

COMPUTER GAMES LABORATORY DOCUMENTATION



Defend the City

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Game Idea Proposal

Game Description

Our game takes place in medieval times setting combined with some fantasy aspects. You control in a standard 3rd person fashion a hero, whose task is to protect the kingdom from a series of attacks on different cities of bloodthirsty creatures. The attack is continuous but sometimes offers some time where the soldiers of the city can defend on their own while you prepare some additional defenses to assist you when the attacks intensify again. Smaller and larger enemies of different types have different targets like defeating your defensive forces or simply destroying the buildings. Don't let the enemies take over the mystical power source of the village, or the village is doomed and you're forced to retreat because you might still be able to win the war in a future fight. But the task of the hero is way beyond only protecting the heart of the city: The hero has to keep the casualties as low possible.

In the beginning and during the quieter phases of the attack stream the player can come up with crazy and clever ideas on how to defend the city. The core idea of this game is that the player needs to use the destructible and buildable buildings/environment to maximize the efficiency of the defense. The hero is able to place spike-fields to block roads, position barrels of black powder, setting up oil fields to slow the enemies down and optionally also ignite them to assist them in the defense. But due to the fact that constructing defensive objects is so expensive, the hero is also able to destroy houses to block roads, set corn fields on fire to hinder the advancing enemies or blow up the local bridge to block direct paths to the center and thus potentially sacrifice some buildings for the greater good. But be careful which buildings or structures you destroy. Some of them have special functionalities (and if they are gone, you can't replace them).

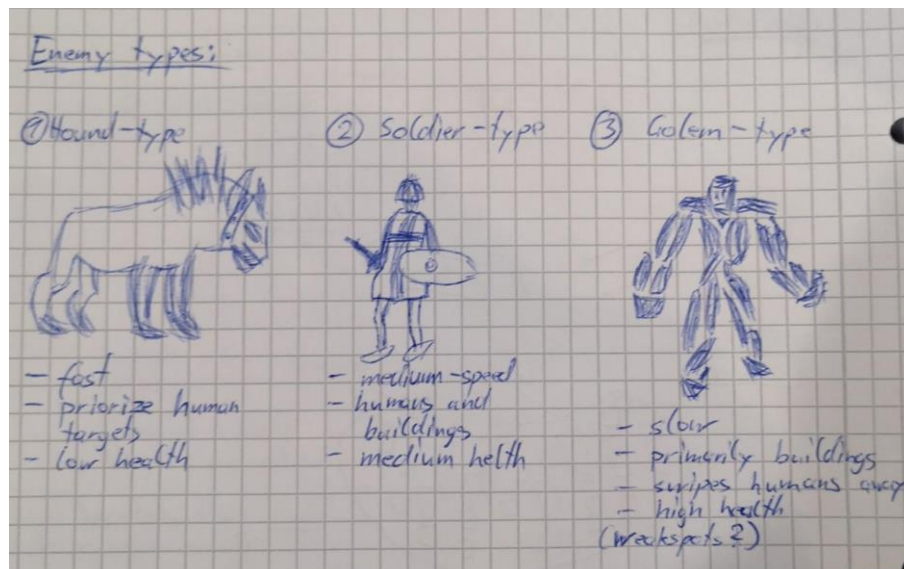
Special buildings include:

- Barracks, where you can spawn fighters which will fight by your side. You can control your fighters by ordering them to defend specific strategic points on the map
- Smithy, which will periodically provide you with equipment upgrades
- Factories, that will provide you with valuable resources for building your traps
- Watchtowers, which will provide you with aurally information about incoming enemies

But the enemies won't always drip in in a small stream. During the mass attacks you have to use all available resources and also participate in defending the city. As a mage you have special abilities to aid you: throwing fireballs to damage enemies and ignite oil or black powder and an AOE spell to fight off the creatures. But you can also help the fighters, which are fighting by your side, with a healing spell. It is important to note that some of these spells can also do harm to the village you would like to keep alive!

The enemies only goal is to overtake the village with its mystical power source and kill and destroy everything and everyone along their paths. There are three types of enemies which behave differently and thus have to be tackled using different approaches.

- The fast dogs are sprinting through the village to find a way to the center and try to kill all humans in their path. Their main goal is to fight against your troops and clear the way for the others. An effective approach against these enemies is to group your units to fight them and to hinder them from advancing. This small and fast enemy type is not capable of destroying things.
- The giants' goal is just destruction. They try to clear the way for the soldiers by destroying the defensive structures and houses where units could find cover.
- Finally, there are the regular soldiers. These units fight against your soldiers but also can destroy your buildings.



If an enemy unit reaches the power source and captures it the game is lost and you have to retreat to maybe hold the next village in your desperate attempt to not let the enemy become too strong.

The main goal is to survive until a critical point, where either the reinforcements arrive or the enemies give up and retreat. By winning the battle you will achieve great success and a score will be calculated based on several parameters. To encourage strategic thinking and keeping the casualties as low possible one of the parameters will be the amount of standing buildings.

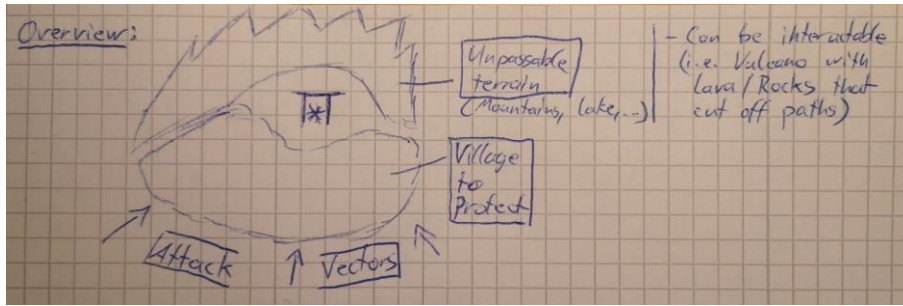


Figure 1: General overview showing the impassable terrain in the back, the village in the middle and the approaching enemies from the front.

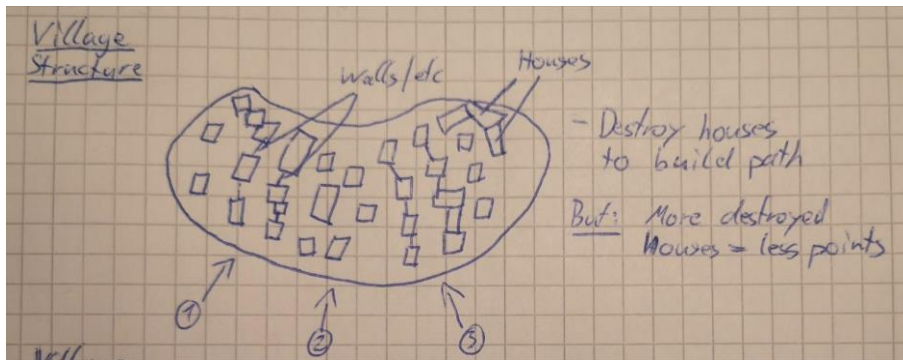


Figure 2: The village with houses walls and paths the enemies could take.

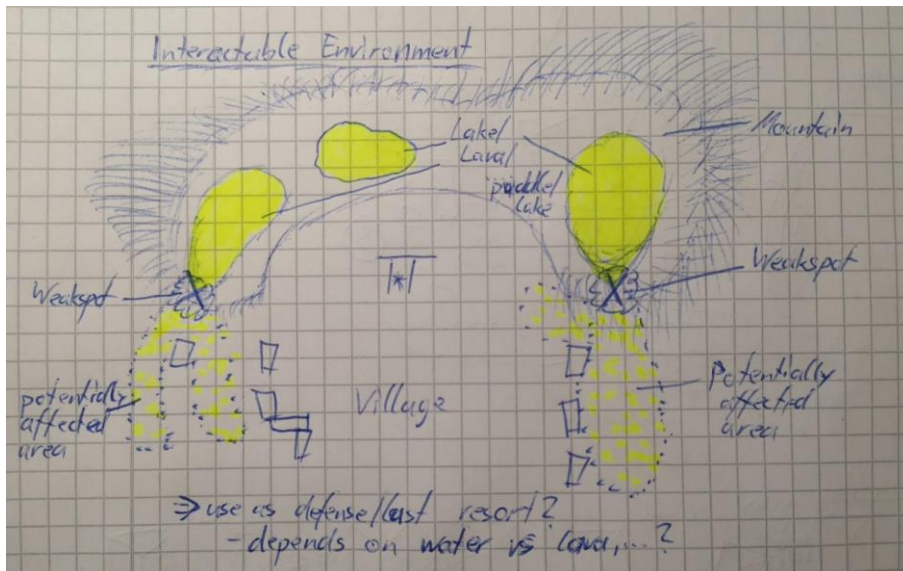


Figure 3: The village was built next to a volcano that can be used to emit lava at certain points.

