COURSEWORK 2:

Process Documentation

Team Purple:

Ahmed Ahmadu, John Chan, Aditya Gaosindhe, Oliver Hamler, Zach Howard, Maximilian Mekiska, Hugh Surdeau, Yiming Yuan

MSc Computer Science
University of Bath

11/12/2020

Contents

List of Figures

1 Introduction

Sprints begin on Friday straight after Customer meeting. The Sprint Planning Meeting takes place immediately after the Sprint Retrospective. These two meetings occur after the Customer Meeting on Friday on a weekly basis. This frees up further time for the week for programming. The Spring Mid Week Review is... Perhaps a Gantt Chart here to explain the whole process...

2 Sprint 0

2.1 Overview

Sprint 0 was the first week of our project, in which our team members were meeting each other for the very first time. It was clear that our team members came from a range of different backgrounds; some with a reasonable amount of experience in software engineering, and some with none at all. Getting to know each other's skills and experiences would help inform our approach to this project, therefore we conducted a skills audit. This was done in the form of a skills matrix, focused around technical skills pertaining to game development (see table 1). It was evident that among our team members, we had more experience with Python than any other programming language, so we agreed it would be sensible to code our game in Python.

Name	Python	C++	Java	Game Design	Git	Graphic Design	Testing	LaTeX	Game Balancing
Max	Intermediate	Beginner	Beginner	No experience	Beginner	No experience	No experience	Beginner	No experience
Zach	Advanced	Intermediate	Intermediate	No experience	Intermediate	No experience	Intermediate	Beginner	No experience
Aditya	Beginner	Beginner	No experience	Beginner	Intermediate	Beginner	No experience	Beginner	No experience
Ahmed	Advanced	Beginner	No experience	Beginner	Intermediate	Intermediate	Intermediate	Intermediate	No experience
John	Beginner	Beginner	Beginner	Beginner	Beginner	No experience	No experience	Intermediate	No experience
Oliver	Beginner	No experience	Beginner	No experience	No experience	No experience	No experience	No experience	No experience
Hugh	Advanced	Beginner	Intermediate	No experience	Intermediate	No experience	Intermediate	Advanced	No experience
Yiming	Intermediate	Advanced	Beginner	Beginner	Intermediate	No experience	Intermediate	Beginner	No experience

As we are collaborating on this project remotely, all meetings must take place virtually. We decided to use Microsoft Teams to conduct our meetings, due to our familiarity with the platform and the numerous beneficial features it provides, such as file sharing and screen sharing. As some team members began the project in different time zones, it was important to take this into consideration and set meeting times that suited the whole team.

During this week we discussed potential ideas for the game. As it is obviously crucial to design a game that meets the customer's requirements, we asked ourselves questions such as: what actually constitutes a dungeon game? Two main ideas were proposed. The first was a top-down, Zelda style adventure dungeon game. In this proposal, the player controls a character who explores a dungeon and fights enemies, with mechanics for upgrading the player character and boss fights. The second proposal was a side-scrolling game where the player controls a drill which has to collect resources to progress and upgrade the player character, all while avoiding obstacles and fighting enemies who are contained in intermittent dungeons.

We also exchanged views on how to implement Agile practices within our team. In order to remain organised while completing various interconnected tasks, we decided to make use of a digital Kanban board with Trello. In addition, we agreed it would be beneficial to employ pair programming once the development phase of the project began. This was decided due to the realisation that there was some disparities in the core skills required to implement the project, such as python programming and Git. As such, it was decided that for the initial sprints of the project, team members who had relatively more experience would pair up with those who had less in order to quickly diffuse knowledge throughout the group and ensure everyone felt they understood the foundations of the game, and were able to contribute adequately. As an added benefit, this approach allows for consistent programming style, as frequent switching of partners means that team members can see how others are formatting their code, and adjust their own conventions to meet those of the team.

2.2 Review

The sprint was good as there were some ideas ready and we had divided the tasks for that week. Skills matrix was a important thing as we got to know what programming experience everyone has

2.3 Meetings

2.3.1 Sprint Planning

Agenda Brainstorming Session

Meeting Records

- Date: 19.10.2020 11:15AM
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Zach
- Not Present: Yiming (flying to UK)

Minutes

- Use Python. We all have some degree of experience with Python, and have some confidence with testing.
- Initially implement a point and click turret on the drill. Automatic shooting can come later.
- As you go down: Fewer resources, more Enemies
- Potentially a boss fight every x amount of layers.
- Potential requirements to drill down:

  Need to have enough coal to dig down a layer.

  Maybe need to find a key??

  Ground gets harder as you go down. Need to upgrade drill to certain strength

  Gets hotter as you go down. Need heat resistance shield.
- How to fill the requirements of bots: The enemies will have AI, Potential boss fights will have their own AI. Potential friendly figure(s) following around the drill to help out the drill.
- How to access the shop: A button which you can press at any time. A merchant which you can find on each level. The shop is accessible every time you advance a layer. The shop is accessible after/before a boss fight.
- Local highscore tracker. The tracker would collect and store the top scores every time the highest score is achieved.
- Agile methods:

  Kanban with use of a Trello board.

  One person in charge of the Trello board: Max

  Test driven development pytest/unittest

  Paired working at the start
- Main Game Class: Input Class, Level/Map, Drill, Autonomous AI, Friendly, Enemies, Boss, Merchant?, 2D UI, HUD, Shop menu, Start menu

Task Assignment

1. Max - Set up trello board
2. Hugh - Set up GitHub repository
3. Everyone - Continue to think about the currently proposed ideas and any ways to solidify them

