Clirty

Clean or Dirty

Game Design Document

1. Formal game proposal

1.1. Game Description

The game is designed as a multiplayer game with two parties. One party's objective is to cause as much mayhem as possible. They scatter paint and dirt and ravage the environment.
The other team needs to clean up after them. They sweep, mop and repair to restore order. To make their efforts less futile and get a break from running after the litterbugs, they may attempt to catch and restrain them.

The game works in a round based fashion with rounds of a fixed length. This makes the game more easy to pace and keeps engagement and variety high. If the teams turn out to be unfair, it is not a big problem, as players can just try again after a couple of minutes. When the countdown ends, a metric decides whether the map is overall more dirty or clean and which team is awarded the win accordingly.

1.2. Technical Achievement

Due to the Coronavirus pandemic, we do not expect players to be able to meet up to play with each other. Because of that, the goal is to set up an online server to enable online multiplayer. Additionally, we would like to personalize the visuals of our game using custom shaders.

1.3. "Big Idea" Bullseye

Due to the game being an asymmetrical multiplayer, the main focus is going to be balancing the mechanics in between the different teams. It has to be fun for all players even though their abilities and objectives are different.

Accordingly, all technical aspects have to be conducive to a smooth multiplayer experience. Wait times need to be short, there must not be lag and the graphics need to be captivating.

„Big Idea" Bullseye

Server based Multiplayer

One Team creates order the other causes chaos
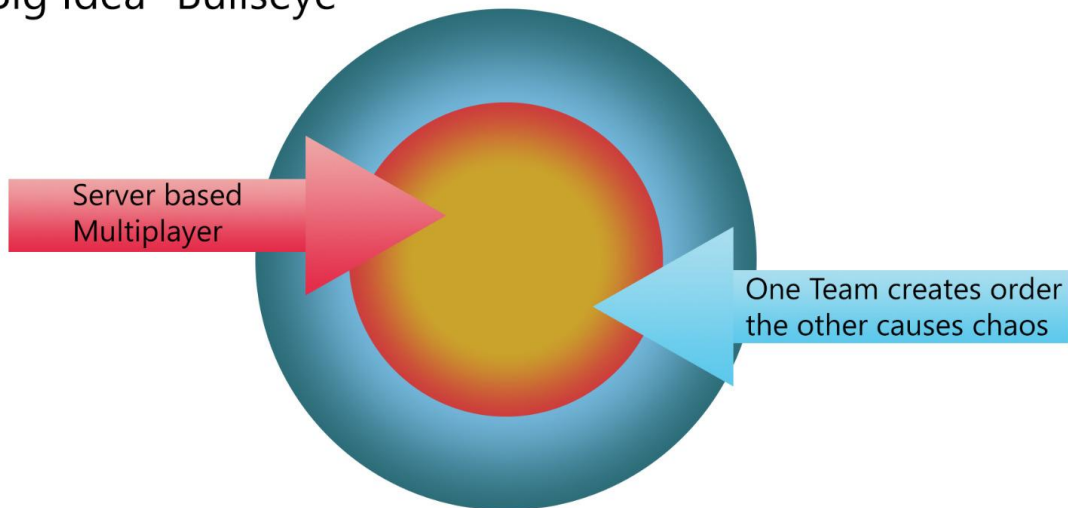
1.4. Development Schedule

Functional minimum:
      Local Multiplayer
      One Squared sample Map
      Ability to create dirt
      Ability to clean up dirt
      Timer

Low Target:
      One Map with fixed props placed on it
      Ability to destroy props
      Ability to repair props
      Simple Assets

Desirable Target:
      Assets for the players and the props
      Simple sound effects
      Item Pickups
      More abilities for dirt creation and cleanup
      Ability to capture other players

High Target:
      Procedural object placement on the map
      Big objectives

Extras:

    Character classes
    Soundtrack

Milestone: Game Idea Pitch (19.04.2021)

    Names Shortened as follows:
    Albert Zach => Albert
    Sahin Er => Sahin
    Daniel Ziese => Daniel
    Matthias Hainz => Mattel

Task Name	Who	Time (in Hours)
Brainstorming	Everyone	2
Documentation start	Everyone	3

Milestone: Formal proposal & prototype (03.05.2020)

Task Name:	Who	Time (in Hours)
Defining the Prototype	Everyone	2
Creation of the Prototype	Everyone	4
Documentation & Presentation	Everyone	5

Milestone: Interim Results (17.05.2021)

Task Name:	Who	Time (in Hours)
Implementation of Player Abilities	Sahin	5
Creation of Menu	Albert	5
Creation of UI	Mattel	2
Map Layout	Daniel	2
Documentation & Presentation	Everyone	5

Milestone: Alpha Release (07.06.2021)

Task Name:	Who	Time (in Hours)
Creation of Assets	Albert	10
Implementation of new abilities	Daniel	2
QA & Balancing	Mattel	4
Map Design	Sahin	1
Documentation & Presentation	Everyone	2

Milestone: Playtesting results (28.06.2021)

Task Name:	Who	Time (in Hours)
Testing and evaluation	Everyone	10
Adjusting the game mechanics based on feedback	Everyone	X
Bug fixing	Everyone	4
Implement Feedback	Everyone	8
Documentation & Presentation	Everyone	2

Milestone: Final release (24.02.2021)

Task Name:	Who	Time (in Hours)
Item Pickups & usage	Albert	2
Abilities	Daniel	4
Balancing	Mattel	2
Simple Soundeffects	Sahin	2
Bug fixing	Mattel	3
Documentation & Presentation	Everyone	2

1.5. Assessment

Tell us what the main strength of the game will be.

The replayability of the game due to its fast-paced PVP nature.

What part is going to be the most cool?

Cooperating with your teammates in order to trick your opponents and take the win.

Who might want to play this game?

Clirty is a bit of a party game by nature. It should appeal to players looking for an engaging evening with their family and friends. It is not meant for players investing hours upon hours honing their skills.

What do they do in the game?

Outplay their friends by ruining their progress in the round in order to win.

What virtual world should the system simulate?

A world of chaos and order where the goal of one team is to annihilate the enemy - but on a small scale.

What criteria should be used to judge whether your design is a success or not?