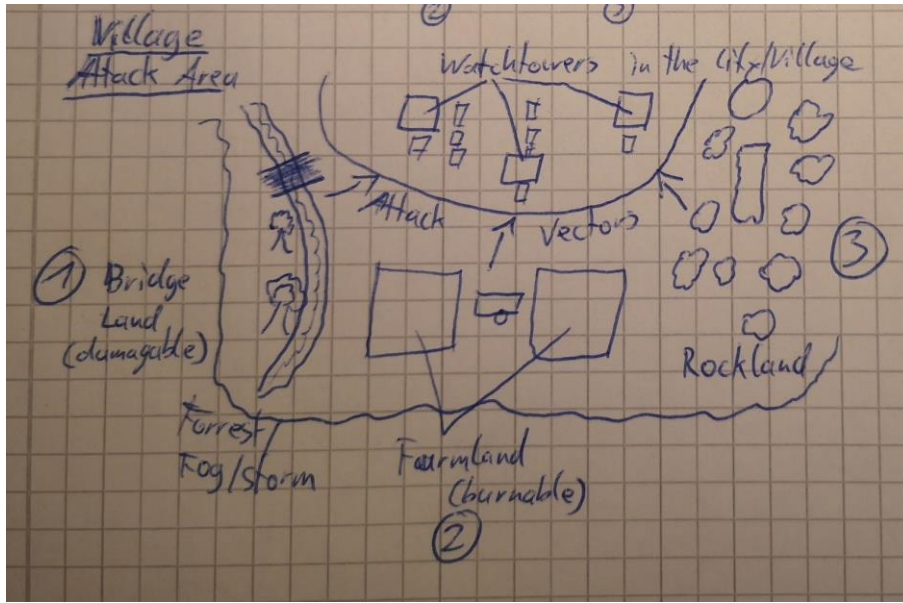


Figure 4: The village is attacked from very distinct sides and when an attack comes from one direction the watchtowers tells the player which side he or she should focus. Some sides also feature a tactical component like a destroyable bridge or burnable farmland

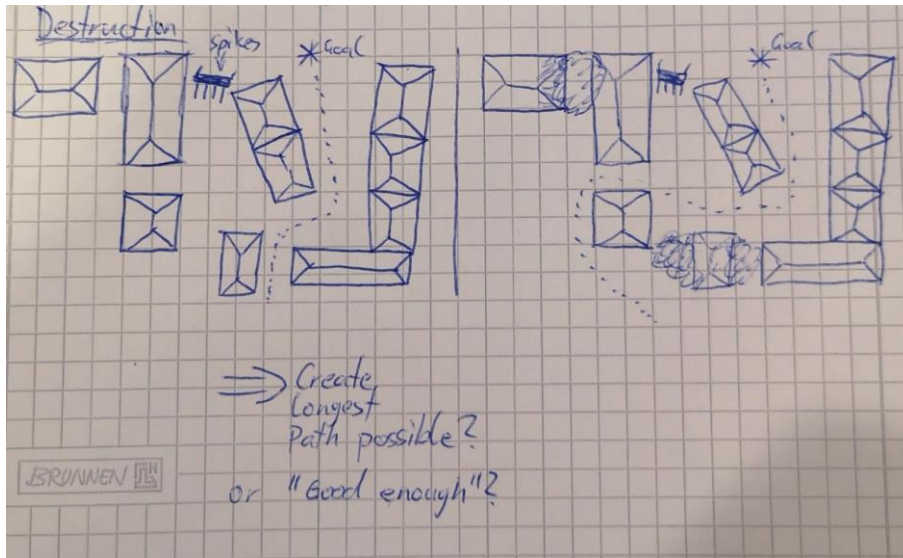


Figure 5: The debris of destroyed buildings and walls will block the path enemies in such a way that they need to take a different road.

The game is played from a third person perspective similar to the game called "Fictorum" seen below.

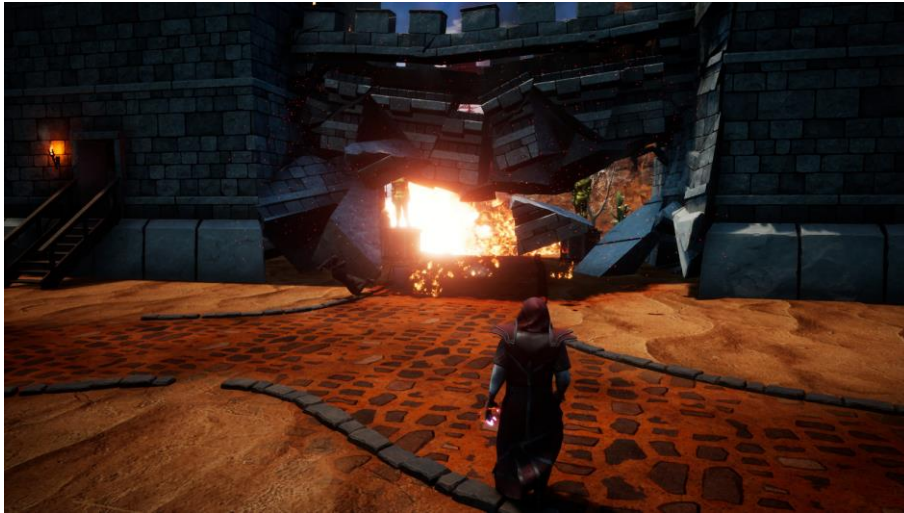


Figure 6: Picture of the game "Fictorum"

Technical Achievement

Our technical achievement is that objects in the environment will interact with each other for example caused by the ability of the player to destroy the environment which affects the objects surrounding the destroyed element/structure. Further flying or rolling parts of the destroyed buildings cause damage. The destroyed buildings and debris create new obstacles for the enemies in such a way that they have to adapt their path to the center.

Talking graphics, we will implement a special blending shader that blends the edges of specific objects with the ground, to improve the impression of a continuous terrain and increase immersion.

"Big Idea" Bullseye

The highlight of the game is destructible environment, which has also an ingame purpose and isn't just a gimmick. This will be our primary feature which will lead to a unique game experience and enables the player to make strategic decisions to achieve his goal of surviving.

Schedule & Tasks

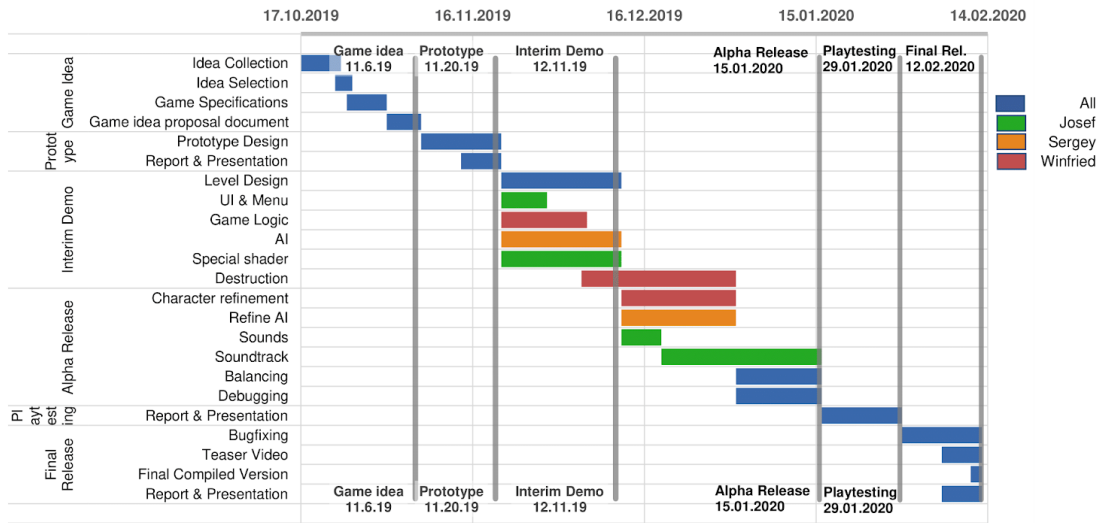
Layered Task Breakdown

1. Functional minimum
 - a. Controllable character (walking around and shooting fireballs)
 - b. Attacking enemies
 - c. Win/Lose condition: mystical power source

2. Low target
 - a. Structures (houses, trees, etc.) can be destroyed
 - b. The destruction is controllable in such a way that the path the enemies take to the center can be shaped by the players will
 - c. Level/City design
 - d. Smart enemies (path planning)
 - e. Score system
3. Desirable target
 - a. More possibilities of shaping the path of the enemies by placing oil traps, spikes etc.
 - b. Some functional buildings (like factories)
 - c. Enemies with different priorities (destroy buildings or find path to center)
4. High target
 - a. Different enemy types (Fighter/Destroyer)
 - b. Controllable minions fighting on your side
 - c. Additional spells (AOE and healing spell)
 - d. Additional strategic possibilities
 - e. Blow up the bridge
 - f. Let lava flow from the mountain into the city
5. Extras
 - a. Campaign where the outcome of previous defenses influence the upcoming attacks
 - b. Multiple heroes
 - c. Skill trees
 - d. Customization (Hats, ...)
 - e. Multiplayer

