Game Programming Laboratory

Grimmetropolis

"Attac & Protec"

TEASER

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Formal Project Proposal

1.1 Game Description

1.1.1 Overview

The idea is a tower defense game with co-op multiplayer capabilities. Each player will control a character in a 3D top-down game world. The players will start at a castle which they have to protect. The players have to collect resources in order to construct buildings. Buildings have mainly two purposes: They help you collect more resources or defend against the enemies. The enemies will constantly come to attack the castle, buildings or the players. They will sometimes attack in smaller groups or in bigger waves. In the course of the game, the enemies become stronger and stronger. Therefore, you need to upgrade buildings or train your character. This also requires more resources which can be accessed when you expand around you castle. Eventually, you will lose. The premise of this game is to find the best strategy to defend against the enemy as long as possible.

1.1.2 Background Story

You are in the hands of some very powerful magical items. Protect them at all costs! With the power of the magical items, you are able to harvest the resources of the world and build a strong economy. But you are not alone! Enemies will come for you and the magical items! Work hand in hand in a team with Puss in Boots, Rapunzel, Cinderella and other famous fairy tale characters, each one of them with their own special quirks.

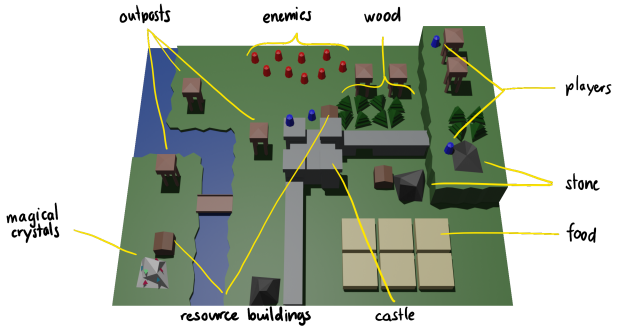
1.1.3 Design Decisions

Introduction

The game genre is mainly a tower defense game, but it also contains elements from a strategy and role play game. The visual style is kept fairly simple with low poly art. The camera is looking from the sky down to the world like in a typical top down view in games like *The Legend of Zelda: Link's Awakening (2019).* The players start as a Grimm's fairy tale character in a world around a castle. The players can collect resources from the world and construct buildings. Buildings support the players at collecting resources or defending against enemies. The players themselves can attack the enemies as well. The goal is to defend the castle as long as possible. The game is over when the the castle is completely looted.

World

The world is a finite map which is structured in square tiles. A tile can be clear or occupied by some natural structures. Natural structures include trees, big stones, rivers, hills or mountains. In the middle of the map is the castle. It will cover three by three tiles. Other buildings can occupy from a single tile to three by three tiles. As an initial step, only one map is planned. The reason for this is that people can compare their score with other players and optimize their strategy. On a later stage of the game development, new maps with interesting features can be played as well. Such features might be a castle surrounded by a river or at the border of the mountains which allow for new defense strategies during game play. A possible addition might be randomly generated maps. It might be difficult to create interesting maps by a random algorithm but it is certainly considered as goal at a very late stage of game development.



Truncated part of the game world. A possible base configuration during gameplay.

Player

The players can choose a character from the Grimm's fairy tales. When every player is ready, they will start in the world around the castle. A player is around half the size of a map tile. That means, two player can walk side by side when walking along a one tile wide path. A player can carry two items which he can use to do various tasks in the world map. Depending on the items the player holds, he can collect resources, construct buildings or fight enemies. The more a player does a certain task, the faster he becomes at doing it permanently. Therefore, a good team distributes the various tasks between the players. Every player has a unique skill which is dependant on the character he chose at the beginning of the game. Such unique skills might be for example pushing enemies away, jumping over stone walls or special magic abilities.

Resources

The map contains resources distributed in clusters all over the map. The are three common resources: wood, stone and food. Wood can be collected from trees around the map and stone from stone quarries. These resources are used to construct buildings. They can be collected by the players or by buildings and are directly transferred to a common resource pool. The resources gradually regenerate after some time. This also means, a player cannot harvest infinitely much resources from a single deposit in a short time. The regeneration of a resource can

be supported by buildings. Food can be harvested from farms, another type of building. It is required for certain types of buildings or as an upkeep. A rare resource is the magical crystal. It is only available further away from the castle. Therefore, it is not easy to harvest this resource. This resource is needed for special buildings or temporary buffs for buildings or players.