If players want to play just one more round. Ideally, at the end of each round, the losers want a rematch and the winners want to extend their dominance.

2. Prototype
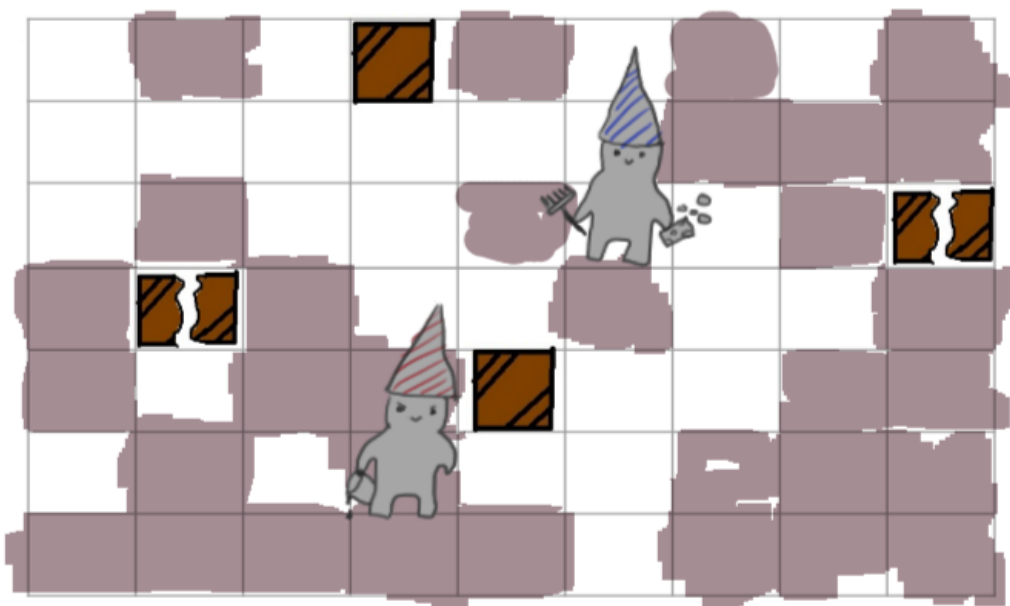
2.1. Development

Our game is ultimately supposed to run in real time but that isn't really feasible even with multiple people keeping the pieces moving. Because of that, we decided early in prototype development to discretize the game to make it more suited for emulation by hand. We decided on a grid for the level and a turn based time system to make interactions easier to process.

2.2. Gameplay

2.2.1. Setup

The game requires a finite grid as the playing field and three kinds of game pieces for the different teams and the props. Cells in the grid start as clean. They can be dirtied if clean and cleaned if dirty. In the beginning the props are distributed randomly across the cells and then half of the remaining cells are randomly dirtied. The members of the teams are placed anywhere in the 3 outer columns of their side. Team Clean on the left and team Dirty on the right.

2.2.2. Skills

In the prototype, we've decided to add the most basic actions to the game. These include walking, creating dirt, cleaning dirt, one skill for each side as well as repairing and destroying objects. Walking onto fields immediately changes them. I.e. that the dirt team creates dirt while walking and the cleaning team cleans.
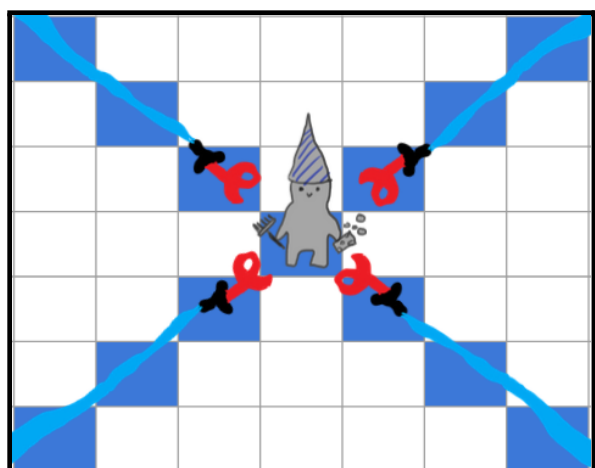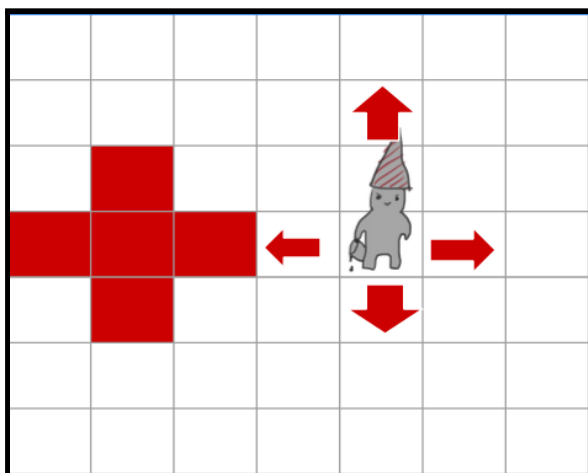
For skills we have the dirt grenade for the dirt team and the water hose for the cleaning team.

The dirt grenade can be thrown in horizontal or vertical direction to make a plus sign shape dirty and also applies dirt to members of the cleaning team which are caught by the impact.

The water hose cleans a diagonal row from dirt and can also hit members of the dirt team.

When a player gets hit by an opposing skill, they are either stunned for one turn or rescued by a member of their own team, which removes the stun effect.
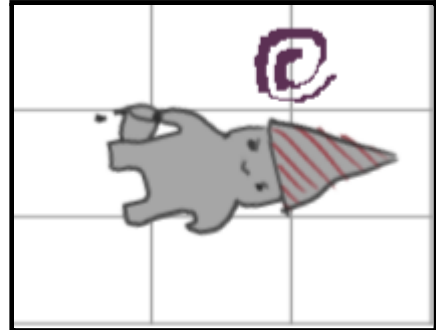
The dirt team also has the ability to destroy props when standing in front of them. Fixing destroyed props is done by the cleaning team and also requires standing in front of it. It was planned that fixing props requires playing a mini game, but we neglected this idea for the prototype as all minigames we came up with were not applicable to a board game.
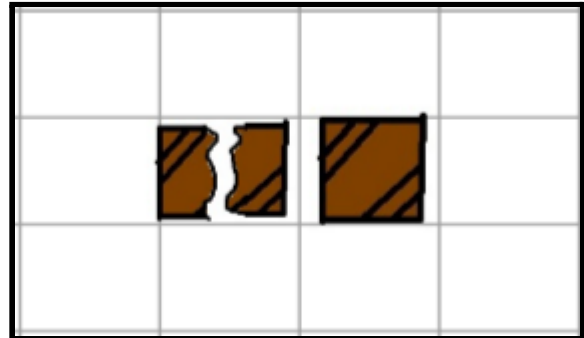
2.2.3. Turn Order

The game is played in turns, which are composed of two actions. Actions are: Moving one field horizontally or vertically, using the skill or destroying/fixing a prop. Both players plan and lock their next turn simultaneously. The dirt team starts executing its turn. Then the cleaning team executes their turn.