Timeline

Defend the City: PROJECT TIMELINE



Project Start		columns used to create the chart									
CATEGORY	TASK	START	END	COLOR	Start	Blue	Red	Green	Brown	Orange	Purple
Game Idea	Idea Collection	10.16.19	10.23.19	Blue	10.16.19	8	0	0	0	0	0
	Idea Selection	10.23.19	10.25.19	Blue	10.23.19	3	0	0	0	0	0
	Game Specifications	10.25.19	10.31.19	Blue	10.25.19	7	0	0	0	0	0
	Game idea proposal document	11.1.19	11.6.19	Blue	11.1.19	6	0	0	0	0	0
Prototype	Prototype Design	11.7.19	11.20.19	Blue	11.7.19	14	0	0	0	0	0
	Report & Presentation	11.14.19	11.20.19	Blue	11.14.19	7	0	0	0	0	0
Interim Demo	Level Design	11.21.19	12.11.19	Blue	11.21.19	21	0	0	0	0	0
	UI & Menu	11.21.19	11.28.19	Green	11.21.19	0	0	8	0	0	0
	Game Logic	11.21.19	12.5.19	Red	11.21.19	0	15	0	0	0	0
	AI	11.21.19	12.11.19	Orange	11.21.19	0	0	0	0	21	0
	Special shader	11.21.19	12.11.19	Green	11.21.19	0	0	21	0	0	0
	Destruction	12.5.19	12.31.19	Red	12.5.19	0	27	0	0	0	0
Alpha Release	Character refinement	12.12.19	12.31.19	Red	12.12.19	0	20	0	0	0	0
	Refine AI	12.12.19	12.31.19	Orange	12.12.19	0	0	0	0	20	0
	Sounds	12.12.19	12.18.19	Green	12.12.19	0	0	7	0	0	0
	Soundtrack	12.19.19	1.15.20	Green	12.19.19	0	0	28	0	0	0
	Balancing	1.1.20	1.15.20	Blue	1.1.20	15	0	0	0	0	0
Playtesting	Debugging	1.1.20	1.15.20	Blue	1.1.20	15	0	0	0	0	0
	Report & Presentation	1.16.20	1.29.20	Blue	1.16.20	14	0	0	0	0	0
Final Release	Bugfixing	1.30.20	2.12.20	Blue	1.30.20	14	0	0	0	0	0
	Teaser Video	2.6.20	2.12.20	Blue	2.6.20	7	0	0	0	0	0
	Final Compiled Version	2.11.20	2.12.20	Blue	2.11.20	2	0	0	0	0	0
	Report & Presentation	2.6.20	2.12.20	Blue	2.6.20	7	0	0	0	0	0

MILESTONE LABEL	DATE	Margin Bottom	Margin Top
Game idea	11.6.19	5%	95%
Prototype	11.20.19	5%	95%
Interim Demo	12.11.19	5%	95%
Alpha Release	1.15.20	5%	95%
Playtesting	1.29.20	5%	95%
Final Release	2.12.20	5%	95%
Demo Day Presentation	2.15.20	5%	95%

Assessment

The main strength of the game is that it will feel very open in terms of what the player can do to achieve the goals (e.g. destroying buildings, building traps, supporting the defending units, ...) but also the immersiveness that this interaction creates with the world. This game is targeted at players who like tower defense style games like "Orcs Must Die!" with an additional tactical layer on top and a not so restrictive environment. The world should reflect that the village is under siege and an action of the player really

matters. Critical for this game idea is the interaction between the player, world and enemies that makes the world feel very dynamic and responsive to the player's actions.

Prototype Report

Prototyping Goals

The goal of our prototype is to test the influence of a destructible environment on the strategic possibilities of the player. How should the enemies itself and the amount of enemies be balanced so that it becomes really challenging to hold the village without using any environmental strategies. Additionally, it needs to be tested, how the players are trying to use the environment to their advantage.

Another key aspect which has to be validated via the prototype is the level design. The level design plays a major role in the game. It defines the limitations and possibilities of using the destructible environment.

Modeled Game

General Rules

For the prototype we chose to simulate the real time action via a turn-based system. The actors in the game (the player and the enemies) are performing their actions in alternating fashion (turns) both with their respectable number of action points. During play testing we realized a flaw in the alternating turns system. Therefore, we changed the system to a simultaneous system, where all actors perform their actions in the same time. Each action consumes points and if the action points are depleted no further moves can be performed during this turn.

Actors

In the prototyped game we have 4 different actors: The hero and the 3 enemy types. The following cards are showing the stats and the abilities of the actors. In the top right corner the amount of action points per turn and the health points are shown. In the middle of the cards is a short description of the actors and their abilities. In the bottom the moving and attack stats are given. The bottom left side represents the amount of action points the actor has to spend to move x centimeter on the game board/level. The right side shows the ratio between action points to spend and damage value. All actors perform the actions simultaneously, therefore it is possible for the hero to react in real time, if he has enough action points left in this turn.



Enemy Behavior

The attack vector from which the enemies are coming is determined by a dice (1&2 from left side, 3&4 from the middle, 5&6 from the right side). The attack then comes in big wave with a certain formation. This formation is shown in the picture below. The big cubes represent our big enemy type, the small cubes the middle one and the small tetrahedron are the small and fast enemies.



Figure 7: Tokens which represent the enemies. The picture shows a wave divided into 3 smaller sub waves.

Each enemy type (big, medium and small) has a different behavior which is based on the common behavior shown in the flow diagram below. The difference between the enemy types is defined by the `prioritize_goal()` function. The general goal of all enemies is to get to the mystical power source of the village. On their way they sense different objects. The goal of the big enemy type is mainly the destruction of functional buildings and the clearing of blocked paths. He has a small sense radius and if he senses a functional building he prioritizes the destruction of that building over walking to the center. The same principle applies for the medium-large enemies. Their sense radius is a little larger, but they sense also hostile units. The small enemies have the biggest sense radius and only prioritize hostile units over advancing to the center. Additional prioritization factor is the length of the estimated path. If the path is too long, the enemies are more likely to attack the surrounding buildings or buildings which are in their way to the center as the costs for the way are higher than the costs for removing a building.

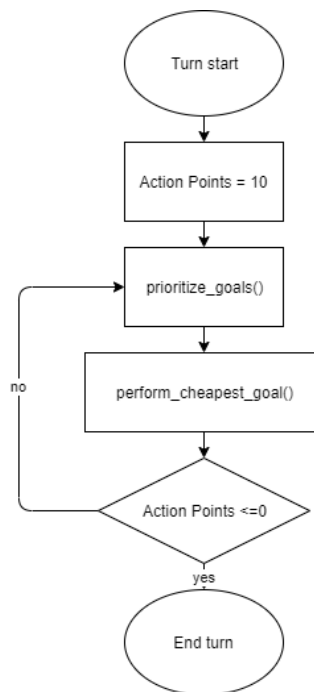


Figure 8: Flow diagram of an enemy

Buildings and their purpose

The village consists of ordinary houses, one bridge in the west, the core (a mystical power source) and 3 functional buildings which produce the placeable traps. The core is the main goal of the enemies and if it falls the fight is lost. The bridge provides a path over the river. It is possible to destroy the bridge and therefore slow everyone down who wants to trespass the river. The 3 factories, which are marked as grey buildings on the gameboard, produce a certain number of placeables during each wave. The number is given in the description text of the respective card. If a particular factory is destroyed it can't be replaced and produces no more objects. All of the functional buildings are subtypes of a house. A house (the ordinary building) can be destroyed by the player or the enemies. It takes 10 damage points to destroy a house and 15 damage points to clean up the debris. If a building is in the destroyed state and is only a pile of debris, it is impossible to walk through it and has to be cleaned up.



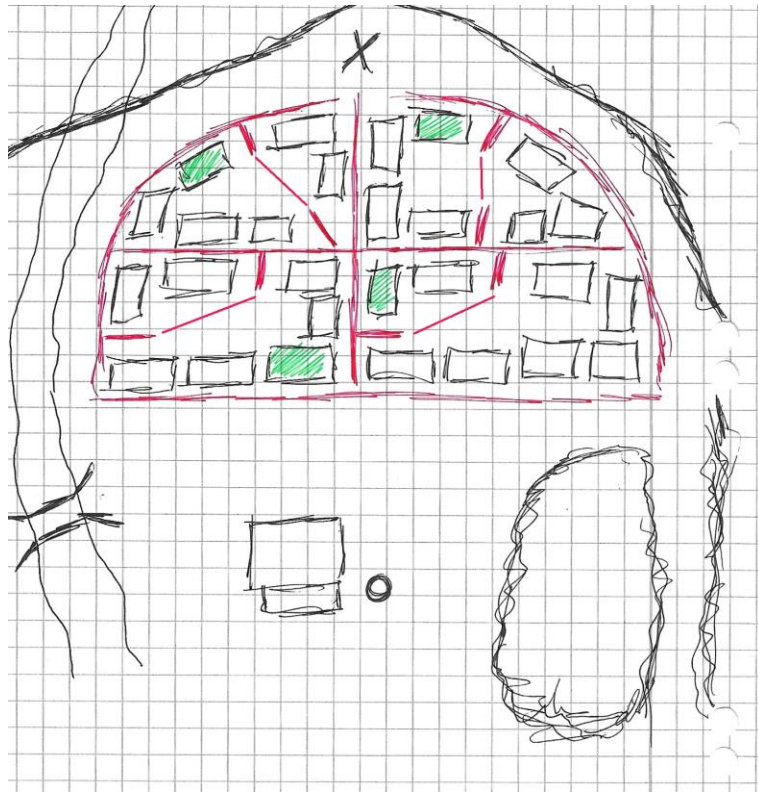
Traps

The traps can be placed before an attack begins and the wave approaches. The player has unlimited time to think about the trap placement. This encourages a deep strategic thinking and planning to accomplish the goal of fighting of the incoming enemies. The 3 different traps are shown in the cards below. The cards describe the effect of the trap and show the amount of health points or damage points it takes to set it off.

