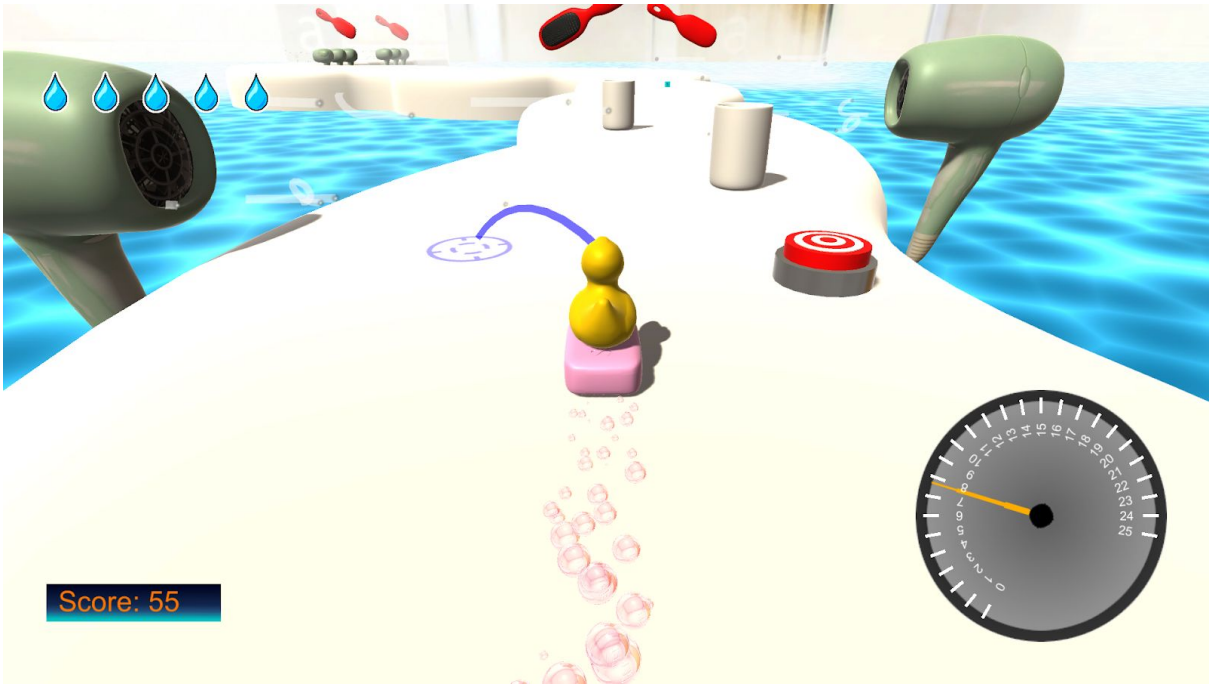
Soaper Duck

Game Design Document



1. Formal game proposal

1.1 Game description

Soaper Duck is a 3D endless runner where the player finds themself trying to progress as fast and as much as possible while navigating on a soap resembling vehicle. They have to successfully maneuver despite the low friction handicap that's put upon them.

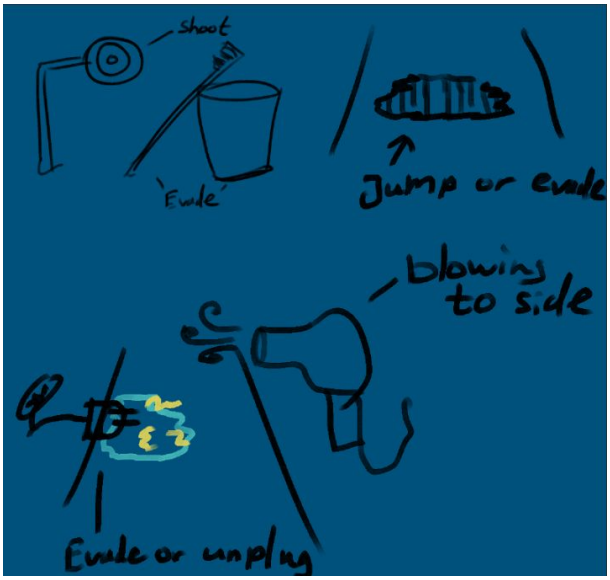
1.2 Core gameplay elements

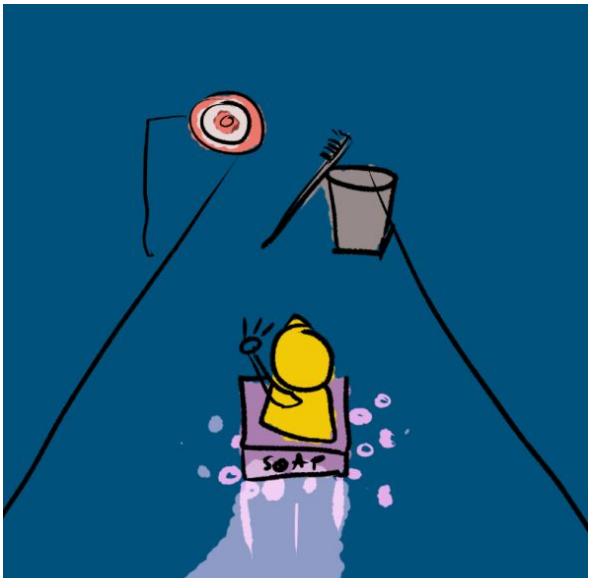
- 2.5D
- Main theme revolves around sliding on soap and water mechanics
- Endless level Generation
- Driving Controls
- Duck that can shoot water
- Triggers, Switches, Power ups
- Enemies

1.3 Features

1. Basic Features
    a. Score
    b. Soaps wears out
    c. Power Ups
    d. Terrain attributes, like wet ground having less friction
    e. Procedurally generated levels become more difficult over time
2. Advanced features
    a. Enemies
    b. Toggles & Obstacles
    c. Duck shoots water

1.4 Gameplay concept art





1.5 Character concept art

1.6 Big idea and technical achievement

1.6.1 Procedural level generation

Our procedural level generation is based on different types of building blocks that are combined in different ways to form a playable level. Levels become longer and more difficult over time by adding enemies, switches, triggers spawn at different locations within the level.There will be random special events like a shark attack that the player has to face.

1.6.2 Special effects

We might use metaballs for foam or other kinds of particle, shader effects to make the game environment more immersive and realistic. The duck can use it’s water shooting ability to make the floor in front wet, which will increase its speed.