2.2.4. Game End

The game ends after a fixed number of turns which is set at the beginning of the game. After both players have finished their last turn, the number of clean and dirty fields are counted and compared. Props are counted as five points. Destroyed one are counted for Team Dirty and repaired ones for Team Clean. The team with the higher score wins.

2.3. What we learned from playing the prototype

Early on we noticed that we need more interactions between the players. That is why we introduced the stun effect when using items. Ideally, there should be more ways of combating or slowing down the enemy team so the game does not devolve to cleaners running after dirt makers removing the dirt they just placed. It also adds tactical considerations to moves if it's more valuable to change terrain or stun an enemy.
Secondly, we learned that the map has to start in a state corresponding to a balanced score, i.e. half clean, half dirty. That way, if both teams are generally equally powerful, the game should be fair. If the map started clean, the dirt making team would need other advantages and then the length of one round would become a balancing consideration. This would probably make properly balancing the game impossible.
Lastly, we realized how important enjoyable graphics and animations are for a party game like this. We experimented with this by adding little scribbles to the prototype and moving the characters in creative ways. When every action a player takes looks funny there is a base layer of entertainment even if the gameplay itself is not perfectly balanced or engaging.

3. Interim Report

3.1. Networking/Online multiplayer

One of our core features is online multiplayer with a dedicated server. Our first step to multiplayer capability was local multiplayer. We managed to implement that, but faced great problems when starting with the online component. Our game was supposed to run a hybrid between online and local. So multiple local people could join an online session as a group. But the synchronization of multiple clients each moving a variable number of objects turned out to be too complex for our scope and we decided to drop it in favor of only online multiplayer.

The game is currently fully online multiplayer capable, but we still need to figure out some issues with mismatched states between players.

We started our networking with Unity's integrated networking solution UNet, but since this framework is currently being reworked and mostly deprecated we switched to a plugin called Mirror.

3.2. Player controls and Skills

We concentrated on the basics of player movement for now. While in the original idea we planned to implement an online + local coop experience, we have faced difficulties at implementing both simultaneously. Because of that, we are focusing on the online experience with only one accepted input per client.

Players can move around using either "WASD" on the keyboard or the left analog stick on the controller. Just by moving, the players will apply the effect of their respective team. Team Dirt will make things dirty and team Clean can clean it up just by moving over it.

This functionality is implemented using a custom grid as an underlying data structure. Currently, the dirty fields are visualized by simply coloring them red. However, the idea going forward is to decouple the grid from the visualization. The grid would be used directly for the game logic and to keep track of the score. To actually render the dirt, we are going to use its data to create a custom texture which can be applied to the floor. Maybe, this will be done in conjunction with custom shaders.

Each player also has skills that they can use during a match by pulling the "Right Trigger" on the controller or by pressing "Spacebar" on the keyboard. Team Dirty is able to throw a grenade that makes a circular area dirty on impact and Team Clean is able to use a water hose to clean a cone-shaped area in front of the player. These effects are implemented efficiently on the custom grid using rasterization algorithms.

Lastly, we implemented objects in the form of destroyables into the game. Players can move towards such an object and, depending on which team they belong to and the current state of the object, destroy or repair it by holding down the "Q" button on keyboard or the "X" button on the gamepad (PS4 controller) for 1.5 seconds.

3.3. Dirt Mechanic

The core gameplay mechanic of our game is the ability to create and clean up dirt. Dirt is created by players, which are members of TEAM-Dirt, moving over clean ground surfaces. Dirty ground surfaces are cleaned again if members of TEAM-Clean are moving over them. Additionally the state of larger ground areas can be swapped by the usage of items, which was described above.
The destroyable/fixable Props are also, according to their states, counted as dirty/clean.

At game end all dirty and clean areas and props are compared to form the final score and decide the winner of the game round.

3.4. Menu and GUI

We decided to keep the GUI for the users relatively simple. Upon launching the game you will get an input to connect to a server via a name. Upon pressing the connect button you will join the lobby.
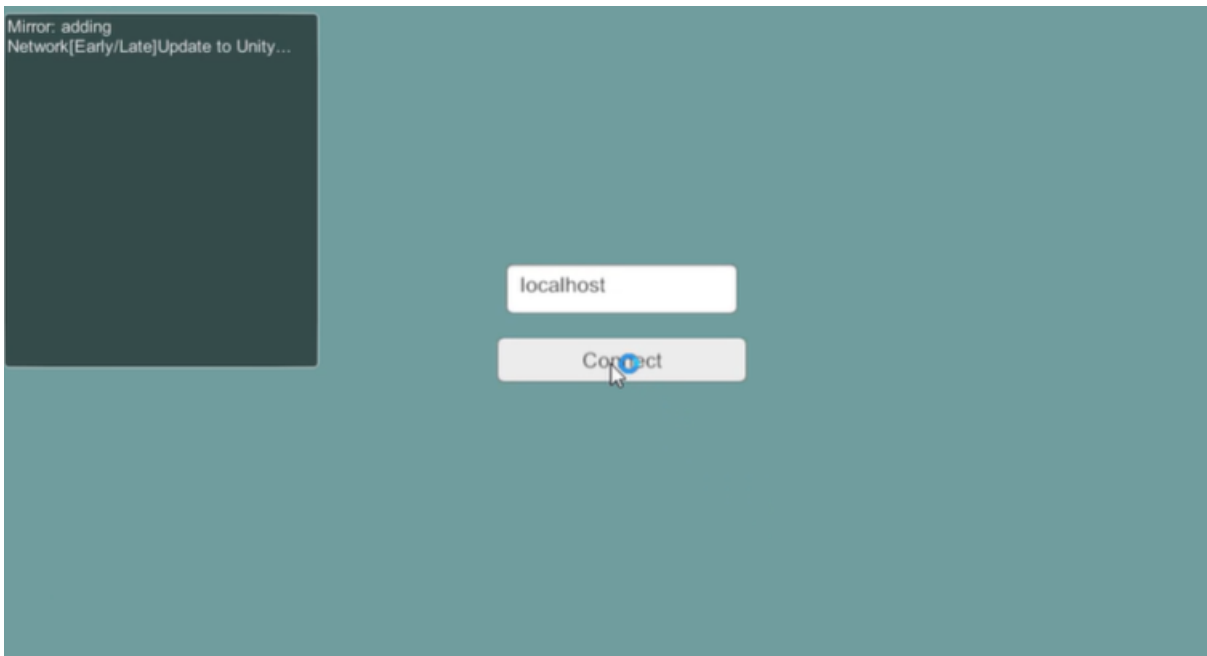
When ending the match you will get a screen telling each player which team won.

