Team Rastermotte: Project “Elevator Pitch”

Milestone 1: Formal Game Proposal

1 Game Description

General Description and Core Mechanics:

Project “Elevator Pitch” is supposed to be a 2D rogue-like (if the time allows it maybe even a rogue-lite) game in which the player will control a space elevator which is equipped with two mechanical multi-purpose arms that are its means of defense as well as accomplishing most tasks during the dangerous climb up into space.
The theme of “UP and DOWN” is at the very core of the whole gameplay loop as the player will start at ground level (or even in a sort of hangar underground) and try to reach several goals further up, returning back down with loot / new knowledge/ etc. and in a final run eventually reach space. During these very vertical missions/climbs the player will face waves of enemies trying to attack the elevator and will have to control the mechanical arms to grab and smash enemies into each other or smack them back down to earth. The arms are the main way to combat enemies, but also a tool used to collect resources from enemy wrecks and the environment and loading in mission objectives down in the hangar. With the arms as the main feature we try to make them feel the most polished. They are supposed to work as a physics-based combat system. Elements like the arms, especially the claws, enemies and environmental objects will each have their own mass and will thus influence the way the arms are able to grab, move and fling them. Punching something with the claws while holding a heavy object will have more impact than with empty claws. The arms are sword and shield at the same time. On the one hand (hahah) grabbing, flinging and punching enemies will serve as attacks while on the other side forming a flat surface will allow the claws to be used as shields for the purpose of pushing back enemies or reflecting projectiles.
Smaller and faster projectiles can be deflected back at enemies that way and larger, slower projectiles might need to be caught for example.
The arms will be controlled via mouse input. Only one arm at a time will be under manual control (later upgrades to the elevator might allow for the inactive arm to be in some sort of automatic defense mode). The claw of the currently controlled arm follows the movement of the mouse as closely as its physical limitations will allow and the movement of the arm will be handled by inverse kinematics. The speed and range of the claw will be limited by its current weight and the length of the arm, so extremely speedy and erratic mouse movements won’t have much of an effect as the claw will need to de- and accelerate accordingly first. Left-clicking will close the claw, right-clicking will make a flat claw to deflect

projectiles. Alternatively, we could make the closing and opening of the claw be controlled by the mouse wheel, which would leave the left mouse button free for another function e.g. forming a fist to punch with, playtesting will have to show what feels more satisfying.
Moving the mouse from one side over to the other side of the elevator will lead the currently active claw back to the elevator-cable and the other claw to become actively controlled. Since the arm has a limited range, the player will have to use the ‘W’ and ‘S’ keys to move the elevator up and down a bit to allow for a small amount of additional vertical movement during combat. To make throwing enemies both easier and more satisfying, the arms each have a ‘fling mode’. For example by pressing the ‘space’ key, the mouse control scheme will switch from directly controlling the claw to directly controlling the movement of the upper arm. In this mode the rest of the arm is simulated by forward kinematics in a ragdoll-like manner, allowing the player to fling grabbed objects (like enemies) in a horizontal direction provided properly timed release of the grabbed object.
The other core mechanic will be the managing of the elevator during the non-combat climb parts. While out of combat the player will control a single character, the pilot, inside the elevator. The player is then free to move inside it for the purpose of refueling the engine, making repairs, controlling the climb rate, adjusting settings of the arms (or if development time allows it even explore the elevators immediate surroundings with e.g. a jetpack). This aspect is inspired mostly by the game “FAR: lone sails” although adapted to our genre and setting and it seems like a nice balance to the dexterity-based combat parts of the game.

General Gameplay Loop:

A single gameplay loop will look something like this: The player starts in the hangar and can browse through several missions (maybe predefined, maybe procedural) and select one or upgrade the elevator with earned funds. Depending on the mission type the player will then have to load cargo into the elevator (using the mechanical arms of course) or let passengers aboard.
Optionally, the hangar might be capable of horizontal underground movement to dock at different space-cables, so the player might need to select a specific one for a mission or choose freely for an exploratory climb. In that case, the final goal might be to upgrade the elevator enough to be able to make a climb at a specific final and particularly dangerous cable to reach an end-goal. Otherwise the end goal might be to just raise enough funds to retire or pay off a debt.
In any case, after starting a climb the player will start out inside the elevator managing it until an enemy-alarm sounds and mechanical arms will have to be manned for defense, thus starting combat mode.
Now, several waves of enemies attack the elevator and using the very versatile arms, the player defends themselves.
After all enemies are vanquished, the opportunity to scavenge the battlefield for resources comes up. The player can collect whatever is in reach, until the cargo is full or the battlefield is empty. Resources allow for repairs and fuel, but a heavier cargo load will also increase fuel consumption (or slow down maximum climb speed. thus giving enemies more opportunities to attack).
These climb, combat and collect phases then repeat until the mission goal is reached or the player is forced to abort and drop back down.
After falling back to the hangar the whole loop reiterates.