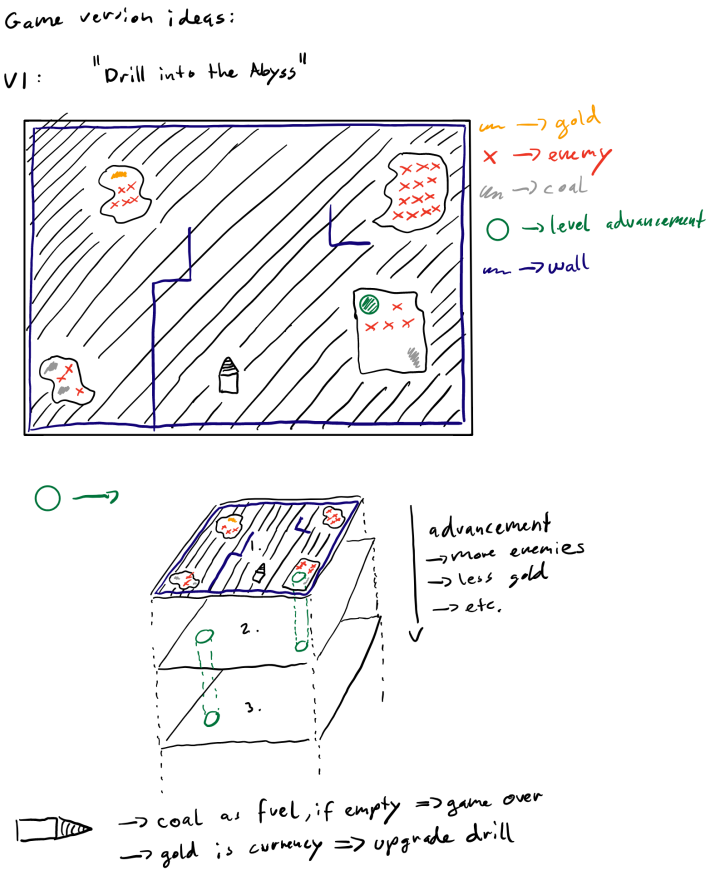

Figure 1: Sketch of our initial game idea in Sprint 0

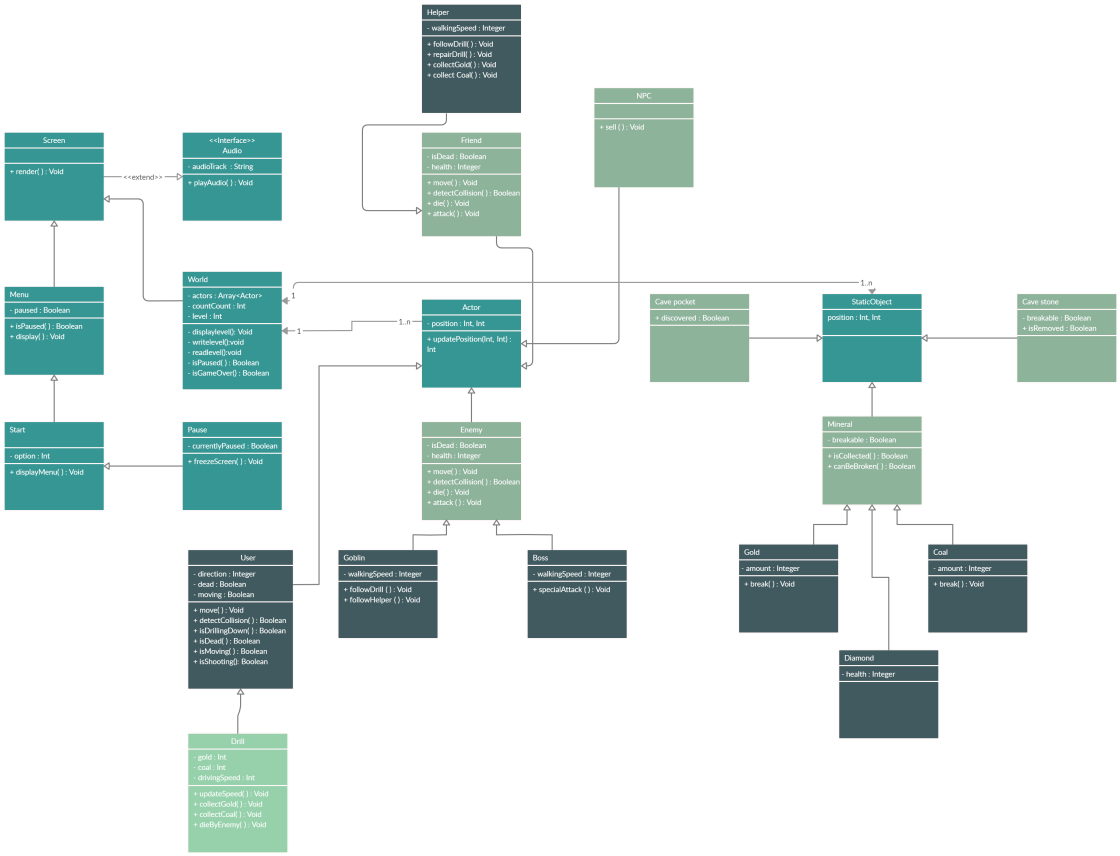
Helper
- walkingSpeed : Integer
+ followDrill( ) : Void
+ repairDrill( ) : Void
+ collectCoal( ) : Void
+ collect Coal( ) : Void
NPC
+ sell ( ) : Void
Screen
+ render( ) : Void
<<extend>>
<<Interface>>
Audio
- audioTrack : String
+ playAudio( ) : Void
Friend
- isDead : Boolean
- health : Integer
+ move( ) : Void
+ detectCollision( ) : Boolean
+ die( ) : Void
+ attack( ) : Void
Menu
- paused : Boolean
+ isPaused( ) : Boolean
+ display( ) : Void
World
- actors : Array<Actor>
- countCount : Int
- level : Int
- displaylevel(): Void
- writelevel():void
- readlevel():void
- isPaused( ) : Boolean
- isGameOver() : Boolean
1
1..n
Actor
- position : Int, Int
+ updatePosition(Int, Int) : Int
1..n
Cave pocket
+ discovered : Boolean
StaticObject
position : Int, Int
Cave stone
- breakable : Boolean
+ isRemoved : Boolean
Start
- option : Int
+ displayMenu( ) : Void
Pause
- currentlyPaused : Boolean
+ freezeScreen( ) : Void
Enemy
- isDead : Boolean
- health : Integer
+ move( ) : Void
+ detectCollision( ) : Boolean
+ die( ) : Void
+ attack ( ) : Void
Mineral
- breakable : Boolean
+ isCollected( ) : Boolean
+ canBeBroken( ) : Boolean
User
- direction : Integer
- dead : Boolean
- moving : Boolean
+ move( ) : Void
+ detectCollision( ) : Boolean
+ isDrillingDown( ) : Boolean
+ isDead( ) : Boolean
+ isMoving( ) : Boolean
+ isShooting(). Boolean
Goblin
- walkingSpeed : Integer
+ followDrill ( ) : Void
+ followHelper ( ) : Void
Boss
- walkingSpeed : Integer
+ specialAttack ( ) : Void
Gold
- amount : Integer
+ break( ) : Void
Coal
- amount : Integer
+ break( ) : Void
Diamond
- health : Integer
Drill
- gold : Int
- coal : Int
- drivingSpeed : Int
+ updateSpeed( ) : Void
+ collectGold( ) : Void
+ collectCoal( ) : Void
+ dieByEnemy( ) : Void

Figure 2: UML

2.3.2 Mid Week Review

Agenda Discussion on what to present to customer

Meeting Records

- Date: 22.10.2020 9:30AM
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

1. What language should we use: Java or Python? - Python and Py-Game are allowed
2. Using a drill as dungeon game? Can we use a pre-made engine API such as LibGDX. Or furthermore can we use Unity/Unreal Engine?
3. Can we mix agile methods?
4. What kind of documentation is required?
5. Perhaps it would be nice to be able to build a "bot" to play the game on its own or perhaps to compete with other bots?
6. How can the challenge of the game be changed?
7. How can I know whether I or my bot are doing well?

Updates

1. Zach - Look into different game frameworks to determine which one suits our needs.

2.3.3 Customer Meeting

Meeting Records

- Date: 23.10.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

Presentation

- Sketch of initial dungeon drill idea presented to customer

Customer feedback

- Playing on mobile would be good, if possible, once PC version works
- What kind of feedback are players going to get? Visual and audio definitely, how about haptic? (vibration, only really possible on mobile)
- Where does the challenge come from: dexterity or thinking?
- How does player interact with drill?
- How can drill be upgraded? A merchant in level or outside the level?
- Bots could be included but are not compulsory
- Drill down option should be possible at any location, not only at specific locations
- Shooting capability for drill to fend off incoming enemies
- Playing on mobile would be good, if possible, once PC version works
- Helper AI should not be directly controllable by User (better user experience)
- Drill down option should be possible at any location not only at specific locations
- Shooting capability for drill to fend off incoming enemies
- Possibility to play game on phone (only if possible after PC version works)

2.3.4 Sprint Retrospective

Agenda Discuss feedback from customer. Use customer meeting to finalise plan for game and begin discussing a minimum viable product for drill game

Meeting Records

- Date: 24.10.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- Response for design was positive, drilling game can meet the criteria of dungeon game
- Certain aspects of the game are finalised - it will be a top-down drilling game with enemies and multiple map layers
- Will need to use sprint planning meeting to finalise the scope of the initial features of the game
- Members to think about what features they feel are essential to the game's integrity and feel and which proposed features are better left for expansion once a final product is created

Retrospective

1. The group is enthusiastic about our overall idea and excited to begin implementing it
2. Based on Julian's feedback in the forum, our team felt we had not prepared adequately for this customer meeting and sprint. Going forward, there will be more of an effort to have completed tasks and ideas to present to the customer in order to have productive customer meetings

2.4 User Stories

2.4.1 Backlog

2.4.2 Completed Tasks

2.4.3 In Progress

2.5 Exception Handling

3 Sprint 1

3.1 Overview

3.2 Review

3.3 Meetings

3.3.1 Sprint Planning

Deciding software engineering methods and tools, and scope of initial game (minimum features required for working product)

- Finalise software engineering methods and tools
- Decide on minimum viable product for game
- Create product backlog and assign user stories for this sprint

Meeting Records

- Date: 24.10.2020
- Attendance: Ahmed, Aditya, Max, Hugh, Yiming, Zach
- Not Present: John, Oliver

Minutes

- Administrative tasks such as meeting minutes, GitHub set-up, adding all members to shared GitHub project
- Unit testing overview
- Game should be playable on the phone
- Combat mechanics: Point and click turret
- Challenge: Fuel is scarce
- As player drills down, there are fewer resources, more enemies
- Boss level each x levels
- Need to use x amount of coal to drill down
- Adding a friendly AI (helping the drill)
- Shop feature for upgrades at specific seller, place
- Colour changes as player drills down
- Starting to develop on PC and port it to mobile at the end
- Tools/Techniques to use

  Kyvi – library for mobile game development

  Python as programming language

  Kanban methodologies – setting up Trello board

  TDD and Pair programming

- Breaking down the game development process into classes: Input, Drill, Map generation (including assets) and evolution, Autonomous and enemy AI, Boss, Shop, HUD (including score tracker), Menu
- What are Front and Back end? Front = implementing functions, Backend = creating functions
- Plan to start programming on Saturday
- For coming week UML modelling
- Pytest and TDD introduction for people who have not used it yet
- Use Git hooks to automatically run tests before pushing to GitHub
- General Design
- Enemies = Goblins
- Cartoon flair

Task Assignment

1. User Story: Create main game loop - Aditya, Zach
2. User Story: Create map generation and destructable blocks - Hugh, Max
3. User Story: Control drill - Yiming, Ahmed
4. User Story: Implement mineable resources (gold and coal) on map - John, Oliver

3.3.2 Mid Week Review

Agenda

- Discuss progress on assigned user stories
- Identify any remaining blockers to deliver increment before customer meeting
- Assist team members in fixing any issues

Meeting Records

- Date: 28.10.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- Yiming and Ahmed:
  - Drill feature is complete, drill can move and break blocks
  - Currently can move left/right and up/down, diagonal movement to be added before Friday
  - Drill works with a basic map, needs to be integrated to the new procedurally generated map
- Max and Hugh:
  - Map and game loop have been completed
  - Map works by first generating a map full of dirt, then uses random walks to create dungeons where the mean size (in blocks) of the dungeon can be altered
  - Implementation method means the map can be quickly extended to adding resources
  - Map is generated in matrix form and is then loaded by the main game loop
- Oliver and John:
  - No progress made on user story due to deadlines on Monday
  - Decided to change weekly deliverable to begin creating formal process documentation
- Zach and Aditya:
  - No progress made on user story due to deadlines on Monday
  - Main game loop already implemented, change weekly task to assist in integrating drill and map components
- Drill and map generator components to be integrated for Friday to show a completed increment
- Decided to show customer the final sprint increment and present a list of potential user stories
- During discussions with customer, if any other exciting features are discussed, will add those to suggestions for meeting
- Ahmed and Yiming decided to add turret that can shoot for Friday
- Max and Hugh decided to add sidescrolling for Friday

