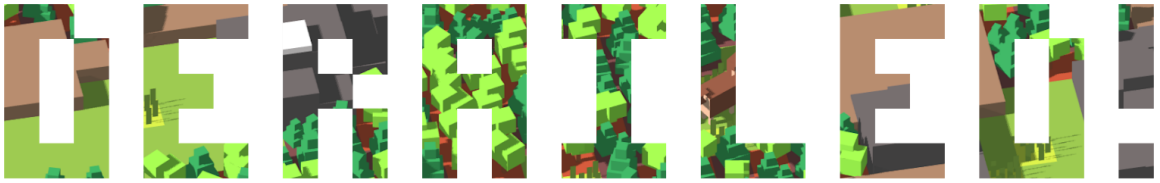
Game Programming Laboratory

TEAM4



„Choo-Choo.“

Team 4:
Thomas Wolf – PRODUCER + (PROGRAMMER, VISUAL ARTIST, GAME DESIGNER)
Hendrik Baatz – (VISUAL DIRECTOR, VISUAL ARTIST, GAME DESIGNER)
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Thomas Lang – (PROGRAMMER, GAME DESIGNER)
Lukas Rahmann – (PROGRAMMER, TESTER, GAME DESIGNER)

Contents

Chapter 1. Formal Project Proposal

1.1. Game Description

1.1.1. Overview

Our game fits best in the cooperative multiplayer genre. Every player has its own character walking on a map with top down view. The map is a typical swiss landscape with mountains, trees and rivers. Additionally there is a train with a beginning of a train track on the map.

The goal of the game is to continue building the track faster than the train catches up. The track can be built by crafting track pieces using resources which can be gathered on the map (wood and iron). If the train reaches the unfinished end of the track the game is over and a highscore for the (horizontal) distance of the track is displayed.

The gameplay is inspired by the game 'Overcooked'.

1.1.2. Background Story

Alfred Escher's swiss train company wants to build the first track across switzerland. To keep up with the competition he hired a group of hardworking construction crew to do the building for him. Unfortunately, time is scarce as the competition is strong and therefore waiting for the tracks to be finished first is not an option...

1.1.3. Design Decisions

The map is tile based and procedurally generated. The camera is placed in a way so that the train is on the left side of the viewport. Only by continuing the track, new parts of the map are revealed.

The players are pressured to extend the tracks to keep the train from crashing into the unfinished end of the track.

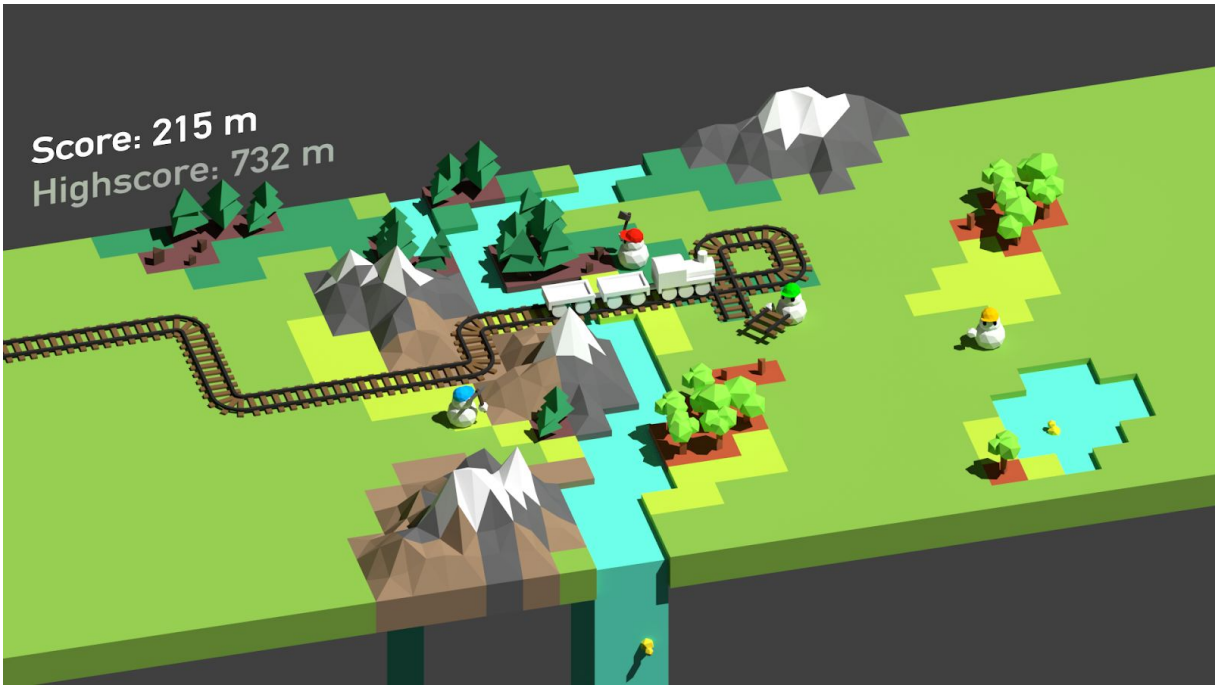
The game feature a simple crafting system based on wood and iron allowing the players to manufacture tracks.

The basic controls are provided by walking with the left analog stick and a single button to pick up up/lay down objects and maybe by an additional button to dash (sprint for a short time).

The game is kept in a clean low-poly look and from a top down perspective to simplify object identification and orientation for players under time pressure.

While the game itself is rendered in 3D, the gameplay is focused on one plane only, the camera is set to a top down view.


PLAYERS MINE RESSOURCES (WOOD / IRON), STORE THEM ON A WAGON AND POSSIBLY PROCESS THEM FURTHER TO CRAFT TRACKS
2 PRIMARY GOALS: BUILDING TRACKS & KEEPING THE ENGINE RUNNING
BROWN TERRAIN CAN BE FLATTENED TO ALLOW THE TRAIN TO PASS


Score: 215 m
Highscore: 732 m

1.2. ‚Big Idea‘ Bullseye

Big Idea: Cooperative Micromanagement that remains fun under time pressure.
Technical Achievement: Continuous procedural map generation under the constraint that progress remains possible (and a game over is triggered only by the players' fault).

1.3. Technical Achievement

As technical achievement we try to procedurally and continuously generate the game's map. This includes placing ressources, obstacles such a mountains and rivers, cities offering special rewards and possibly random events distracting players from their main goal to keep the train running. All this should be done under the constraint that the game's task remains solvable.