Buildings

Buildings can be categorized in two types of buildings: defensive and supporting buildings. The defensive buildings include a castle, outposts, stone walls and trenches. The castle and outposts attack close by enemies. Stone walls hinder enemies from walking freely around. Trenches offer more protection to the player from incoming fire. Supporting buildings include resource buildings, farms, hospitals, maintenance buildings, bridges and tunnels. Resource buildings give the player a passive resource income if build near resource deposits. Farms deliver food. Hospitals heal the players. Maintenance buildings repair other buildings or give them permanent buffs as long as the building stays. These buildings all have a non linear upgrade tree. Bridges can be build over rivers to reach new areas of the map. Tunnels have the same use as the bridges but are used for mountains. The enemies will use these structures as well to reach the castle.

Items

In order for the players to do certain tasks, they need to equip themselves with the right items. The player can get their items at the castle and change it whenever they want to do so. At a later stage of the game development, an idea might be that the players start with some necessary tools, but have to produce the other items at a special building. There are two types of items: weapons and tools. Weapons include swords, lances, shields, bows, crossbow or muskets. The weapons feel different to use and have different efficiency against certain types of enemies. Tools include items to harvest the resources: food requires a scythe, wood requires an axe, stone requires a hammer, magical crystals require a pick axe. Buildings can be build with a trowel.

Enemies

The enemies will attack from any direction as long as the map layout does not hinder it. They usually attack in waves. Between the waves, the player has time to collect resources and construct buildings. The enemies will attack between the waves as well, but only in very small groups. There are going to be different types of enemies available: close combat fighters (sword fighter, lance fighter, beasts), ranged units (archer, wizard) and siege units (catapult, trebuchet, giants), maybe even flying units (crows). Depending on the base the players have built or the map layout, the enemies should attack cleverly. As an example, if the player is completely protected by stone walls, the enemies will first try to breach the wall with siege units before attacking with all their close combat units. After defeating enemy units, they will drop resources. An idea is also to introduce boss enemies which will come at certain waves. They will drop special items which the player can equip.

Tutorial

Whenever the players start a new game, another character spawns around the castle. He will talk about the first steps to build up a working economy and how to build a defense against the enemies. The player can skip the tutorial by killing him. He will drop some resources for the players to collect.

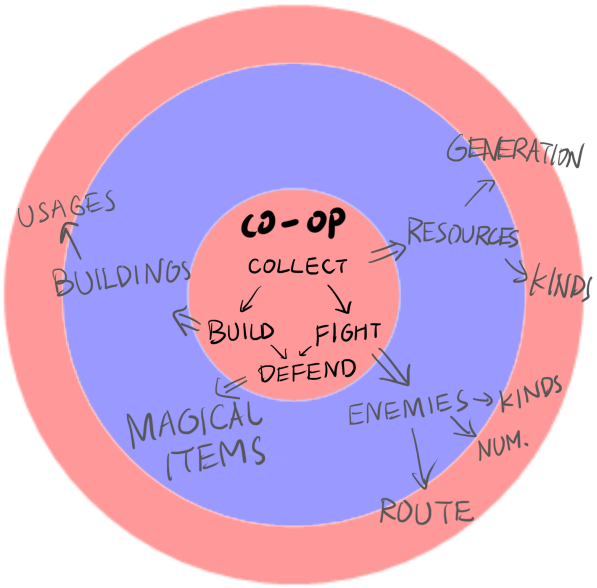
1.2 "Big Idea" Bullseye

Core Idea

Players cooperate with each other and defend the castle as long as possible by fighting against the enemies, collecting common and rare resources, constructing and upgrading buildings and improving skills.

Technical Innovation

Each player has his own special ability depending on the character from the Grimm's Fairy Tale. Different tools can be used to harvest resources and constructing buildings. The palyers need to expand to get more resources. An algorithm needs to be developed for enemy attacking routes.