1.7 Development schedule & Timeline

1.7.1 Layered development schedule

1. Functional minimum
    - Simple Player Character, that can move and jump
    - Start Platform
    - Playable Looping Test-Level
    - Game Over Screen
    - Input Manager (Controller/ Keyboard)
    - Simple models

2. Low Target:
    - Simple procedural Level Generation
    - Simple Menu UI
    - High Score (Points / Distance)
    - Restart Button
    - Visual Cues for Soap Mechanic
    - Scoreboard
    - Duck can shoot water

3. Desirable target:
    - At least 5 different spawnable obstacles in the procedural Level Generation
    - Background Music & Sound effects
    - Duck model for the Player
    - Different properties for Soap Vehicle and/or Floor
    - Power ups
    - Interactable Objects

4. High Target:
    - Playable without crashing
    - Multiplayer
    - Different Models for the Player to choose from
    - Different Sets of Level kinds to choose from
    - Character Customization
    - Seeds for level generation
        i. Ghost silhouette of previous runs for self competition
    - Save Replays
    - Watch Replays
    - Boss Fights

5. Extras:
    - Mobile Support
    - Twitch Chat Integration

1.7.2 Milestones and tasks

Milestone: Game Idea Pitch (18.11.2020)

Names Shortened as follows:

Albert Zach
Marco Grasso
Sahin Er
Sebastian Walchshäusl

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

Milestone: Physical Prototype (02.12.2020)

Task Name:	Who	Time (in Hours)
Defining of Prototype	Everyone	2
Creating a physical Prototype	Everyone	4
Documentation & Presentation	Everyone	5

Milestone: Interim Results (23.12.2020)

Task Name:	Who	Time (in Hours)
Simple Player Script → Movement & Jump	Marco	20
Playable Looping Test-Level → Start Platform & Simple Track	Sebastian	6
Simple UI → Start Screen & Game Over Screen	Albert	6
Assets & Models → Duck & Soap model, track parts	Sahin	6
Controller Support	Sahin	2

Simple Procedural Track Generation → Simple track building blocks (soap/bathroom styled)	Albert, Wacken, Marco	24
Infinite generation	Sahin	8
Documentation & Presentation	Everyone	5

Milestone: Alpha Release (27.01.2021)

Task Name:	Who	Time (in Hours)
Duck model for the Player	Albert	2
Soap model for the Vehicle	Albert	2
Interactable Objects → Switches, Triggers, ...	Sahin	4
Hair Dryer that blows player to the side	Sahin	1
Holes the player needs to jump over	Sahin	1
Power ups	Marco	2
Collectibles	Marco	1
Music & Sound	Sebastian	6
Advanced Procedural Track Generation → Include Obstacles & Collectibles	Marco	4
Different properties for the Soap Vehicle and/or the Floor	Sebastian	4
Documentation & Presentation	Everyone	2

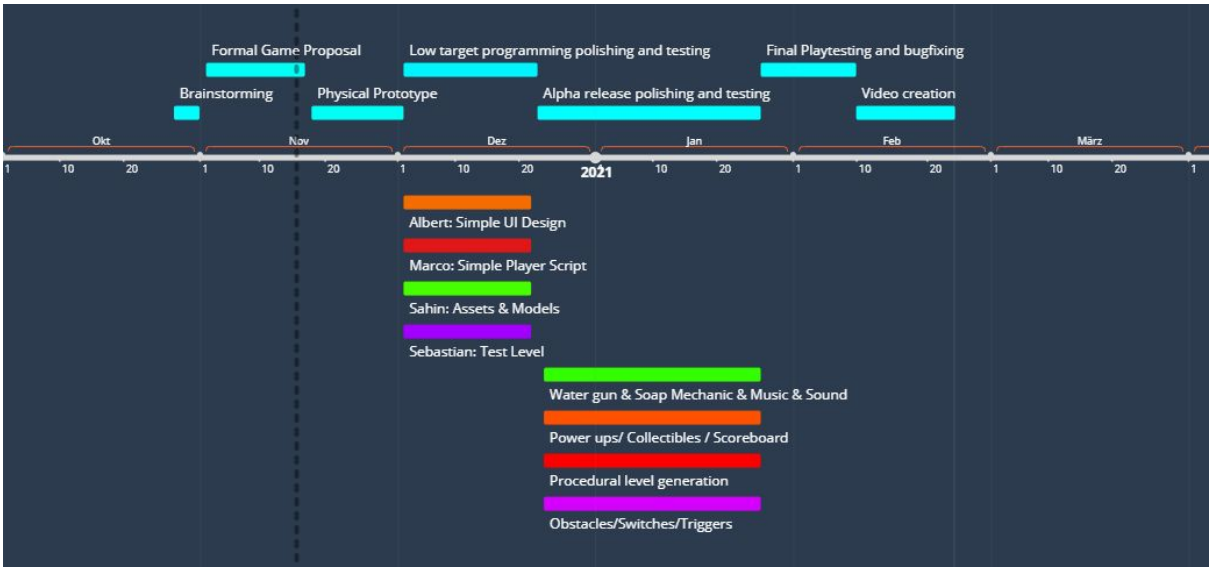
Milestone: Playtesting results (27.01.2021)

Task Name:	Who	Time (in Hours)
Testing and evaluation	Everyone	10
Bug fixing	Everyone	4
Implement Feedback	Everyone	8
Documentation & Presentation	Everyone	2

Milestone: Final release (24.02.2021)

Task Name:	Who	Time (in Hours)
Defining of Prototype	Everyone	2
Creating a physical Prototype	Everyone	4
Documentation & Presentation	Everyone	2

1.7.3 Timeline



1.8 Assessment

Tell us what the main strength of the game will be.
A challenge to beat your highscore and high skill ceiling.

What part is going to be the most cool?
Sliding as a rubber duck on a soap bar, while sniping targets with a beam of water.

Who might want to play this game?
Everyone who needs a little distraction, while having to wait. People in public transit, children during breaks, etc.

What do they do in the game?
Trying to get as far as possible and gain a higher score.

What virtual world should the system simulate?
A world where an innocent duck escapes the burden of humanity by gliding on a soap to it's freedom.

What criteria should be used to judge whether your design is a success or not?
If players want to play just one more round. Players don't get bored after a few minutes.

2. Physical Prototype

2.1 Prototype idea development

The goal of the physical prototype was to show the core mechanic to the user, or viewer in this case. Since an actual physical playtest is not possible we thought about how to properly show the mechanics involved. The gameplay in itself is simple. You play a duck on a piece of soap. You slide, you dodge projectiles in a never ending fashion.

The original idea was to simply do what with the physical prototype and record it in a video to show it, expecting that this would provide sufficient insight on how the gameplay is supposed to feel like while keeping a small comedic touch.

However upon more thinking within the team and some research on physical prototypes we came to the conclusion that it is possible to cover the main aspects in a more gameplay related manner, while still keeping the core aspects intact.

So the idea we came up for the prototype that is going to be built is a turn based “racing-styled” game.

2.2 Prototype description

The prototype is made out of cardboard, because it is cheap and can be cut into same sized blocks. Apart from cardboard, a player piece, paper for notes, indicator tokens for water and some pencils are used in our prototype. Race track building blocks are simulated by having multiple cardboard pieces with track parts such as straight lines and curves.
The tracks are divided into 6 lanes which consist of steps. The player starts at a bottom field and needs to stay on track as long as possible. Water is indicated by blue tokens on the track. Obstacles and power ups are drawn onto the tracks in different colors. The track pieces can be combined in different ways and reused several times to simulate the infinite procedural track generation that will be included in the digital version.

2.3 Prototype Gameplay

Materials:

- Player piece
- Multiple set size track pieces
- Indicator tokens for wet floor
- Paper
- Pencils

Since the physical prototype is going to be quite different from the real game, some further explanation is required.
First of all the goal of the game remains basically the same. While in the real game the player has to survive as long as possible while also maintaining a high score. The real time component in this case is going to be replaced by a turn counter, while the high score will also be simply calculable by using for example a field crossed counter with some bonus points for clearing certain objectives.

2.3.1 The Track

Two track elements are always in play. Namely the one the player is on and the next one in movement direction. Whenever the player leaves a track part that one is removed from the track and added back to the track part pool. Then the player has to blindly draw the next part from the pool. The new part is added to the track so that the red arrows point in the same direction.

2.3.2 Turns

Instead of real time reactions, the main gameplay has also been changed to a turn based play style, with the player being able to make decisions every turn.