3.5. Goal achievement summary

We have managed to implement almost all of the points that we set for our functional minimum as well as the low target, missing things being the assets for the world.
With this we covered all the objectives we set ourselves for the interim results.

The chosen objectives result in a functional playable version of the game, where the players can join an online match with the client, clean/dirty the map within a constrained time and at the end, one team is declared the winner.

As mentioned in the networking part, we did have to cut down on some features regarding joining an online lobby with 2 players on 1 local client for now.
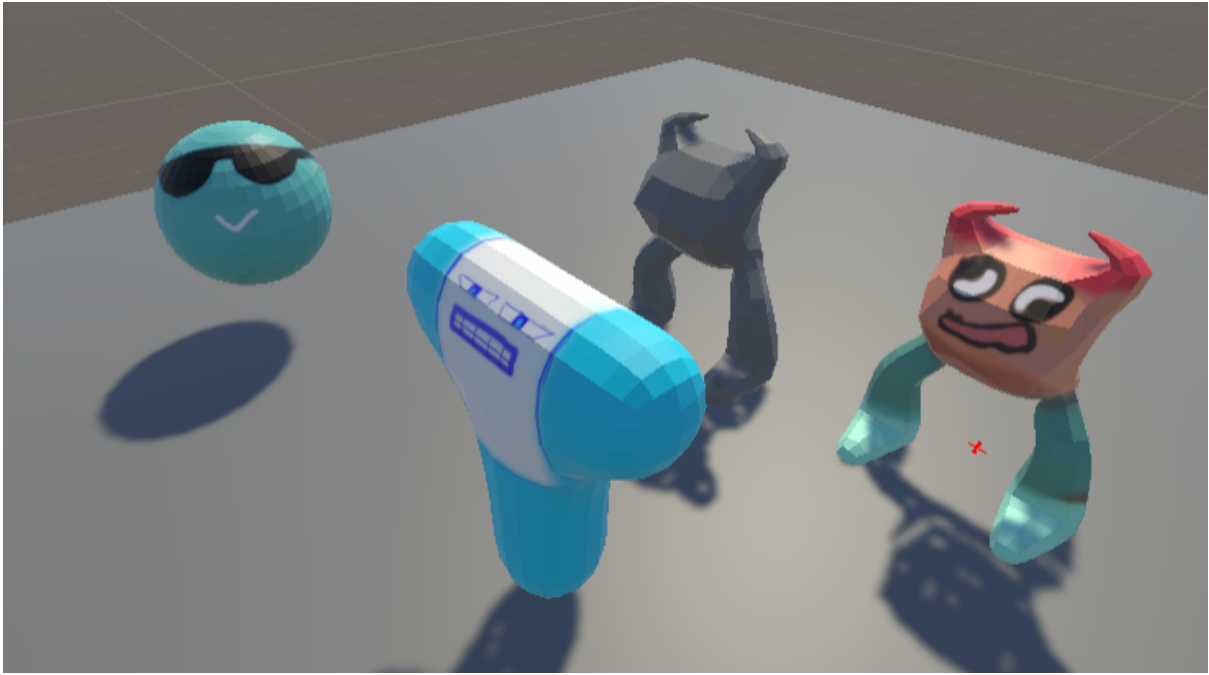
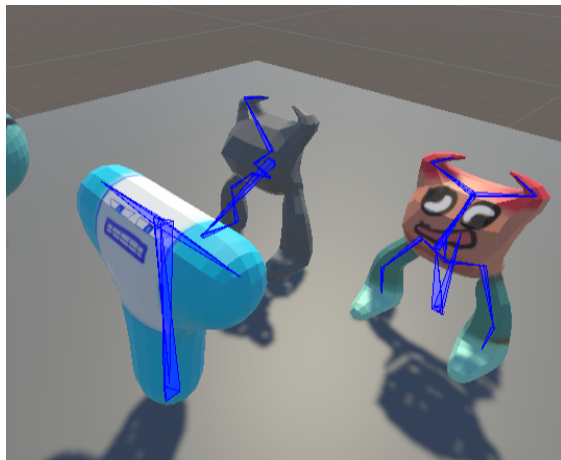# 4. Alpha Release

4.1. Props

We used Blender to start to create our own 3D models for the game.
Characters for both team dirt and team clean have been created and painted to match their according goal.

Furthermore multiple props that can be interacted with have been created.

4.2. Animations

The characters have been rigged in Blender and received an idle animation, as well as a walking animation using the Animation Rigging 1.0.3 Package of Unity.

4.3. Skills Refined

In the previous version of the game both teams used the same spell in the form of inflicting their team effect on their surroundings.
Now team dirty is able to throw a bomb in the form of a projectile where the distance is defined by the amount of time that the ability button is pressed.

Meanwhile team dirty is able to use a water hose that cleans cone shaped form in front of the player for 0.3 seconds.