Updates

1. Ahmed and Yiming - Created a user-controlled drill that can move around the map
2. Max and Hugh - Created map with randomised dungeons and drillable blocks of dirt

3.3.3 Customer Meeting

Meeting Records

- Date: 30.10.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Julian
- Not Present: Zach

Minutes

Initial discussion with TAs

- Create user stories
- Start to develop initial prototype by creating map
- Presentation of reiterated idea

Customer feedback

- Make drill go slower the more level progress is made
- Keep in mind to create game immersion by keeping control simple and minimal
- Think about creating more versions of Goblins
- User story selected: ability for player to drill down to lower levels
- User story selected: Implement enemies and combat mechanics
- User story selected: Find and collect gold and coal

3.3.4 Sprint Retrospective

Agenda Discussion of team member performance and how to address issues

Meeting Records

- Date: 31.10.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- Discussion around why less than was initially planned was implemented this week.
- Some team members felt they had no time to contribute due to upcoming deadlines
- Others felt they were not adequately prepared to contribute and felt lost when attempting to do so
- Full code review is done to bring all members up to speed. Each class and method is explained to the whole team to ensure all members are equally aware of the workings of the program
- Discussion on how to ensure everyone has the resources to assist in the process. Pair programming will be extended to next sprint with new pairs to ensure everyone is up to date with new developments and identify any knowledge gaps
- Overview on how to use Git and GitHub, as well as how to write and run software in python, is given to the team
- Code style and refactoring is discussed. All pairs will clean up their code to meet PEP8 standard and help with readability for those entering the programming stage late

Retrospective

1. The team is enthusiastic about the product so far. The minimum viable product seems achievable from what is currently completed.
2. Some members felt that it was difficult to find time this week to make progress on our project due to the CW1 deadline.
3. Optimistic that in the next sprint everyone will be able to devote much more time to the project.

3.4 User Stories

3.4.1 Backlog

- Game sounds
- Drill upgrades and shop NPC
- Boss levels and fights
- Enemies
- Combat mechanics
- Helper AI
- Progressive difficulty
- Main menu
- Undrillable blocks
- Drilling up and down
- Find resources (coal and gold)

3.4.2 Completed Tasks

- Control drill
- Click and shoot drill turret
- Create map

3.4.3 In Progress

3.4.4 New Tasks

- Drill up
- Add multi-layer mazes

3.5 Exception Handling

- Turret aiming experiences some bugs as the drill reaches the edge of the map - does not aim in the correct direction
- When the game is minimised, the drill keeps going in the direction of the last button pressed until this button is pressed again

4 Sprint 2

4.1 Overview

4.2 Review

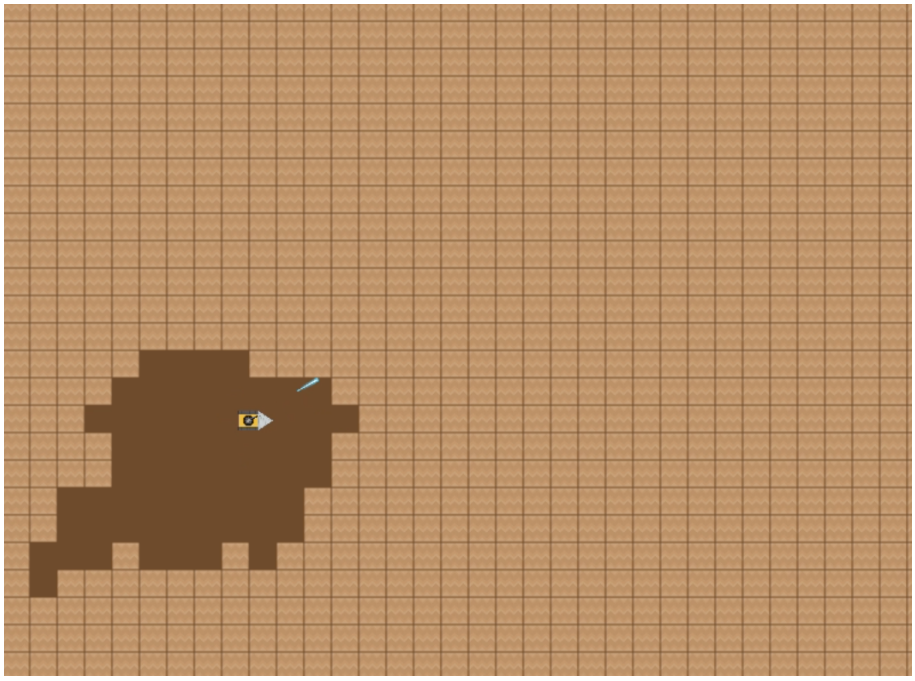

Figure 3: The iteration of the game produced during Sprint 2

4.3 Meetings

4.3.1 Sprint Planning

Agenda What the meeting is about

Meeting Records

- Date: 31.10.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Yiming, Zach
- Not Present: Oliver

Minutes

- User stories selected by customer are discussed and ranked on importance. Enemies is the highest priority, followed by drilling down and finally resources.
- Bugs left over from Sprint 1 are discussed. Ahmed feels he can address them best as he understands the drill and turret modules well
- New partners are allocated. The pairs are: Max and John, Hugh and Oliver, Zach and Yiming, Ahmed and Aditya

Task Assignment

1. User Story: Collect resources - Max, John
2. User Story: Drill down - Hugh, Oliver
3. User Story: Add and fight enemies - Zach, Yiming
4. User Story: Add undrillable blocks - Ahmed, Aditya
5. Turret bugfixing - Ahmed, Aditya

4.3.2 Mid Week Review

Agenda

- Discuss progress on assigned user stories
- Identify any remaining blockers to deliver increment before customer meeting
- Assist team members in fixing any issues

Meeting Records

- Date: 4.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- User stories implemented thus far are discussed
- Max and John have implemented the resource counting, as well as an ammunition system and explosions on collision
- Hugh and Oliver have implemented the drill down feature that remembers the drill's location. To add is a feature to drill up, and storing of maps
- Aditya and Ahmed have added undrillable walls and fixed the bugs from sprint 1. They noted some additional bugs which they also fixed, particularly the turret moving when the drill did not when it moved against undrillable terrain
- Zach and Yiming have implemented enemies and pathfinding. There are still some issues with the enemies, their bullets don't fire
- Team helps Zach and Yiming fix the enemy bullet bug with Zach talking through the issues and then noticing that the bullet's location update method did not call the velocity of the bullet, but the location of the enemy
- Zach presents a major refactoring to entities on the map. Enemies will now inherit from different classes to customise their functionality
- It is decided that the main file will be refactored to improve readability, and docstrings will be added where they are missing

4.3.3 Customer Meeting

Meeting Records

- Date: 06.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach, Julian
- Not Present: None

Minutes

Initial discussion with TA's

- TA's emphasised importance of having documentation in order

Presentation

- Map, filled with dirt blocks, can move drill
- Randomly generated dungeons
- The turret can shoot and delete blocks
- Scrolling map, can only see a small amount
- Enemies and resources are still missing

Customer feedback

- Julian likes the diagonal movement
- Need to make sure game is not too easy
- Julian agrees that adding coal and gold will add dimension to the game
- Julian advises first adding drilling down functionality, then resources, then enemies
- Other ideas for challenges: Areas that are harder to drill through? Non-drillable walls? Areas of water?
- Keep in mind that the customer is not necessarily aware of how hard it is to implement a function

4.3.4 Sprint Retrospective

Agenda What the meeting is about

Meeting Records

- Date: 07.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- Discussed the need to focus on getting documentation in order over the next sprint
- Team members with less experience would like to be more involved with the coding process, so they will be paired up with an experienced teammate during the next sprint to do pair programming

Retrospective

1. Team optimism continues to be high since the game development progress is going as planned
2. Members are getting used to the overall development methodology and processes involved
3. All members were able to step up their productivity since workload of other courses declined
4. More attention needs to be given to good GitHub practices to guarantee good code quality and enable faster code documentation

4.4 User Stories

4.4.1 Backlog

- User Story: Collect resources - Max, John
- User Story: Drill down - Hugh, Oliver
- User Story: Add and fight enemies - Zach, Yiming
- User Story: Add undrillable blocks - Ahmed, Aditya
- Turret bugfixing - Ahmed, Aditya

4.4.2 Completed Tasks

- Max and John have implemented the resource counting, as well as an ammunition system and explosions on collision
- Hugh and Oliver have implemented the drill down feature that remembers the drill's location.
- Aditya and Ahmed have added undrillable walls and fixed the bugs from Sprint 1. They noted some additional bugs which they also fixed, particularly the turret moving when the drill did not when it moved against undrillable terrain.
- Zach and Yiming have implemented enemies and pathfinding. There are still some issues with the enemies, their bullets don't fire
- Team helps Zach and Yiming fix the enemy bullet bug with Zach talking through the issues and then noticing that the bullet's location update method did not call the velocity of the bullet, but the location of the enemy
- Zach presents a major refactoring to entities on the map. Enemies will now inherit from different classes to customise their functionality

4.4.3 New Tasks

- It is decided that the main file will be refactored to improve readability, and docstrings will be added where they are missing