A turn consists of the following steps:

- Move forward according to your speed
- In the meantime apply all effects of fields you pass
- You may move one field left or right
- If no water field was passed this turn you lose one speed
- You may shoot water at a field
- Calculate your points for this round

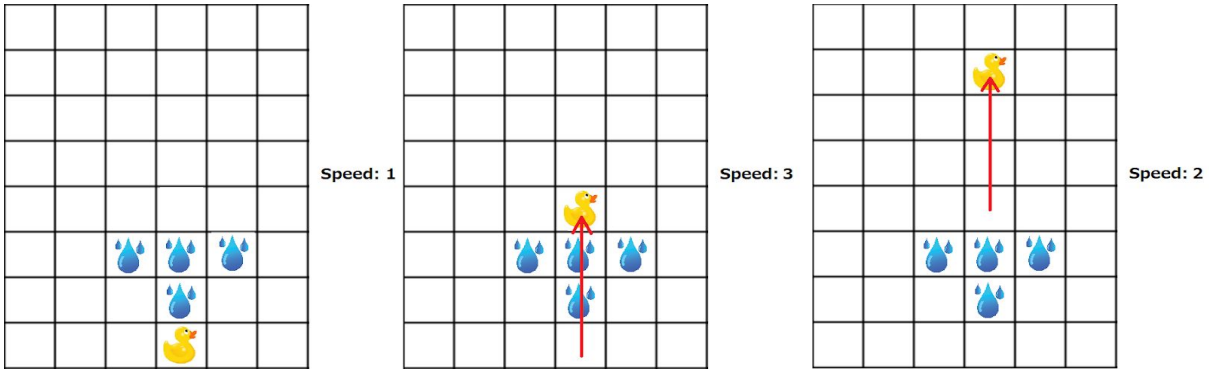
The game continues until the player collides with an obstacle, falls of the track or has a speed of zero.

2.3.3 Basic Field Types

There are several types of fields that have different effects while passing over them:

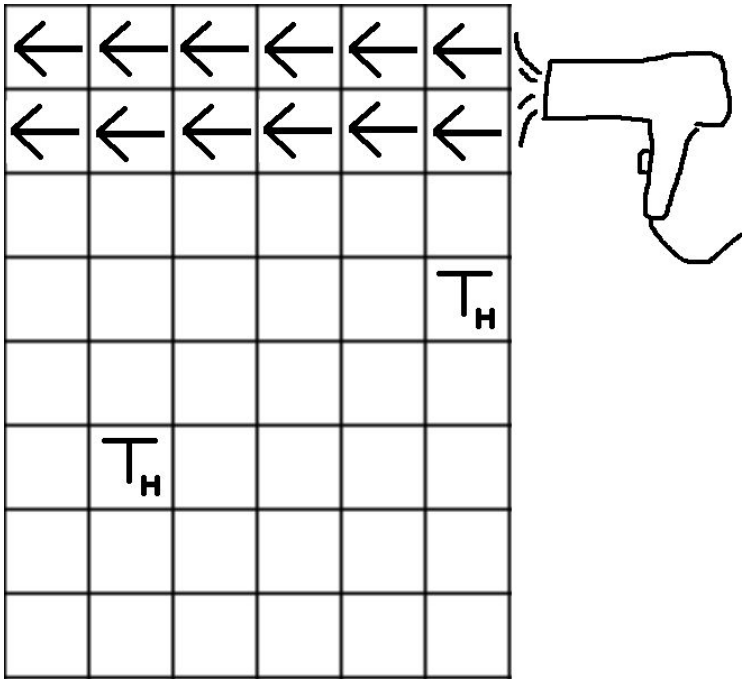
- X: Obstacles end the game immediately on collision.
- H: Holes end the game if you stop on them. Moving over them has no effect.
- W or fields marked with a water token: Add one speed point and let the player slide to the next field along direction arrows.
- R: Refill the water reservoir completely.
- T: Targets that grant a permanent multiplier if shot with water. They also count as obstacles.
- P: Powerups grant one additional field of movement to the sides for this turn.

The following image demonstrates the effect of the water fields:



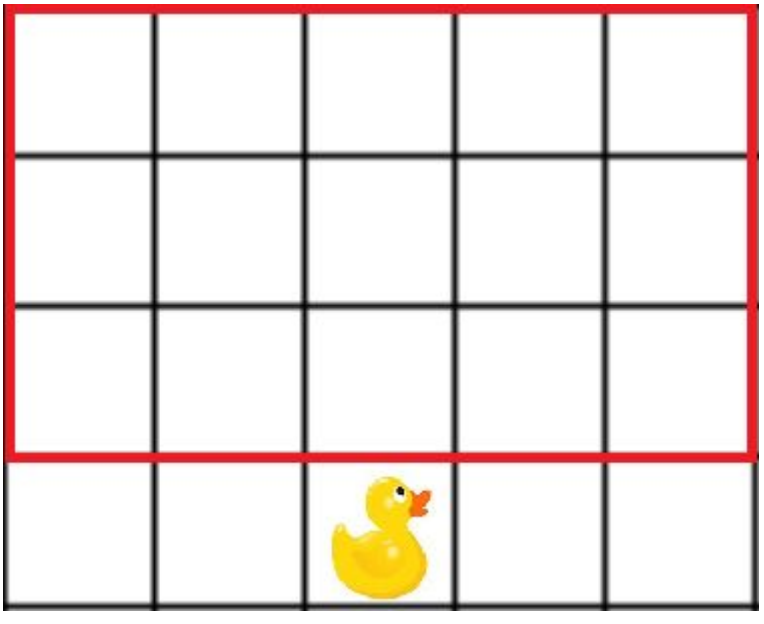
2.3.4 Special Obstacles

Special Obstacles are obstacles for which the player needs to do something other than dodge to overcome them. For this prototype we created one track part with a special obstacle, a hair dryer that pushes you off the track if you don't deactivate it first. To deactivate it you need to hit at least one of the special targets with water.



2.3.5 Water Shooting

The player has a reservoir that holds up to three charges of water. To shoot water the player needs at least one water charge in the reservoir. Water can be shot on any field in the five by three rectangle in front of the player.