4.4. New Interaction with Objects

In the previous version the only interaction between players and objects were simple destroy and repair calls to change the state and visual appearance of the object. Beside this, a new form of asymmetrical interaction was added into the alpha release.
A new prop type, which can be emptied by the dirt team was implemented. After emptying such an object, 4 smaller objects spawn into the world, which must then be collected by the cleaning team and put back into their original places. If one of the objects, which were put back this way, is any form of the Matrojska-Object, a mini game is triggered, which must be solved by the player.

4.5. Dirt Visualization revamped

The dirt grid has been made finer and there now is a proper starting distribution of dirt on the map which lays itself out in the form of a gradient.

4.6. Powerups

One powerup has been implemented that has fixed spawns on the map with a cooldown. The powerup enlargens the player picking it up and giving them a temporary passive area of effect ability based on which team they are on.

4.7. Goal achievement summary

We have managed to implement the missing features of the low target from the previous version which is simple assets and improved that into assets for both players and the props in the alpha version, Since player now have models as well as animations and we have multiple other props that decorate the environment and are interactable.

We have further implemented most of our desirable targets with the exception of sound effects and the exclusion of capturing other players with abilities, since we have realised that disabling other players for a longer time is not a fun game mechanic to play around. Instead the plan is to interact with them for shorter times with abilities.

5. Playtesting

5.1.1 Demo

Given the circumstances at the time of the demo, we have decided to hold the playtesting in an online environment. We built the game and uploaded it to Google Drive.

5.1.2 Procedure

Due to the Corona situation we are not able to do playtesting at the university. Therefore, we ask friends and other students to play our game. We create a download link as well as a Google questionnaire that we send to the participants. The structure of the playtesting looks like this:

Play the game	5 ~ 10min
Fill out the survey	10 ~ 15min
Short discussion about the game experience	~ 5min

We try not to explain any game mechanics. Instead, we are interested in whether or not the testers would figure the game out by themselves and through communication among each other.

They are asked to join a group voice chat with all current participants and then they play the game for 5 to 10 minutes depending on how many rounds they want to play. Afterwards, they fill out the survey. At the end, we have a short discussion with each participant about their experience.

5.2 Survey

At the beginning of the survey, we inquire about aspects of the testers' gaming habits as well as general Information about the player.

We include a measure to see how often video games are being played by the testers to see if players with little to no prior experience have more trouble learning the game than those who play games regularly.

Beyond that, we also include questions asking how much fun players had as well as how intuitive the game and its controls feel and how balanced the two teams are.

At the end of the survey, we ask for additional feedback. Those short sentences or paragraphs contain the most practical and applicable criticism and suggestions.

5.3 Results

Most of our players are regularly playing video games, leaving us to assume that they are fairly proficient at adapting to new controls and styles of games.

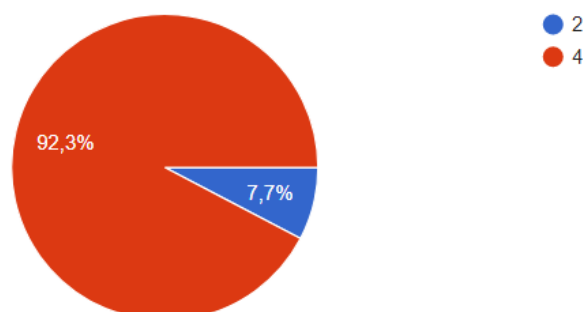How frequently do you play video games

13 Antworten

- Daily
- At least once a week
- I usually do not play video games
- I do not play video games at all
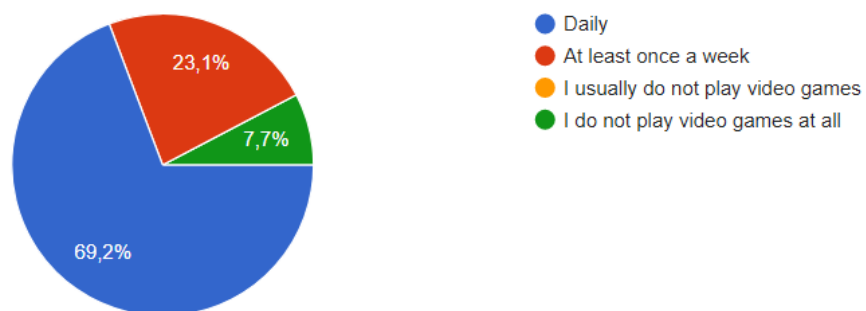
Most players play a 2v2 Matchup instead of a 1v1 match.

How many players participated in the Match?

13 Antworten

- 2
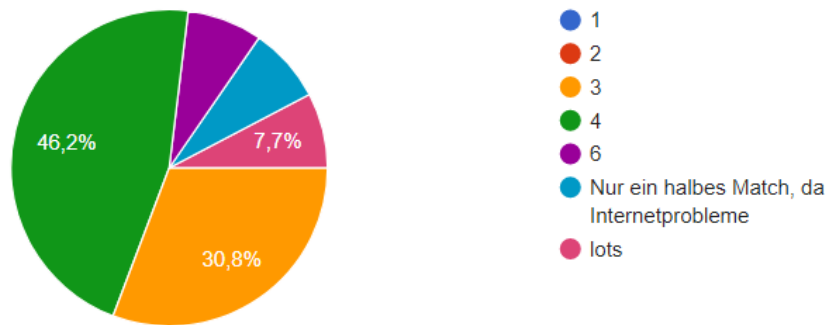- 4

Varying amount of matches have been played with one player being unable to enjoy it due to connection issues on their side

How many matches did you play?

13 Antworten

Legend:
- 1
- 2
- 3
- 4
- 6
- Nur ein halbes Match, da Internetprobleme
- lots

The overall experience of the players is that they did in fact enjoy the game despite some flaws, which are going to be mentioned later on.

