New Technologies

"Work together and fail together."

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The <u>goal</u> of the *project.*

Different movement system.

One of our main focuses for this project was finding a solution for movement in VR. Most games use a teleportation system or the touch/joystick to move. However, these movement methods can feel natural because you are moving in the game but standing still in real life.

PC + VR working together.

In an earlier project, we have already made a single-player VR experience. So this time around we wanted to try making a duo VR game. One in which the VR and the PC player have to rely on each other. An important aspect is making sure the PC does not feel like he is having a worse version of the same game while the VR player is having all the fun.

Gaining More Experience with VR.

VR can be a very powerful tool for experiences, making you truly become part of the game. We want to gain more experience with the creation of VR games so we can better create them.

The *technology* we used and <u>why</u>.

VR

There is still a lot to explore in this relatively new medium and New Technologies is the perfect time to experiment. VR places the player right in the middle of the game. Which is perfect for a game in which you are seated within a mech.

Design choices we made and <u>why.</u>

Starting Concepts:

Sorcery game
Massive Army Control with speech commands.
Robots and Mechs
Multiplayer (Multiple VR players)
Asymmetrical VR game (PC + VR)

-Sorcery: Already done a lot.
-Multiplayer (Multiple VR players): Going to be too challenging for the short time period we have.
-Massive Army Control with speech commands. Not a bad choice but we saw more potential in the Mech + Asymmetrical concept in this limited time.

Early Ideas for this concept:

2 Players, VR, and PC
Work together to control one Mech.
Parts of the Mech have their own health bars. Creating Destructible Parts.
VR Player: Combat oriented using hands and keeping guns to a minimum.
PC, Strategist, Overseer, Movement.
Enemies: Large amount of weak enemies.
Powerful feeling.

Research

We did some research on existing VR Mech games by playing and watching them. One common thing we noticed is that most of these games are focused on shooting targets. However, we feel like you can do so much more with a giant robot than just shoot. As shooting is already a very common thing in a large number of games and is not specific to mechs. So we wondered how we could make our game more interesting or at the very least less like other games. With this in mind, we started thinking about alternatives.

Some examples of games we watched/played.
Vox Machinae (Control movement from within the mech itself)
https://www.youtube.com/watch?v=lsUjARSsEFA&t=102s
Archangel Mech Game (linear)
https://youtu.be/KrTQ3SPxOik?t=600
Archangel Hellfire (can move freely)
https://youtu.be/0262K3wqxN4?t=168

Iteration 2

The focus of this iteration was trying to be different than other games on the market. So we decided to focus on the interaction between both players rather than make a standard shooting game. We wanted both players to work together but not necessarily be stuck to each other for the whole game. So we came up with the splitting mechanic. In which both the bottom half (the movement system) and the upper half (combat and the arms) could function separately. And also make the puzzles in such a way that it is sometimes required to disconnect from each other.
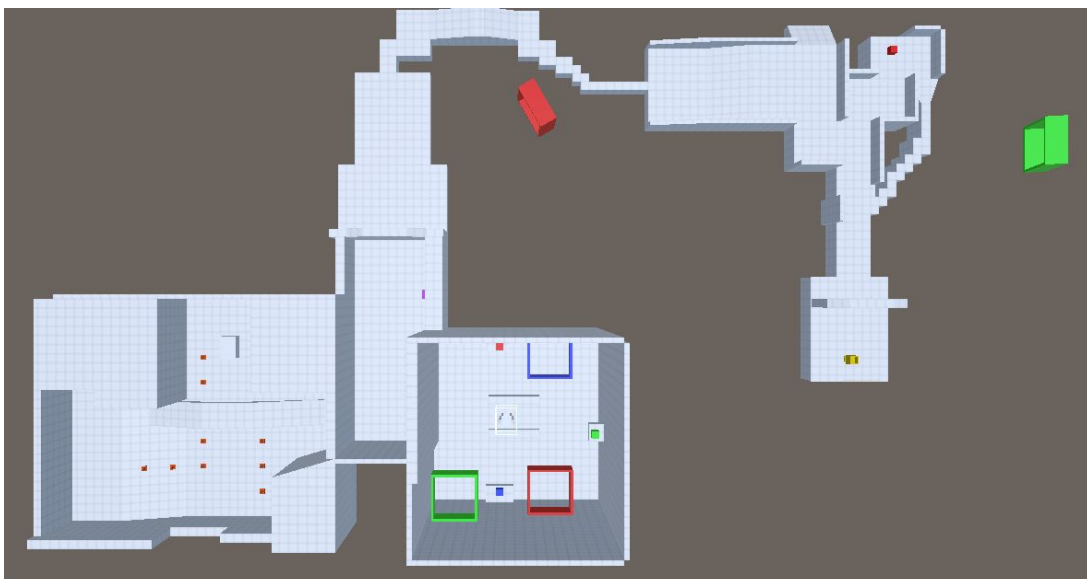
Iteration 3
Stage Design

