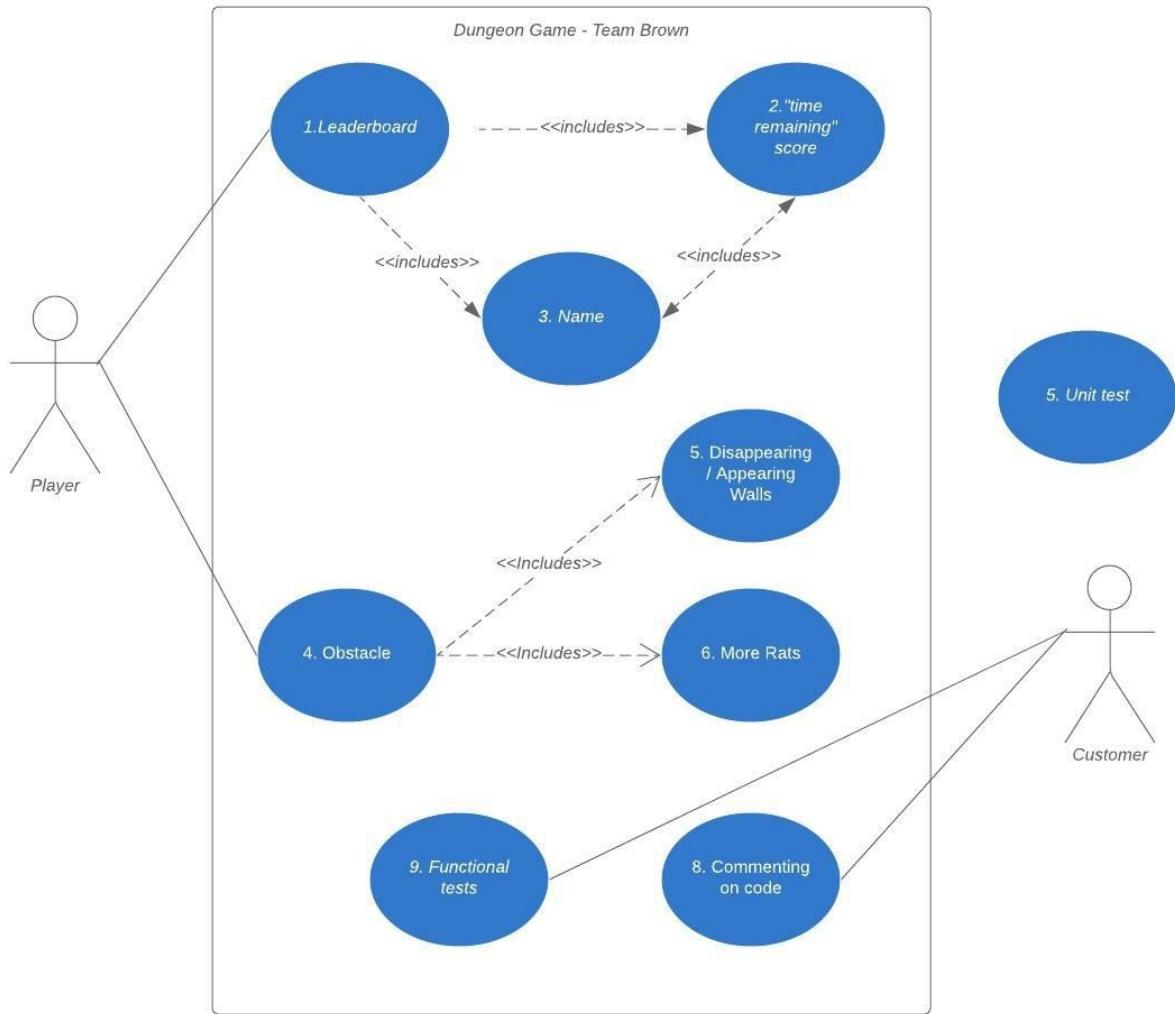
- Connected to the following user stories:
 - 2. As a player, I would like the game to be made more difficult

7. Commenting on code

8. Unit tests

9. Functional tests

Figure 27. UML use case diagram for sprint three



4.2.5 Software design documentation (CRC cards)

Module: Pygame

Pygame

Create screen object
Create clock
Manipulate subsurface objects with rectangle definitions

GameMap
Main
Hero

Module: run_jeff

Game

Initialise Pygame (screen, clock) Updates itself (main game loop) Draws to screen Checks to see if you've won game Checks to see if you've quit game Updates timer	Pygame Hero GameMap
---	---------------------------

Connects back to the following user stories:

- SPRINT 1: 3: As a player, I want to be able to see the time I have left (countdown)
- SPRINT 1: 5: As a player, I want to be able to move my character
- SPRINT 1: 6: As a player, I want to be able to view the maze I need to traverse
- SPRINT 1: 7: As a player, I want to be able to know when I have completed the maze

Module: Hero

Hero	
Draws itself Moves itself within walls when keys pressed	Pygame Game GameMap

Connects back to the following user stories:

- SPRINT 1: 5: As a player, I want to be able to move my character
- SPRINT 1: 6: As a player, I want to be able to view the maze I need to traverse

Monster_move

Draws itself Decides where hero is and tries to move towards it Moves itself within walls when keys pressed Knows if it has caught a hero	Pygame Game GameMap Hero
--	-----------------------------------