4.5 Exception Handling

5 Sprint 3

5.1 Overview

5.2 Review

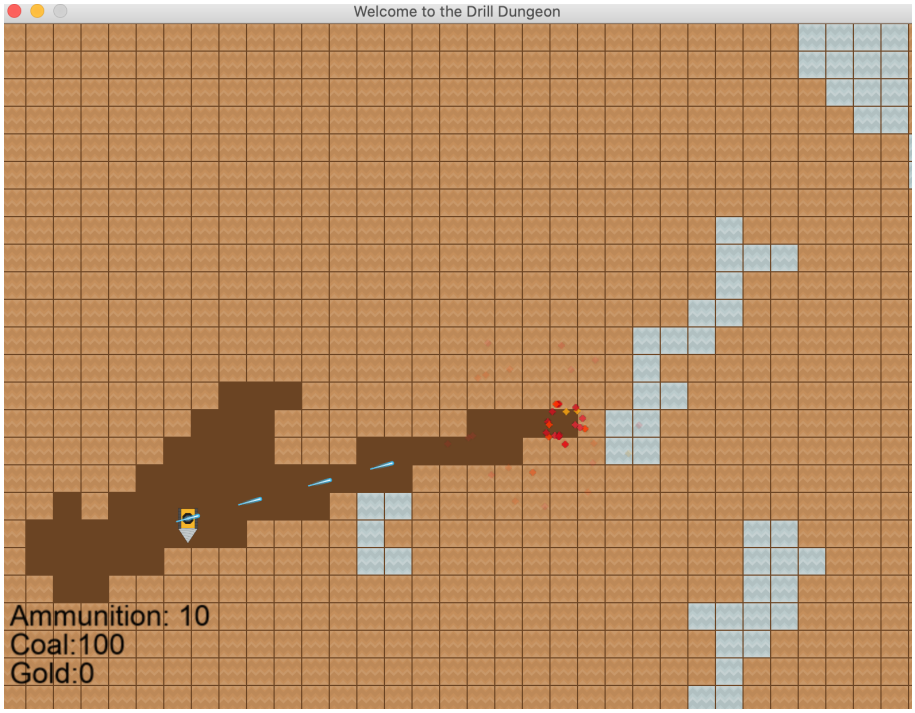

Figure 4: The iteration of the game produced during Sprint 3, featuring coal and gold blocks

5.3 Meetings

5.3.1 Sprint Planning

Agenda Plan for Increment 3

Meeting Records

- Date: 06.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

Task Assignment

1. User Story: Drill Down - Hugh, Oliver
2. User Story: Find Gold, Find Coal - John, Maximilian
3. User Story: Add Enemies - Yiming, Zach
4. User Story: Bugs – Aditya, Ahmed
5. Documentation - John, Oliver

5.3.2 Mid Week Review

Agenda

- Discuss progress on assigned user stories
- Identify any remaining blockers to deliver increment before customer meeting
- Assist team members in fixing any issues

Meeting Records

- Date: 11.11.2020 10:30AM
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- Assign a date for user stories - easier to keep track on Trello
- Issue with enemies spawning in dirt
- Lag at the start - too many animations? More enemies means slower game
- Discussion of implementing A* path finding algorithm for enemies
- Resources and Drill Down user stories done
- Ahmed has fixed old bugs
- 200x200 size lag - 150x150 ok
- Blocks should be smaller in larger scale. (could be that it is checking collision of every single block)
- Suggestion - Loading screen
- Too many features may lag
- Documentation: Add screenshot of what the game looks like, perhaps Trello board screenshot too
- This week focus on improving documentation Restructure - the
- Add docstrings to completed features and where it is needed
- See if anything can be taken out of main - refactor
- Need to write tests

5.3.3 Customer Meeting

Meeting Records

- Date: 13.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

Initial discussion with TA's

- Presented documentation and game to TA's
- Are we sticking to the same roles or switching up?
- Are we writing up use cases? No we are not yet, TA's recommended us to start doing it

Presentation

- Particle Effects - explosion colour based on material
- Drill Down - to next layer of map
- Enemies - Path find and shoot at you
- Ammunition -
- Coal and Gold - increment accordingly

Customer feedback

- Progression is good in general
- Get more images into documentation
- Get screenshots of Trello and tools for Backlog
- Trail use cases to design
- Mention changes in practice in the overview
- CRC cards- user story to code artefacts
- Next User Stories - NPC Shop Menu
- Add exception and acceptance criteria for each user story

5.3.4 Sprint Retrospective

Agenda What the meeting is about

Meeting Records

- Date: 14.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- be clear on the branches on GitHub, merge earlier,less branches
- Introduce acceptance criteria for the user stories - this has been added to the Trello board.

Retrospective

- Thoughts
- Overall the team felt positive about this sprint, user stories completed successfully

5.4 User Stories

5.4.1 Backlog

- Generate Dungeon Features
- Drill Up
- Main Menu
- Find Shop
- Upgrade Drill Skills
- Hear Sounds
- Boss Fight
- Difficulty Level
- Fix Bullet Path

5.4.2 Completed Tasks

- Yiming and Zach have added enemies to the game.
- Documentation has been filled in, and templates created for all meetings.
- Max and John completed Find Coal and Find Gold user stories.
- Ahmed and Aditya have fixed some of the bugs.

5.4.3 New Tasks

5.5 Exception Handling

- Issue with lag at the start. Too many animations? More enemies slow the game down.
- Issues with enemies.

6 Sprint 4

6.1 Overview

After feedback from the teachers during the previous sprint, we made a few changes to our process. Firstly, we decided to introduce acceptance criteria for all user stories. This ensures the whole team and the customer understand precisely what should be achieved by each user story, and helps to guide the development process. We also developed CRC cards to help visualise the various classes within our game and how they are associated with one another. In addition, to enable us to reflect on the development process and provide more detailed documentation of the user stories, we began to affix screenshots of our Trello board at the end of each sprint.

6.2 Review

Our team felt that we made significant progress in developing the functionality of the game during this sprint. With enemies now capable of attacking and destroying the drill, the challenge and excitement of gameplay have been greatly enhanced. We felt that our game almost contained enough features to be considered a minimum viable product.

However, our team found it difficult to meet all of the acceptance criteria set for the user stories during this sprint. Consequently, although we were pleased with the latest iteration of the game achieved by the end of the sprint, most stories remained in the 'In Progress' column rather than 'Done'. We decided that in the future, we should ideally try to set acceptance criteria that can realistically be completed within a single sprint.

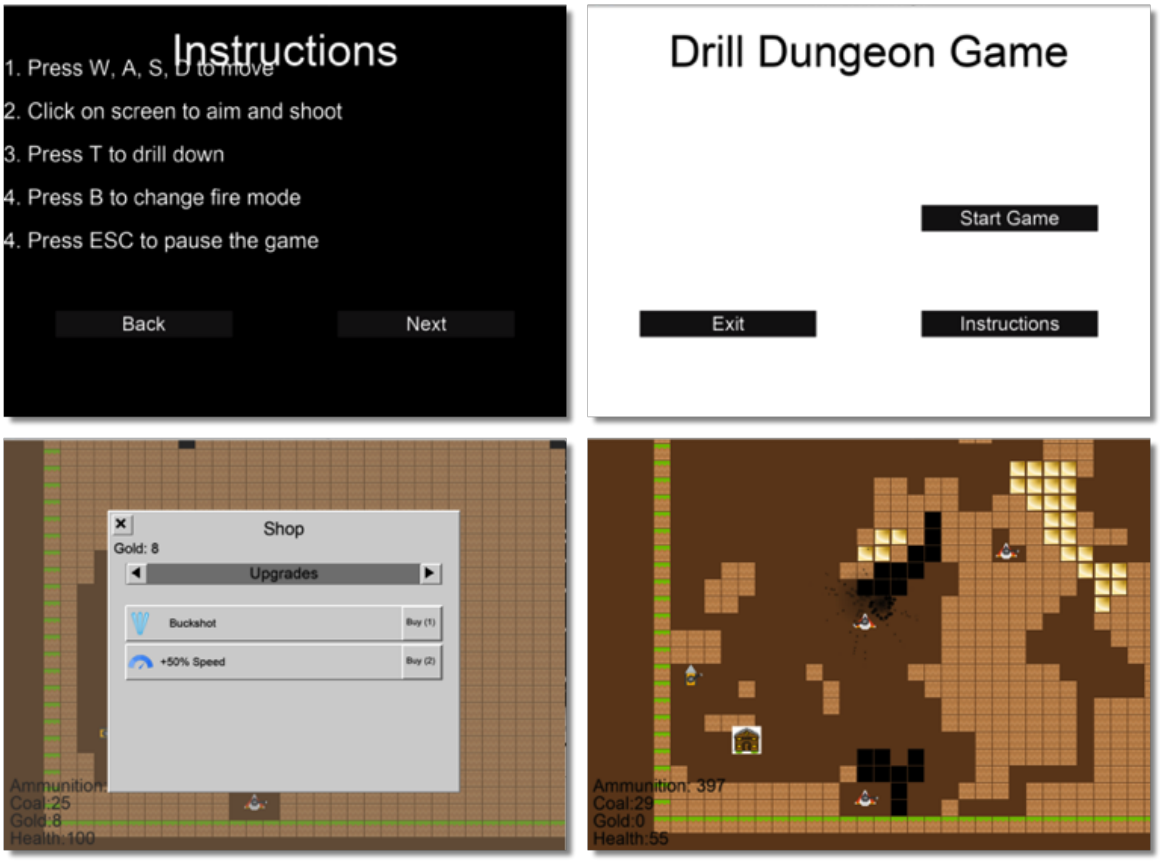

Figure 5: The iteration of the game produced during Sprint 4, featuring a start screen, instructions, enemy battles and a shop