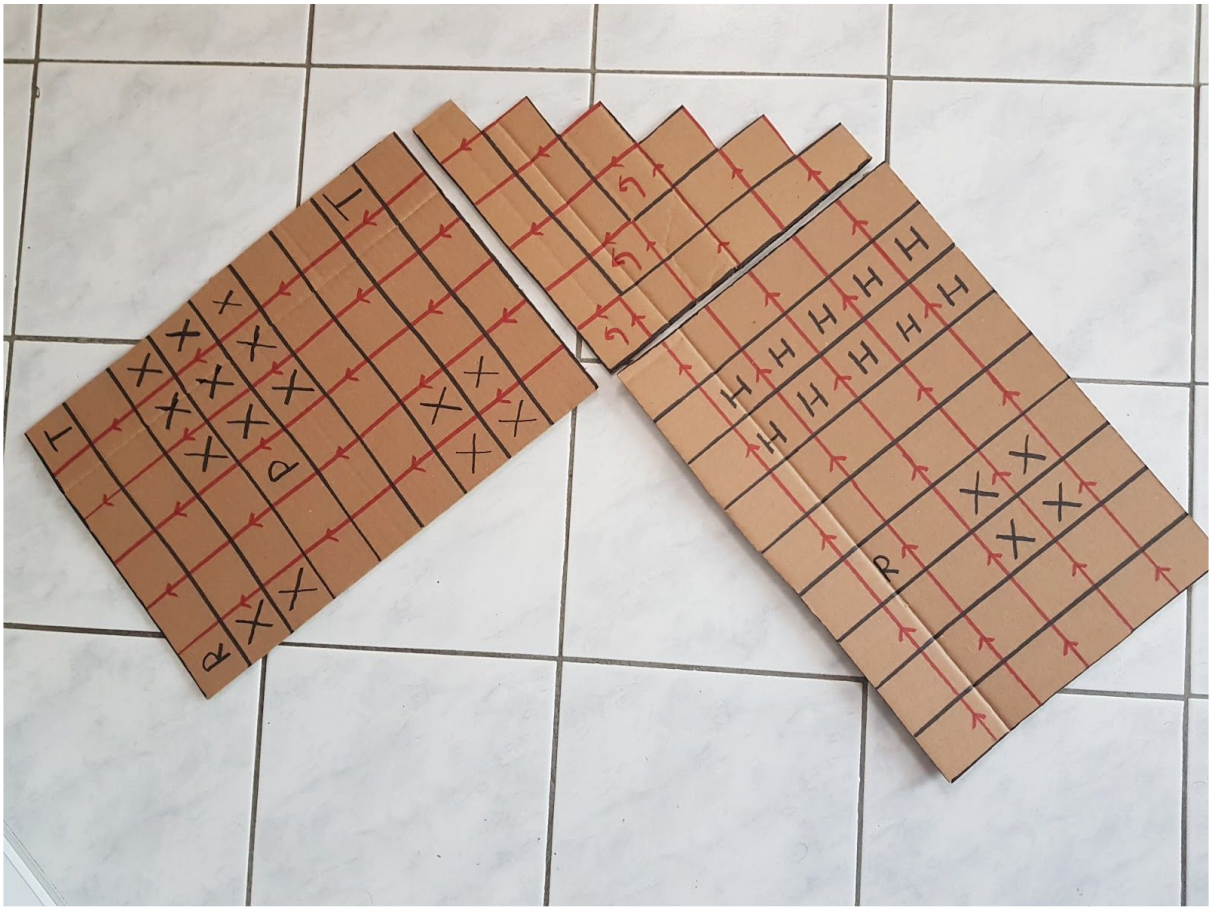
Water shot at a non empty field has no effect except if it’s a target field. Targets get activated if they are not already activated yet. Water shot at an empty field creates a puddle starting from the field.

2.3.6 Point Calculation

Points are calculated per turn and added together at the end of the game. Every turn the player gets points equal to their speed. This number is multiplied by the number of targets shot up to that point.

2.4 Prototype level

This is an example of how a track could look.



2.5 Next steps: from prototype to real game

Since our main game is more reaction and racing based it was impossible to truly recreate the main concepts into a board game. Instead we ended up going for a turn based game to keep the main mechanics the same. This allows for a close enough experience while still

For example, we have some obstacles and fields that get randomly placed by rolling a die. This is done to diminish the repetitiveness of placing the objects manually. Instead of repeating tracks one could also consider randomizing obstacles inside the randomized track pieces.

Via the prototype we tried balancing the secondary mechanics, which are not dependent on real time. We thought about how the speed-up works exactly, how the objects should interact with the player, how the high score is calculated, how to manage the water level and where to shoot it and how powerups should work and be interacted with conceptually.

2.6 What we learned from prototyping

Prototyping is a valuable method for testing different game ideas. It gives fast feedback, if a certain idea is valuable and should be considered further, following the principle of “fail faster”. This is not only valuable for testing game concepts, but also quite useful for testing certain mechanics of a game.

Nintendo has a popular Philosophy of Designing games, especially the Super Mario games, by having a Prototype with only the player (in unity often just a sphere). In this extremely limited environment they try to make the movement as fun as possible, which is the core mechanic of the game. After using this core mechanic, you can increase the scope with interesting additions, which change up or complement the core mechanic.

Most Prototypes are and should be throwaway. The reason for this is that you will not try to write good code, but fast code. And even more important, you should not already start with bad code, which destroys a codebase the longer you work on it without serious and time wasting refactoring.

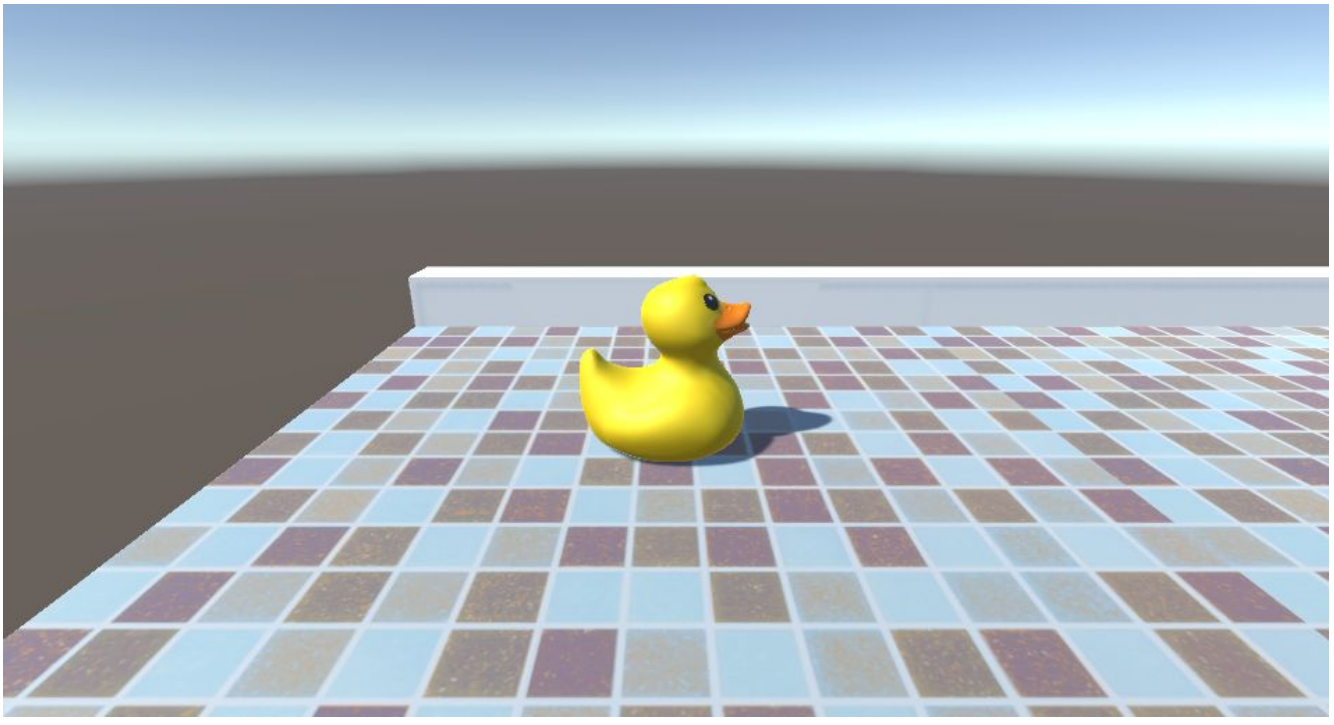
A Physical Prototype is another kind of Prototype. This kind of prototype is fast to develop, especially if you are an unexperienced game developer. Another advantage is that you can’t adapt a bad code base, because there is none. A Physical Prototype is especially useful for any kind of strategic, tactic or puzzle game. Turn based

games are the most fitting kind of game. For These Complex games, a Physical Prototype is often prefered, because coding takes much longer. Other fitting games are adventure games, story driven games and card games.