1.4. Development Schedule

1.4.1. Layered Task Breakdown

1.4.1.1. Functional Minimum

- Core gameplay
- Train moving on tracks
- Character controllable
- Tracks placeable by characters
- Static map

- UI

1.4.1.2. Low Target

- Simple map generation (not guaranteed to be solvable)
- Scoreboard
- Dummy assets

1.4.1.3. Desired Target

- Advanced map generation (solvable)
- Crafting system
- Individual scores
- Gameplay relevant attractive assets and animation

1.4.1.4. High Target

- NPCs (sheeps, bandits)
- Tutorial: Gameplay already active, but train is not running yet. Small hints until players lay some tracks.
- Environment assets (not gameplay relevant)

1.4.1.5. Extras

- Unlockables
- Character customization
- Visual effects (Particles)
- Random events (map dynamically changes)

1.4.2. Task List

(Check the Gantt chart below for the list of tasks)

1.4.3. Timeline

		Monday	19.2	26.2	5.3	12.3	19.03	26.03	2.4	9.4	16.4	23.4	30.4	7.5	14.5
		Project Week	1	2	3	4	5	6	7	8	9	10	11	12	13
		Deadlines			Rough Proposal	Final Proposal	Phyisical Prorotype			First Playable Demo		Interim Report		Alpha	Playtest
Target level	**Task**	**Responsability**													
Functional Minimum	Proposal graphics	Hendrik			6h										
	Finalized proposal	All				4h									
	Core gameplay, train moving on tracks	Thomas				12h									
	Character controllable, tracks placeable	Lukas					12h								
	Game state manager/ UI	Tommy					10h								
Low Target	Simple map generation	Valentin, Tommy					15h								
	Scoreboard	Thomas						2h							
	Dummy assets	Hendrik				8h									
Desired Target	Advanced map generation (solvable)	Valentin, Tommy							25h						
	Crafting system concept & implementation	Valentin						15h							
	Individual Scores	Lukas							2h						
	Attractive assets & animation	Thomas & Hendrik						24h							
	Fun & balancing	All						24h							
High Target	NPCs	Lukas									10h				
	Tutorial	Valentin										10h			
	Environment assets (not gameplay relevant)	Hendrik											12h		
Extras	Unlockables	???													
	Character Customization	???													
	Visual effects	???													
	Random events	???													

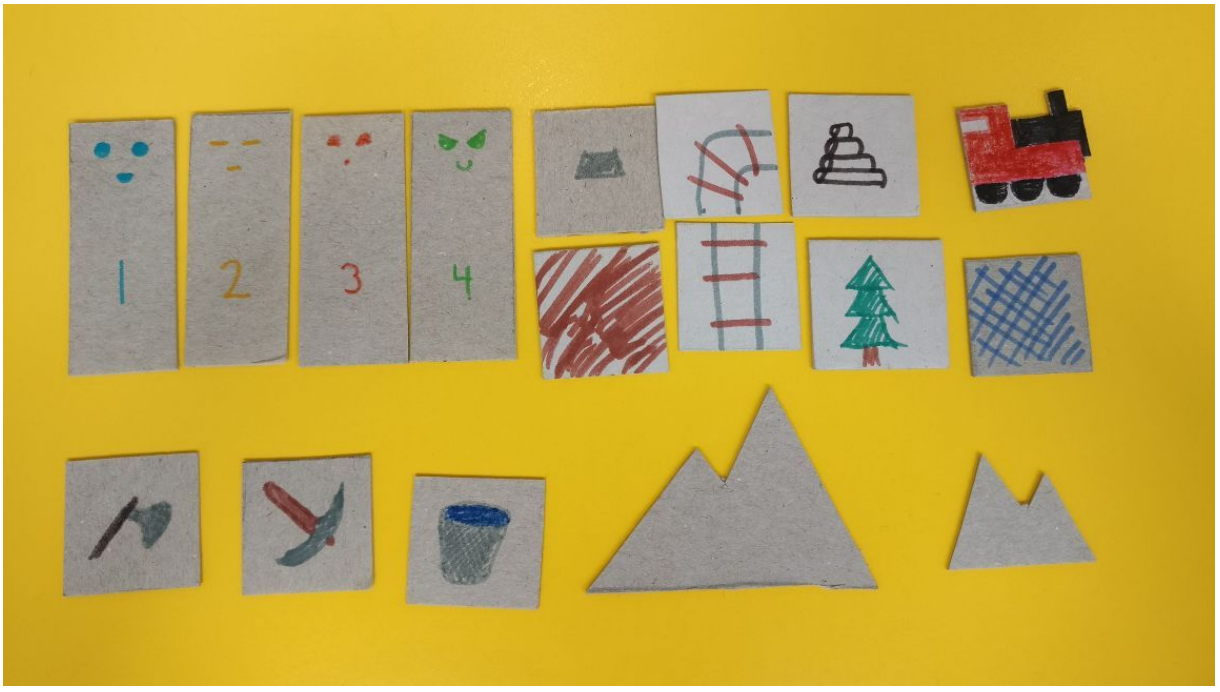
1.5. Assessment

The game is designed for groups of two to four players seeking cooperative fun. The game design encourages communication between the players and the ever increasing speed ensures chaos as the players try to coordinate their efforts to keep the train going.

Chapter 2. Prototype

2.1. Prototype Setup

Our prototype ist based on a tile map of size (23x34) of which we restricted ourselves to a height of 10 tiles. All objects are build out of carton with simple drawings as seen in the picture below:



From left to right, we can see the four players, the mountain (front side) and iron (back side) tile, the railroad (straight on front and curved on back) tile, the tree (tree on front and wood on the back) tile and the train and and water tile.
In the lower part we can see various tools, we were experimenting with, as well as mountains as obstacles.

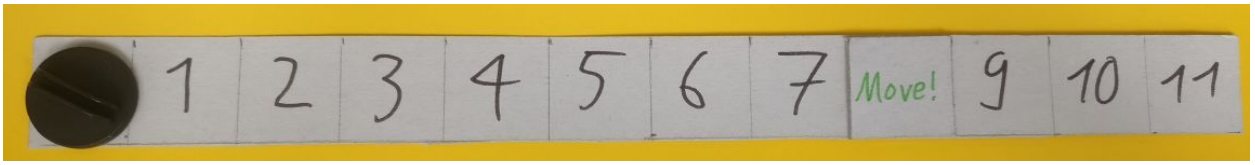
The game is played by up the four players on the map and one additional player keeping track of the train.

To play the game, we use a metronome application which plays a sound every 4 seconds which indicates the beginning of a round.

Each player is allowed to move one tile (only in horizontal or vertical direction) in one round. Players can move only on empty tiles, on railroad tiles, on wood piles and on iron tiles.

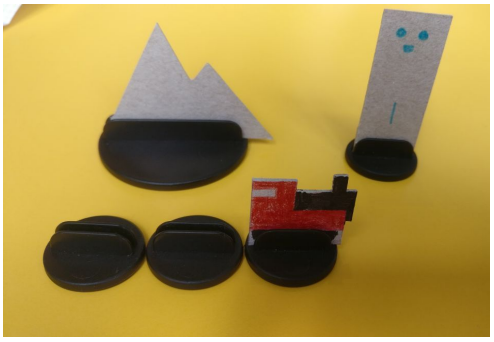
To move the train, we have a train state tracker which indicates when the train needs to move one tile forward (shown in the next image): The black base is moved to the right in each round until it hits

the “Move!” tile which indicates that the train should move forward and the black base is reset to the left.