To make the design of the puzzles and the stage easier we decided to create some narrative for the game. This way you could make the puzzles have something to do with the current environment for example. In summary, the game would take place in a future where the earth has become uninhabitable. Humans live on Mars with the help of Elon Musk. 2 young people manage to get remote access to a special type of exploration vehicle left behind on earth. However, this vehicle requires two people to control. The game then would be about exploring the desolate earth and figuring bit by bit what happened. This would be done by open-world sections and leftover Research bases. These bases would future more linear dungeonesque gameplay. Fighting enemies and solving puzzles, unlocking new parts for your vehicle.
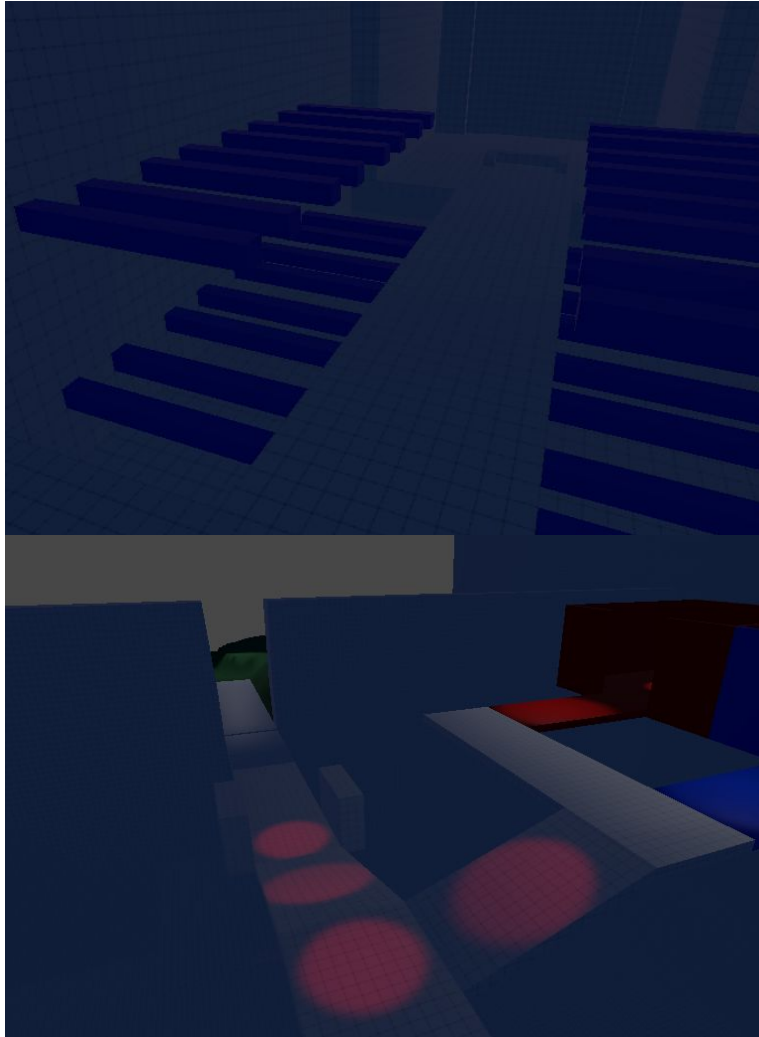
This would be your starting room. Multiple copies of the same vehicles would be located on the blue rails. The room is dark because the power for the lights is no longer active. You would drive towards the door activating a panel to turn on emergency power. The door would open in front of you. At this point in time, the visual for the mech would come online. The top part of the mech would be located in a random room distinguishable by their color.