6.3 Meetings

6.3.1 Sprint Planning

Agenda Plan for Increment 4

Meeting Records

- Date: 14.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- Additional sprite list for only visible blocks to reduce lag
- User Story: Find and battle enemies - Zach, Yiming - carrying on to next week
- Possible to finish but would need more refactoring due to dependencies - Perhaps completely finished base model in two weeks
- Drill up - need to see how it would work with the map Also need to think of upgrade list - speed, damage, shooting
- HUD with health bar in the corner
- How does the health go up? eg buy a repair from the shop
- When do come across the shop, eg at the end of the level, spawn randomly,
- Should the enemy have a health bar or hit count. Red health bar for enemy, green for user
- attach supporting screenshot of trello
- acceptance criteria
- menu should pause the game but be an overlay (state pause boolean)
- if too difficult then separate menu
- New User Story: Generate Dungeon Features
- Part of battle enemies user story: Add health bar

Task Assignment

1. User Story: Find and battle enemies - Zach, Yiming
2. User Story: Generate dungeon features (wall,chests enemies etc.) - Hugh
3. User Story: Drill Up - Hugh
4. User Story: Main Menu - John, Maximilian
5. User Story: Find Shop(NPC) - Aditya, Ahmed , Oliver
6. User Story: Upgrade Drill Skills - Aditya, Ahmed , Oliver
7. Documentation - all
8. Issue: Change block spawning so they only spawn when in range of drill - Hugh, Zach

6.3.2 Mid Week Review

Agenda

- Discuss progress on assigned user stories
- Identify any remaining blockers to deliver increment before customer meeting
- Assist team members in fixing any issues

Meeting Records

- Date: 18.11.2020 10:30AM
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming
- Not Present: Zach

Minutes

- Ahmed, Aditya, Oliver worked on the shop. Ahmed showed team how the shop works. Shop is clickable. Upgrade is the 'buckshot' so far.
- Max and John - Buttons on the menu, can go to 'Instructions', 'Game objectives', 'Start Game', 'Go Back'.
- Need to figure out general game aesthetic design.
- A lot of sprites that we should improve later, but for now focus on getting user stories completed
- Discussion about what audio we can add
- Yiming - Enemies can kill drill, drill can kill enemies. But still some bugs
- Zach - Will add more features (e.g. different kinds of enemies or different kinds of bullets)
- Hugh - 16x16 blocks for map, reduces lag. Drill up added - 1 layer only.
- Add uses cases from Sprint 4
- For Friday - User Stories in merge-able form. Write uses cases for our stories this week.

6.3.3 Customer Meeting

Meeting Records

- Date: 20.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- shop and upgrades
- menu - instructions
- enemy kill
- can be killed by enemy
- health goes down
- drill down
- drill up
- CRC cards
- need to fix backlog
- 16x16 check blocks to reduce lag (16 x 16 chosen)
- exception backlog - not all user stories complete and need to polish

Initial discussion with TA's

- change the HUD so it is easier to read
- level of detail for CRC cards - some responsibilities could use some more details.
- level of detail for use case - content wise seems good. eg sort into a table.
- use case diagram not necessary but may have them.

Presentation

-

Customer feedback

- divide by 2 at each level. Would like logarithmic behaviour not linear. Divide into quad tree or oct tree.
- how to transfer Trello to document? Screenshots at the end of each sprint to capture changing Trello board.
- use cases to be transferred to document (connection between user story and implementation)
- don't try and back-fill the CRC cards and use cases

6.3.4 Sprint Retrospective

Agenda What the meeting is about

Meeting Records

- Date: 21.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

-

Retrospective

- Team feeling positive about the project, but some concern that with other deadlines coming up we won't be able to devote as much time to it. Hoping to get a lot done in the coming sprint.
- Zach - feels the week went alright, but the scope of the tasks were large, meaning that many of the stories are not fully implemented
- Max - agrees. Feels that everything went well and was a good sprint
- Aditya - Shop took more time than expected but a lot of the shop implementation relies on game design/balance rather than implementation. Therefore, will be easier to complete as we get closer to the final product
- Everyone else in agreement.

6.4 User Stories

6.4.1 Backlog

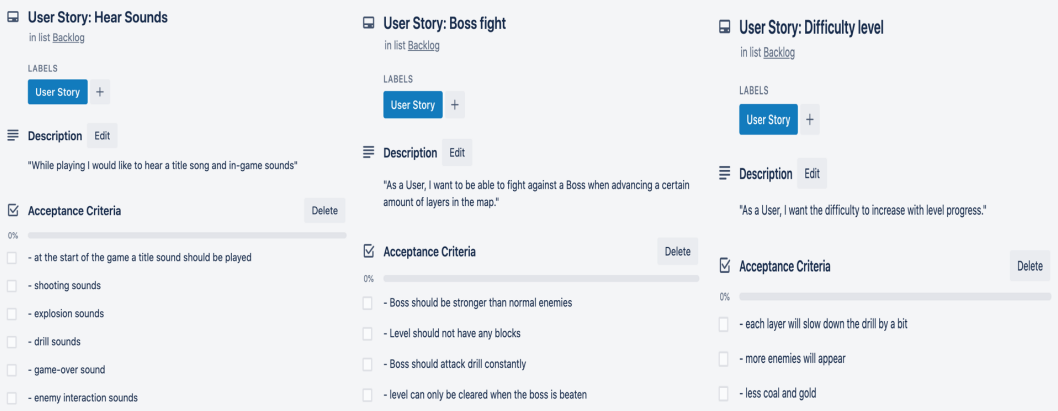

Figure 6: Backlog at end of Sprint 4

6.4.2 Completed Tasks

- Fix bullet path outside map after scrolling

6.4.3 In Progress

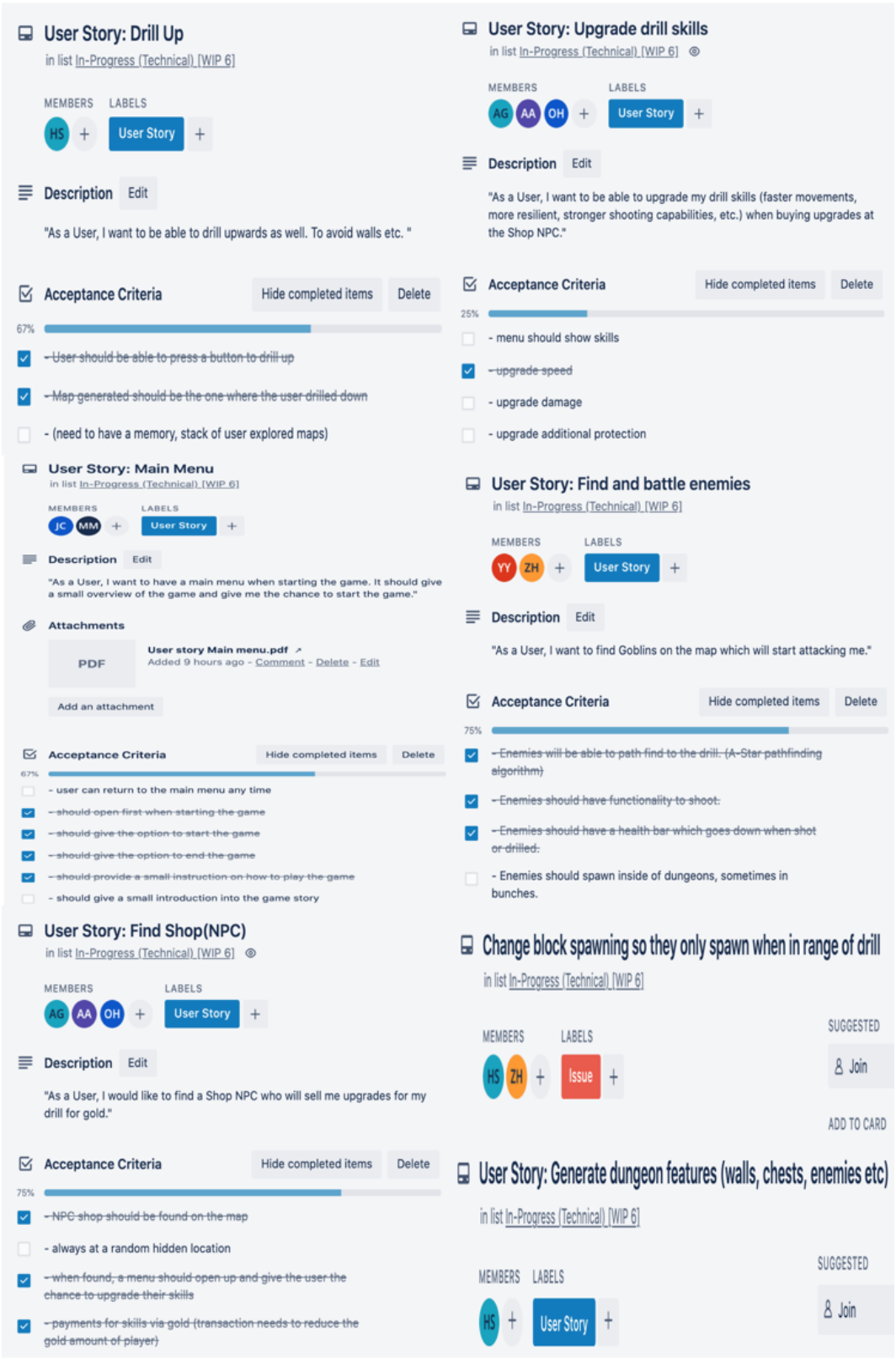

Figure 7: User stories in progress at the end of Sprint 4

6.5 Exception Handling

7 Sprint 5

7.1 Overview

During Sprint 5 we planned to continue working on the user stories that failed to meet all the acceptance criteria at the end of the previous week. With limited time remaining, we agreed it would be sensible for task assignment on these user stories to remain unchanged.