To cut down a tree, a player has to stand next to a tree tile and he has to wait 1 round. After this round, the tree is flipped upside down s.t. the wood pile gets visible.
In a similar way, iron can be mined from a mountain but the player has to wait 2 rounds for it.

Railroads tiles (which the train has not passed yet), wood pile tiles and iron tiles can be picked up by a player if he is standing next to it (with the cost of an additional round). Directly after harvesting a resource, the player can decide to either carry the resource (without an additional round) or the keep it on the ground. Each player can carry at most one item and he can lay it down on any free position on the map or on a wagon on the train (which can be seen in the picture below).



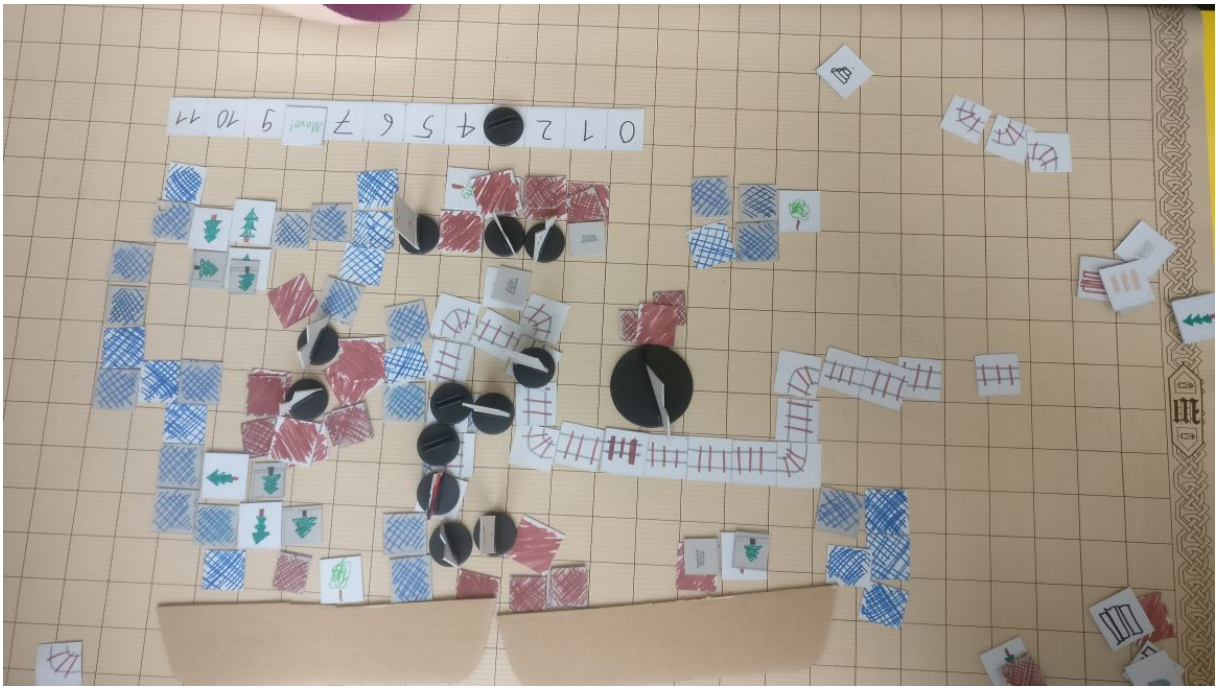
To craft a track, the players have to put one iron and one wood pile onto a wagon of the train (which takes one round each) and than may pick up a railroad tile from the wagon (again, picking up the tile takes one round).

2.2. Playing Experience

- We had a lot of fun playing the game, especially due to a high factor of interaction among the players, the time stress and the high chaos factor.
- Even after six hours sitting in front of game, we still got a satisfying experience.
- We noticed that our game works quite well as a board game and it could actually be played in that way. Only in tight map passages, when all players are very close, it became a bit confusing to do all the actions at once.

Beginning of a round:

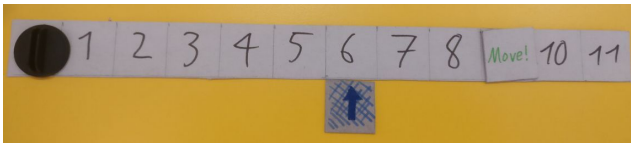
End of a round:



2.3. Findings and Conclusion

- After each round we tried to build more obstacles on the map, since we tended to build only straight tracks otherwise. It also helped to stack trees or mountains which can only be mined in sequence.

- To increase the difficulty (s.t. not everybody can act independently), we added an axe and a pickaxe which need to be carried to harvest resources (the axe can be used to cut down trees and the pickaxe to mine the mountains).
- To even further increase the chaos factor, we also added an water bucket as an additional item which can be carried around and which can be filled with water when standing with it next to a water tile. The full water bucket needs to be brought to the train to fill up the train boiler every two rounds (of the train moving) at the latest. We used an additional indicator to keep track of when the last water had been brought.



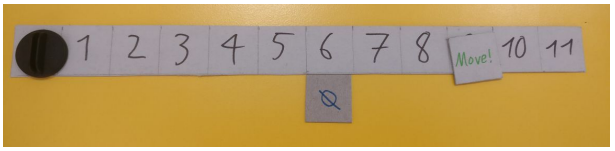


Image of the game including the axe, pickaxe and water bucket:

Chapter 3. Interim Report

3.1. Progress

We have worked on multiple target levels at the same time, thus some parts of higher targets are already completed while lower targets might still have some subtasks unimplemented. We are however done with the first level, and what is left of the second and third level should not be difficult to complete. It follows a breakdown of the tasks and their completion status:

Functional Minimum

- Core gameplay — Done
- Train moving on tracks — Done
- Character controllable — Done
- Tracks placeable by characters — Done
- Static map — Done
- UI — Done

Low Target

- Simple map generation (not guaranteed to be solvable) — Done
- Scoreboard — Not yet implemented
- Dummy assets — Done

Desired Target

- Advanced map generation (solvable) — Done
- Crafting system — Done
- Individual scores — Not yet implemented
- Gameplay relevant attractive assets and animation — Done