In other cases, like Action games, racing games, fps, Jump and runs and every other fast-pace game, Physical Prototypes often fall flat. The core mechanic of these kinds of games is almost always movement based, instead of methodical or combinatorial like in puzzle games. It’s extraordinarily difficult to test any kind of movement based mechanic with a physical prototype. These kinds of mechanics are best tested by playing around with them and getting a feel for the movement. This is impossible for physical prototypes.

Therefore a physical prototype has to be severely adapted to use and transform the secondary mechanics into a scheme, to make it testable in a more turn-based, methodical way. This is an interesting way to explore these secondary mechanics and can almost be developed in its own game. However the core mechanic will not be tested in a fitting manner to make it possible to make a decision, how the mechanic should be adapted or if you should drop it entirely.

It is also a bit more difficult to work on a prototype in collaboration. Usually you are dependent on other people, available material, time and location, which is not the case, if you use some collaborative workflow tool like git. This is especially difficult in a Lockdown phase, because most collaboration has to be at the same place at the same time.



3. Interim Report

3.1 Level Generation

The first idea for generating Levels was to have a purely random approach. The randomness for the interim results mainly focused on the obstacle placement. For this the collider of the ground was used to randomly place objects inside it with a margin on the border. The objects were placed completely random and therefore some problems appeared.

One problem was the placement of multiple objects. It has to be considered to place objects only on areas, where they don’t interfere with others. This was not that big a problem, but still noteworthy.

More problems occured with the timing of the generation. It has to be considered, when the objects should be spawned exactly. A main focus for this is on the speed of the duck and the distance to the next point, which is visible. The best approach for solving this problem is to spawn objects outside the visible field at once for a whole segment. This should depend on when the player leaves the current segment and should trigger the object generation just outside of view. This obviously means segments have to be generated out of the track.

Another big problem is how curves should be integrated. With this the separation of the track is even more necessary. The curves can then simply be placed on the end of the straight tracks and generate a cohesive track in total.

The biggest problems appeared in regards to game fun and Game Design aspects. The problem with random placement is, that it is, well, random. With random placement it is not given that the track is fun or even possible. With a truly random track, there could be long empty areas and some impossibly packed ones. Additionally, even if the track generation would be possible, when you have segments it could still be that the connection with other segments generates an impossible to traverse path.

To make the game fun a priority, there shouldn’t be any paths which make you lose instantly, because it's impossible to dodge the next obstacle. Additionally there should be a consistent level of challenge, with no long segments of boredom and no extreme difficulty spikes. The difficulty should ramp up over time through either obstacle placement or simply the character speed.

To make this possible, inspiration was drawn from Derek's Yu philosophy of designing the critically acclaimed game Spelunky. Derek generates the level by having a collection of interesting challenging rooms, put together in a way to have at least one possible path from the start to goal. This makes it possible to have a random map which is possible to traverse and still has interesting gameplay.

We therefore plan for future track generation to build a collection of various small mini challenges, which have some free space at the start and beginning of each segment. This makes it possible to have an interesting, unique track with few impossible paths. The more track segments are collected, the more varied the final track should be. For alleviating the burden of manual track generation, track segments can also be mirrored.

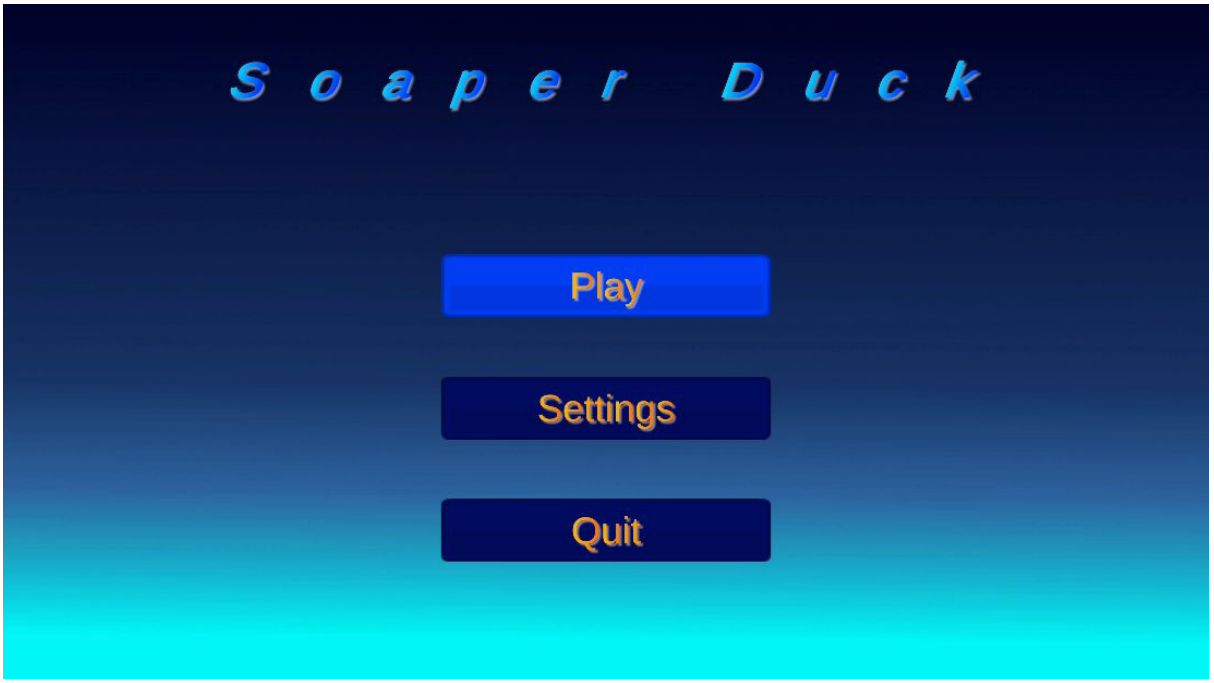
For the first results we however still use random generation and try to live with the problems mentioned before, until enough time is available for the new, pseudo random track generation.

The track generation itself (excluding obstacles) is quite simple yet effective on a technical view. Every track has a point set as the end of the segment, so for the endless generation of a given track, we first have to decide when to add a new track at all. That is decided with the distance of the player towards the current end of the track. If that distance passes a certain threshold, a new track segment is attached by spawning the new segment at the point where the previous segment ended. This supports different rotations of the segments, meaning that turns and changes in direction have been accounted for.

3.2 Player Controls

We concentrated on the basics of player movement for now. The player has the abilities to move left and right as well as to jump. Also the player moves forward automatically at a specific speed. We are currently testing different techniques for water shooting. It is important for the aiming to be quick so the player can react in time.

3.3 Menu and GUI



In our simple game menu the player has the options to start the game, set the settings and quit the game. The menu is optimized for 4k resolution, but works with every resolution. The text and button are getting scaled automatically so that the game could in the future also be ported to mobile or console without having to change the graphical user interface.