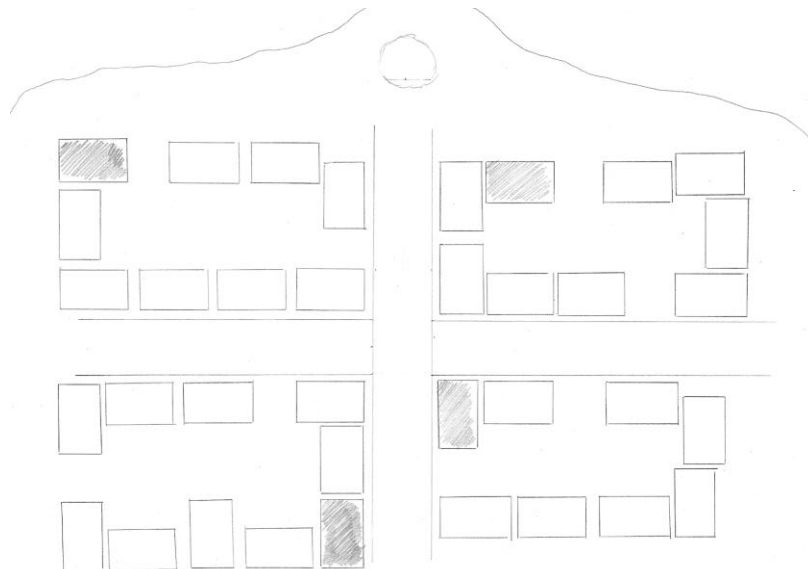


Level Design

Our first level design prototype is shown in the picture below. The X marks the core, which has to be defended from enemies. The main paths/roads have a certain width, so it takes two destroyed buildings or two spike walls to block them. Between the main streets are house blocks located with a yard. Every block has two entrances which can be blocked by destroying a building or placing a spike wall. This placement of the buildings allows the enemies to find many ways through the village and challenge the player to think of a strategy of how to use the buildings to his advantage. With this constellation the player has many options to get the upper hand.



The next pictures show the next and final iteration of the level. At the same time, it serves as the gameboard or rather as the placement outline for the houses. The functional buildings are the grey filled rectangles. The last picture of this section shows a photo of the final placement of the buildings and the final game board as well as some already placed traps.





What we've learned

- Village can be small but should provide lots of destruction possibilities which can be achieved by letting the player form a longer path through the quarters of the village.
- House groups with two entrances improve the gameplay and strategic thinking and enables the player to think more easily about possible paths.
- Watchtowers are not necessary and make the game too complicated but could be added later on for players that seek a more challenging experience.
- Functional buildings make the player really think about the paths and require more strategic thinking because it adds another limitation on the planning of the path.
- Playtesting has shown that lava is optional but might be a good effect to give the player more options in defending and it increases the immersion of the place.
- The defending units are optional but could be used to increase the depth of the game and it might be really interesting to decide on the upgrades and placement of them. Additionally, having allied units could lead to a more immersive world because more enemies could attack at the same time.
- Placing the objects only before the attack lets the player focus on the attack and requires them to plan ahead or “quick fixing” of a situation by destroying buildings if something doesn't turn out as planned.
- Realtime actions can only be partly simulated using a prototype but is a great way of having a first gameplay test.

Influences on the game

- For the destruction to really make a difference the width of the paths is important. In the gameplay prototype the widths were initially too big and it was hard to use the destruction of the buildings to block a path.
- We learned that the feature of destructible buildings in combination with a few traps to add an additional layer of strategy to the game is enough and should be polished before continuing with the optional features like upgradable allied soldiers or the lava simulation.
- We realized that if the game is not played top down it will probably be very hard for new players to anticipate the behavior of the approaching forces. Thus, we talked about adding a spell that shows the outlines of the enemies even through walls so the player can better react to the situation. This new spell will be called mage vision.
- Another option of letting the player learn the game would be the addition of a (mini)map with an optional addition of the paths the enemies currently decided on. This can also help new players getting used to the planning aspect of the game.

Card Artwork:

- <https://www.deviantart.com/alaiarax/art/Hellhound-Gwent-art-contest-739096007>
- <https://www.deviantart.com/jfoliveras/art/Carolingian-infantryman-698137923>
- <https://www.deviantart.com/zummeng/art/Fire-Golem-Comission-600366053>
- <https://www.deviantart.com/2blind2draw/art/fire-mage-495226541>
- <https://www.deviantart.com/vityar83/art/village-square-713601193>
- <https://www.deviantart.com/moonscreamer/art/Sawmill-215736092>
- <https://www.deviantart.com/rhysgriffiths/art/Medieval-Fabric-Dyers-416841070>
- http://66.media.tumblr.com/a6e0d062de47911517ccb254917c81f0/tumblr_nulaczmDfw1qg48x7o1_1280.jpg
- <https://www.deviantart.com/fluffyslipper/art/Ice-cave-763888602>
- <https://www.deviantart.com/dhurgan/art/Barrels-WIPsmall-574931788>
- <https://www.deviantart.com/themefinland/art/Chemical-Rainbows-556941562>
- https://ark.gamepedia.com/Wooden_Spike_Wall
- <https://www.deviantart.com/chateaugrief/art/Stow-Lake-642314674>

Interim Report

1. **Functional minimum**
2. **Low target**
 - a. Structures (houses, trees, etc.) can be destroyed
 - b. The destruction is controllable in such a way that the path the enemies take to the center can be shaped by the players will
 - c. Level/City design
 - d. Smart enemies (path planning)
 - e. ~~Score system~~
3. **Desirable target**

- a. More possibilities of shaping the path of the enemies by placing oil traps, spikes etc.
 - b. Some functional buildings (like factories)
 - c. Enemies with different priorities (destroy buildings or find path to center)
4. High target
 5. Extras

Progress Report

Character

We have implemented a controllable 3rd person character, which is able to cast different magic spells and can perform a roll and jump. The character has a health, stamina and a mana pool. The state of the character is shown as UI bars at the top left and spells are shown at the bottom of the screen. If his mana or stamina is depleted, he is not able to cast any spells or can't roll anymore. Both mana and stamina replenish over time. The player controls the character with the typical WASD and mouse control. WASD keys for movement, left mouse button to cast a spell, which then uses mana. The roll is performed by the Alt key and consumes stamina. The spells can be selected via the number keys. With the middle mouse button the player can open a ring menu and choose a trap type to place. Placing of the traps is not implemented yet.



Figure 9: The radial menu for selecting a trap.

Traps

We have also started to implement some trap functionalities like the slowing effect of the enemies if they are walking through an oil field and the effect on the pathing due to the slow movement speed.



Figure 10: Enemy spider walking through an oil field.

AI

Two enemy types (spider and gruntling) have been added to the game with the fundamentals of the required AI system. The enemy AI first and foremost finds a path to the mystical power source (back of the village), runs towards it and tries to destroy it. The enemies have also a sight perception, which means that if they see the player character they start to approach and attack him instead of running to the core. When they lose sight, they start advancing to the mystical power source again.



Figure 11: Fighting against a wave of damaged enemies.

Destructible Environment

Up until now the basic house types are in the game and are destructible by shooting at them. Further the destroyed houses also interact with other destructions. The destruction of the houses can be controlled in such a way that you can destroy a building on the side it should collapse. The debris are rigid bodies which interact with other rigid bodies in the scene.

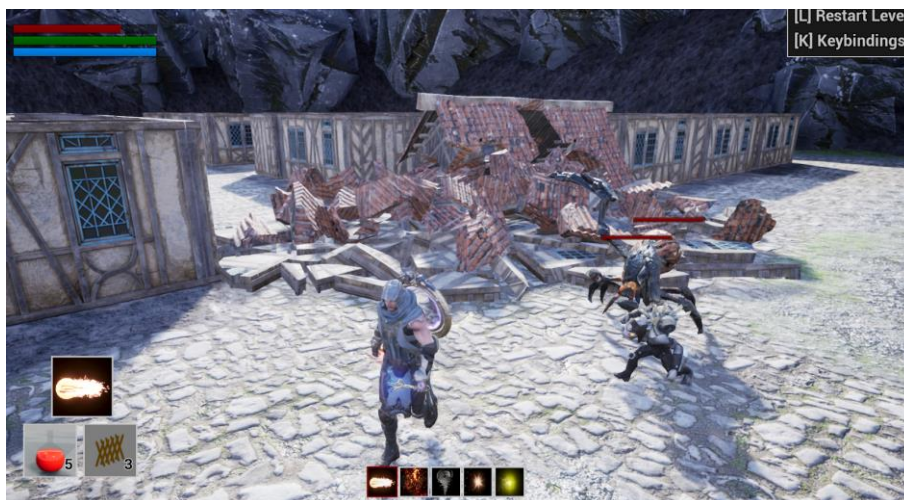


Figure 12: Destruction of a two-story building.

Level Design

The level design was already established during the prototype phase. During the implementation of the interim demo the level has been set up the same way in the game. Only the bridge over the river is missing. Due to the fact that our basic houses are not final and currently rather small we decided to wait with the final level design until all the houses are done.



Figure 13: Overview over the current state of the city.

General Gameplay

In the current version of our game enemies are spawning in 3 different locations and have the main priority of destroying the mystical power source of our village. The enemies can see the player and also attack him if they do so. If they reach the mystical power source, they attack it until destroyed, causing the player to lose the game. If the player is able to fight off all incoming enemy waves, he has successfully defended the city and thus won the game. Currently the user can destroy houses to block roads to slow down enemies to make the game easier. In order to inform about the currently selected skill or trap, the user has UI elements to do so.

Challenges and Problems

The destruction of houses turns out to be a lot of work to get the settings right and achieve the desired results. Furthermore, the interaction of the destruction with the pathfinding of enemies is a challenging task which we have to solve.

Creating missing animations with no animator in the team turned out to be more time consuming than expected.