I had fun playing the game
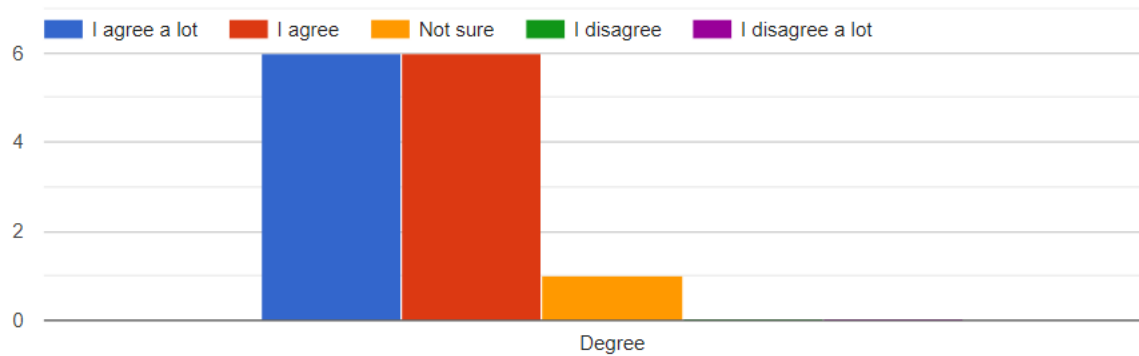
Despite having a lot of video game experience, it seems that the players are a little bit confused by the controls at times.

The controls were easy to understand
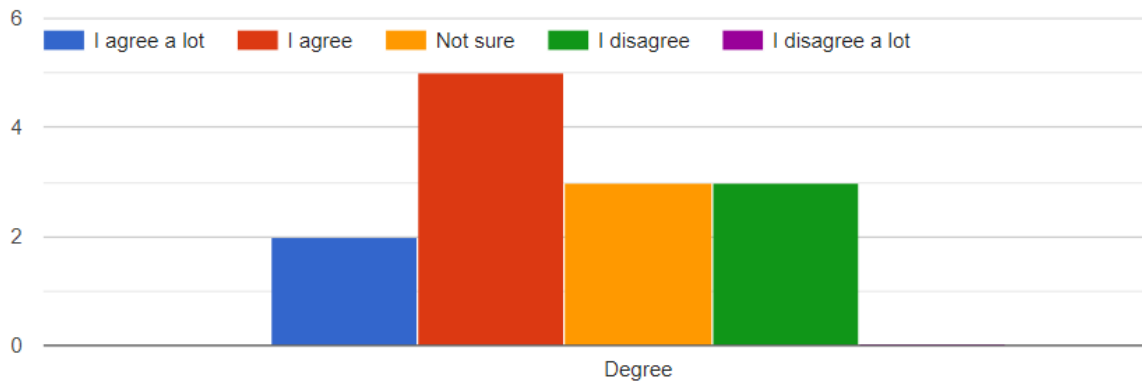
To add onto this, it becomes prevalent that the objectives as well as the optimal strategy how to win is not as obvious as expected since you can see that most players are struggling to fully grasp what would be a good course of action in certain situations.

There were times where I didn't know what to do
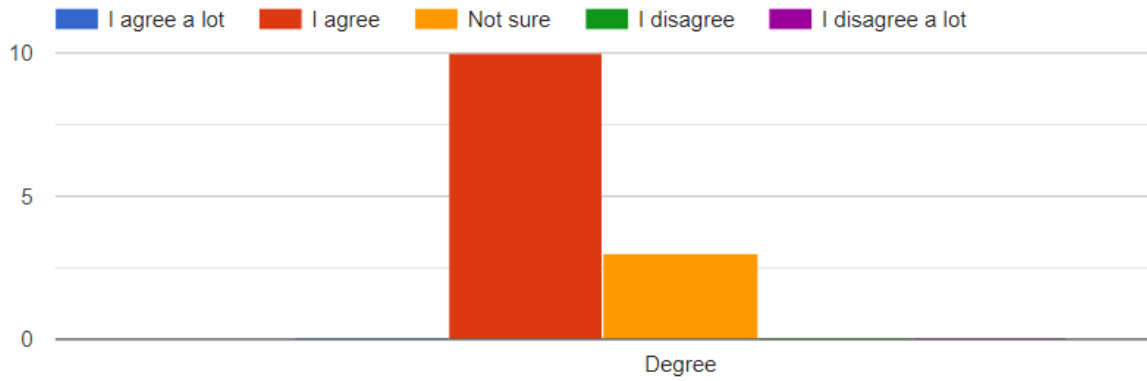
Many players only fully grasp the objectives and controls after a few matches and do not know for sure what to do at the beginning

The objective of the game was clear from the very beginning
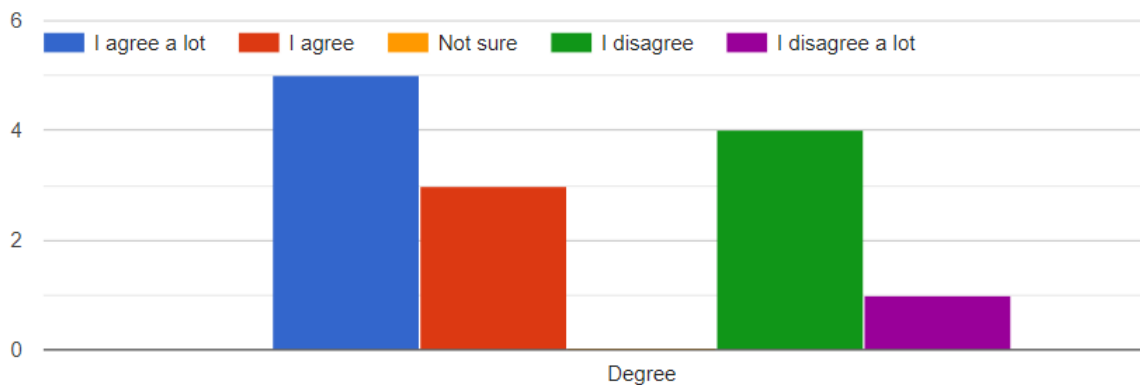
The opinions are split on the visuals of the game.