The bottom part would then drive through the path lit up by the emergency lights. The mech player would have to communicate in which color room they are located. In a later version, you could make it based on objects in the room rather than a basic color to make it a bit less obvious. They would then combine together and go towards the exit. However, the bridge to the outside would then collapse. You would have to traverse the Research Base and find your way out through solving puzzles.

# The game/experience we have created
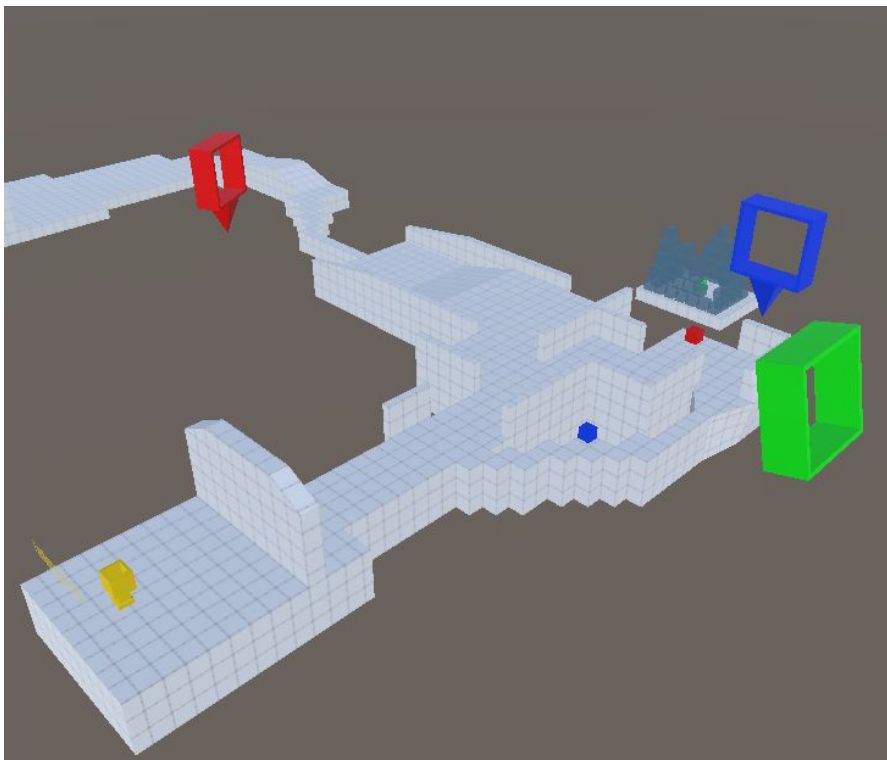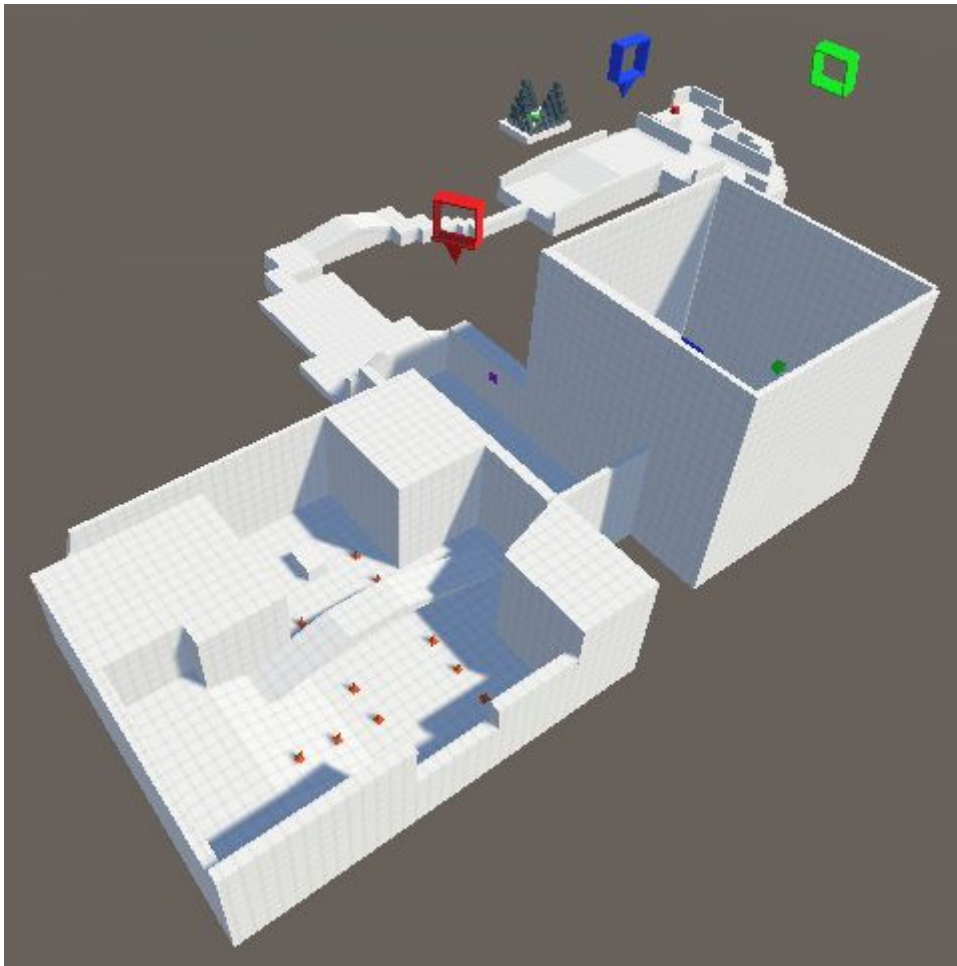
That looks quite different than what we just showed, what happened?