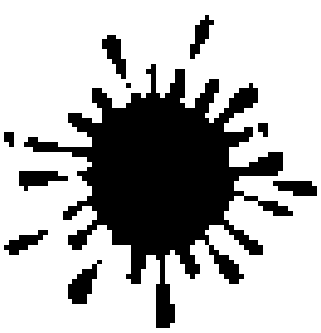
The title text uses Unity's new TextMeshPro feature that allows for more customization options like for example dynamic gradients, shadow effects, character spacing and mouse hover effects. The buttons are located in a panel that uses a vertical layout group to align the buttons on all resolutions.

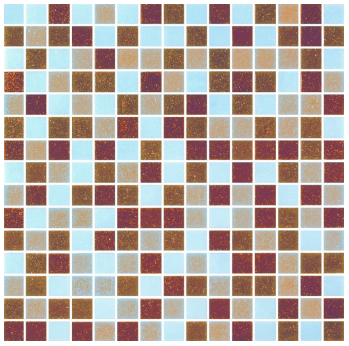
The settings menu is invisible at the start and gets activated once the settings button is clicked, of course this will deactivate the main menu. Using a back button the main menu shows up again. The settings menu is currently empty, but we are planning to add options like for example sound volume later on.

The start buttons loads the game scene and the quit button ends the application when clicked, this is achieved via a simple C# script.

3.4 Splash and water shader

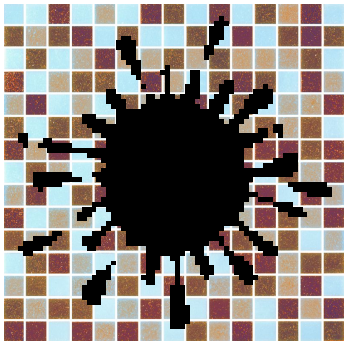
3.4.1 Current Approach



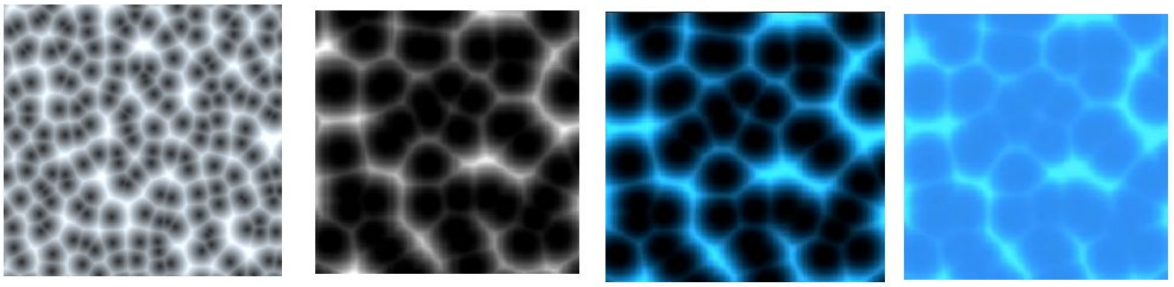


Our first approach to render water at the position where the projectile hits a surface is based on a shader and a splash texture mask. The splash texture is black and white, because the idea is to render this texture onto the ground texture and then use it as a mask for the water shader. Using a C# script and raycasting the position of the bullet hit point in world position as well as the UV coordinate on the ground texture is calculated. Using this UV coordinate as the middle point of the splash every pixel in the splash texture that is black gets rendered onto the ground texture and replaces the original pixel.

The result looks like this:

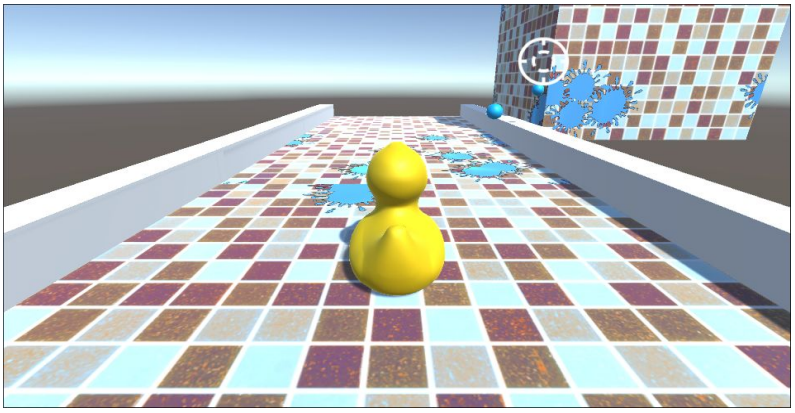


With this setup we created a very simple water shader using a Voronoi noise.
The voronoi noise has several cells and ripples, we only want to use the ripples and have the cells in one color. Therefore we increase the cell density and multiplay the white parts of the voronoi with a sky blue color. The blue base color is added to the black inner parts of the cell. Finally we added time to move the water in negative z-direction to make it look more realistic.



Sources:
Voronoi shader: https://www.ronja-tutorials.com/2018/09/29/voronoi-noise.html
Simple water shader: https://www.youtube.com/watch?v=Vg0L9aCRWPE
Original splash C# script (we edited it a lot):
https://sergeyshamov.wordpress.com/2018/05/22/paint-splat-on-objects-in-game/

Using a simple if-statement, that checks on runtime whether or not the current pixel on the ground texture is black, we render the water shader on top of the black splash parts which then makes for a decent looking water splash.

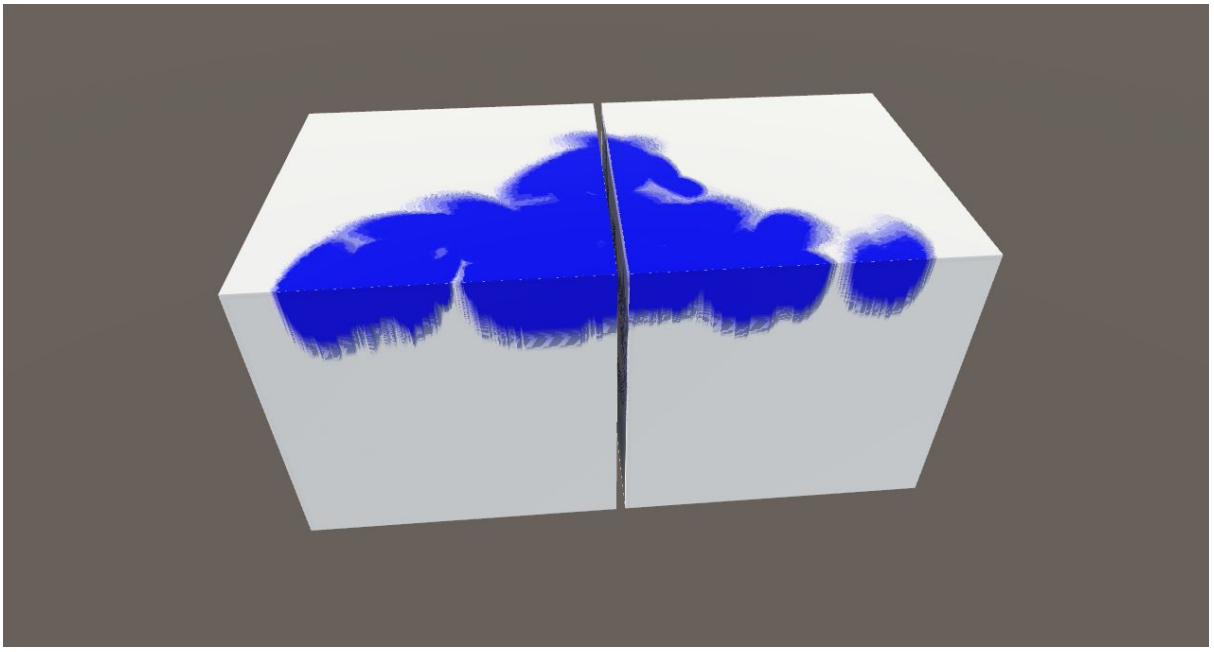


Problems with the current system:

- Splashes don't work on disjointed uv edges.
- If its UVs overlap, the splashes appear on multiple places on an object.
- Splash size is tied to object scale.
- Splashes don't wrap around edges.
- Raycast can only hit one object at a time, so splashes can't cover multiple objects that are close together.