During the sprint planning meeting, the topic of product documentation was raised and we spent time together reading through the guidelines. While the game itself, in addition to the process documentation, were already looking in good shape, this part of the assignment certainly needed more attention in the remaining weeks. As some product documentation requirements remained unclear, we prepared several questions to ask the teachers on the Q & A forum and/or in the following customer meeting.

7.2 Review

Most user stories worked on during this week were completed and our backlog had been significantly cleared up at the end of Sprint 5. Upon reflection, we were in agreement that the game is in good condition and our focus should clearly be on the documentation in the following sprint. There was some concern within the team that with many documentation tasks remaining, we would not be able to implement some of the remaining user stories on the backlog. In particular, the idea of shelving the 'Boss Fight' user story was discussed, as some team members felt that it could take too long to implement. After discussion, we observed that it should be fairly quick to add bosses as they share many properties with the existing enemies.

Figure 8: Iteration of the game produced in Sprint 5, featuring health bars, undrillable blocks and limited vision

7.3 Meetings

7.3.1 Sprint Planning

Agenda Plan for Increment 5

Meeting Records

- Date: 21.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- What is product documentation? Demonstration video, user manual and software documentation. Things like docstrings etc.
- How do we want to go about writing product docs? User manual - we should start writing it now as towards the end we will have too much pressure. Maintenance manual -
- CRC cards - need to fix them up and add a bit more detail. Should be clear what they mean based on what we read.
- Tests - enumerated and versioned tests? These are required. Tests should be in 2 kinds - 1) fulfils the story, 2) unit testing.
- Can tests for fulfilling the story (i.e. per use case) be unit tests? Question for Julian.
- Question for Julian: What does customer interview + analysis mean in product documentation?
- Tests - will need to implement the majority of them this week as we have lagged behind. This will require that code is primarily maintained this week.
- This week the focus should be on getting everything into good shape so that the remaining two weeks can just be extensions of what is already in place. This goes for the code, process and product documentation
- For this week: 1) add tests 2) Polish the code's structure and documentation to be uniform 3) CRC cards and use cases 4) Finish in progress user stories
- Question for Julian: What is the user interface design for product content documentation? Is this pertaining to how the user interacts with it and how we chose to implement it?
- Look and feel of game: Do we want to design our own or not? We can take a little time to research alternative sprites etc. If we cant find any can try to make our own.
- Look into the quad tree map generation for optimising speed

Task Assignment

1. Make docstrings and code formatting uniform - Max, Aditya
2. CRC Cards - Everyone to work on their own class, add enough detail that its unambiguous but not verbose
3. Use Cases - John, Oliver

4. Unit Tests - Ahmed, Hugh, Zach
5. Product Documentation - Max
6. Process Documentation - John, Oliver (Add in overviews etc.)
7. Finish open user stories (Lower priority) - Same assignments as last week

7.3.2 Mid Week Review

Agenda

- Discuss progress on assigned user stories
- Identify any remaining blockers to deliver increment before customer meeting
- Assist team members in fixing any issues

Meeting Records

- Date: 25.11.2020 12:30PM
- Attendance: Ahmed, Aditya, Max, John, Oliver, Yiming, Zach
- Not Present: Hugh

Minutes

- Zach presents game update to team
- Issues with spawning in black area
- Health bar has been implemented
- Idea: add faster fire rate to shop to enable quicker shooting.
- Idea: Bullets can damage shield. Shield upgrades available at shop.
- Shop is broken. Ahmed is fixing it.
- We can get rid of chunking
- As you go down and difficulty increases, there should be fewer shops
- Yiming has added sounds: title music and effect music
- Discussion about time.sleep in 'play song' function - do we need it?
- Docstrings have been added
- Need to create product documentation template. Split into three parts. Maintenance guide will probably take the most time.
- John presents use case diagrams, still in progress. Discussion about best way to implement use cases
- Each user story should have one use case
- General direction of use cases could be: Main menu - start game - generation of features - user finds minerals - user battles enemies etc.
- Use case should focus on the flow of the game and how user plays it
- John and Oliver to keep working on use cases
- Zach working on bug fixing, eg. drilling down, issue with blocks not aligning to grid properly
- Max and Aditya working on product documentation template
- Changing imports and generating Pydocs on Thursday

7.3.3 Customer Meeting

Meeting Records

- Date: 27.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

-

Initial discussion with TA's

- Zach presents - HUD, sounds, reduced visibility, change blocks, health bar. Add more enemies and balancing.
- Oliver presents - Process Doc. Ensure it is legible. Try landscape mode (separate page). Preconditions - where the particular thing is before the use case begins
- Max - Product Doc - Docstring for functions. Need to talk about the dependency for user and setup for user. 1 doc for Developer and 1 doc for user (less technical).
- Unit tests and acceptance criteria relate back to user story

Presentation

- Zach presents update.
- Last sprint is next week

Customer feedback

- Likes how you can increase how far you can see.
- Likes the integration with the menu and game.
- perhaps too much space?
- Likes surprise factor of the game and increased performance.
- Question about tests - Few unit tests. Mainly Acceptance Criteria - Whether you built the right product.
- Uses cases and tests should be versioned.
- Docstrings use as a base. Something else needs to be added to show how the game architecture works with all the functional units

7.3.4 Sprint Retrospective

Agenda What the meeting is about

Meeting Records

- Date: 28.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- Good, should be mostly cleaning up the game now,
- Use MK docs for product manual
- Get rid of circular dependencies
- Need to be efficient with time with deadlines
- Sound User Story carrying over