Iteration 3 shows how we would like to see our game as a finished product. However, trying to create a finished product of that scale within 3 weeks is simply not going to happen and is not the goal of this module.
So we decided to change our **approach.**
Instead of making a small part of a large Triple-A game idea we would make a prototype. Something you could show of to someone so they can understand the very basic idea behind the game. Which is linking and splitting up so you can overcome challenges together. So we started from scratch on the level design.
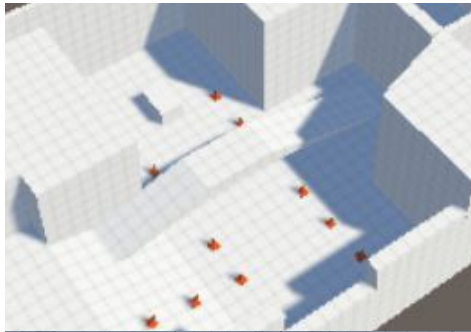

The first section of the stage would feature both parts introducing their main mechanics for this demo. The movement player would drive around a small course to get an understand of the way the bottom part controlled.
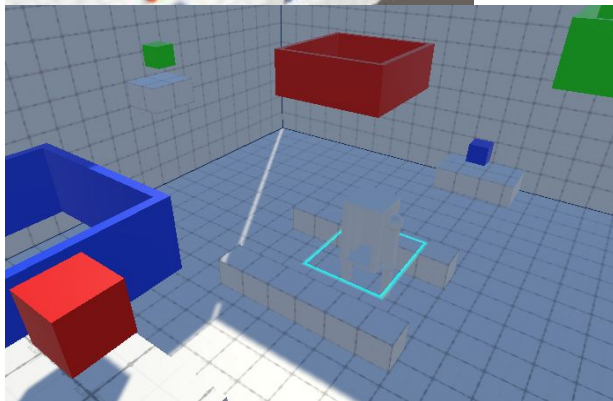
In the meantime, the VR player would have to solve a puzzle grabbing and throwing the correct cubes into the correct rings. The cubes cannot leave the area so the person can try throwing as much as they want, to get a feel of the arc the cube travels.