Connects back to the following user stories:

- SPRINT 2: 3: As a player I would like to see a character that chases me, making the game harder
- SPRINT 1: 5: As a player, I want to be able to move my character

Module: GameMap

Block (rectangle describing position of a wall block)	
Assign rectangle property	GameMap

GameMap

Load the logical map from file
Draw the map image to the screen
Make a list of the wall blocks

Pygame
Block

Connects back to the following user stories:

- SPRINT 1: 6: As a player, I want to be able to view the maze I need to traverse
- SPRINT 3: 2: As a player, I would like the game to be made more difficult

Module: LeaderBoard

LeaderBoard

Loads the leaderboard scores from file
Sorts the leaderboard scores
Knows the score of the game just finished
and adds to the leaderboard

Game

Connects back to the following user stories:

- SPRINT 1: 3: As a player, I want to be able to see the time I have left (countdown)
- SPRINT 2: 1: As a player I would like to be able to name my character
- SPRINT 2: 4: As a player I would like to see my final score on a leaderboard

Module: Startbox

Startbox

Asks user for their name
Starts the game

Game

Connects back to the following user stories:

- SPRINT 2: 1: As a player I would like to be able to name my character
- SPRINT 3: 3: As a player, I would like to be given some context and instructions on how to play the game

4.2.6 User interface design

Figure 28. Multiple rats and appearing walls - shows the user interface development achieved in sprint 3, the screenshot shows the addition of moving rats as well as further blocks of wall that appear to increase the difficulty of the game.



Figure 29. scene setting introduction screen - shows the introduction screen with instructions for the user and an audio of the instructions in an evil wizard's voice can be heard.

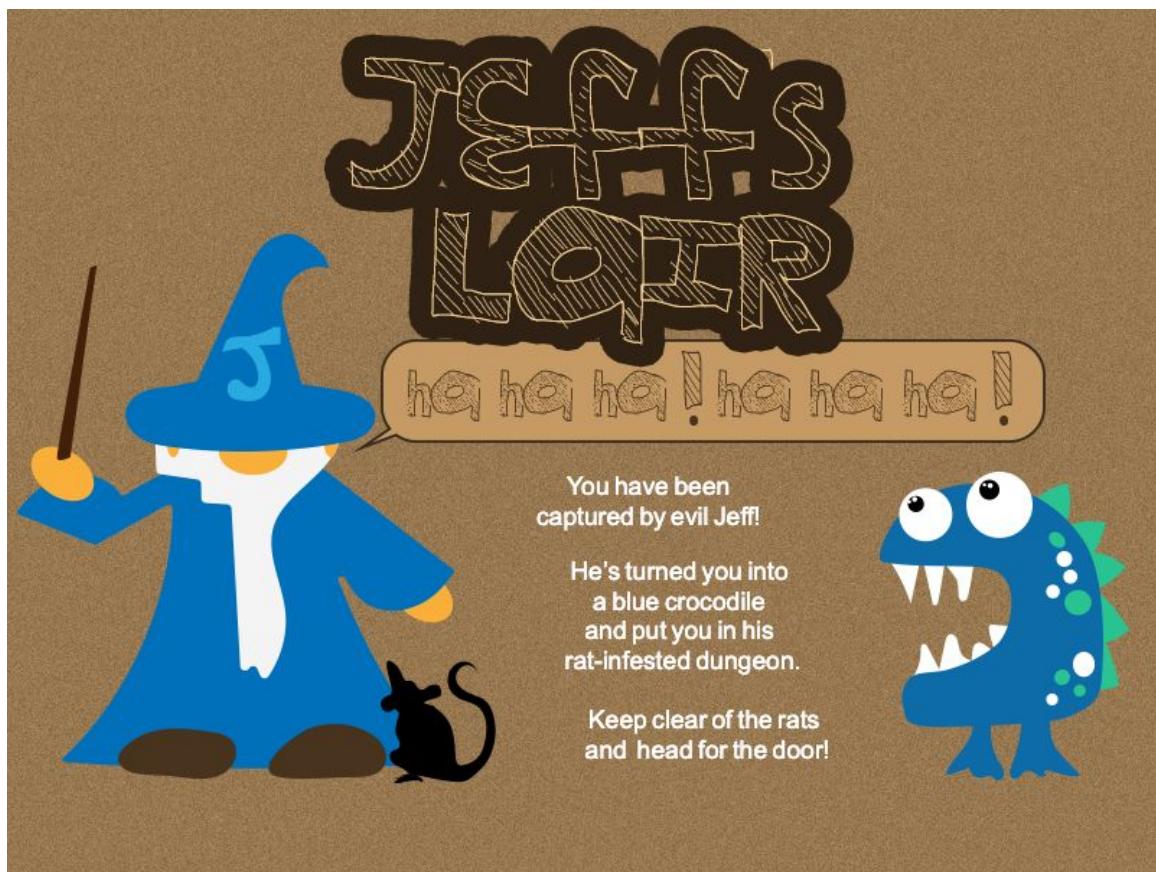


Figure 30. 4 keys to collect to escape the dungeon - following the client's expression of preference on the 6th December, Figure 30. presents the design of the four keys that were later added into the maze. As per the sprint objective (section 4.1.3, 3.11)