1.3 Technical Achievement

In the tower defense genre, usually the enemies either take a predefined path or the shortest path to the base while ignoring towers. This leads to the incentive of placing walls to create artificial

choke points and build defenses around them such that the enemies stay under fire as long as possible and run to their death.

The enemies however should act in an intelligent way using their knowledge of the map. They should avoid well defended choke points if they can simply take a longer path. Furthermore they will retaliate against towers and try to breach walls were they are less defended.

usual TD behaviour: enemies take shortest distance to target or there is only a distinct amount of predefined paths to target. usually avoid attacking obstacles. ignore towers.

our behaviour: avoid powerful defenses attack walls if path is shorter/safer prefer attacking walls where there are few defense prefer using counter units (wave layout changes depending on defensive buildings)

challenges for player: needs to have some defensive buildings on all paths (no single choke point) needs a balanced defense (don't only use the same tower type) needs to adapt/improve defense

Ideas: Do the enemies know our current defensive layout or a previous one? Do the enemies build structures of their own? (bridges, tunnels, defense on resource locations) Do the straggler count as scouts? (If they escape, the next wave will be better prepared.) Provide an UI-layer to show potential enemies attack routes? Hit and run tactics? Do the enemies have a vision? (they only know the defensive layout of where they attacked)

@Note: Your game should include at least one core technical item. This technical element should help your game stand out in an innovative way by providing an element that goes beyond the normal functionalities. This is your chance to select a concept from another course or something that you have always been interested in and implement it in the context of your game. Try to impress us, while still ensuring that the concepts you target fit within the scope of the course.

@Note: This section should detail the core technical item you plan to include. You are free to present more than one idea, but remember that it's better to be super successful at one item than to try to include many and fail.

1.4 Development Schedule

@Note: The development schedule is crucial and should contain two basic parts. First, you must provide a layered development description of your game that divides the development schedule into five categories based on how crucial each element is. Second, you must provide a timeline for the course including major milestones and deliverables.

@Note: Structure your development so that you complete each layer before going on to the next. Plan exactly what is entailed in each layer, and which team member is going to do each component. Include this layered description in your proposal.

1.4.1 Layered Task Breakdown

@Note: You can't accurately anticipate how long each step in your project is going to take. Consequently, you need to make a detailed development schedule that is layered.

Functional Minimum

- A single character can play the game.
- The map contains no natural structures apart from the trees.
- The only resource available is wood.
- The character can collect resources, build outposts and fight enemies without any items.
- A single type of close combat enemy will attack the castle by going straight to it.

Low Target

- Multiple people can play the game at the same time. The camera will zoom out so that all players are always visible.
- The map now also has more natural structures like big stones or rivers.
- Stone can be now collected as an additional resource.
- New buildings like resource collecting buildings and stone walls should be available.
- The outposts should have a simple upgrade tree available.
- Close combat weapons and tools have to be used by the players now.
- A single type of ranged unit and siege unit will appear in the waves.
- The enemies attack with more intelligence: If they are attacked by something, they counter attack.
- A simple game menu to start with.

Desired Target

- The player have some basic skills which they can improve.
- The players are unique characters with a special skill.
- The map contains now also hills and mountains.
- Magical crystals can now be collected.
- At least two enemies of each type except the flying type should appear in waves.
- Further buildings like the trenches, farms, hospitals, maintenance buildings and bridges should be available.
- All added buildings should have a unique upgrade tree.

- The player should also have access to ranged weapons like a bow.
- The tutorial character exists in the world map.
- The players have the possibility to pause the game.
- The game over screen should appear when the players lose.

High Target

- All previously mentioned enemy types should be available
- Boss enemies are introduced which attack at certain waves.
- Boss enemies will drop very strong and unique items which the players can equip.
- All previously mentioned weapons should be now available.
- More maps are created which should offer very interesting strategies.

Extras

- Each player has their own camera view when the camera has to zoom too far away to get all players on one screen.
- Map generation should deliver always new experiences while the playing the game.
- The game can be played online with other players.