If both players complete their separate challenges the players will be able to meet up as the walls would open up. This part was received with excitement in the playtests because both players had not seen each other until that point. The Movement player would drive towards the top and combine into one vehicle. This combination is required as the movement player has no way to reach the button to open up the next area otherwise.
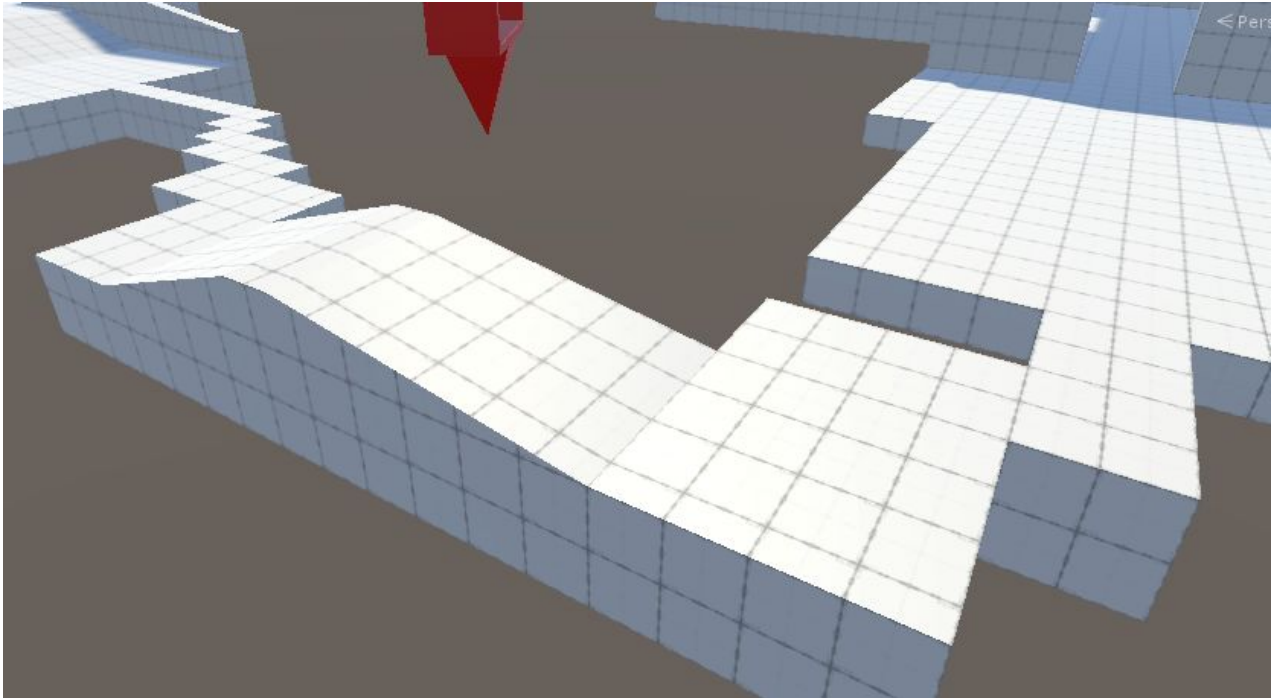
This next area features a very narrow pathway that is already quite hard to traverse but there is something making it even more difficult.