Another time-consuming task was to build the Unreal Editor from source to have full support for the Chaos destruction system and compatibility of Chaos with the standard physics system of Unreal.

Luckily, we expected these challenges and thus weren't forced to remove any of our previously stated goals.

ToDoS for next Milestone

The current destruction is not influencing the pathfinding. This is however a must have for the game to work and will be the primary goal for the alpha release. The next goals are also implementing the trap placement and trap functionalities and an advanced AI system with pathing and the ability to destroy obstacles/buildings. Additionally, we have to further develop the level.

Alpha Release Report

1. Functional minimum

2. Low target

- a. Structures (houses, trees, etc.) can be destroyed
- b. The destruction is controllable in such a way that the path the enemies take to the center can be shaped by the players will
- c. Level/City design
- d. Smart enemies (path planning)
- e. ~~Score system~~

3. Desirable target

- a. More possibilities of shaping the path of the enemies by placing oil traps, spikes etc.
- b. ~~Some functional buildings (like factories)~~
- c. Enemies with different priorities (destroy buildings or find path to center)

4. High target

- a. Different enemy types (Fighter/Destroyer)
- b. ~~Controllable minions fighting on your side~~
- c. Additional spells (AOE and healing spell)
- d. ~~Blow up the bridge~~
- e. ~~Let lava flow from the mountain into the city~~

5. Extras

The Layer 1 (Functional minimum), Layer 2 (Low target) and most features of Layer 3 (Desirable target) are finished and implemented. We are thinking about changing the level/city design a little and we still have some bugs with the shaping of the enemies' path by the debris. Our top priority is to fix the bugs. Therefore, we prioritized down or cut some of the desirable target and high target features, which we found to be not that important for the general game flow. These features can be implemented in a later stage of development.

Progress Report

Traps

We made good progress and finished with the implementation of the traps. The implemented oil field now slows enemies, which are walking on it, and when ignited with a fireball, applies a burn effect on them and deals continuous fire damage. Also, the explosive barrels have been added to the game. When the barrel is shot by a fireball, it explodes and deals area of effect damage around it to the enemies. Finally, the spike walls are added, which prevent the enemies of walking certain paths. The enemies are able to attack the spike walls and destroy them to free up the path again. All the traps can be placed by selecting the “trap placement spell” and clicking the left mouse button to spawn the trap. The trap type can be selected by clicking the middle mouse button, which opens a ring menu.



Figure 14: Placement of a trap.

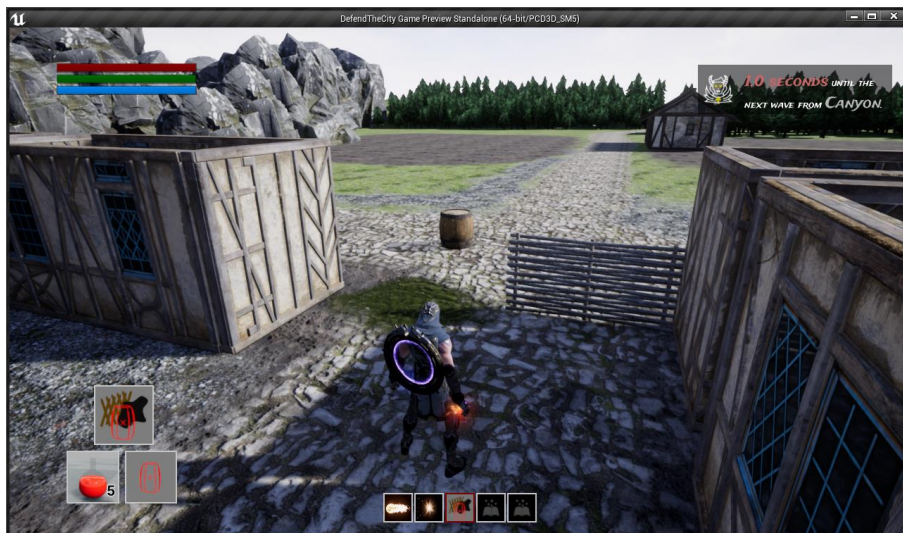


Figure 15: Example of all traps placed.

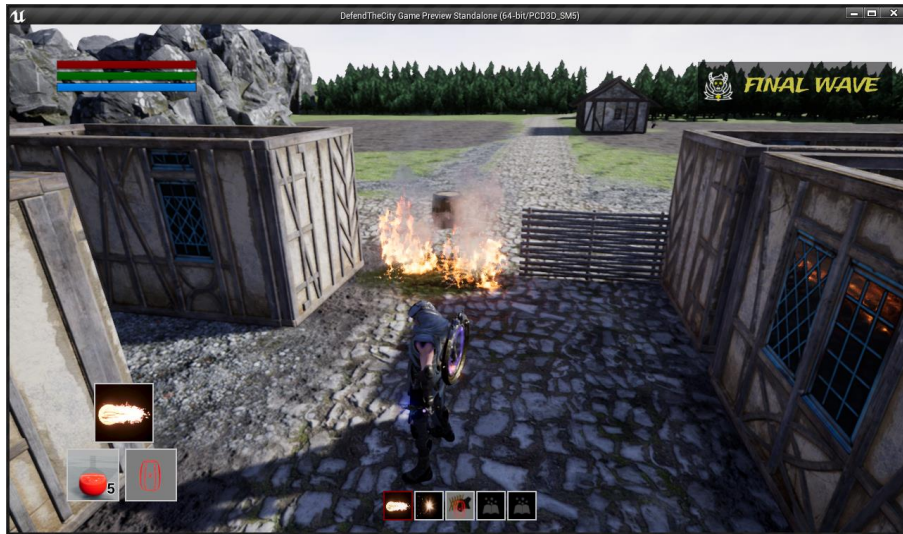


Figure 16: Example of all traps placed with burning oil field.

UI

For playtesting and for general understanding of the game, a basic tutorial with popups has been implemented to show the player the controls and the goals of the game. Additionally, if needed, the key bindings can be shown by holding the letter 'K'. Also, a very basic menu has been added to start and quit the game, as well as some icons for the traps and a logo for the game. To provide the player with more information, an UI element has been added to inform the player of the next enemy wave and the direction from which it is coming. We decided for now to keep it simple for the player to find out from which angle the enemies will attack. Our initial idea to have a tower at the mystical power source or a mage vision spell has been changed in favor of simplicity and practicability. Also, if the core is attacked, it will now show a health bar underneath the mystical power source. That way the player is able to see the remaining health of the main structure.



Figure 17: Information about next wave shown in the upper right corner.

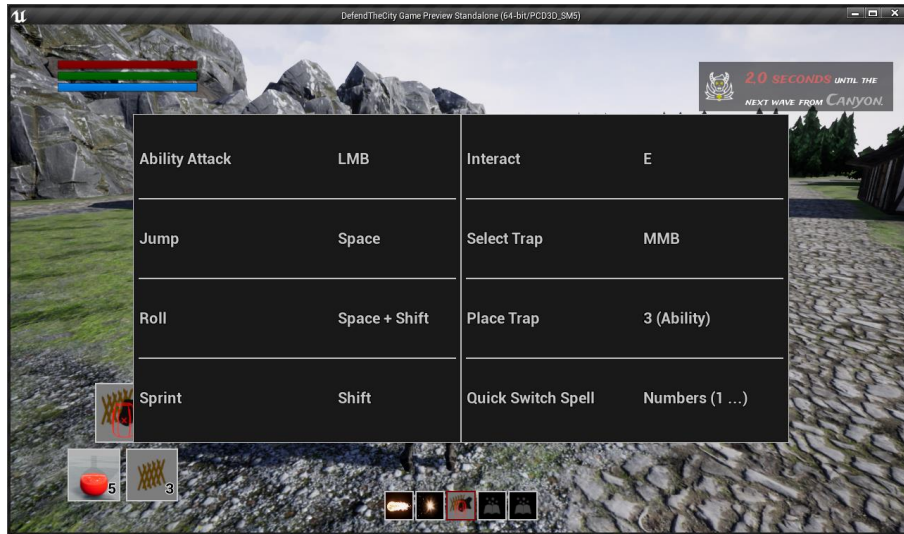


Figure 18: On pressing 'K' the player gets all the key bindings information.

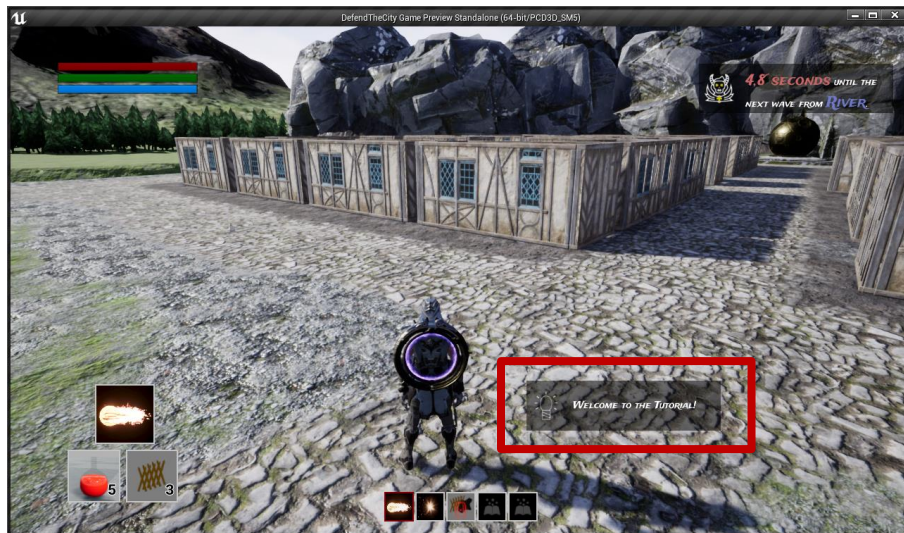


Figure 19: Tutorial shown on the right side of the character.