High Target

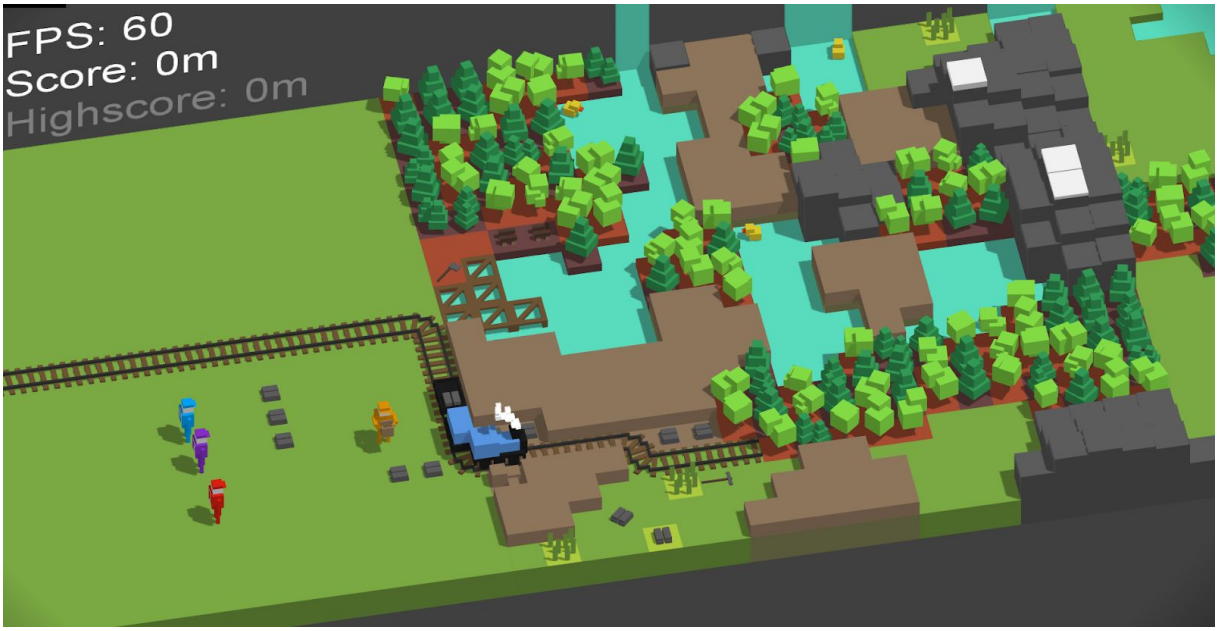
- NPCs (sheeps, bandits) — Done
- Tutorial — In progress
- Environment assets (not gameplay relevant) — In progress

Extras

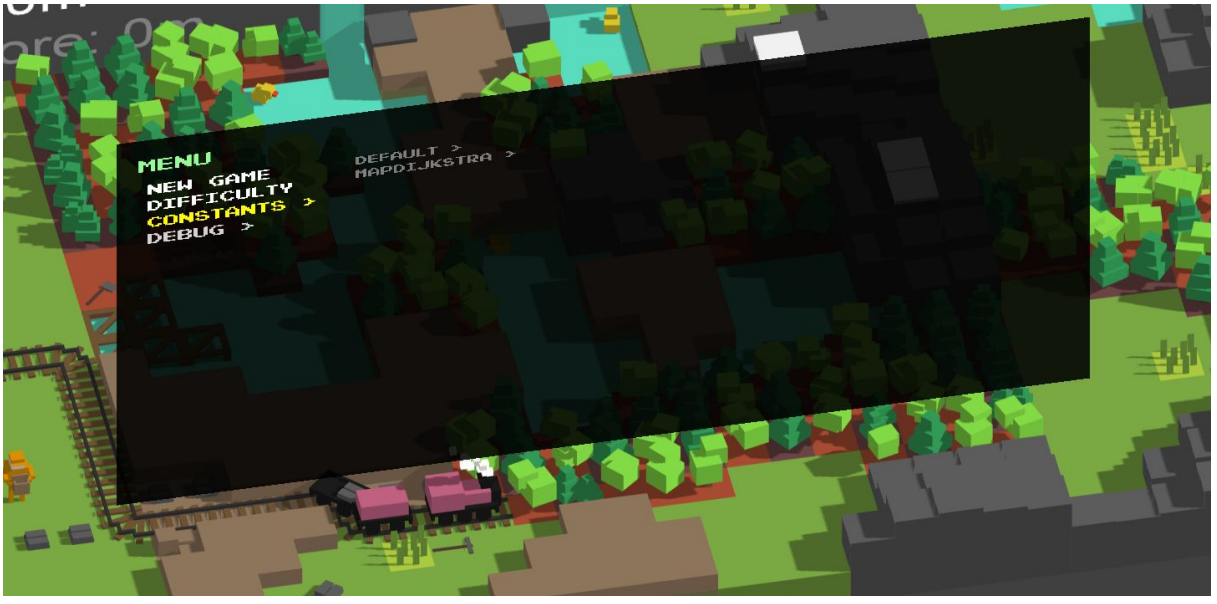
- Unlockables — Not yet implemented
- Character customization — Not yet implemented
- Visual effects (Particles) — Done
- Random events — In progress

Progress Screenshots

Current look of the game (the map part on the right side is generated with a medium difficulty level):

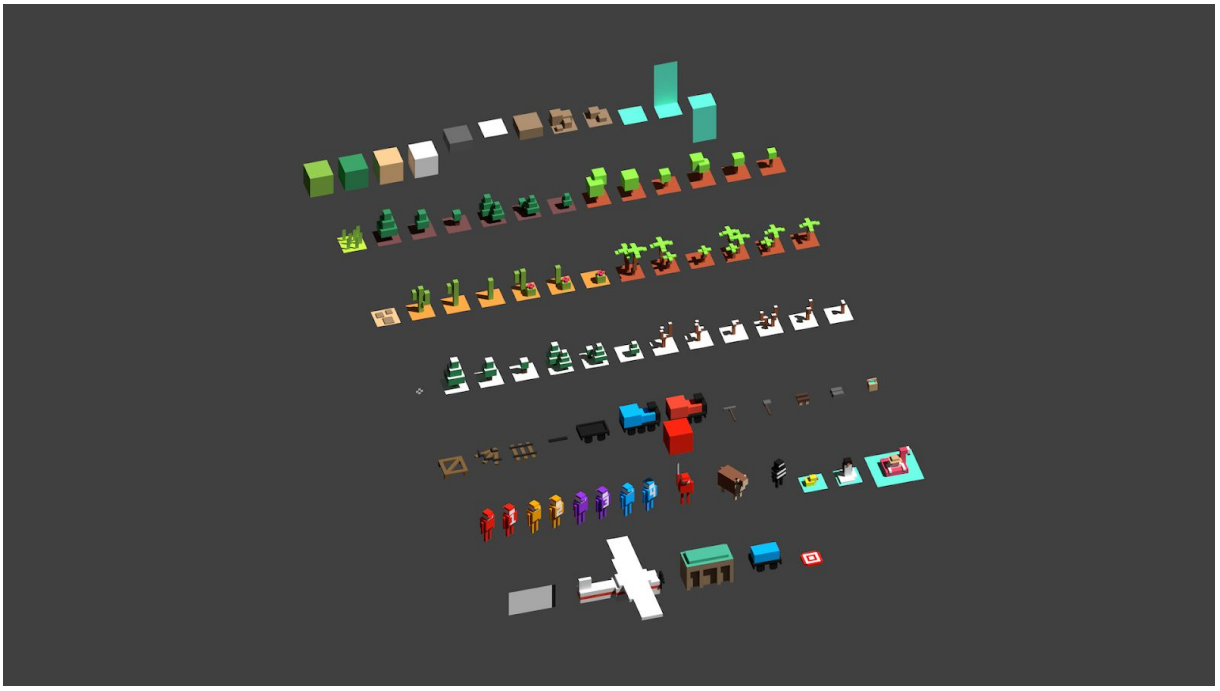


User interface:



Particle simulation: Here the boiler did not get enough water which triggers the train to burn.