The screen of the movement player is almost completely covered in keyboard cat videos. The VR player will have to guide and direct the movement player across this narrow bridge. (Note: In the demo there was no fall gravity, this made falling off the bridge impossible as you can just float. However, players still expect this to work so they tried very hard and panicked to not fall off. Like Richard always says, if you cannot make it just fake it. As we did not have time to fix the gravity issue as it was needed for the custom tank controls it also did not take away from the expected experience.)
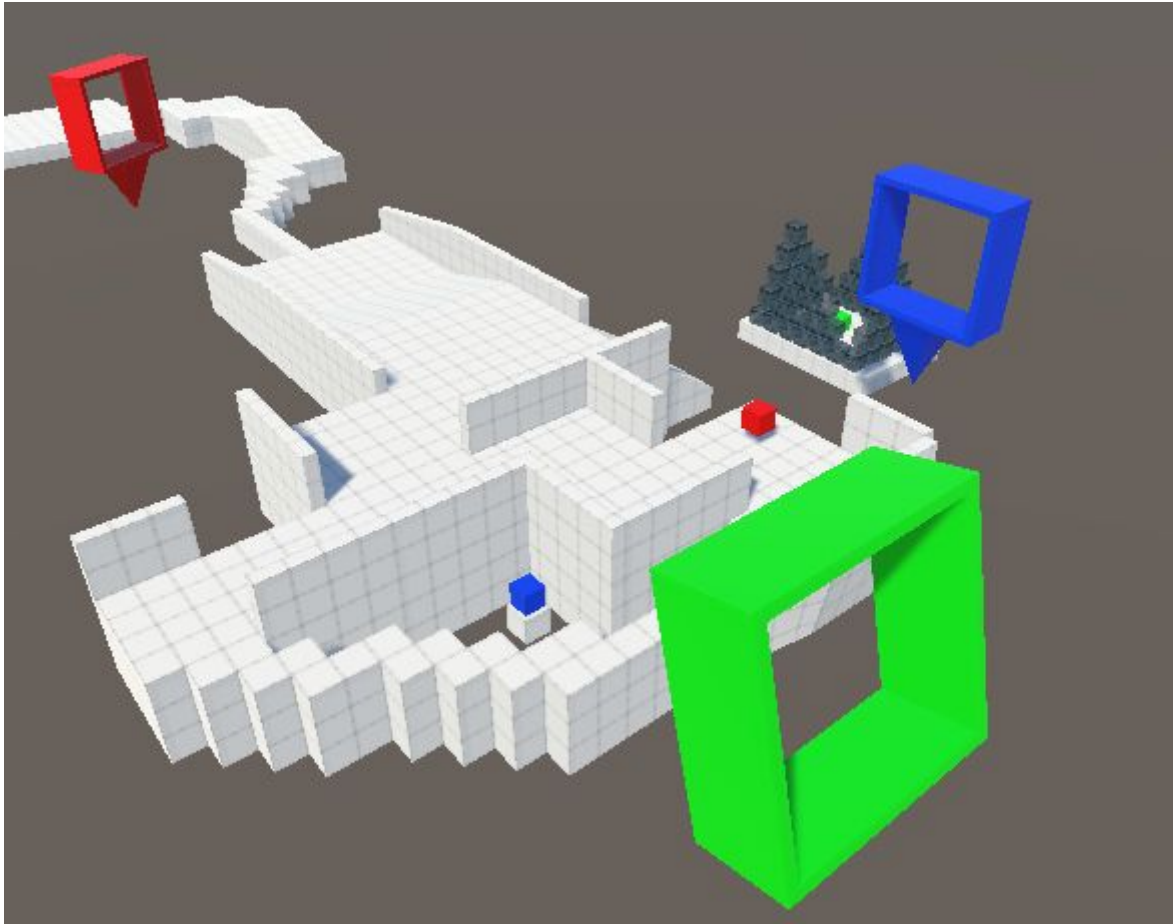
If you survived the "deadly" bridge you reach the last section. In the last section you have to work together to throw the cubes through the colored rings. The perspective of the movement player allows him to see in a wider range than the VR player. This way he can call out, for example, the blue cube which might be hard to spot from the view of the VR player due to their limited view.