Retrospective

-

7.4 User Stories

7.4.1 Backlog

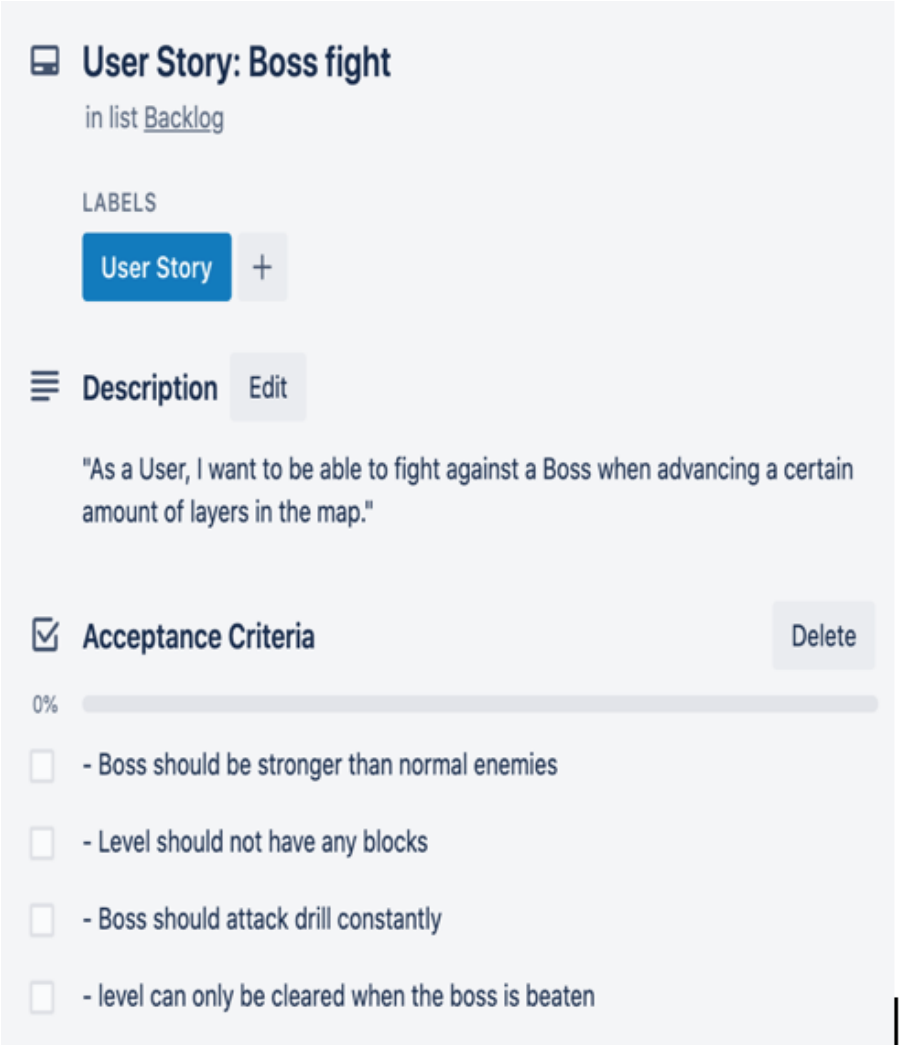

Figure 9: Backlog at end of Sprint 5

7.4.2 Completed Tasks

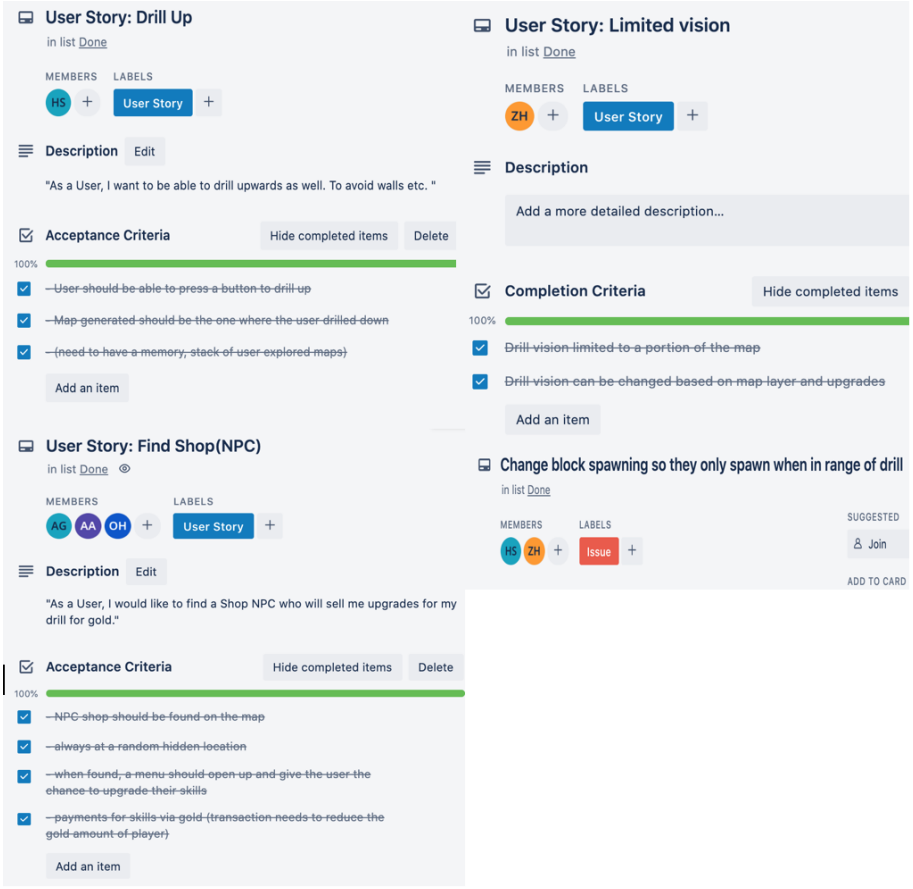

Figure 10: User stories completed in Sprint 5

7.4.3 In Progress

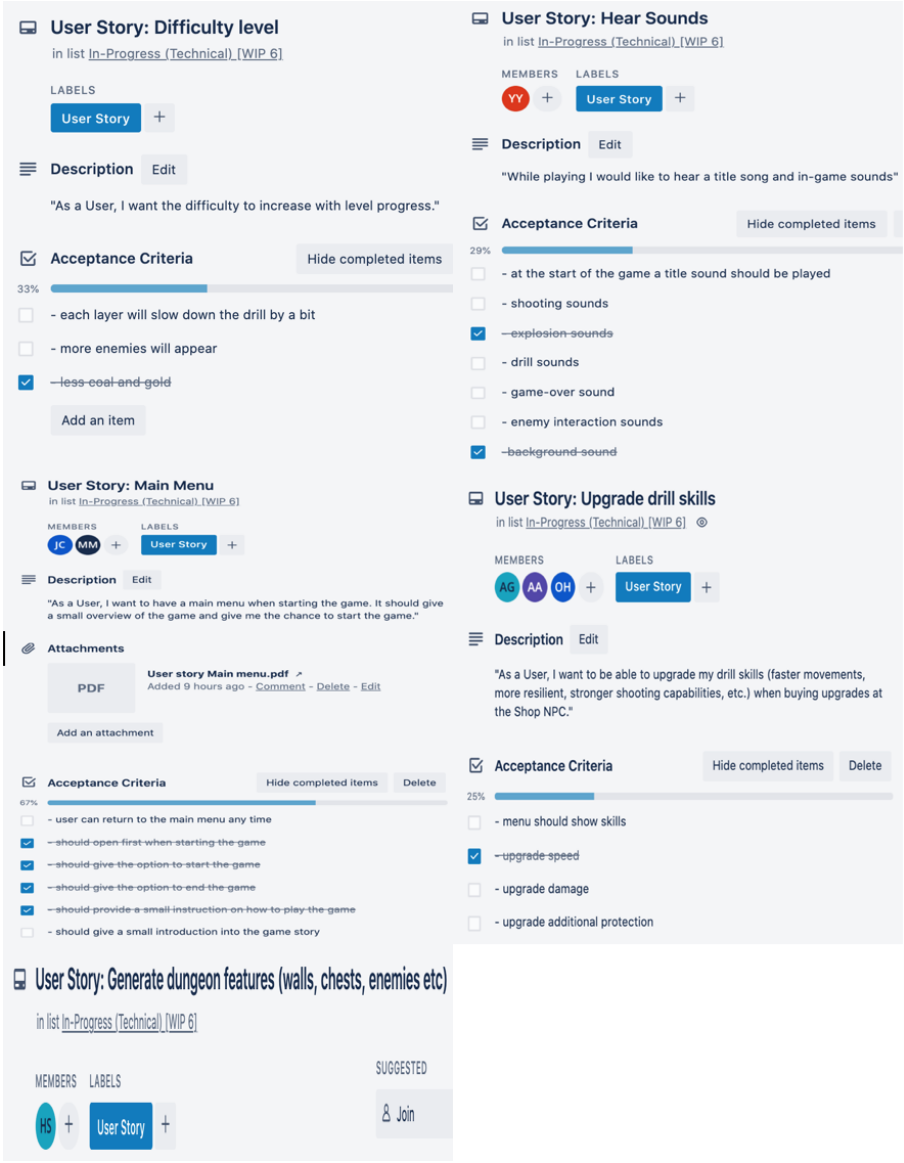

Figure 11: User stories in progress at end of Sprint 5

7.5 Exception Handling

(Need to rearrange to when it happened)

- Coal depletion when driving broke
- The aiming position of the drill turret doesn't update unless you move the mouse. It should track the mouse.
- Increment of Gold and Coal broke
- Fix turret aiming
- Fix bullet path outside map after scrolling
- Change block spawning so they only spawn when in range of drill
- When drilling down, the ammunition counter is resets

8 Sprint 6

8.1 Overview

With the deadline fast approaching, it was decided that this would be the final proper sprint for our project. We essentially aimed to have the game ready for release by the time of the following customer meeting. This would allow a buffer period in case of any necessary exception handling, and crucially provide time to finalise all of the product and process documentation. If time allows, small adjustments that do not require large-scale refactoring could also be carried out during the final week. However, this is considered low on our list of priorities. Our team recognised that it was important not to get bogged down striving for perfection in every aspect of the game. Rather, we should ensure the product is "good enough" to satisfy the customer's requirements. Potential extensions that we do not have time to implement can be included in the Maintenance Guide.

We were all in agreement that, until the deadline, more time needs to be spent on documentation than on game development. In the sprint planning meeting, incomplete documentation tasks were assigned with a view to completing them before the final week.

Figure 12:

8.2 Meetings

8.2.1 Sprint Planning

Agenda Plan for Increment 6

Meeting Records

- Date: 28.11.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

- User Story - Limiting where user can drill down. Drill down block (Hugh)
- User Story - change from boss - Mini bosses (Ahmed)
- User Story - More variation in enemies (Ahmed)
- User Story - dungeon generation. More features, clean up and balance (Hugh)
- Tests and Use Cases - numerated and versioned (Hugh, Max)
- CRC Cards - Needs updating and details added on (Ahmed)
- Process Documentation - Sprint Overview and Sprint Retrospective paragraph summary (Oliver), add use cases into word and add into overleaf and their precondition (Zach), add exception handling - add issues from Trello to overleaf (John)
- Product Documentation - User Manual (Aditya), Installation guide for the developer and end user (Zach), and Maintenance Guide (Aditya)
- User Story - Sounds (Yiming)
- Use Cases - (Zach and Oliver)
- UI Design - Need to ask (Could be drawings, diagrams, screenshots etc?)

Task Assignment

1.

8.2.2 Mid Week Review

Agenda

- Discuss progress on assigned user stories
- Identify any remaining blockers to deliver increment before customer meeting
- Assist team members in fixing any issues

Meeting Records

- Date: 2.12.2020 10:30AM
- Attendance: Ahmed, Aditya, Max, Hugh, Oliver, Yiming, Zach
- Not Present: John

Minutes

- Zach presents updated use cases to team
- Questions to ask Julian - last chance this Friday
- Max presents test log for all use cases
- Max presents updated user manual - should be in good shape to present this Friday
- Zach presents Pydoc for documentation. Discussion about including hyperlinks
- If we have Javadocs file, can we include a link to that in maintenance manual?
- How to submit source code? GitHub?
- Debug mode can be included and mentioned in maintenance manual
- Oliver and John to keep improving documentation and review writing in documentation/user manual
- Max came up with an interesting backstory for the game
- Instructions screen - include all commands and objective
- Add a number on the screen that shows the level user is on.
- Game shouldn't crash when user dies
- Important to keep each other updated on everything throughout remaining time - not just at meeting times

8.2.3 Customer Meeting

Meeting Records

- Date: 4.12.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

-

Initial discussion with TA's

-

Presentation

-

Customer feedback

-

8.2.4 Sprint Retrospective

Agenda What the meeting is about

Meeting Records

- Date: 5.12.2020
- Attendance: Ahmed, Aditya, Max, Hugh, John, Oliver, Yiming, Zach
- Not Present: None