AI

We implemented some fixes for the AI, so that it won't walk into a wall. Also, we now have three different enemy types (the gruntlings, dinosaurs and big spiders). The dinosaurs are the small and fast enemies, the gruntlings are the medium type enemies and the spiders are our big tank enemies. All missing animations have been created and added to the game.



Figure 20: An enemy wave with all three types.

Destructible Environment

The main feature that has been implemented in this milestone is the collision damage of the falling structures. The enemies now take damage from crashing debris parts. This means that the player now can use the environment to his advantage and hold off the waves by destroying the buildings and houses around him. The mystical power source asset has also been changed and is now much more visible and prominent in the world.

Challenges and Problems

Unfortunately, we are currently using beta features in a prerelease version of the editor, that leads to a really unstable editor (the editor crashes very often). The current stable releases of unreal are extremely unstable in combination with the chaos features we use for our game due to a complete rework of their physics system. Therefore, we have to implement many features in an alternative way, which makes the destruction, collision damage calculation of falling debris, and path blocking of destructed structures not as pretty as it could be. The better solution, which we know works quite well, can't be implemented in the unreal version we are using (next version is very buggy). This is also a reason we are not implementing the feature, that the enemy AI can destroy houses or clean up destroyed buildings.

ToDo's for next Milestone

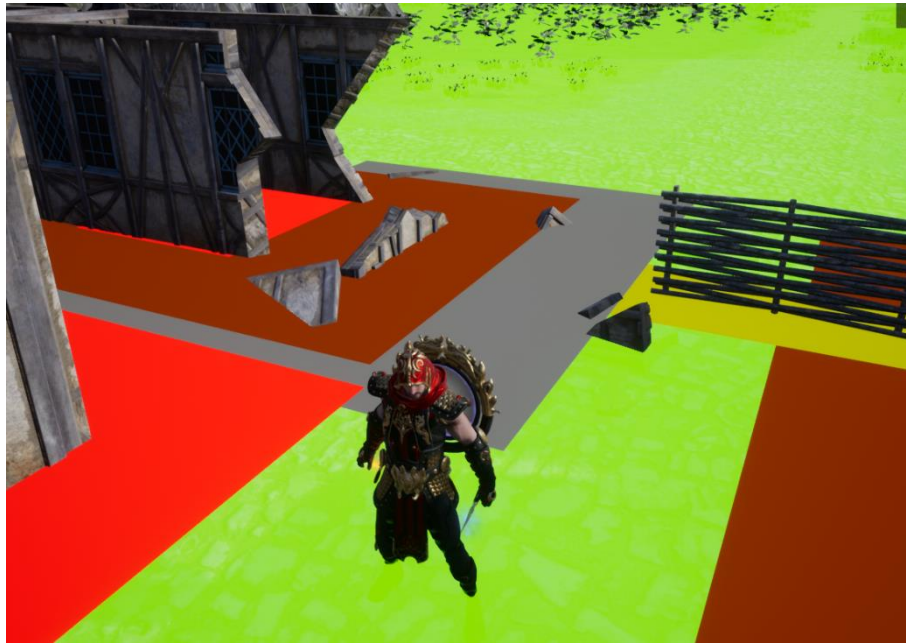
The key thing we still need to implement is the path blocking of the destructed structures. Like earlier mentioned we have some issues with the engine to completely incorporate the feature into our game. We will try to come up with a solution before the

playtesting. During the playtesting we hope to get valuable feedback and include the proposed changes afterwards into the game. Some key aspects we want to get feedback on, is the difficulty of the game (if need to change some parameters to make it easier), the UI and controls, and the level design. Additionally, we still need to do some fine-tuning and final touches (e.g. adding roofs to the buildings).

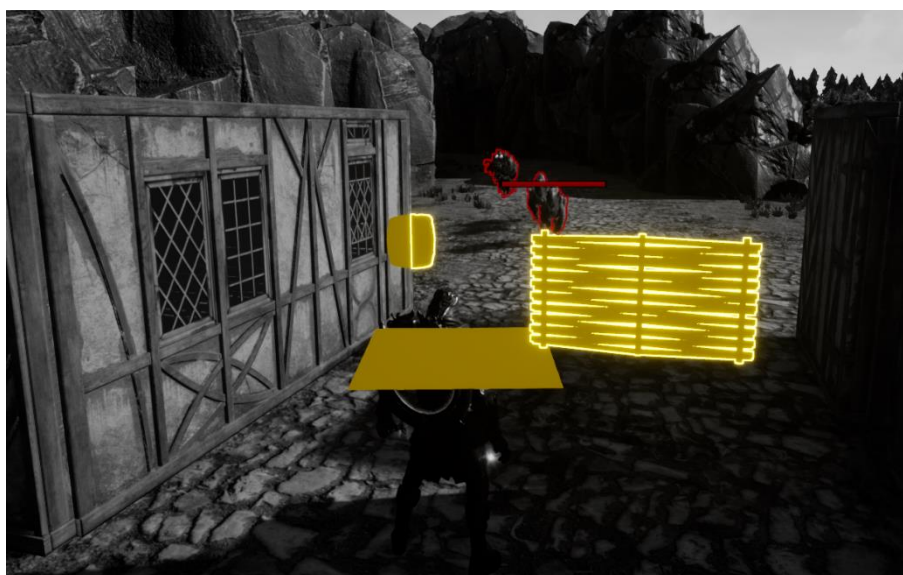
Playtesting

Changes before Playtesting

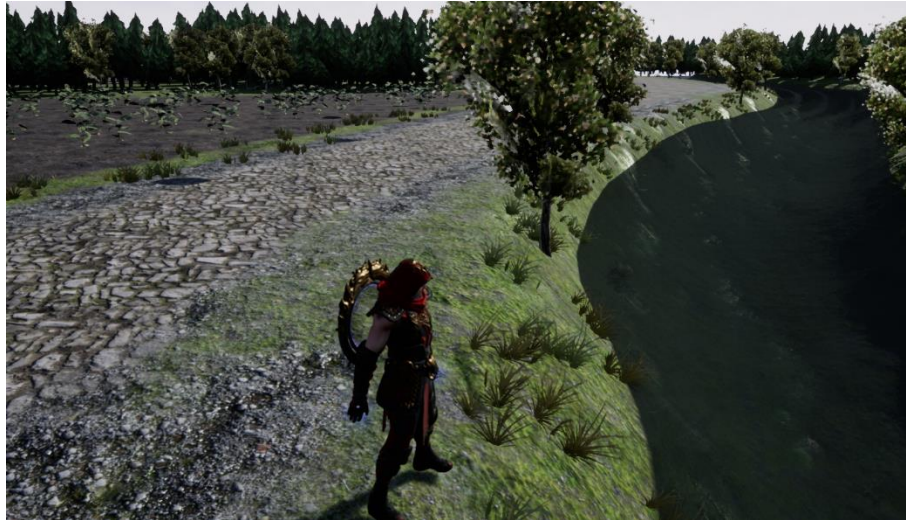
Most importantly we managed to implement the path blocking of the destroyed buildings. If a building is destroyed the debris blocks the area for the enemies. This encourages the player to think about his moves and he can try to block paths with the buildings. We also changed the level/village layout a little bit to give the player more possibilities to form the enemies' path.



Another major addition to the game is the mage vision, which can be activated by pressing the Tab key. With the mage vision the player is able to see the outlines of the enemies and all of his placed traps through the walls of the buildings. This way the player is always aware of the location of the enemies and doesn't feel lost in the process of defending the city or placing traps.



Finally, we again fixed some bugs (character was permanently slowed from oil fields while using the mage vision) and improved visuals (added grass and effects).



We also adjusted the individual enemies sight range. The bigger and tougher ones (the spiders) have now a shorter sight range than the faster units. That way it is more likely to be attacked by the smaller units, than by the tank units. This also reflects their unique goal of attacking structures or the player.

Playtesting Report

Setting

We sat down in the Magistrale and asked our friends and some people walking by to play our game. We also got some help to find more participants. We managed to get 9 participants who were willing to try our game and to take on the challenge of defending the village. All participants played roughly 30 minutes or 3-4 rounds. After the play session most of the participants filled out our questionnaire. Therefore, we collected 6 responses and took some notes about our discoveries and how to improve our game.