Assets created so far:



3.2. Challenges

The tools are sometimes hardly visible if laying on certain ground tiles. We will thus add markers pointing to dropped tools, indicating which tool it is.
Map Generation is still a bit of a challenge, even after dividing the map into 20x20 parts which are generated independently. The game is way too complex to check for each specific part whether it is solvable or not. As we choose to use Voronoi Diagrams to generate the maps, and wanted to be able to adapt to different Settings/Terrains, we can't build proven solvable maps. Therefore, we currently use two metrics - one for determining how hard it is to walk through a given part and the other as a rough estimate of the resources needed to build a track using this path. We then use rejection sampling until we get a map with enough resources and a path with the appropriate difficulty. These constraints will need further testing to make them more sane.

3.3. Future Work

Having quite a lot of features implemented, we want to consolidate them by implementing a game planner which should control all elements of the game that have effect in the gameplay like the map generation, special events, the difficulty etc.
Furthermore, sound effects and music are still missing and a lot of testing is required.

Chapter 4. Alpha Release

4.1. Progress

We have been continuously improving our game in various areas. We added an initial set of sound effects and a scoreboard, improved the map generation, added weather particles and a day and night cycle as well as a new biome and new NPCs for the existing biomes. It follows a breakdown of the tasks and their completion status:

Functional Minimum

- Core gameplay — Done
- Train moving on tracks — Done
- Character controllable — Done
- Tracks placeable by characters — Done
- Static map — Done
- UI — Done

Low Target

- Simple map generation (not guaranteed to be solvable) — Done
- Scoreboard — Done
- Dummy assets — Done

Desired Target

- Advanced map generation (solvable) — Done
- Crafting system — Done
- Individual scores — Not yet implemented
- Gameplay relevant attractive assets and animation — Done

High Target

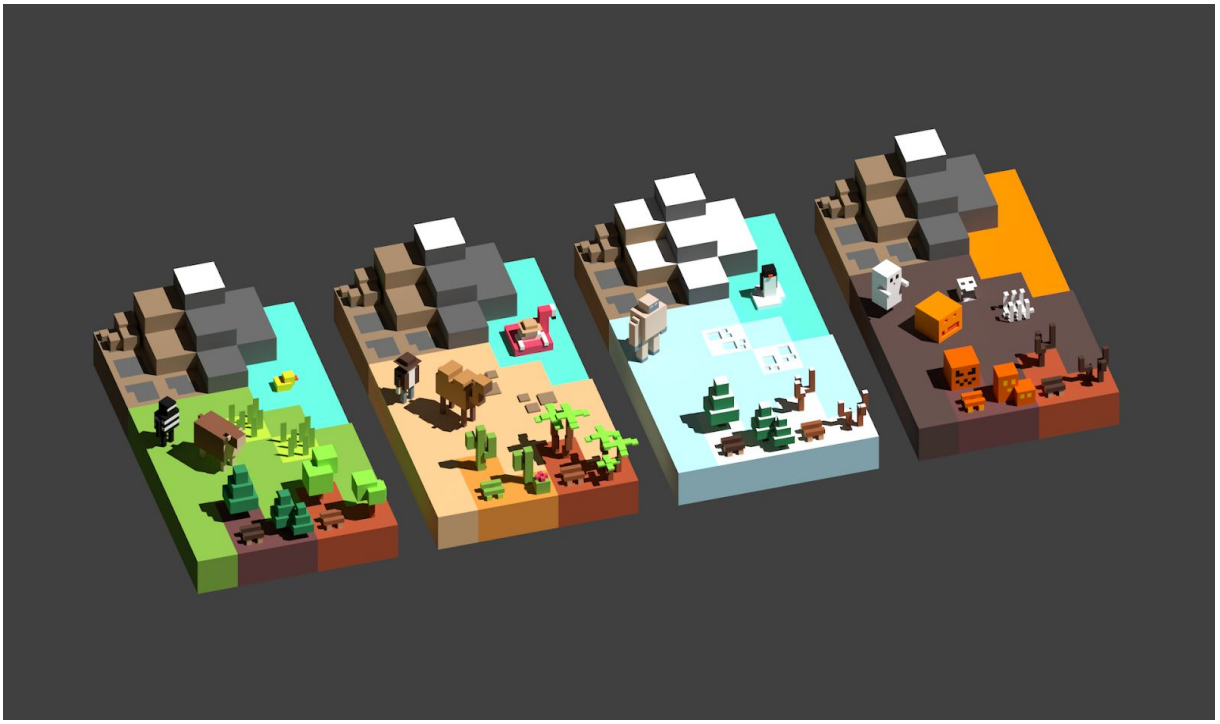
- NPCs (sheeps, bandits) — Done
- Tutorial — Needs overhaul
- Environment assets (not gameplay relevant) — Mostly done

Extras

- Unlockables — In progress
- Character customization — In progress
- Visual effects (Particles) — Done
- Random events — In progress

Progress Screenshots

Overview of the four settings and the respective assets:



4.2. Challenges

Our technical challenge consists of procedurally generating a map for the players that is challenging but not impossible to solve. Due to performance concerns, we decided to implement a system based on heuristics, which ensures that at least one path exists for the players to build through and provides them with enough resources to do so. We carefully tweaked the parameters for this algorithm to be able to generate maps in three different difficulty levels.

4.3. Future Work

Early testing showed that the tutorial is working as intended for a single player but does not manage to explain the mechanics properly to multiple players. The issue is that only one player at a time can progress the tutorial, whose actions the other players might miss and therefore not learn the corresponding mechanic.

Additionally, the game lacks several sound effects for the additional biomes and their NPCs. These will be selected and added as soon as possible. Similarly, some of the late-game enemies are not finished yet (mostly for the lava biome).

Chapter 5. Playtest

5.1. Playtesting Session

We invited four times four playtesters (mostly fellow students and friends) to play as a group for a full hour and also had an open hour to allow spontaneous passersby to try out our game. As location for the playtest we reserved the monitor wall opposite of the library in the CAB building to advertise the game to a broader audience. We recorded the player movement of a couple of plays and completed each session with a discussion between the playtesters and us guided by a questionnaire. The following pictures show the setup and the different groups of playtesters:


POLICE PUBLIC CALL BOX


Computer Science Library

5.2. Questions and Comments

Was the game fun to play?

Yes. Testers had a lot of fun, and tried beating the highscore got more and more difficult.
It also occurred to us that the game had quite a steep learning curve, so teams which were more or less lost when playing the first round, got pretty good in the second one.

How did you like the tutorial?

Most people actually did not even notice the tutorial, some even thought, that it wasn't there when they played it. This made clear to us that the Tutorial could not stay in the current stat.