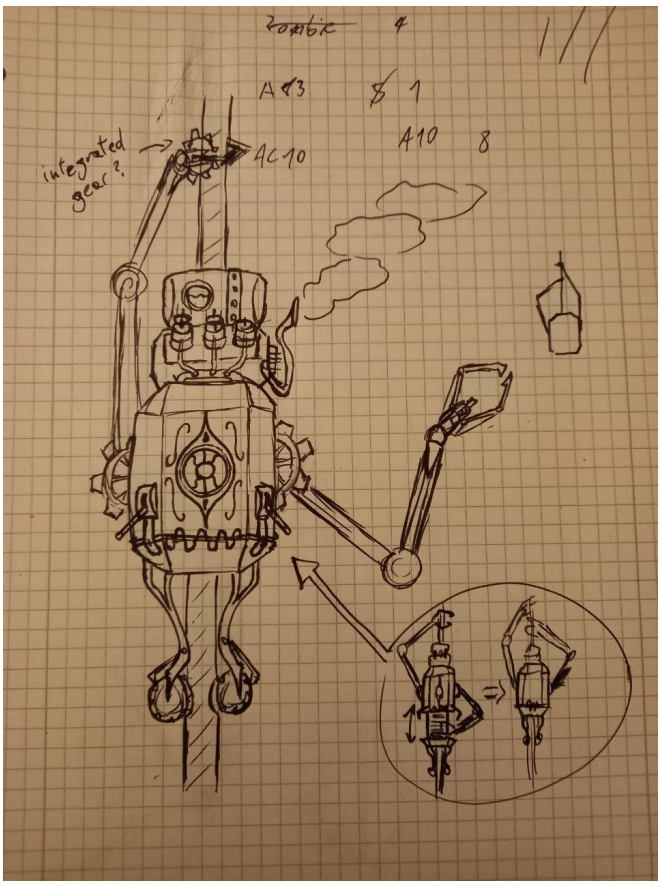
Story and Setting:

We aim for a steam- or dieselpunk aesthetic. Inspiration for the style and world are games like the “Deponia”-series and maybe in some aspects classic post-apocalyptic settings like the “Fallout”-series, although with the aforementioned steampunk twist.
The ground of the planet is mostly a wasteland of trash, scrap metal and derelict machines of a long past and more developed world, but anything but dead. While plant-life is rare, humanity survives between all the trash in smaller groups and villages, a far cry from the continent spanning states of the past. Following environmental collapse, the rich and mighty of the people started building a new society in orbit, creating thousands of (almost) self-sustained space stations and spanning equally many cables between the earth and orbit for use with space elevators to efficiently reach those stations. The poor were left on Earth. While the original upper class fled the furthest out into space, with time some of the more powerful lords that arose from the trash-folk of the surface started to claim certain space-cables and building stations around them inside still breathable parts of the atmosphere, forming a new kind of ‘middle’-class. The new rule of human society thus became that a person's status was literally determined by how ‘far up’ they are, although quite a big buffer still exists between the true space stations of the now-called ‘Orbitals’ and the ‘Scrappers’ who are still bound to breathable parts of the atmosphere.
We have several ideas for the story of the player character themselves all depending on what the actual long term goal will be.

1. The player could be aspiring to live among the Orbitals in space and in need to raise enough funds to afford the enormous entrance fee.
2. The player could be a secret revolutionist trying to abolish the class system, upgrading the elevator until it is capable of rising up to actual space, delivering a payload of a small revolutionist army to one of the stations.
3. The player could be an explorer with the goal to discover the mysteries of the upper atmosphere, dreaming of proving the legends of another society in space right (or disprove them)

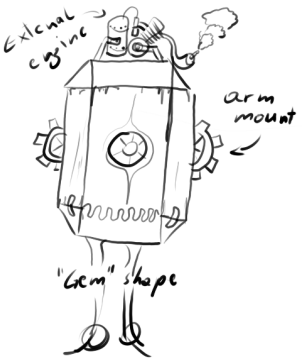
Concept Art and Illustrations

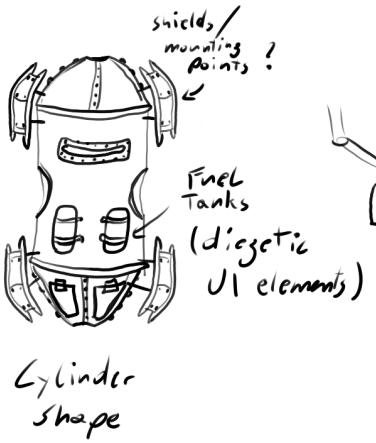
Ideas for the design of the Elevator:

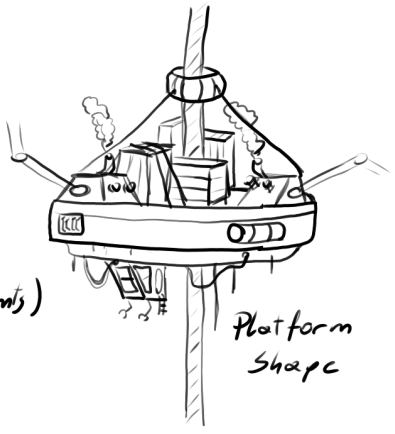


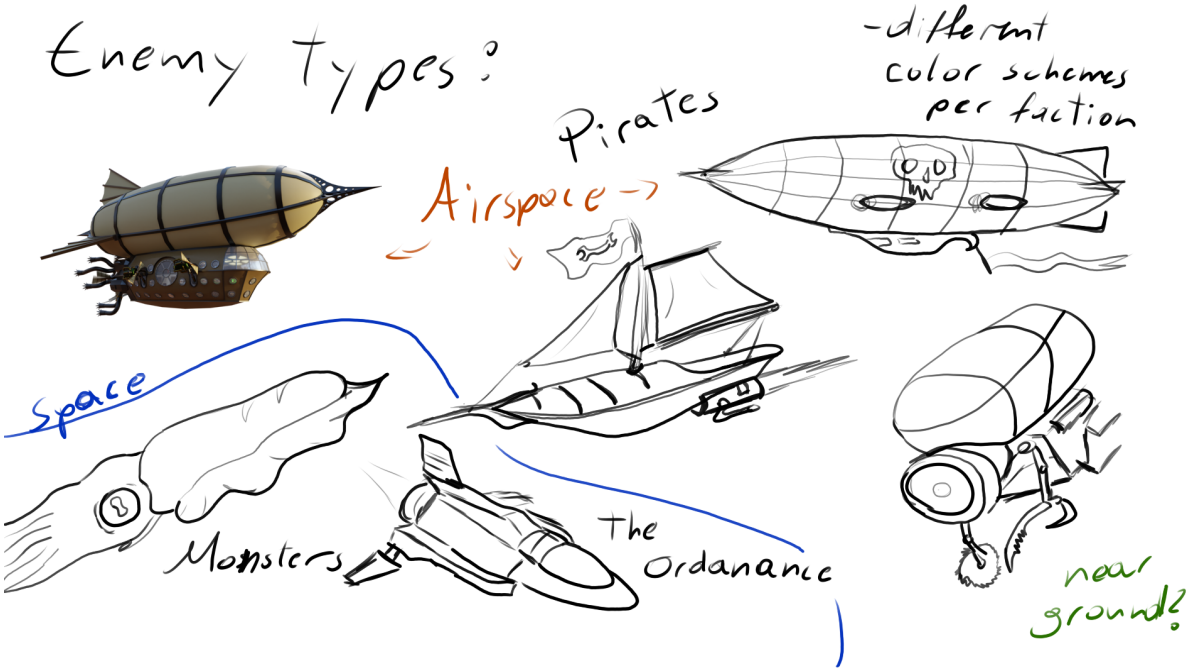
Elevator Designs: (To be realized in 2D Pixel Art ?)

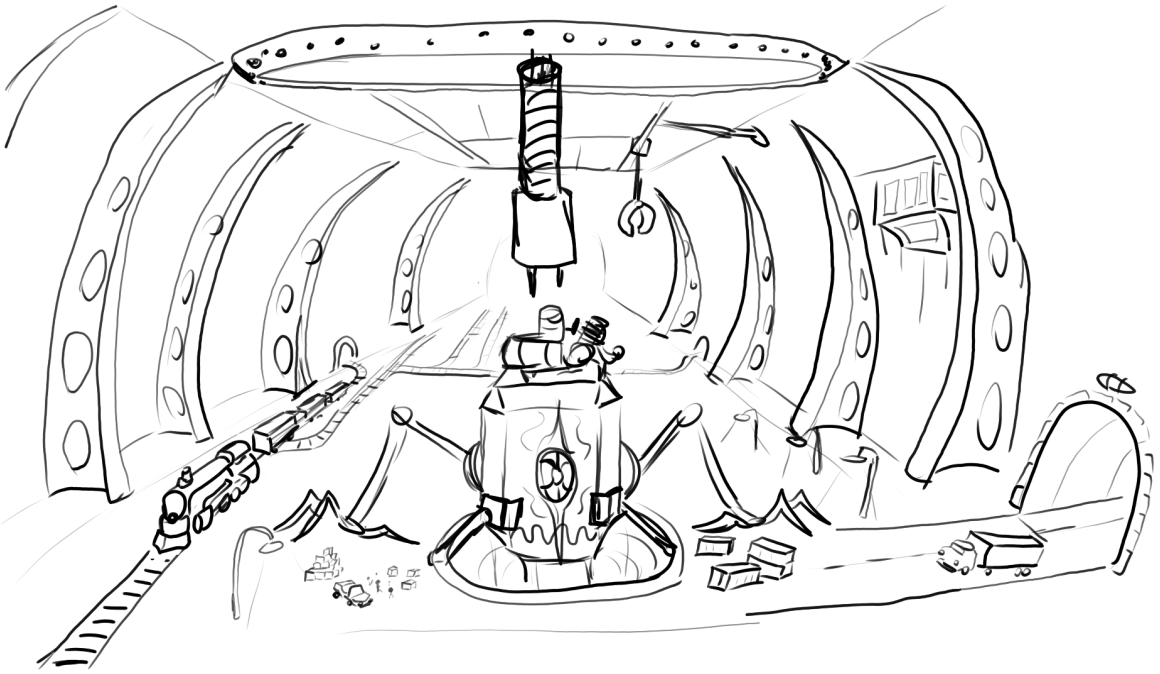
Body:

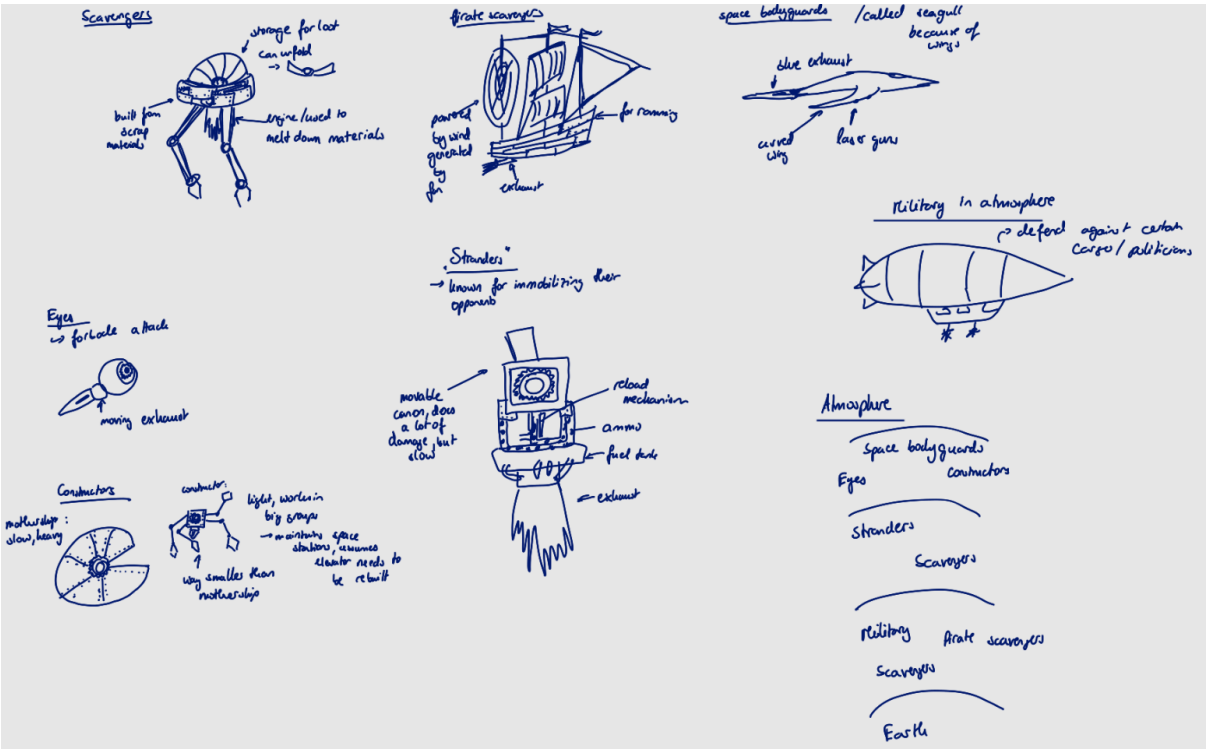







Enemy Types?
-different color schemes per faction
Pirates
Airspace
Space
Monsters
The Ordanance
near ground?





2 Technical Achievement

Physics-based Combat

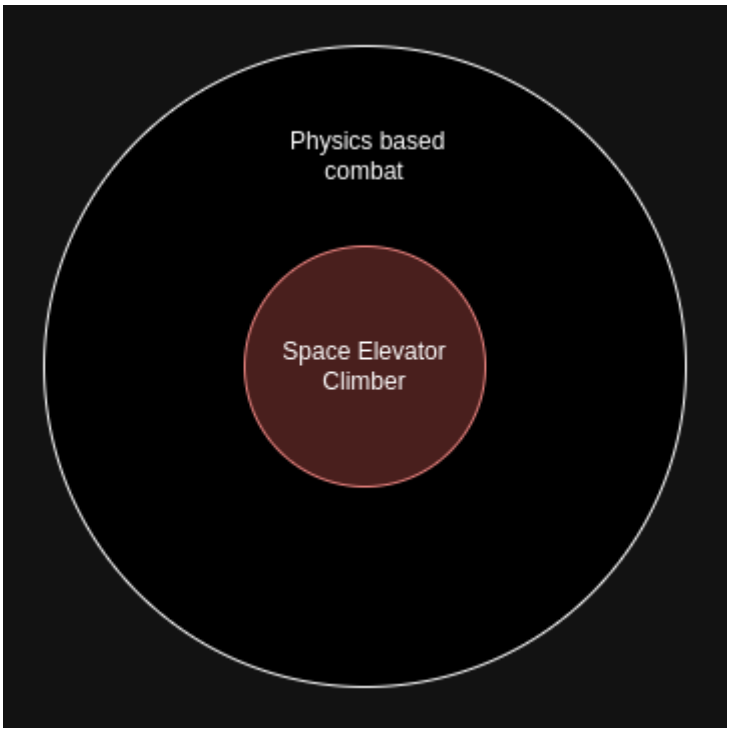
The combat is going to be the focus of the game. We want to make it very physics-based, not only to make the control of the mechanical arms feel satisfying but also to let the player make use of it in creative ways.
We want to associate mass with most objects in the game and have it take effect in various ways like how hard punches hit or how hard/far objects can be thrown. We also have the idea of a simplified air-drag simulation based on object shape and material also mostly affecting throwability. This last point goes well together with giving objects (mostly enemies) different parts with different structural integrity, so that the player is able to rip up (or rip out) parts that affect air-drag negatively or to rid enemies of their buoyancy. This should also make combat more interesting because it should allow the player to strategically target specific parts of enemies.

Inverse/Forward Kinematics

A secondary feature we want to take a look at is the use of Inverse and Forward Kinematics to make the arms and claws look good. This is something we want to experiment with out of interest and because we think it would greatly improve the look of the game. How much or even if it will be a technical challenge at all will reveal itself once we get to that part.

3 Big Idea Bullseye

The core idea of the game is the space elevator with its mechanical arms that are used both for movement as well as defense.
As a twist, we will implement physics based combat, where the movement and the effect of the claws is based on physical properties as well as the throwing and interacting behavior of the enemies.



4 Development Schedule

Goals

1. Functional Minimum
    a. Basic sprite for elevator with arms
    b. Basic movement of the elevator and arms
    c. Basic grabbing and throwing of enemies with arms
    d. Enemies that can be grabbed and attack elevator in a simple way
    e. Simple movement inside of elevator and press button to keep elevator going
    f. Cycle between movement in elevator and fighting
    g. Simple health bar
2. Low Target
    a. Basic, static environment
    b. Loading phase: grabbing of grabbables and counter how much is loaded
    c. Basic mission: load either cargo or people, no real impact on gameplay (always similar enemies)
    d. UI to indicate health of elevator and cargo
    e. Delivery of cargo