3.4.2 Outlook and new Approach

Since our first idea to display water on the track has some major technical difficulties we are currently testing a different approach. If we render the splashes as decals instead of drawing directly on the texture we can circumvent many of the issues we had. We still need to figure out how to best create and organize the decals but first simple tests seem promising. We can hopefully also transfer the animation we created in the first approach to the decals.



3.5 Goal achievement summary

We have managed to implement all the points that we set for our functional minimum, as well as half of the features for our low target. 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 player can dodge obstacles, shoot with a water gun and try to reach a high score as high as possible.

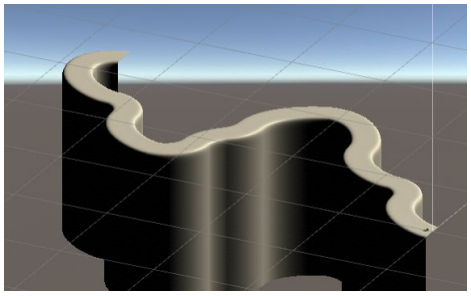
4. Alpha release

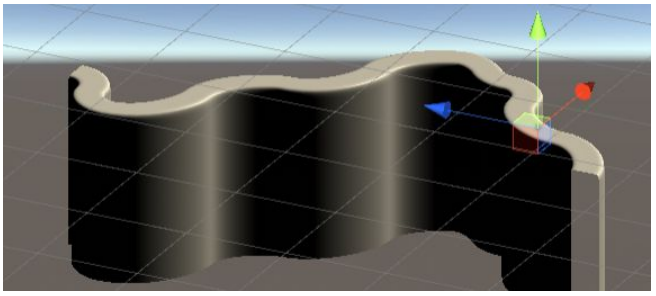
4.1 Improved track generation

With more tracks to implement than just straight ones, a few problems have appeared that would have to be addressed in one way or another.
With the earlier implementation of the tracks it was possible to attach one track to another for a seamless track, after fixing some rotational issues of the individual tracks this part worked without any bigger issues.

Next we implemented a cleanup after the tracks. In earlier versions we just spawned the next track ahead of the player and didn't delete previous tracks. For a more immersive gameplay however we decided to spawn multiple tracks as soon as the game starts (10, at the time of writing this document). The way it's been implemented is with a FIFO queue of track objects which are then cleaned up based on their index. So there will always be 2 track pieces behind the player left before the cleanup starts while also continuously generating 8 track pieces ahead of them. Multiple track pieces can be spawned or cleaned up at once in case the player manages to somehow skip track pieces.

How would they be able to do it?
Originally we planned to spawn 20 tracks ahead of the player for a more immersive gameplay, this has however been reduced to 10 because of a certain problem: the tracks spawning inside each other because too many right/left turns have been chosen consecutively at random.
First attempted fix:
For starters we reduced the tracks to be spawned at once. Next, every time a track gets spawned we check if it would collide with a previous track, if yes we roll the dice again and choose another track at random and check again if that applies. This has led to rather clean and interesting levels with a relatively low chance of collisions. It can still happen for the track generator to trap itself in a circle with no escape anymore, in that case we spawn a piece that crosses the previous track, the player may skip it as the previous parts just get cleaned up and new tracks are spawned. Furthermore the probability of it having no escape gets reduced when more tracks





are thrown into the track generator, especially straight track pieces. Example Spawn layouts are shown below:

The now working solution is to never spawn a right piece before having spawned a left piece before. This leads to a very straightforward track with a few turns in between. This turned out to be the most convenient given the speed and difficulty of turns in both implementing difficulty as well as gameplay balancing.

4.2 Slippery mechanics

To implement proper slippery movements have been proven more difficult than expected. We graduated from our previous simple movement implementation and started to implement a movement system which was satisfying to control: From cars.

Thus we attached four invisible wheels to our little duckling for new controls. For this we used the unity wheel colliders and the wheel sideways friction to achieve a slippery mechanic. Parameter tweaking is still necessary for smooth gameplay at this point.

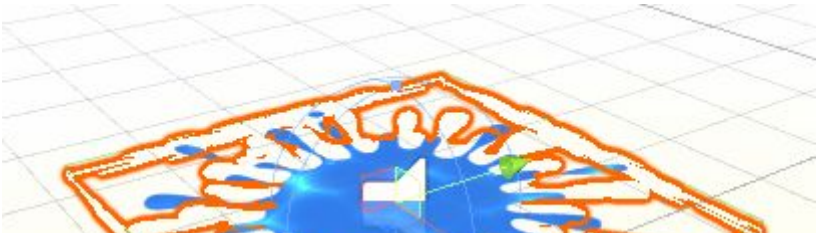
The jumping mechanic has been removed because we realised it serves no good merit in our current game. It would lift you off the ground, removing the slippery factor which is supposed to be the core, so it felt contradictory to keep it.

4.3 Improved Water shooting

Our old water shooting approach had several downsides. It shot water projectiles in a straight line, which was not very realistic. Because we started the raycast from the camera position the shooting was accurate enough to target smaller objects. On top of that the old water shader has several disadvantages:

- Splashes don’t work on disjointed uv edges.
- If its UVs overlap, the splashes appear in multiple places on an object.
- Splash size is tied to object scale.
- Splashes don’t wrap around edges.
- Raycast can only hit one object at a time, so splashes can’t cover multiple objects that are close together.

To fix the problem with the shader we decided to use Unity’s Decal Projectors. A decal project is a cube that references a transparent texture. The cube gets dragged into the object onto which we want to project the texture. It is important that the positive z axis points into the direction of where we want to project the texture.