Questions

Demography

- Gender *[Drop-down]*
- How old are you? *[short answer]*
- How experienced are you with digital games? *[linear scalar]*

General Gameplay

- Was the goal/objective of the game clear? *[multiple-choice]*
- Where you able to save the city? *[multiple-choice]*
- What was your goto strategy? *[short answer]*
- How difficult was the game? *[linear scalar]*
- Why do you think the game was too easy/difficult? *[short answer]*
- How did you like the pace of the game? *[linear scalar]*

- How skill or chance based do you think the game is? *[linear scalar]*
- In which way does the game challenge the player? *[linear scalar]*

Environment and Trap Usage

- Did you use any traps? *[multiple-choice]*
- If yes, were the traps helpful? *[multiple-choice]*
- Would you do any changes to the traps, and if yes, which ones? *[short answer]*
- Did you know, that you can use your surroundings/buildings to block roads and to kill enemies? *[multiple-choice]*
- Were you able to use your surroundings/buildings to help you with the defense? *[multiple-choice]*
- How impactful is the interaction with the environment and the usage of traps? *[linear scalar]*

Controls, Interface and Level Design

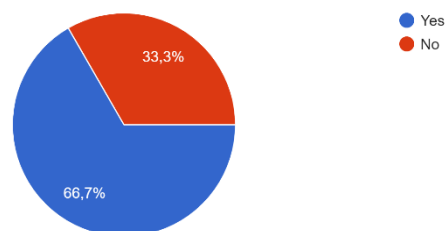
- Rate how good the controls felt. *[linear scalar]*
- Would you change anything about the controls of the game? *[short answer]*
- Where the UI elements clear and gave you a better understanding of the game and the events happening? *[linear scalar]*
- Was there anything about the interface you would change? *[short answer]*
- Are there any controls or interface features you would like to see added? *[short answer]*
- Had the city a clear structure for you? *[linear scalar]*

Final Feedback Questions

- Rate your overall game experience. *[linear scalar]*
- Did you especially like something? *[short answer]*
- Did you especially dislike anything? *[short answer]*
- Do you have suggestions for improvement? *[short answer]*
- If you have any other remarks which did not fit to any questions above, please state them here. *[short answer]*

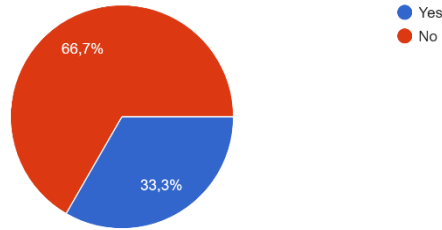
Observations

Was the goal/objective of the game clear?
6 Antworten

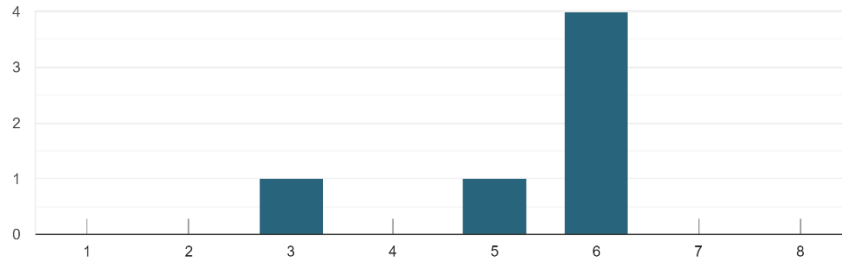


The next two graphs show, that the testers perceived the game as difficult and challenging, which was exactly our goal. Only two participants were able to save the city, in which one of them had some luck with the AI being buggy and getting stuck in a wall.

Where you able to save the city?
6 Antworten

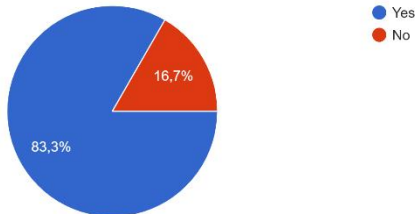


How difficult was the game?
6 Antworten

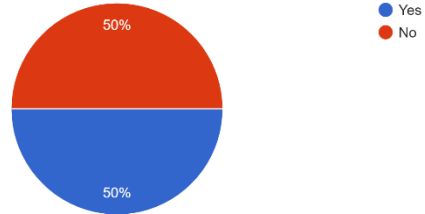


Also, we observed that the player started to develop strategies using the traps and the environment after several rounds. Still, for many of the participants it wasn't clear, that they could use the destruction of the buildings in an effective way. One of the key reasons for this is the lack of time spent reading the tutorial. This issue has been tackled in further development.

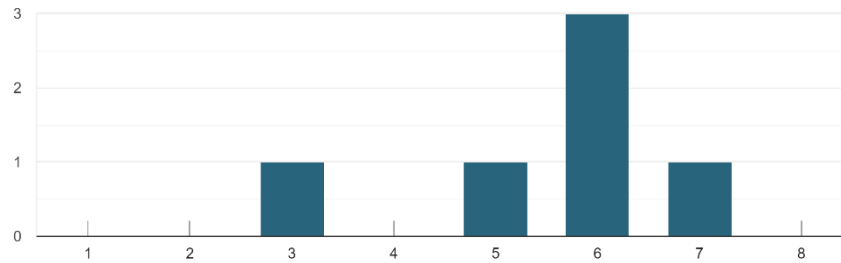
Did you use any traps?
6 Antworten



Did you know, that you can use your surroundings/buildings to block
6 Antworten



How impactful is the interaction with the environment and the usage of traps?
6 Antworten



Results and Changes

Due to the feedback and our own observation of the people playing the game, we made many slight changes to the interface, balancing and other aspects of the game.

Interface

During the playtesting we found out, that no one reads the tutorial messages. Absolutely no one. Therefore, we increased the show time of the tutorial messages and added a bar to show how long the message will be shown. Another possible and probably better solution would be to force the player to press all the control buttons once to get to the next tutorial message. But this solution is not implemented yet because of time restrictions.

Additionally, we added tutorial messages to give the player a better understanding of the game mechanics and the controls. From the survey we learned, that many participants didn't know they could use their surroundings and buildings to block roads and to crush enemies and therefore help them to defend the city. That's why we added some additional tutorial messages, which explicitly tell the player that there is the possibility to do so.

Many participants got a better understanding of the game after several rounds. As in the beginning of every round the tutorial should be completed, we added the feature to skip the tutorial by pressing the 'P' key.

Another problem arising in the playtesting was, that the testers weren't able to see the hp bar of the core very well and lost, as they did not realize quickly enough that the core was damaged. To fix this, the position and size of the status bar has been adjusted. Further the tester remarked that it is hard to tell when enemies will break through barricades, making it hard to plan strategically ahead. The solution for this issue was to simply add a health bar to the spike walls.

One major critic point of the play testers was the trap selection and the lack of information how many traps the player has available. We added a label showing the number of the remaining traps. We further are planning to change the selection and placement of the traps to make it more intuitive.



Balancing

We observed that when are spawned after fixed amount of time, often the enemies accumulate too much and the player doesn't have enough time to plan an according strategy for the next incoming wave. To fix this issue, we now spawn the waves after all enemies of the previous wave died.

Further we realized, that for a successful defense of the city and better strategic opportunities require a larger number of traps. Thus, we gave the player more traps in the beginning as well as provide him with additional traps after each successful wave. The test showed also, that the path cost of the oil field was too high and therefore the enemies would always choose to not pass the oil field and instead walk a much longer distance to the core. We balanced this by reducing the path cost.

Bug fixing

During playtesting we observed several minor bugs, which we mostly fixed during the testing. One of these bugs was that the core was regenerating after being already exploded.

We also found a critical soft lock bug, which denied the player to progress further in the game. This was caused by occasionally spawning an enemy outside of the ground plane. This causing him to fall infinitely into the abyss of gaming hell and therefore never die. Spawns were adjusted to avoid this problem.

Another bug we discovered was that the fireball didn't collide with the barrel. Thus, we make the barrel collide with fireball.

Something else which we realized was the unlimited curiosity of the players thriving them to go the absolute edges of our world. To avoid this, we added a bounding box which kills the player if he should go too far from the village.

The playtesting further showed that there was a bug with the oilfields, enabling the player to permanently slow down enemies and himself. This has been fixed.

Additional feedback

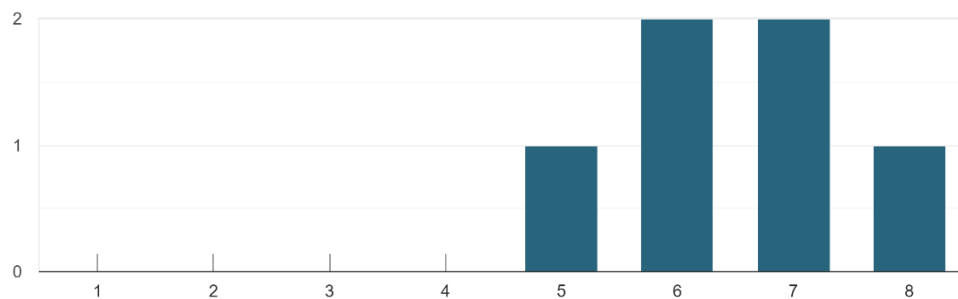
- The ability to change camera position
- Increased camera angle on teleport
- Gradient slowdown for stamina meter
- More traps and spells
- Range for setting traps should be increased
- Better interaction between traps (E.g. Ignited oilfield should explode barrel)
- Clarify the use of traps
- Clarify goal of the game
- The tutorial should be in the center to put more focus on it
- The player should not be invulnerable to the traps
- Teleport through walls and traps
- Less mana cost for the fireball but also less damage per fireball

Feedback will be incorporated in further development.

Most of the participants liked out game after a few rounds, which is reflected in their ranting in the end.

Rate your overall game experience.