1.4.2 Task List

@ Note: Provide a table showing who is responsible for each task, how many hours will each task require, etc.

In the following two pages, a list of all tasks can be seen. They are listed with the responsible person and the inital planned duration for this task.

1.4.3 Timeline

@ Note: Provide a Gantt chart when each task will be started and finished, etc.

No Gantt chart created yet. Will be done next week.

1.5 Assessment

Compared to conventional tower defense games, our game offers more varieties with the add-on RTS elements and multi-player collaborations. Players are free to choose different characters

1	**Functional Minimum**		
1.1	Inital engine setup	Michael, Manuel	24h
1.2	Create map consisting of tiles	Yelan, Tianyu	16h
1.3	Player control	Manuel	16h
1.4	Assets (player, castle, enemy, tree) for the functional minimum	Yelan, Tianyu	16h
1.5	Player can collect wood as a resource	Yelan	32h
1.6	Fighting system with the player	Michael	24h
1.6	Very simple AI pathing aiming for the castle	Manuel	32h

2	**Low Target**		
2.1	Player can build an outpost	Michael	24h
2.2	Implement multiple players	Manuel	24h
2.3	Adding new map features like big stones or rivers	Tianyu	32h
2.4	Add new stone resource	Yelan	16h
2.5	Asset creation for buildings (stone wall)	Yelan	16h
2.6	Asset creation for enemies	Yelan	40h
2.7	Asset for items (5 items)	Tianyu	32h
2.8	Asset for UI	Tianyu	16h
2.9	Adding new resource buildings	Michael	32h
2.10	Adding stone walls	Michael	4h
2.11	Adding UI for building's upgrade tree	Michael	32h
2.12	The player can take items with themselves	Manuel	16h
2.13	Adding items like swords and their behaviour	Manuel	16h
2.14	Adding tools	Manuel	16h
2.15	Add a ranged and siege enemy unit	Michael	32h
2.16	Enhancing enemy AI (counter attack)	Manuel	48h
2.17	Adding a simple game menu	Michael	32h
2.18	Testing out the game	Everyone	32h
2.19	Balancing the game	Everyone	32h

3	**Desired Target**		
3.1	Players have a basic skill	Michael	24h
3.2	Assets and implementation of unique characters	Michael, Yelan	64h
3.3	Map contains hills and mountains	Tianyu	24h
3.4	Adding magical crystal as a new resource	Tianyu	12h
3.5	Asset creation for buildings	Michael, Yelan	40h
3.6	Asset creation for enemies	Yelan	40h
3.7	Asset for bow	Tianyu	16h
3.8	Add more enemies types (3 enemies)	Manuel	32h
3.9	Add more buildings: trenches, farms, hospitals, maintance buildings and bridges	Michael	16h
3.10	Add functionality to buildings	Michael	40h
3.11	Add upgrade tree to buildings	Michael	24h
3.12	Adding a bow for the player	Manuel	32h
3.13	Adding pause menu	Michael, Yelan	32h
3.14	Adding a game over screen	Michael, Tianyu	24h
3.15	Testing out the game	Everyone	32h
3.16	Balancing the game	Everyone	32h

4	**High Target**		
4.1	Add all enemy types (4 more enemies)	Manuel	32h
4.2	Asset for additional items	Tianyu	24h
4.3	Asset creation for boss and enemies	Yelan	48h
4.4	Add a boss enemy	Michael	16h
4.5	Add special items dropped by the boss enemy	Michael	8h
4.6	Adding different kinds of weapons	Manuel	24h
4.7	Add more maps	Tianyu	16h
4.8	Improve intelligence of the AI	Michael, Manuel	64h
4.9	Add some cool information to the game over screen	Manuel	32h
4.10	Testing out the game	Everyone	32h
4.11	Balancing the game	Everyone	32h

inspired by the Grimm's fairy tales with their unique abilities and fight together to protect the castle in a fantasy world. During the game, players have a lot of freedom in what they do. Therefore, the players can develop various strategies to fight against the enemies. The enemies of the games are designed to be more intelligent who can also make use of their knowledge of the map to avoid choke points, unlike taking a predefined or shortest path to the base in traditional tower defense games. This innovation adds more fun to the game, making the game experience more thrilling and challenging. The collaborative setting of the game makes our game a perfect fit for a multiplayer couch game with friends and may be of particular interest to strategy game addicts ranging from young teenagers to adults, seeking challenging and off-center gameplay.