The visuals were appealing

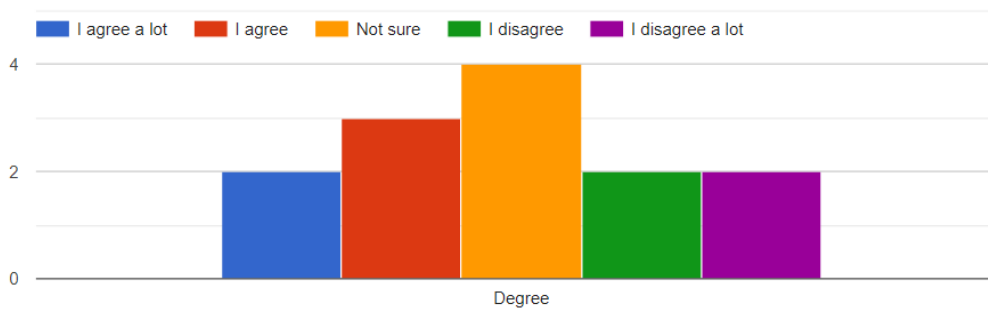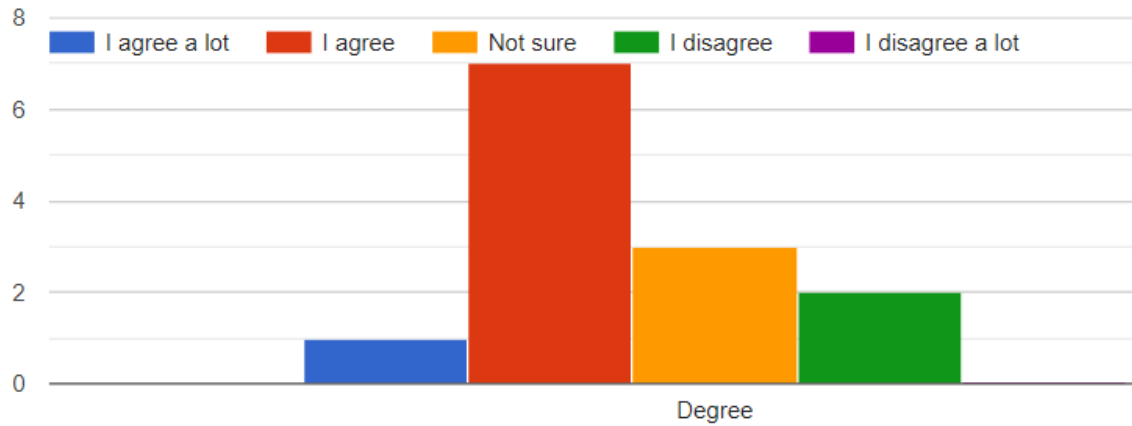However, while many do not really like the visuals, most agree that the design makes the game easy to follow.

The visuals made the game easy to follow

The balancing results are difficult to handle, because the players are split on that matter. This might be because the win conditions and current scoring in the game is not apparent at all times but it requires more testing within the team.

I felt one side was favored
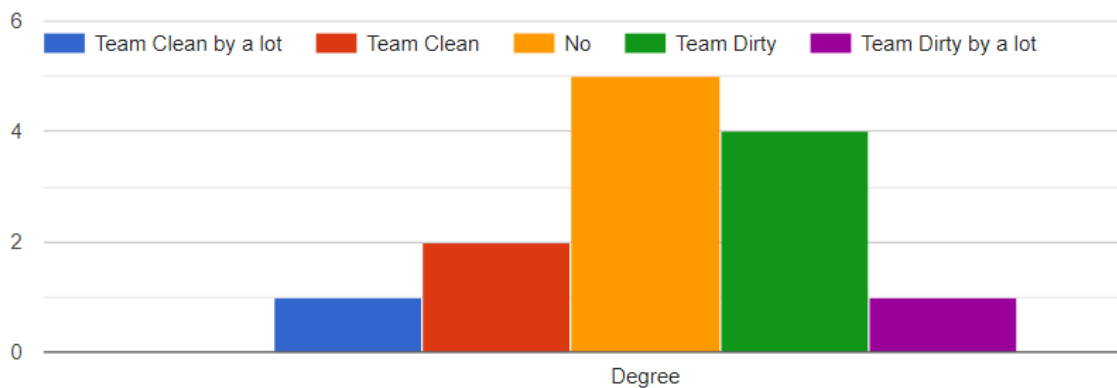
5.4 Improvements

We have decided to take a lot of advice from the free form answers within the survey and hope to implement them in the coming two weeks. The prioritized list looks as follows:
1. Resolve ability to "stun-lock" (Short invincibility after stun)
2. Progress bar when holding E to destroy objects
3. Tutorial-elements in lobby
4. Show team-sizes in lobby
5. Countdown at gamestart
6. Show score during game
7. Make objects (closets, table) directly influence floor colors

6. Conclusion

6.1 The Final Product

The game is a multiplayer PVP game based around area control. There are two teams, team Dirt and team Clean. Team Dirt has the goal of spreading dirt all over the map and wreaking as much havoc as they can while team Clean's aim is preventing them from doing so and cleaning up after them.

After inputting your name and connecting to the server, you are sent to a lobby room. This makes the game more dynamic. Instead of clicking through menus, you just walk through the doorway corresponding with the team you want to play as. Alternatively, you can walk over to an adjacent room to watch short tutorial clips that should bring you up to speed on the game's mechanics.

Choosing a team sends you to the actual gamestage. To start the match, all players who have chosen a team have to signal that they are ready. When that happens, a short countdown begins, giving anyone in the lobby time to join the round. When the countdown ends, the barriers to the map open and the match starts.

The map is a square platform with multiple objectives placed on top of it. These objectives can be destroyed by team Dirt or subsequently repaired by team Clean in order to affect a large area on the floor. Furthermore, powerups can be picked up to enable a special passive ability for the players for a set time. Additionally, the powerup makes you invincible to the enemies' attacks and boosts your movement speed.

Team Dirt has the ability to channel and throw a bomb for a short distance, spreading dirt in a circular area while also stunning any enemy hit by the explosion. To defend themselves, team Clean has the ability to shoot a cone shaped water splash which cleans the floor as well as stunning any enemy player hit by it.You can use your ability up to four times in a row and then you have to wait for the cooldown which is recharging your ammunition one by one.

The goal of the game is to cover as much of the map with your respective team effect as you can. So after two minutes, when the match is over, the team with the higher percentage of floor coverage wins.

Clirty can be played with any number of players bigger than two but it makes sense to play with equally sized teams.

6.2 Personal Impressions

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

Mattel: The biggest difficulty was definitely the networking part of our implementation. As it seemed like there was no feasible native solution we used a framework and had one expert in this topic. However this made the game unplayable locally. Therefore testing always had to be done in the online environment. Also contacting our expert was necessary quite often, due to this.