    f. Basic sound effects when grabbing enemies
    g. Different movement of arm depending on mass
    h. Flinging mechanic
    i. Final goal: maximum points
    j. Music
    k. Enemy dismemberment
3. Desirable Target
    a. Enhanced sprite for elevator and arms
    b. Changing environment (depending on height)
    c. Type of mission (cargo or people delivery) determines types of enemies that attack
    d. Cargo types imply story (radioactive material, food, politicians)
    e. Satisfying movement of arms
    f. Player inside of elevator tasked with fixing and fueling elevator
    g. Mounting points for extra stuff (artillery, shields, gadgets…)
    h. Shield that has to be timed to reflect incoming enemies
    i. Enhanced enemy sprites (space pirates, trash junkers, bodyguards, depending on height of elevator)
    j. Sound effects for space elevator (on hit, fueling, fixing)
    k. Collect money for final ticket
    l. Switch between different cables (locked by money), to reach final climb
    m. Different physical properties on different enemy parts
    n. Voluntary Mission Abort
    o. Complex enemy behavior (different behavior depending on enemy type, pirates attack alone, bodyguards more often in formation)
    p. Different themed music depending on height and location.
    q. Procedural generation of missions
    r. Player Character selection. Unlock new characters by winning. Different skin and special ability.
    s. Player can move outside of space elevator to scavenge for resources
4. Extras
    a. Online Cooperative Multiplayer
    b. People/Cargo smuggling
    c. Interactive Story (Mission dependent NPC dialogue etc.)

Tasks

Based on our goals, we have identified the following tasks for each milestone to achieve our goals:

Interims demo	**Responsible**	**Time estimate in h**	**Actual time spent in h**
1. Elevator sprites	Philipp	6	
2. Elevator and Claw	Philipp	5	

code			
3. Interior code	Natia	6	
4. Interior interactables	Natia	6	
5. Interior sprites	Philipp / Lukas	4	
6. Environment sprites	Lukas	5	
7. Enemy sprites	Lukas	5	
8. Enemy code	Lukas	10	
9. UI graphics	Lukas	2	
10. UI code	Natia	3	
11. Code/Asset tuning	All	8	
12. Presentation	Natia	1	

Alpha release	**Responsible**	**Time estimate in h**	**Actual time spent in h**
1. Enemy AI		15	
2. Enemy dismemberment		4	
3. Claw physics		10	
4. Base station sprites		6	
5. Base station logic		5	
6. Loading phase code		3	
7. Mission generation		10	
8. Adaptive environment		7	
9. Mission abort		2	
10. Physics fine tuning		8	
11. Extra sprites		4	
12. Cable switching		4	

13. Presentation		1	

Playtest release	**Responsible**	**Time estimate in h**	**Actual time spent in h**
1. Equipment modules code		12	
2. Eq. Mod. sprites		4	
3. Eq. Mod. UI		3	
4. Enemy part physics		9	
5. Sound effects		4	
6. Extra sprites		5	
7. Questionnaire preparation		2	
8. Presentation		1	

Final release	**Responsible**	**Time estimate in h**	**Actual time spent in h**
1. Better mission generation		10	
2. Complex enemy AI		10	
3. Movement outside of elevator		20	
4. Presentation		1	

Timeline

Our timeline looks as follows:

Working				
Interims demo	8.11.-14.11.	15.11.-21.11	22.11.-28.11	29.11.-5.12.
1. Elevator sprites				
2. Elevator and claw code				
3. Interior code				
4. Interior interactables				
5. Interior sprites				
6. Environment sprites				
7. Enemy sprites				
8. Enemy code				
9. UI graphics				
10. UI code				
11. Code/Asset tuning				
12. Presentation				

Working					
Alpha release	6.12.-12.12.	13.12.-19.12.	20.12.-26.12.	27.12.-2.1.	3.1.-9.1.
1. Enemy AI					
2. Enemy dismemberment					
3. Claw physics improvement					
4. Base station sprites					
5. Loading phase code					
6. Mission generation					
7. Adaptive environment					
8. Mission abort					
9. Physics fine tuning					
10. Extra sprites					
11. Cable switching					
12. Presentation					

Working		
Playtest release	10.1.-16.1.	17.1.-23.1.
1. Equipment modules code		
2. Eq. Mod. sprites		
3. Eq. Mod. UI		
4. Enemy part physics		
5. Sound effects		
6. Extra sprites		
7. Questionnaire preparation		
8. Presentation		

Working		
Final release	24.1.-30.1.	31.1.-6.2.
1. Better mission generation		
2. Complex enemy AI		
3. Movement outside elevator		
4. Presentation		

5 Assessment

In summary, the strengths of the game should be a fun way of fighting off enemies, while the micromanaging of the elevator should be a way to increase the challenge and make the player feel in control of their vehicle.
The game should be suitable for all ages and the intuitive control schemes should make it approachable for all levels of skill. That being said, players who are especially fond of the rogue-like genre and a good mix of dexterity and management based types of games will have the most fun.
The player will do multiple runs of the main gameloop until they have amassed enough skill and/or ressources and upgrade to tackle the final goal during which they will either win or fail and start over again.
The world that the player will get to explore should be in equal amounts fun to look at and atmospheric, which is why we are going for a light-hearted and novel approach of the otherwise very overdone post-apocalyptic setting.
The criteria on which we will judge our success are therefore:

1. Is the combat fun?
2. Does the combat benefit from the degree of physically-based systems in the background?
3. Is the game challenge balanced appropriately?
4. Did we successfully hit the genre target we were aiming for?
5. Does the game world feel unique enough and is fun to look at?