There was a lot of specific suggestions on how to make the tutorial actually more visible and interactive, like for example, that we should make it more concurrent (such that multiple players can take part at the same time). People also soon discovered a bug within the tutorial, which they instantly used to improve their highscore.

Where the controls easy to handle?

It was experienced to be hard to target a specific tile/item for pickup or placing, and suggestion where made into e.g. adding a special slow mode which made it easier to target a specific tile for track placement.

How did you like the graphics?

The general response was, that everybody liked the overall style of the game, but there where smaller suggestions like most people did not recognize train stations as such, therefore mostly ignoring them. This was actually adapted and whe have since replaced the train station asset with a better one.

How did you like the sound?

(As there was a bug within the sound system of our game, we disabled sound in the second half of the playtest). Most people found that cows where to loud (we fixed that) and that many parts still missed sound assets.

How did you like the map?

The map was liked by most of the players, and was not considered to easy or unsolvable. So we think that our map generation is good enough for the game.

5.3. Design Revisions

Even though the instructions during the tutorial were displayed on a large in-game screen (see picture below), most playtesters ignored them and tried to figure out the controls by themselves. Additionally, while the tutorial explains all steps necessary to play the game, only one player could at each time execute the action mandated by the tutorial. This lead to the other players not paying attention and missing the necessary informations. We thus decided to completely redesign the tutorial letting each player execute all steps on their own. Additionally due to our minimalistic artstyle some icons and models were not as readable as we thought and we will either try to make them visually clearer or include them in the tutorial.

The tutorial and its instructions on the in-game screen:

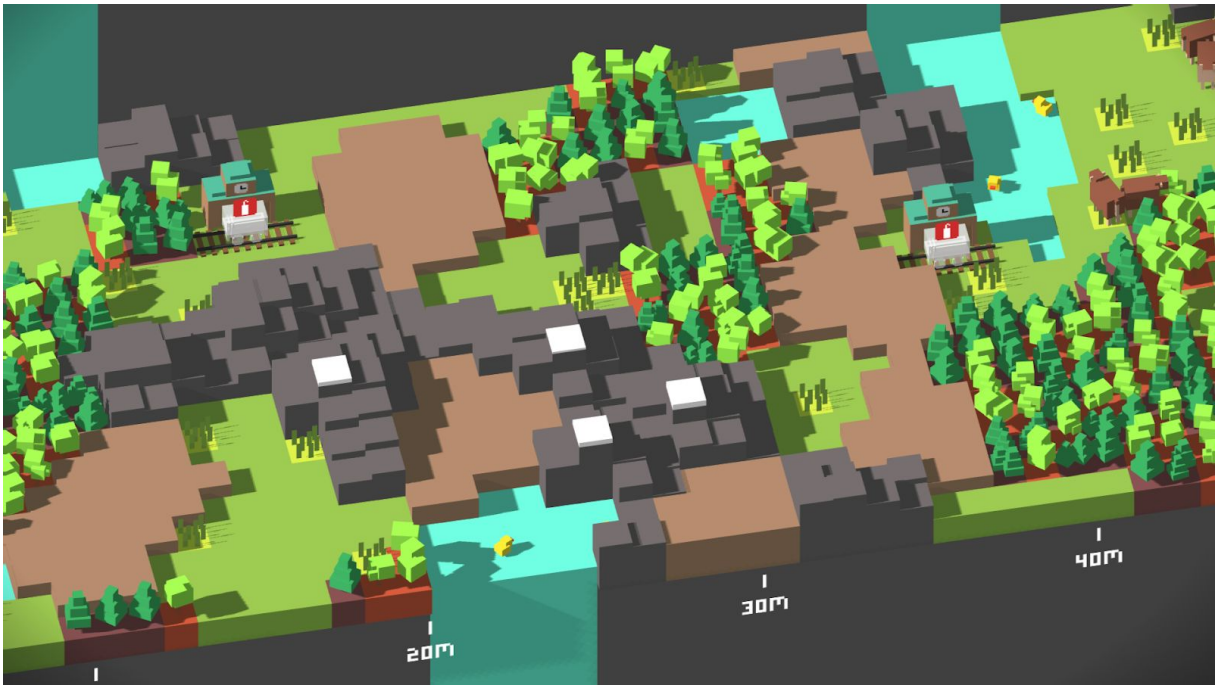
Chapter 6. Conclusion

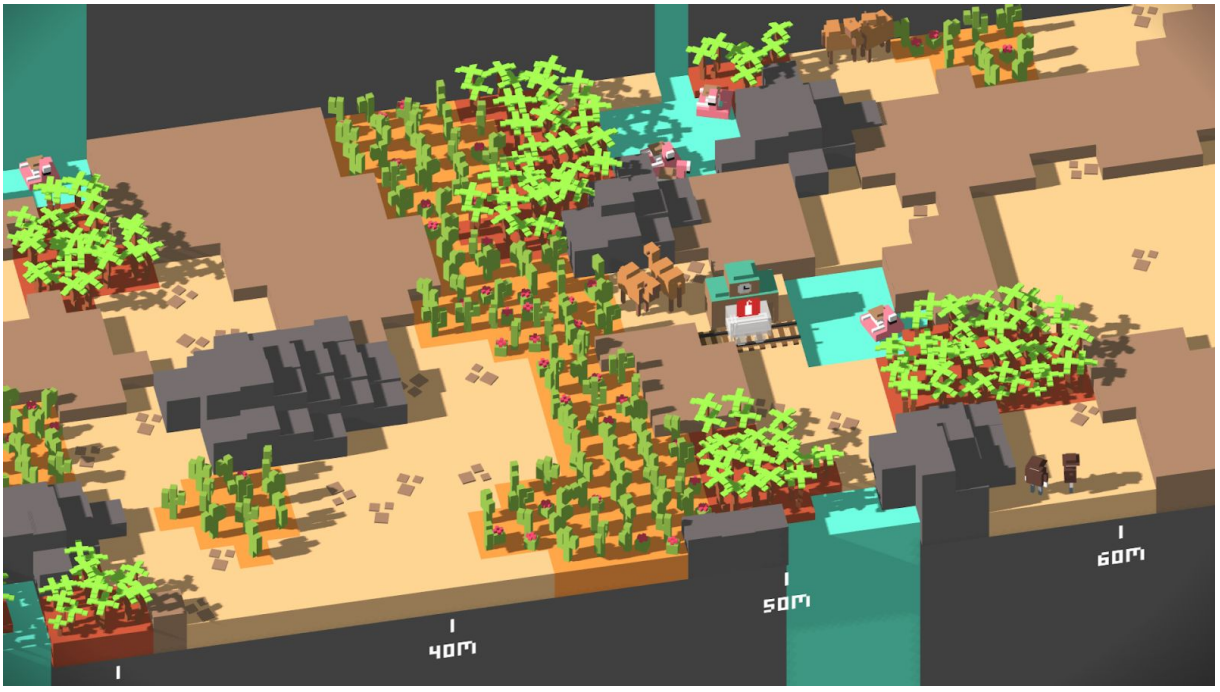
6.1. Final Results

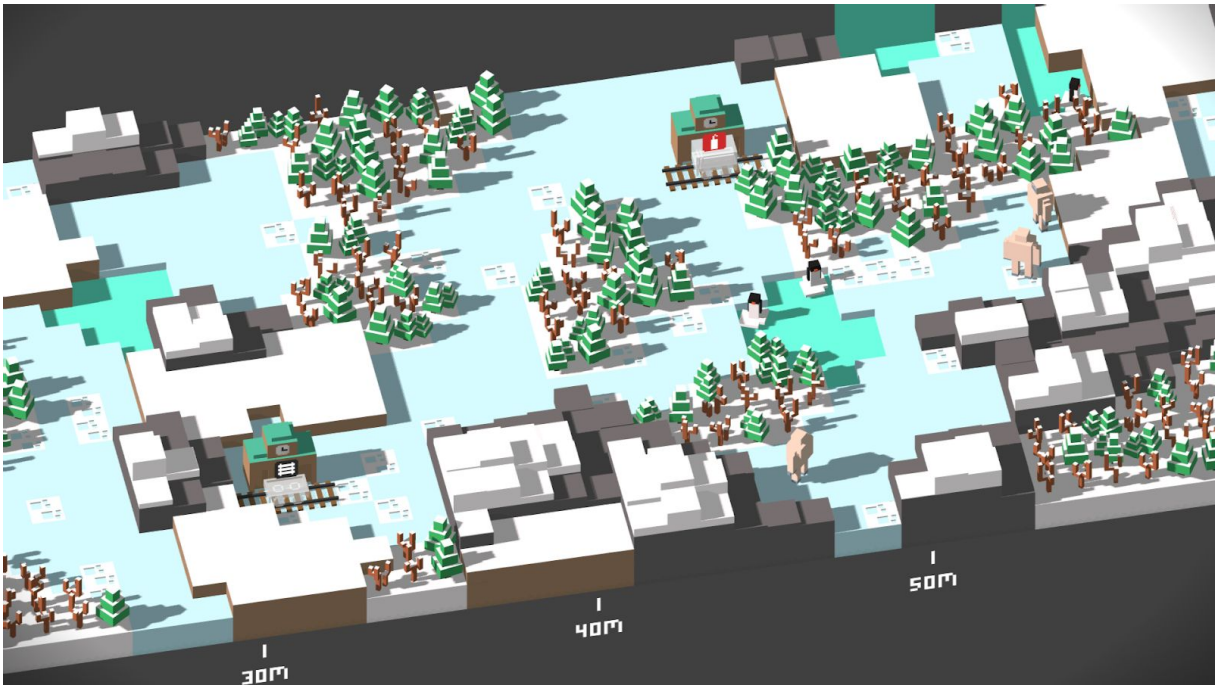
We have met all our goals except for unlockables, however the respective assets are already created and implementing this last target should be a small hurdle to overcome. Additionally we added a lot of features that were not on our original target list such as dynamic weather, a day and night cycle, different biomes to travel through and a replay function that allows players to quickly skim through their latest playthroughs and even to reenter the game at any time. One of the areas of our game that has seen the most change is the tutorial, and its current third iteration seemed to work well for playtesters and has received high praise from Studio Gobo.

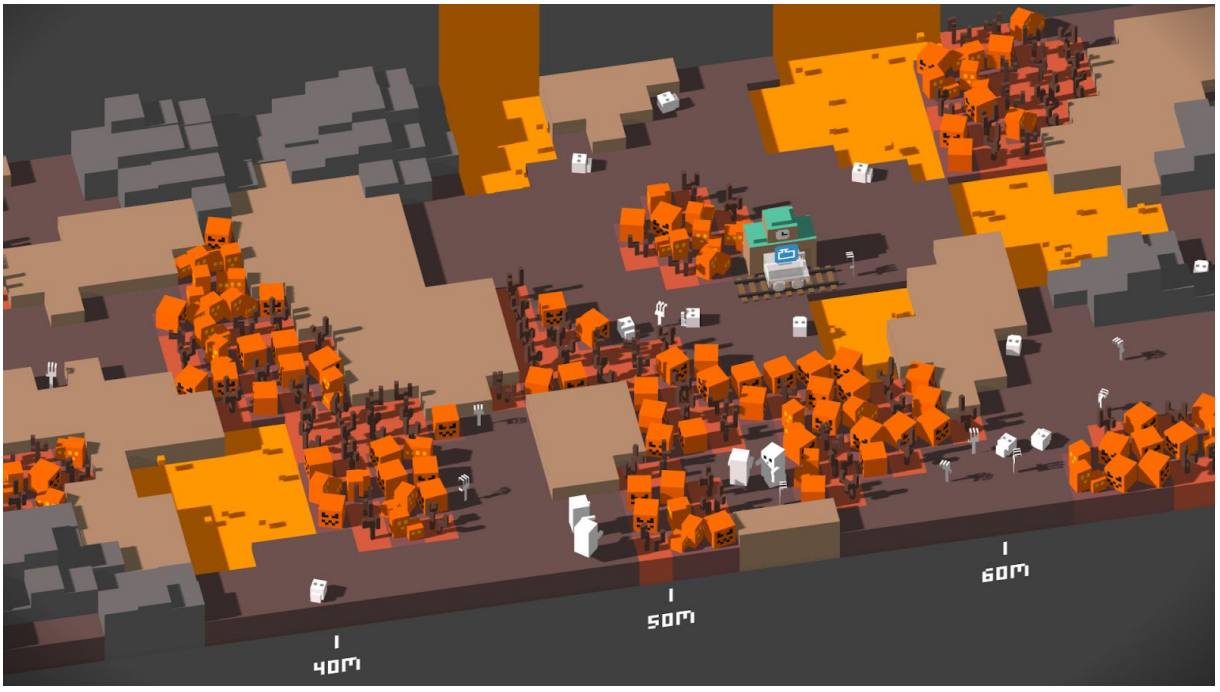
Progress Screenshots

Examples of generated maps for the four biomes:

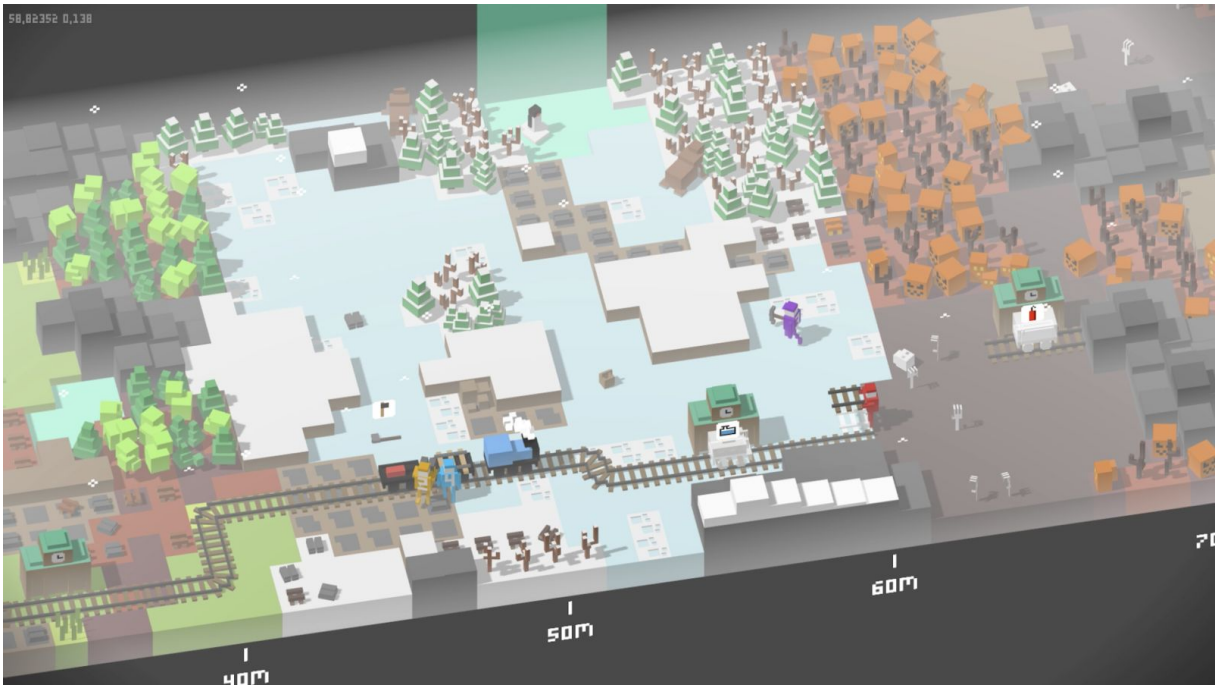

20M
30M
40M


40M
50M
60M

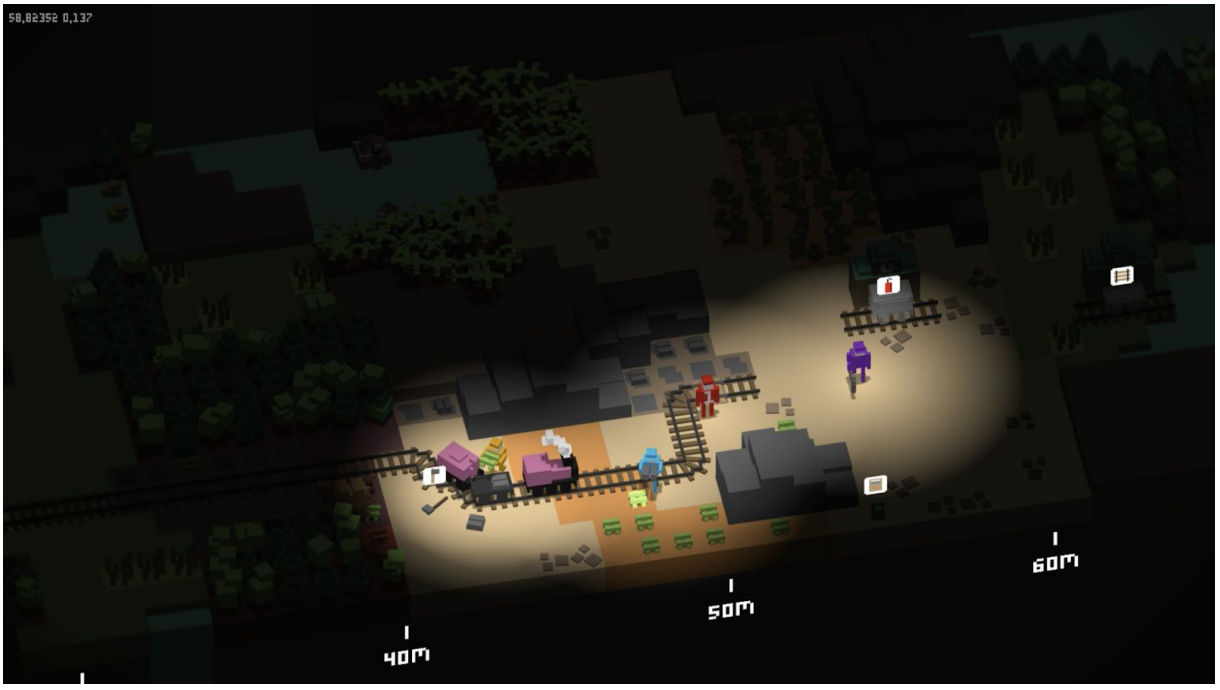




Dynamic weather (fog, snow and rain) depending on the current biomes:



Night mode:



Tutorial:

6.2. Experience

If you look back to chapter one, the initial gameplay idea of the proposal survived and lies still at the heart of our game. Over the course of the past semester however we added a lot of features to the game to make it feel more vivid and to meet our playtester's demand. We did not always follow the order imposed by our development schedule but implemented features we felt would add most to the game's completeness. The reasons for this are on the one hand that some features took more/less time to complete than expected, while others (such as sound) were forgotten in the initial plan. Finally, the playtest helped to turn our focus to parts of our game that we ourselves found adequate but were in fact hard to use for external players.

6.3. Personal Impressions

What was the biggest technical difficulty during the project?
Next to the map generation, which was technically sophisticated, we needed to rewrite many parts of the game just the get the replay functionality to work.

What was your impression of working with the theme? Do you think the theme enhanced your game, or would you have been happier with total freedom?
The theme certainly helped to focus the search of a game idea on gameplay instead of game setting. It was also not too restrictive in the sense that it would disallow certain game genres.

What would you do differently in your next game project?
We definitely wouldn't forget to consider sound in the project planning phase again. Maybe we even would try to find someone who has experience with sound and music and could directly work together with us.

What was your greatest success during the project?

When one playtester said that playing our game for 40 minutes felt like 5, on par with the moment when we heard that the jury of Studio Gobo continued to play our game even after having finished assessing all submitted games.

Are you happy with the final result of your project? Do you consider the project a success? To what extent did you meet your project plan and milestones?
In the end we can definitely say that we met, or maybe even exceeded, our own expectations. Not only have we achieved more than outlined in our original game proposal, but we have created a visually appealing game that players enjoyed together for hours and encouraged them to beat their own and others highscores.

What improvements would you suggest for the course organization? (Perhaps in D1 evaluation)?
Overall, there isn't really anything that needs to be changed, the organization is fine as it is. Maybe it would be worth a try to squeeze in all the lectures relevant to programming and development of the game (sounds, controls, etc.) as early as possible?

Did you like using MonoGame?
Although MonoGame has its limitations and was sometimes a bit restrictive, regarding performance and such, it was alright to use. Sometimes we stumbled over a few bugs, like one in the sound engine on the XBox, Anti-aliasing and some discrepancies between the shader binding for OpenGL and DirectX, but in the end we managed to deal with all the problems.