@Note: Tell us what the main strength of the game will be. What part is going to be the coolest? Who might want to play this game? What do they do in the game? What virtual world should the system simulate? Basically, you are setting up a world view for your subsequent design. What criteria should be used to judge if your design is a success or not?

Prototype

(Min 3, Max 5 pages)

@Note: The key goal of this part of the project is to develop a prototype of your game that distills out the core game play. The prototype should incorporate the game mechanics while providing only a crude approximation of other features like artwork.

2.1 Prototype Setup

@Note: Include sketches and photos of your prototype in such a way that you can demonstrate how the prototype works and how the gameplay is modeled. How did you model environment, characters, and other features of the game?

2.2 Playing Experience

@Note: Your experience playing the game. Was it fun?

2.3 Findings and Conclusion

@Note: Explain what you have learned from creating the prototype. What has proved to be harder (or easier) than expected? What design revisions have you made to your game based on your experience creating the prototype?

Interim Report

(Max 5 pages)

3.1 Progress

@Note: Describe how many layers you have finished. You can include screen shots to help explain your game so far, and text to describe how a user would interact with it. Our hope is that you have completely finished layer 2 and are well into layer 3.

3.2 Challenges

@Note: Explain what has proved to be harder (or easier) than expected. What design revisions have you made to your game as a result of what you've learned with the implementation? Discuss the implementation challenges you faced. Were there aspects that you wanted to build but were unable to do so?

3.3 Future Work

@Note: What are the planned tasks that will be implemented next? Shortly explain.

Alpha Release

(Max 5 pages)

@Note: Follows the same guidelines as the interim report chapter

4.1 Progress

@Note: Comment on how far you have progressed and show us what is exciting about your game. Ideally, you will have met the goals outlined in layer 3 (your desired target) and possibly part or all of layer 4 (your high target). You can include screenshots.

4.2 Challenges

@Note: Explain what has proved to be harder (or easier) than expected. What design revisions have you made to your game as a result of what you've learned with the implementation? Discuss the implementation challenges you faced. Were there aspects that you wanted to build but were unable to do so?

4.3 Future Work

@Note: What are the planned tasks that will be implemented next? Shortly explain.

Playtest

(Max 5 pages)

5.1 Playtesting Session

@Note: Describe who you recruited for playtesting and how you organized the playtesting sessions. If possible, include some photos.

5.2 Questions and Comments

@Note: List the questions you chose to ask the testers. Summarize their answers. Comment on overall trends you learned from the exercise, as well as any specific suggestions that were particularly useful.

5.3 Design Revisions

@Note: Finally, describe any changes you made to your game based on the playtesting.

Conclusion

(Max 5 pages)

6.1 Final Results

@Note: In this chapter, first provide a summary of your final results including screenshots from your final game. Comment on any significant changes from the alpha release.

6.2 Experience

@Note: Here you should provide commentary about your experience during the class. How well did your initial design ideas materialize into the final game. Were you able to follow your development schedule, or did you deviate significantly from it? How did the different elements of the project structure (development schedule, prototype, playtesting, etc.) contribute to or hinder your progress?

6.3 Personal Impressions

@Note: Did it meet your expectations? Are you happy and proud of your game? Do you feel there wasn't enough time or that the schedule was too compressed?

@Note: You might also consider these questions:

- What was the biggest technical difficulty during the project?
- What was your impression of working with the theme?
- Do you think the theme enhanced your game, or would you have been happier with total freedom?
- What would you do differently in your next game project?

- What was your greatest success during the project?
- Are you happy with the final result of your project?
- Do you consider the project a success?
- To what extend did you meet your project plan and milestones (not at all, partly, mostly, or always)?
- What improvements would you suggest for the course organization? (Perhaps in D1 evaluation)?
- Did you like using MonoGame?