Milestone 2: Physical Prototype

1. Approach

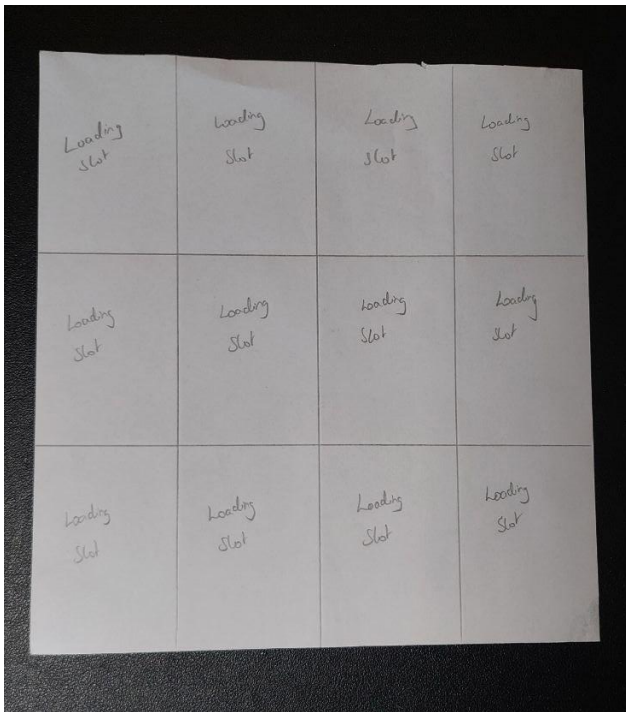
To create the prototype, we first gathered the most important aspects of our proposed game. These are:

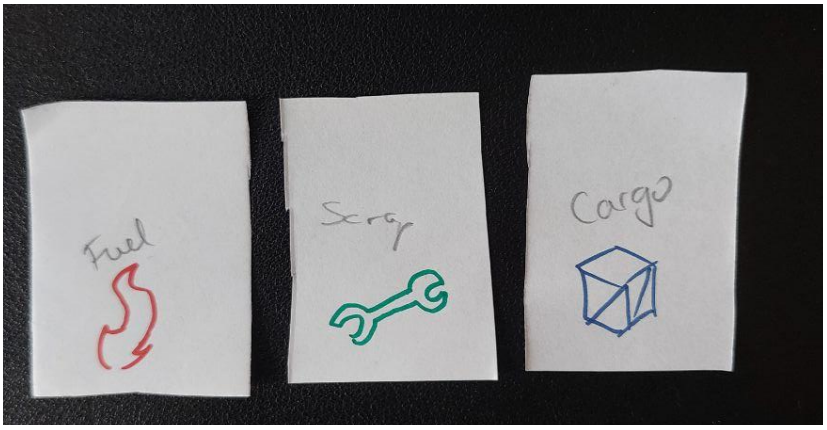
- upward movement of the elevator to deliver cargo
- downward movement of the elevator upon completed mission
- enemy types based on the height of the elevator
- physics based combat
- satisfying movement of the arm to defend against enemies
- flinging mechanic of arm
- loading phase

As the physics based combat as well as the satisfying movement of the arm are strongly bound to the actual digital implementation of our game, we did not find a good way to translate and incorporate this aspect into a physical prototype. One considered possibility was the use of an elastic rubber band based arm, which could translate the flinging

mechanic of the arm. This did not produce a satisfying result, so instead we opted to focus on our remaining aspects.
We built the prototype to include the three important phases of the later actual game:

1. Loading Phase: Here the player has to load up their cargo space with either cargo crates that they can deliver at their destination and exchange for money or they spend their precious cargo space on fuel which is needed for the climb itself.