Minutes

-

Retrospective

-

8.3 User Stories

8.3.1 Backlog

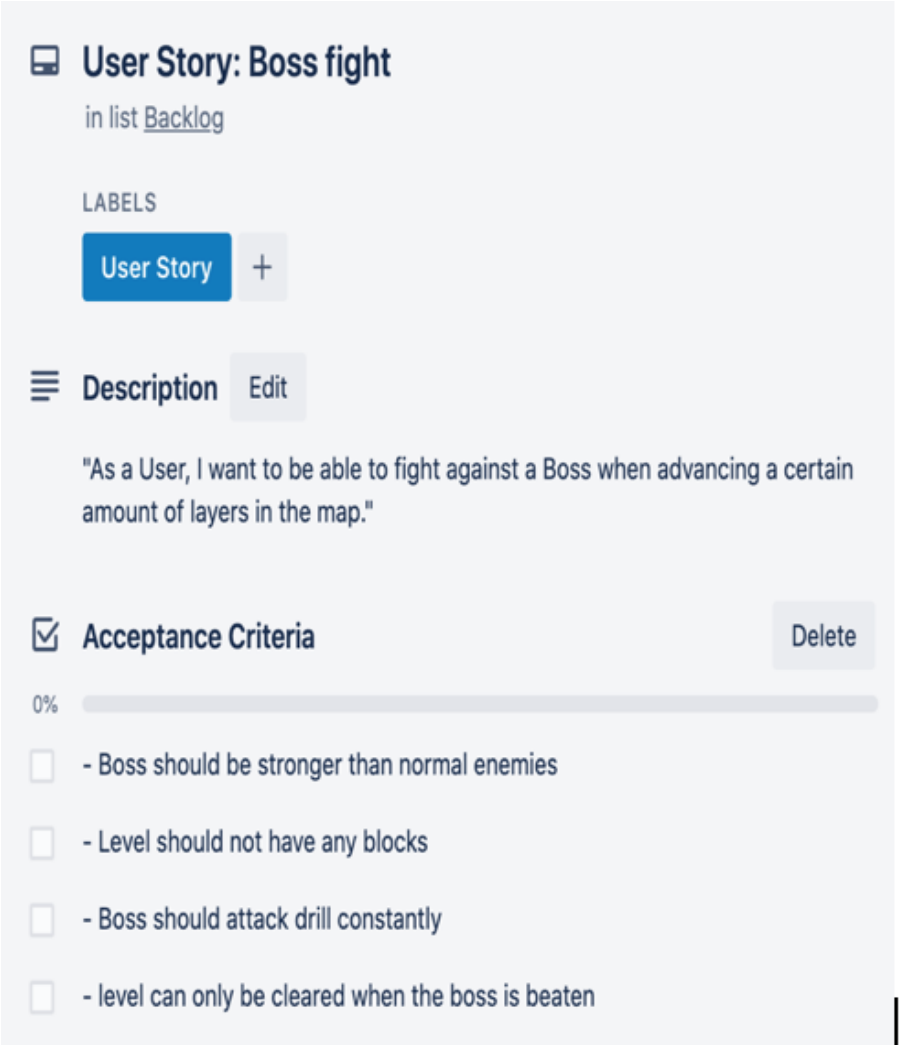

Figure 13: Backlog at end of Sprint 5

8.3.2 Completed Tasks

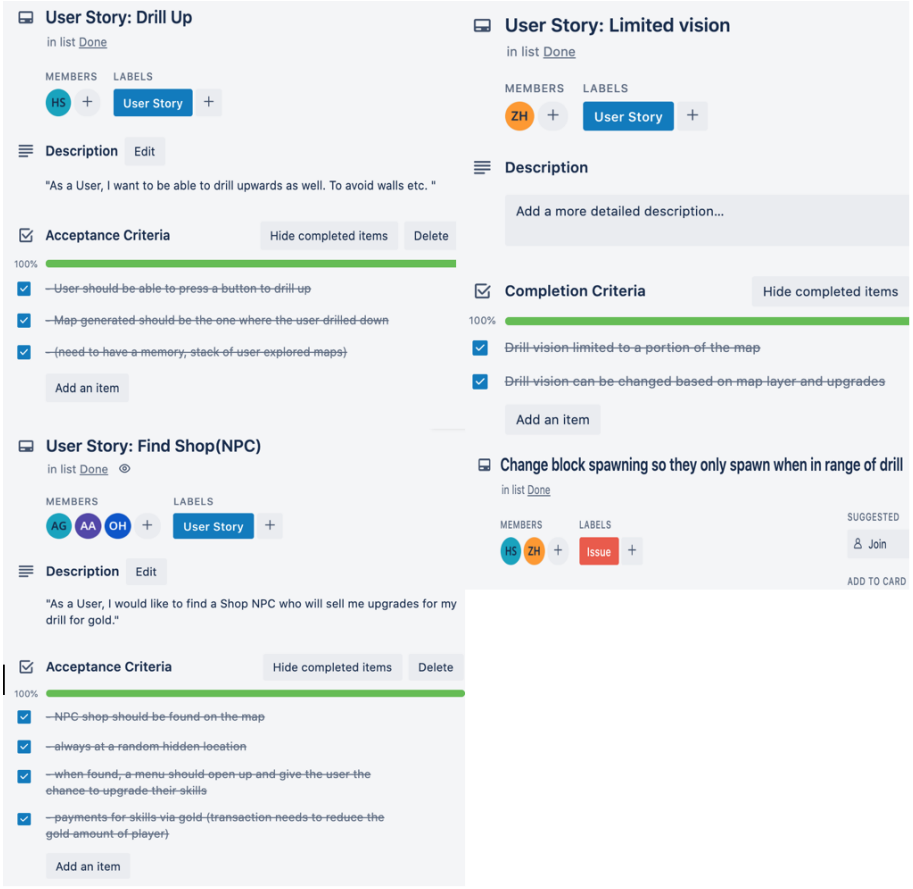

Figure 14: User stories completed in Sprint 5

8.3.3 In Progress

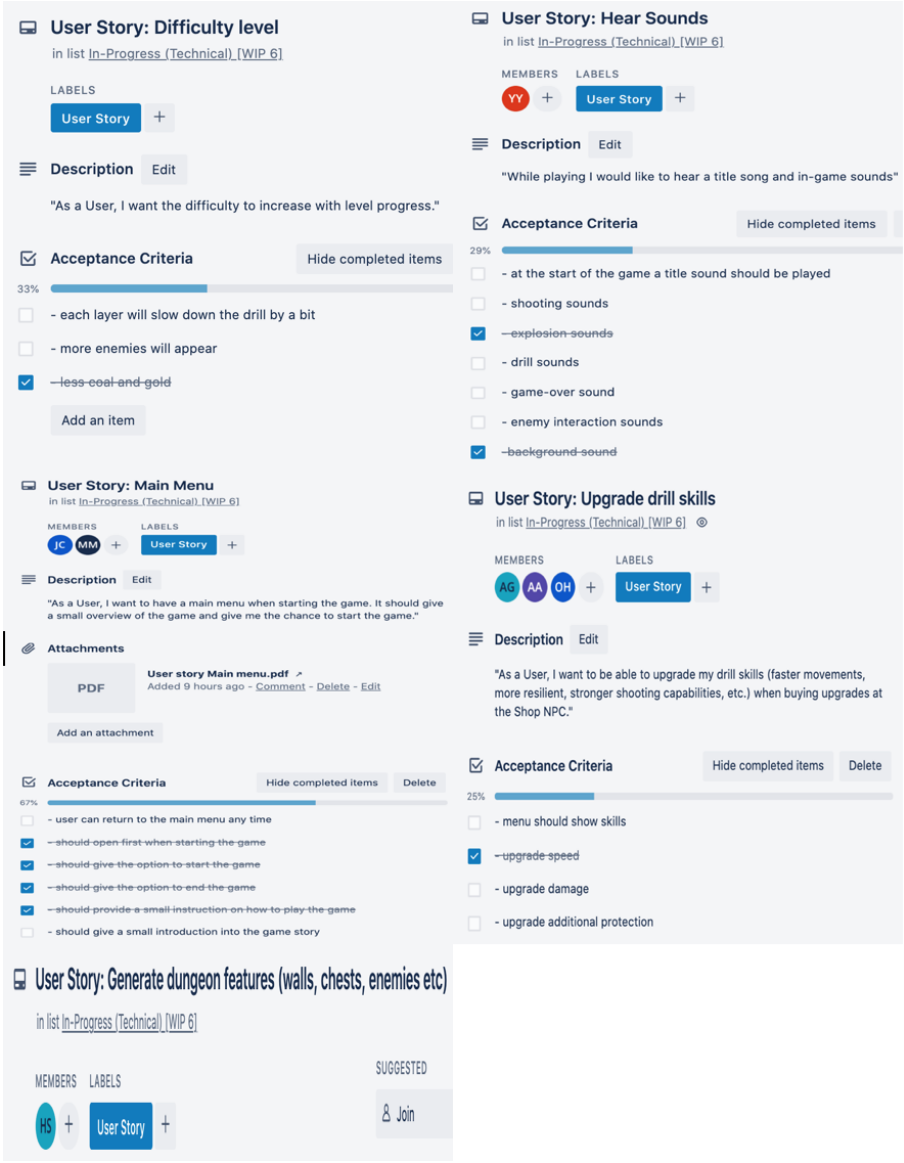

Figure 15: User stories in progress at end of Sprint 5

8.4 Exception Handling

9 Conclusion