6 Antworten



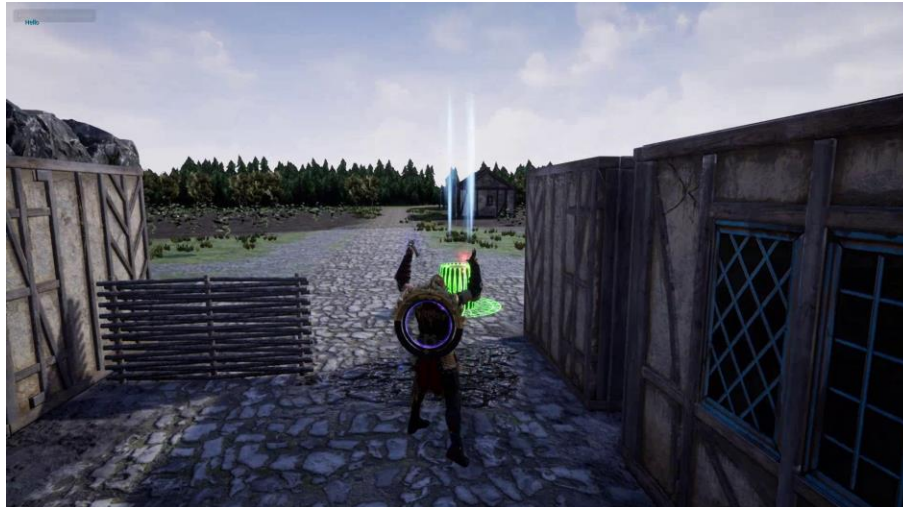
Conclusion

The Final Product

We developed a 3rd person tower defense like action game with a big focus on strategic thinking by using all the available resources. In the game the player has to fight off several challenging waves of incoming enemies by developing a strategy and using the traps and the destructible environment in a smart way.

There are 3 types of traps (spike walls, oil fields and explosive barrels) which can and should be used. As an additional aid, the player is able to destroy the buildings and therefore block paths for the incoming enemies and even damage them with the falling debris. The arsenal of the characters abilities includes the fireball (the main damage skill), the teleport (for mobility) and the mage vision, which allows the character to sense the enemies through walls.





Experience

Overall, we are very pleased with our final game. Especially, with the difficulty, because it engaged the testing players to think about their strategy and always try something new. Most of the planned features turned out great and really benefited the strategic aspect of the game. Due to the issues with the unreal editor we had to cut some features and really focus on our core ideas, which in the end we managed to implement. The development schedule was a great help and allowed us to focus on the core features which we had to implement and gave us a prioritization scale for each individual feature (the different layers). Therefore, when we were slacking behind the schedule, we exactly knew which feature we could cut and which feature had the highest priority for the next milestone. For the actual scheduling, discussing and reprioritizing of feature we had a regular (weekly) meeting, where we would go through the features, discuss what had to be done and document everything in the issues board of our repository.

During the designing phase of our game particularly the prototype helped us a lot to filter out the main features to develop a challenging and strategic game. We were able to transfer many of the ideas of our “board game” into the actual game. However, it took a considerable amount of time to transfer our ideas of a real time action game into a board game (it is hard to transfer a real time game into a round based kind of game). So, there is a tradeoff between time spend on transferring the idea and building the physical prototype and getting a better insight of the features you actually need to focus on.

The playtesting phase was a really insightful addition to the course. As a developer you develop a kind of tunnel vision for your game, where you lose track of unpolished or unintuitive features or elements. The playtesting and the feedback really helped us to improve the game experience by changing small things we didn't thought about. Also, during the playtesting, we got additional cool ideas for features and possible interactions, which we hadn't in the first place. This experience again showed us that sometimes including more people into the designing phase can (but don't have to) improve a game by giving a bigger variety of ideas.

Altogether, the practical course was a great and insightful experience where we had learned many aspects of the game development by giving us the milestones without restricting our creative thinking.

Course personal impression

Q: What was the biggest technical difficulty during the project?

Winfried: In terms of problems I would say the beta-ness of the chaos destruction system because most of the features we needed were either not well documented or not implemented in the version we were using. When not considering this the biggest challenge was to implement the different game systems like traps and destruction in a good way meaning such that the systems play well with each other and don't cause unintentional bugs.

Josef: By far the largest problem were the bugs, which were caused by the unstable unreal editor we were using. As we rely heavily on the new destruction system of unreal and especially this part of the editor was hard to use, the development of the destructive part of the game was very hard.

Sergey: For me personally it was the usage of the unreal engine. It was the first time I've used the engine for a project and in the beginning I had to learn many of its features and getting used to them. Also, it didn't really help, that the version of the unreal engine we used was unstable and buggy.

Q: What was your impression of working with the theme?

Winfried: I think the theme helped us finding this very unique game idea and didn't restrict us too much in the execution of the game.

Josef: The theme was a very good basis, around which we were able to create a cool game with awesome features.

Sergey: I really liked the theme. It enabled us to have relative freedom to design a game of any kind of genre, to think about the gameplay and engaged some creative thinking on how to combine the game ideas with the theme. Especially, if the theme is so open like 'Destruction'.

Q: Do you think the theme enhanced your game, or would you have been happier with total freedom?

Winfried: I think a theme always helps you in finding new ideas or putting a twist on existing ideas. Total freedom is usually coupled with less creativity in the end based on my experience.

Josef: Overall, I like it if there is a bit of restriction with respect to the type of game one is supposed to make. Having full freedom is nice, but it also creates problems in the early game development stages, as it is harder to agree upon a good game idea.

Sergey: I think the idea of having a theme is great! It engages creative thinking of an individual to combine game ideas with an actual theme. We had many great and crazy ideas from different genres and it was a fun experience coming up with them. Although,

we had a theme, we were still pretty unrestricted on the idea itself, and this is what made it great.

Q: What would you do differently in your next game project?

Winfried: Even though we reduced the scope of the implementation to a minimum we realized that this was still a little bit too big due to the fact that the destruction was very hard to implement. Adding extra time for such a case and bug fixing would be different in the next project. Additionally, I now know how to build and ship custom versions of the Unreal Engine which would save us a few man days of compile time.

Josef: For the next game project it would be very wise to test beforehand a bit more in depth whether the technical aspects (features in the game engine) are well enough for the game we want to develop. Further it would be wise to reduce the game idea a bit more, especially when the group size is on the smaller side.

Sergey: First and foremost, I learned many things during the course which I will transfer into my next project. The iterative process of designing/planning, developing and getting feedback is a process I would like to incorporate more into my next game project. But probably I wouldn't build a game again on features which are in a very early development stage.

Q: What was your greatest success during the project?

Winfried: I think the size of the project and our ambitious goals and the fact that we managed to have the features we wanted to have in the game is our biggest success. After thinking more about this question, I also liked how well the mapping from physical prototype to the game worked out and because of that how much we already knew how to approach.

Josef: The biggest success in my opinion was that we actually were able to create a game such that it felt quite as we wanted it to feel. In particular we had to create a physical prototype in which we already could make out the core concepts of our game and exactly the same core concepts are also available in the game and lead to very similar strategies.

Sergey: In my opinion it is the feeling and the difficulty of the game. We managed to balance it pretty perfectly between having to think of a strategy and having fun. But actually, the while project is the biggest success. Although our ideas and goals where ambitious we handled the challenge pretty well and build an awesome and fun game. At this point I want to thank Winfried, who is the most experienced in the unreal engine, for his dedication and helpfulness, which made the project a great success.

Q: Are you happy with the final result of your project?

Winfried: I, like most people during our pitch, was very interested in seeing how much we actually manage to implement. The fact that in the end almost everything worked out as we planned it makes me extremely happy with the result.

Josef: I am extremely happy with the final result of our project. I have to add here special thanks to Winfried, who already had quite a lot of experience with unreal engine, implemented a great deal of the project and still helped out when problems arose.

Sergey: I am super happy with our final game. I didn't expect, that the strategic part would turn out so good, but it did. It is actually almost impossible to win the game without having a strategy and this is what I like the most about our game. Although, we couldn't completely realize our visions it captured our core idea, which is awesome.

Q: Do you consider the project a success?

Winfried: Yes, and I am looking forward to continue working on the project after the new destruction features are fully implemented.

Josef: Yes!!

Sergey: Absolutely! Despite the problems with the engine we managed to overcome the problems, find different solutions and develop a great product which is fun to play and at the same time challenging to win.

Q: To what extent did you meet your project plan and milestones (not at all, partly, mostly, always)?

Winfried: We had a very conservative project plan but due to the big challenge with the destruction system we were able to implement everything but one feature in the last two milestones but managed to catch up in the end.

Josef: In the end we meet our project plan quite nicely. We also achieved nearly all our goals for the game.

Sergey: It was pretty hard in the beginning to keep up with our initial plan, because of the issues with the unreal engine and the used beta features. We weren't really able to develop on our core features (the destruction of the houses and their impact on the enemies). Although, it was part of our Low Target, we just finished the development shortly before the Playtesting session. Besides that, we were pretty much always on track and in the end we managed to implement most of the features we were planning on doing. But eventually we still had to cut some features.

Q: What improvements would you suggest for the course organization?

Winfried: The only thing I think could be improved is the communication with the students. We missed one short lecture after the initial meeting because it was not listed in the timeline. So, I suggest keeping the plan a little bit more up to date would be a welcome change for the future.

Josef: One thing that might be nice is just a short information slide for the essential things we have to do for the demo day. Other than that, I found the organization good.

Sergey: I liked the general structure of the course. The only thing is the real tight development schedule for the project (especially if you want to experiment with new technologies). I probably would suggest extending the time for the alpha release, playtesting, beta and final release (or in general for the development). I know from other practical courses, that the time period for handing in the project and grading is pretty flexible and can extend deep into the semester break. I would suggest using this time as well to get even better projects. Also, if the time for the project increases, I would like to have multiple playtesting iterations. I think it would be a great addition to get more feedback and would give the possibility to change and evolve the game to a better version.