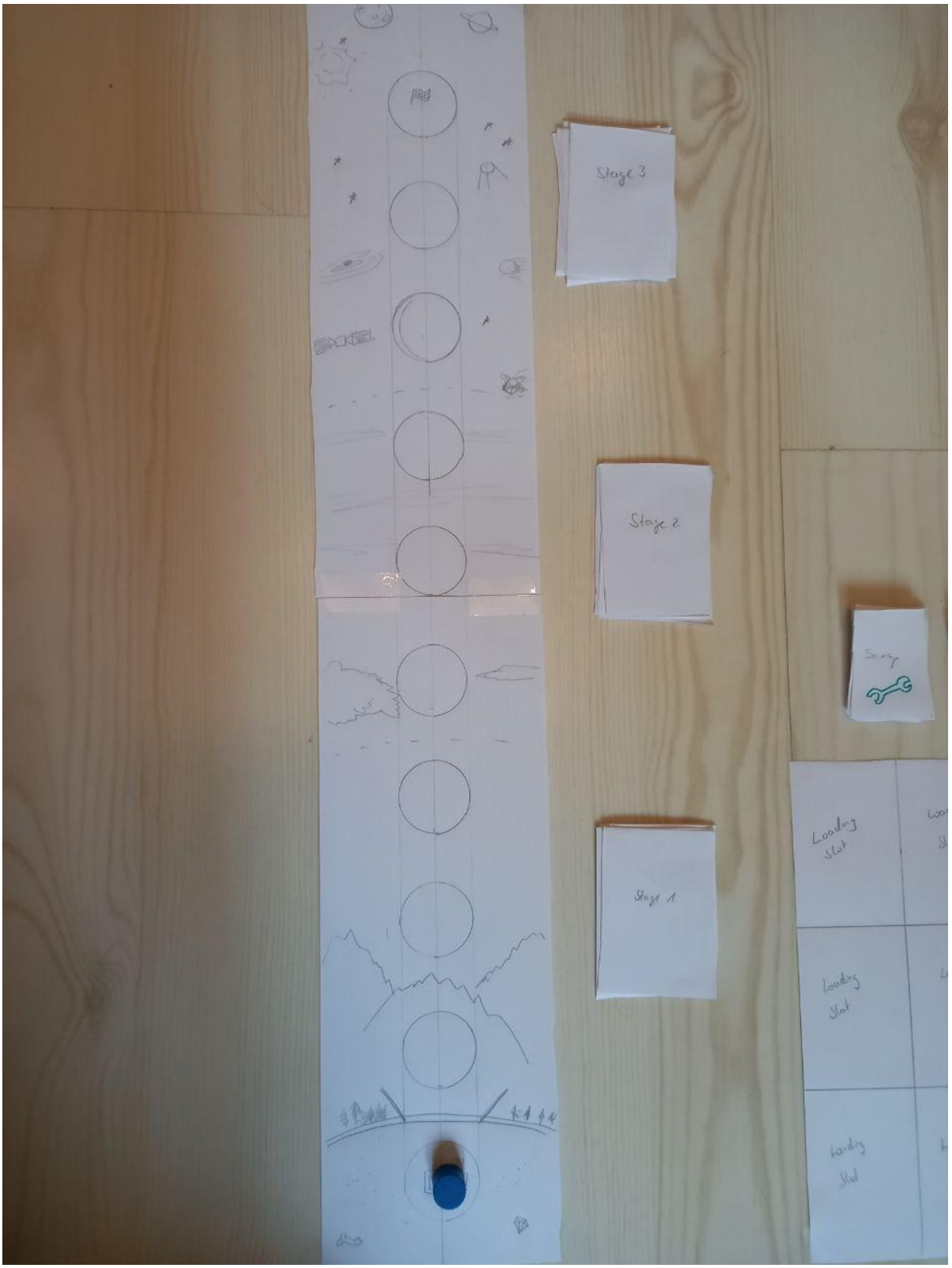




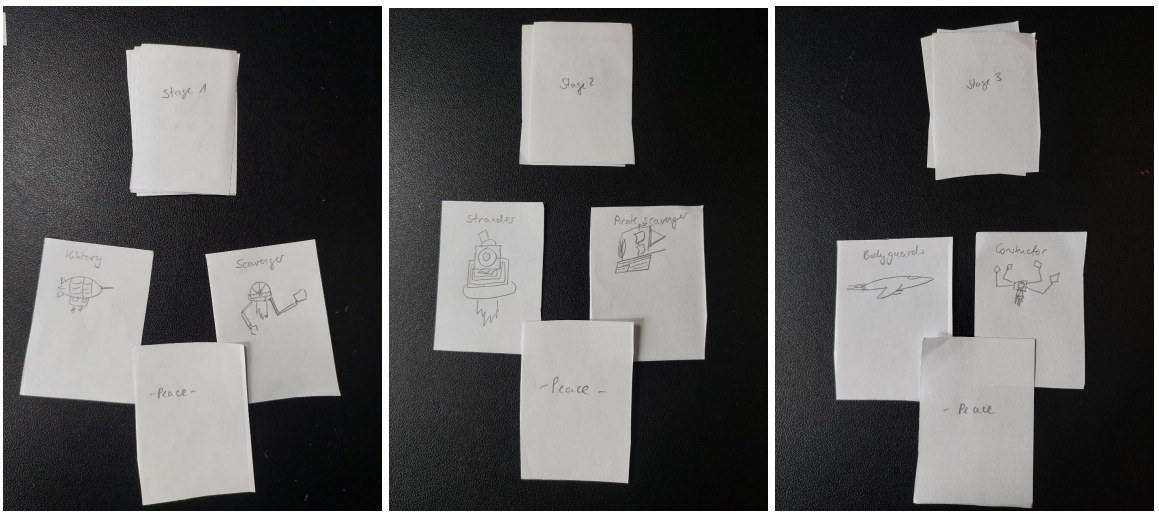
The first image shows the loading space with a total of 12 slots, while the second picture shows the items that can be put into these slots. In this phase, only fuel and cargo can be placed inside the slots, as scrap can only be obtained through enemy encounters.

2. Climbing Phase: Here the Player can move one field up on the square which requires one fuel card. When reaching a new field, an event card is drawn which may result in

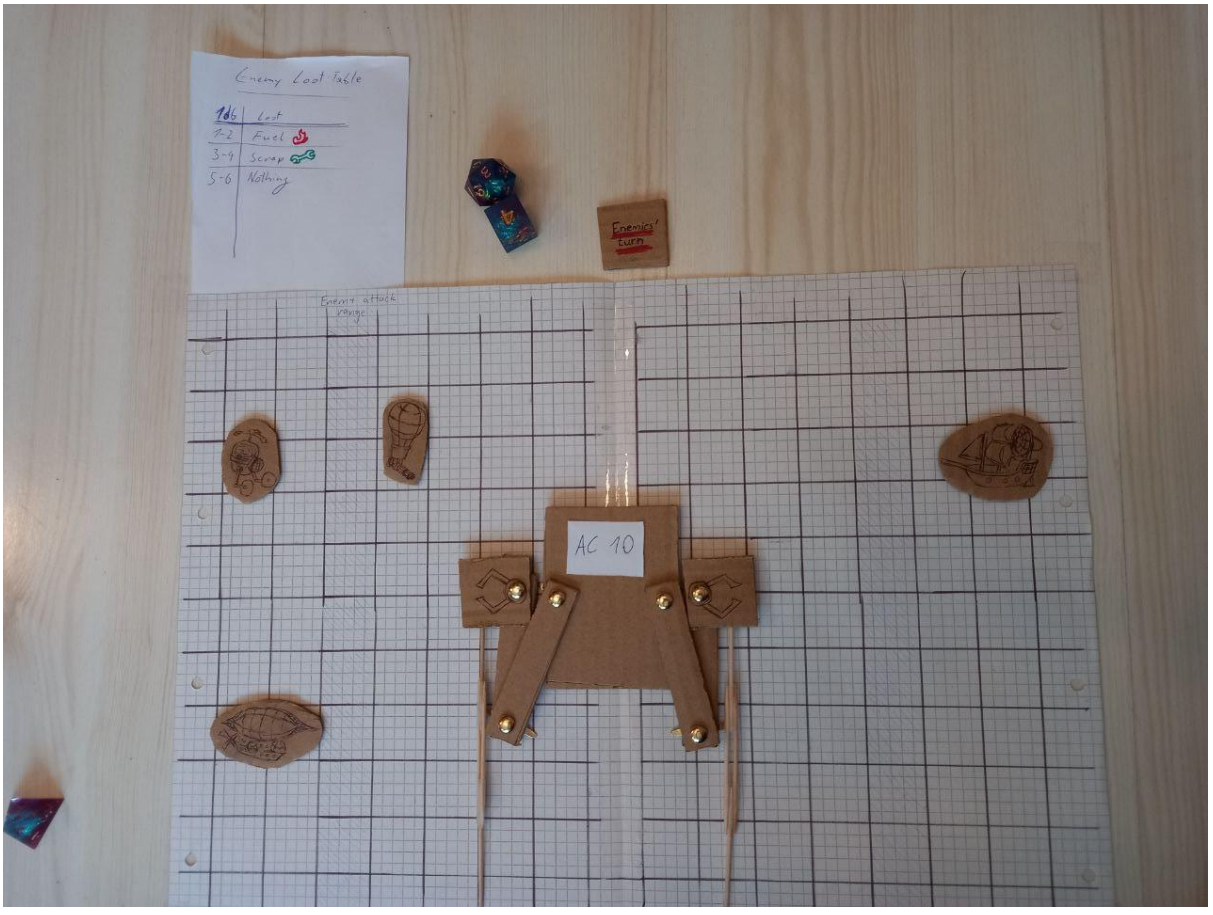
an enemy attack. Each phase consists of 6 different cards, 4 being enemies and 2 being “Peace” card, in which case no enemy attack occurs.