Daniel: I agree with my teammates that networking was the biggest hurdle. With no experience with online games, in the beginning it was difficult to get my head around the principles of server-client game architecture. Then, for every feature, the networking had to be considered: What data has to be transmitted, how can that efficiently be implemented, what can be computed locally and will the gamestate of all clients stay synchronous? Additionally, every time an incremental feature is tested, a client has to be built, the server is run in the editor, and two clients have to connect to the server to start the game. Especially when debugging, this really added to the time expenditure.

Sahin: Developing with multiple people in combination with the networking, it made it more difficult to test things and to develop things in an offline environment.

Albert: Networking is a thing that seems easy if handled carefully at first but can get out of hand very easily. We had many problems with keeping all the clients

synchronized and correctly resolving player actions. So that was definitely our biggest technical hurdle.

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

Mattel: By combining two contrary aspects, the theme made it quite difficult, but also interesting to come up with good ideas. As both parts needed to be captured in the mechanics or gameplay. A more straightforward theme would have eased some things, while keeping restrictions on the game.

Daniel: I like the theme of chaos and order. It spawns some specific ideas but also leaves lots of room for totally different concepts, as you can see from the wildly different games. However, if I could start over, I would spend more time coming up and prototyping mechanics to reflect the theme in the momentary gameplay. In Clirty, it lies more in the general concept of the game.

Sahin: I liked the theme in some aspects. I think it promotes some interesting ideas but also added some difficulty to it because you always needed 2 sides of something, which added some complexity.

Albert: The theme is very interesting but hard to actualize in a fitting manner. There is lots of thematic possibility. The gameplay for this theme can be a challenge. We wanted to capture the difference between both sides with asymmetric gameplay but that ultimately failed and we made the game more samey than originally planned.

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

Mattel: Maybe the theme did not enhance the game itself, but it definitely was useful during the brainstorming process to come up with a good game idea. Having total freedom would most likely result in a lot of discussions between the team members, because everyone wants to make a game of a different genre or setting or stuff like this. By the restrictions given from the theme the teams learn to work together during brainstorming and value everyone's ideas to get a feasible game idea in the end.

Daniel: I like having a theme as I often struggle to come up with ideas out of the blue. I feel when you could do anything you tend to be more critical of each idea as there are infinitely many other possibilities. The theme gives you a starting point of cognitive associations from where you can develop your ideas.

Sahin: In my opinion total freedom is a bait that only hurts projects more than it does any good. So maybe instead of total freedom it might be an interesting idea to instead of focusing on a theme like "order&chaos" to choose a concept like "multiplayer" or "action" or "shooter". This gives freedom in a different direction but you probably still have to go out of your comfort zone to try to implement something interesting.

Albert: Constraints help with creativity. If there are too many options it's often hard to find a fitting starting point. With a theme we could quickly focus on the main problem of creating a game and were also challenged to find ways to express the theme.

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

Mattel: I would probably speak against an online game as it made a lot of things difficult and was very time consuming this time.

Daniel: As I said before, I would try to focus more on the moment to moment gameplay. With the time pressure, you kind of get into a rut of chasing features instead of actually developing and refining mechanics that are fun. I guess that's difficult to circumvent and only more experience developing and more time to invest can help.

Sahin: Not sure, from personal experience all game projects have a different dynamic to them because the team members are always different.

Albert: I would try to prototype more. We mostly used the first things we had and maybe trying different solutions would have made for a game that is more well rounded.

Q: What was your greatest success during the project?

Mattel: For me there was not this one success. The best thing was seeing the game grow and improve over time, from milestone to milestone.

Daniel: I'm somewhat proud of the implementation of the grid and the basic clean/dirt mechanic. It's quite a high resolution grid with a lot of stuff going on from frame to frame and neither the visualization nor the score keeping slows the game down noticeably.

Sahin: For me it was the first time to do 3D modelling for a game and on top of that the animations kind of worked as well, so that felt pretty good.

Albert: The grid we use to display the dirt on the floor looks really nice now and the networking parts (should) be doing just fine.

Q: Are you happy with the final result of your project?
Do you consider the project a success?

Mattel: Yes, I am happy with the final result. Also, I think that the whole project time was a success and not only the outcome.

Daniel: Yes. I guess, for the time frame we can be happy with the result. The project as a whole was a success, as I learned a lot and had fun with my teammates.

Sahin: Yes and yes :)

Albert: The road was rocky but overall we did good on many fronts. I see this project as an overall success.

Q: To what extent did you meet your project plan and milestones?

Mattel: Most of the goals we specified in our desirable target were met in the end. We fell a bit behind our plan in the beginning, but could compensate for it afterwards.

Daniel: We technically hit the targets we set for ourselves. However, the quality of the actual features can be debated in some cases.

Sahin: We considered putting in some balancing for uneven team members but scrapped that part because we've had other stuff to do. Generally we met most of our goals though.

Albert: The milestones we chose were all met, but realizing the project plan was messy. That's to be expected of most bigger team projects.

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

Mattel: I would definitely recommend to clarify in the first meeting that there is a hard cap on the presentation time and that noone is interested in the code people wrote or stuff like this. Giving a clearer list of: What should be in the presentation! and: What should not be in the presentation! might be useful in this concern.

Daniel: I agree that the presentations should be kept short and focused on what the current state of the game is.

Beyond that, I generally like the frequent meetings to keep the development on schedule. However, it feels like you have to get to a playable version of the game really early which kind of locks you in with whatever you do in the first couple of weeks. Maybe, the physical prototype could be replaced with extended digital prototyping to give teams the chance to really play around with their concepts.

Sahin: It got better after the first 2 presentations but the amount of leeway presenters got with going over the presentation time was quite frankly infuriating. The meetings dragged hours longer than they were supposed to be even on a national holiday. I don't quite feel the usefulness of physical prototypes to video games but I can see that maybe it's a concept you have to use a bit more often first, interesting to get introduced to it.

Otherwise I liked the course organization.

Albert: Maybe it would be good to compress some of the idea finding and start sooner with the implementation. As for everything else the organization was good and easy to follow.