Here is a link to a gameplay video:
https://drive.google.com/open?id=1TCs7iIxXxQ3xgWwGe3P_2GcIpKJFw6SY
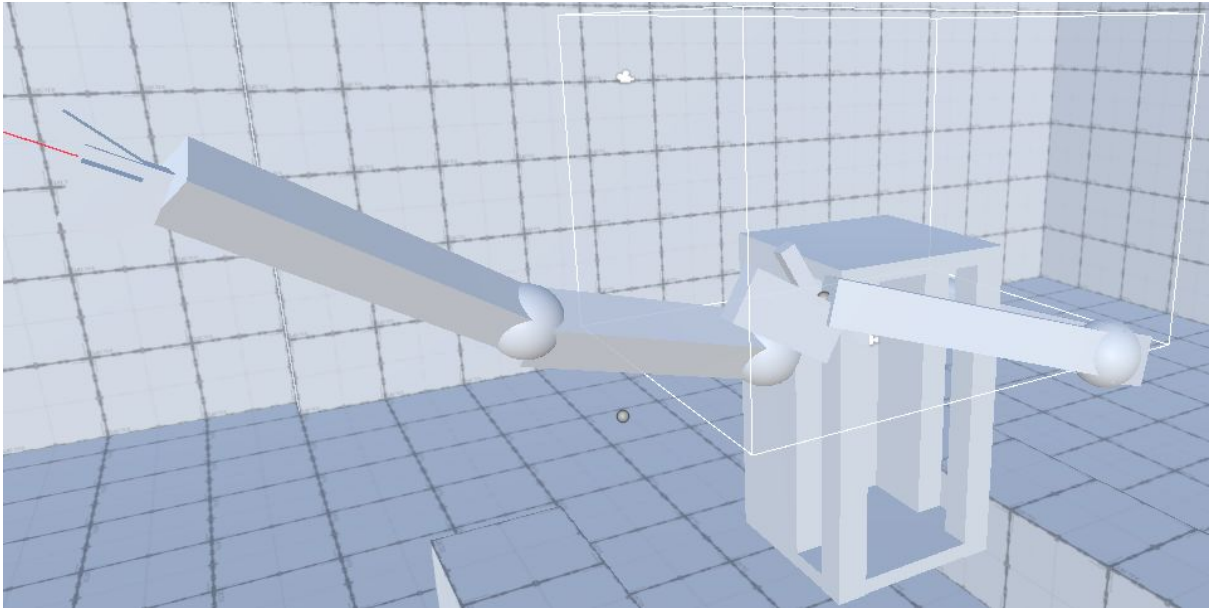
Inverse Kinematics at its finest
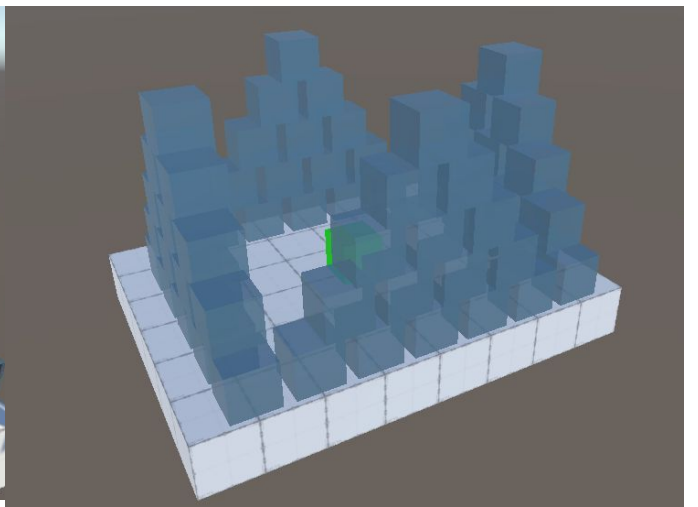
Always use someone's face when using prototype assets. Because this is just boring.

Troubles we encountered/solved

Inverse Kinematics

The arms of the mech are an important part of the game, to create the movement of these arms inverse kinematics was needed. I don't know how these systems work, so I decided to try out some existing code. The SteamVR IK code was hard to figure out how it worked but after I finally got it working, I still had to change their code. The problem that I had to fix was that when the target was out of range, the arm started spinning. Now the Inverse Kinematics was working, I needed to make the arms be controlled by the controllers in a 'scaled' way, this went wrong many times but in the end, I got it working.

Player position in play-area (calibration)

Because the player is in a mech but can be anywhere in the play-area, there had to be a calibration button to place the player back in the mech. This takes the offset of the player in the physical world and uses this offset to correctly place him in the mech.

SteamVR input

For the input from the VR player I had to learn the SteamVR input system that looked daunting but ended up being easy to use, both in code with events and in the input setting for mapping the controls to buttons.

Creating meaningful gameplay for both players.

Creating satisfying puzzles to complete is already a very hard task. But creating puzzles for two players at the same time is even more difficult. That is why in this demo we have focused on creating very simple puzzles that require both players to work together and use their own mechanics. This way it does not feel like one of the players is just watching someone else complete the puzzle for them. Instead, they are actively participating in the act of finding a solution by requiring both players to work together.

Positive insights of our approach

- ❏ Prototyping was quick with the use of ProBuilder and ProGrids.
- ❏ Events made it easy to connect small behaviors together.
- ❏ Having our own headset made it easy to test and also made us independent from 'uitleen'
- ❏ Gained experience in finding the right scale for the project depending on the time and tools you have.

Negative insights of our approach

- ❏ VR can be a lot of back and forth with testing and building.
- ❏ VRTK was too big to quickly understand.

Interesting insights of our approach

Disconnected heads in Github can cause a lot of trouble. Especially because this happened on the last day before the deadline. We had to spend some time to figure out how to fix this by using the git command line.

A link to the project's GitHub

https://github.com/StijnOnline/Mech-VR