The following pictures show the cards for each stage in detail:



3. Combat Phase: When enemies attack the player will switch to the combat playboard. Here another player who acts as the enemies can attack while the elevator player defends themselves.



2. Prototype Rules of Play

The rules are as follows:

- Since cargo space is limited, during phase 1, the player will have to make a choice whether or not they fill their cargo slots with enough fuel for the whole climb or if they take the chances of looting fuel during the climb but can therefore load more cargo which means more profit. Once the inventory is all filled up they continue with phase 2.
- Now, the game will alternate between the second and third phase until the player either loses all cargo or reaches the last field on the map.
- Moving up one field requires spending one fuel card and forces the player to draw an event card of the associated climbing height they are currently at. The card can either result in “peace” (nothing happens) or an enemy encounter.
  In the case of an enemy encounter, 1d4 is rolled to determine the number of attacking enemies. Then, the player switches to the combat scene for the encounter.
- During combat, one supporting player, from now on referred to as “evil player” may control the enemies while the other is controlling the arms of the elevator. Combat is turn-based and alternates between the evil player’s and the elevator player’s turn. On their turn, the evil player can either move one enemy up to 2 fields and attack (if within range, marked on the board) or spend their turn to introduce one new enemy from their pool of enemy tokens. On the elevator player’s turn, they can move one arm up to 4 fields and if they reach an enemy token they automatically destroy it by crushing the enemy. Only one of the two arms can be active at a time. If the player switches control from one arm to the other, the former has its position reset to hug the elevator again. When an enemy is crushed, the player must roll 1d6 on the loot table to determine whether they receive fuel, scrap or nothing. When an enemy attacks, the evil player rolls 1d20. If they manage to roll equal or higher than the Elevators Armor Class (AC), then they cause damage, which manifests itself in the player losing one cargo card. When all enemies are defeated or the player loses all cargo, combat is concluded and the player either returns to the Climb Map or has lost the game.
- After making it to the last field at the top of the Climb Map, the player can exchange all remaining Cargo Cards for one Money card each and then drop back down to base.
- Once back down the player can spend 5 Scrap Cards to upgrade their AC, buy Scrap with their earned money (exchange rate 1:1), and start another climb. When accumulating 20 money cards, the player wins the game.
- The amount of enemies is increased for each encounter by 1 per 5 money cards the player has. E.g when in possession of 5 Money Cards, on each encounter 1d4+1 is rolled.

A small overview of the available resources and their function:

- **Cargo Cards**: These represent the players health points as well as being the goal of the climb. Bringing these cards to the highest field on the map lets the player exchange them for money cards and win the run.
- **Fuel Cards**: One of these each is required to move one field on the Climb Map.
- **Scrap Cards**: These can be looted from enemies (or possibly bought during the loading phase for money). 5 of these can be used to increase the Elevators AC by 1.

- **Money Cards**: Collecting 20 of these represents gathering the entry fee for the final climb, making the player win the game. They can also be exchanged for 1 scrap during the loading phase.

3. Verdict

Utilizing dice rolls, similar to the way they are used in Dungeons&Dragons, gave the game a nice element of randomness and helped a little against it feeling repetitive. Also rolling dice is fun.
Overall however, it does definitely feel more like an analog simulation of what is obviously supposed to be a videogame rather than a functional board game with replay value, especially due to the very asymmetric nature of the two players' roles. The second player who we aptly named the "support player" is needed only to simulate a basic enemy AI, which would have been very hard to do otherwise without introducing a lot more complicated dice rules.
While we would not play it for fun in our free time, it was still a nice way of looking at the way our planned ressources and the three different phases of gameplay are interacting.

4. Lessons learned

- Having either nothing or an enemy encounter happen, makes the climb phase feel a little bare bones. While the digital game version will include the whole "repair and manage the elevator" mechanic during these climbing phases as well, the idea of also introducing small random encounters other than just attacking enemies came up a lot.
- The choice to make combat turn-based was only due to the limitations of the analogue pen-and-paper medium, but it still confirmed our suspicion that turn-based combat definitely is not the way to go for the actual game.