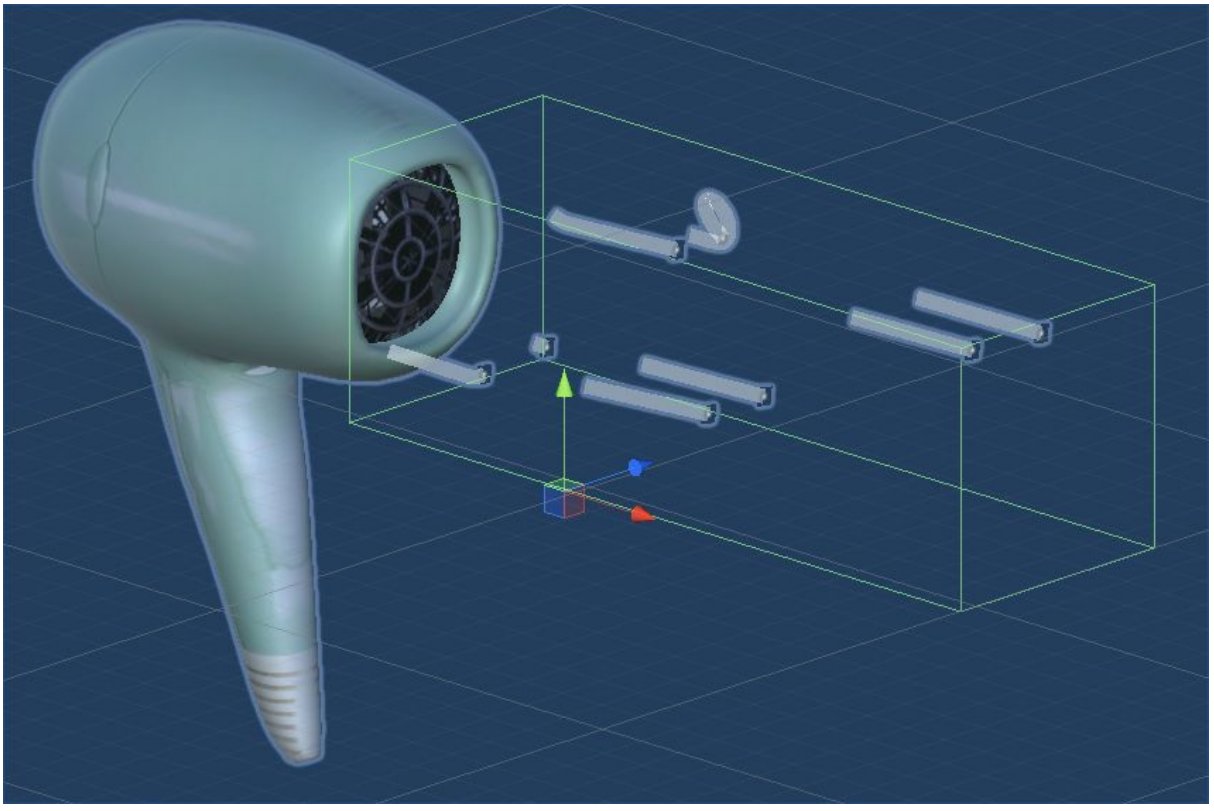
This approach solves the problems with disjointed uv edges, UVs overlaps, splash size, and now we also don’t need to use the computational expensive mesh collider anymore and can just use a normal box collider. The only problem remaining is that splashes don’t wrap around edges, but since decal projectors solve 4 out of 5 problems we believe this is sufficient enough for the alpha release.

4.4 Obstacles

There are many different kinds of obstacles, or objects in general. These are contained in categories. There are Obstacles which lead to a game Over, obstacles that affect the movement abilities and obstacles, that are temporary.

The game over obstacles are either static obstacles like a cup or moving obstacles, like the razor pendels, which swing around on the track. These obstacles are placed together with others on track pieces to generate interesting challenges.

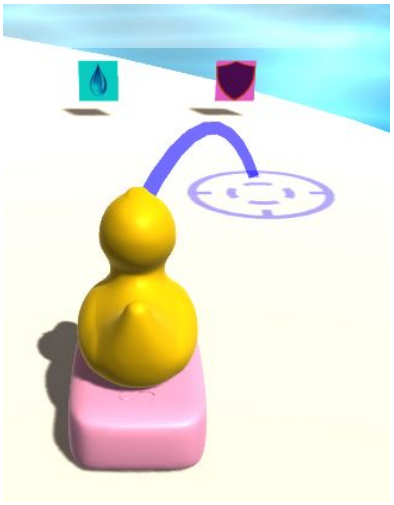
The movement abilities affecting obstacles are the hair dryer, which pushes the player in a certain direction, and the ramp, which can be used to jump a short time. These are used together with other obstacles. For example you could use the hair dryer to lead the player into a static obstacle. The ramp can be used to jump over some other objects to reach an otherwise blocked path.



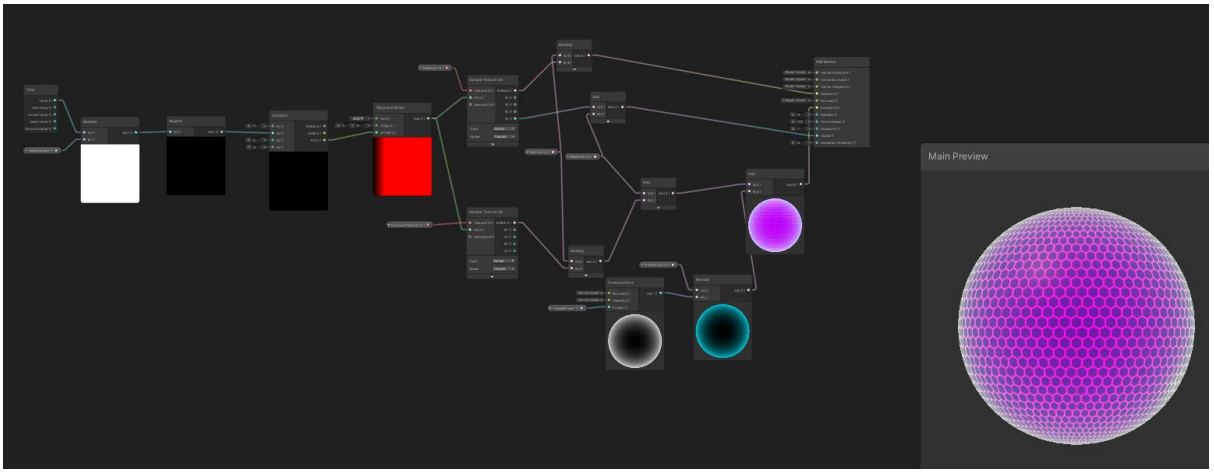
The last obstacles are the temporary objects. These can be moved away under certain conditions. The current one used is a razor blade, blocking a path and moving away, after a target was hit.

All the obstacles were adjusted to fit the current track. The first track used a much smaller area, wherefor all objects were smaller and shorter. To accommodate the obstacles to the new track, they had to be resized, rescaled, moved and the animations and particles had to be fitted to either slow down or also increase in size.

4.5 Power Ups



We implemented two power ups using inheritance and unity shader graph. The first power up will refill your water. The second power up gives you a shield that will save you from dying through a crash. The shield uses two textures, a base texture and an emission texture in order to make it look realistic. In addition the fresnel effect is used to blur the edges. In order to move the textures to the top, the time gets multiplied with the offset and tiling of the textures. Color is added by multiplying the white parts of the base texture with a light purple color and adding a dark purple color to the black parts. This allows us to change the color in the future if we please so.



4.6 Gameplay GUI

We improved the graphical user interface by adding a water counter in the top left corner that shows you how any water bullets you have left to shoot. In the bottom right corner we implemented a speedometer that uses GUI prefabs and some euclidean math to visualize the speed in a more appealing way. The current score of the player is now shown in the bottom left corner.

4.7 Art & Sound

4.7.1 Models

We created models that fit our bathroom setting and fit the scale of our main character. For a character as small as our little duck here even an ordinary soap dispenser is a considerable obstacle.

4.7.2 Sound

We added five different sound effects to the game:

- Button sound, that plays when you hit the play button
- Crash sound, that plays when you crash against an obstacle.
- Duck sound, that plays when you drive over a water puddle.
- Power up sound, that plays when you collect a power up.
- Water splash sound, that plays when you shoot a water drop.

4.8 Challenges during development

We faced some difficulties during the development in the track generation regarding the collision of the track within itself given the random nature of the procedural generation. More on how this has been addressed in the track generation part.

Another problem we encountered was with the movement of the player, the earlier versions did not satisfy our requirements for movement anymore so we switched to a wheel based alternative which brought all kinds of problems with itself, this got addressed in the slippery mechanic part.

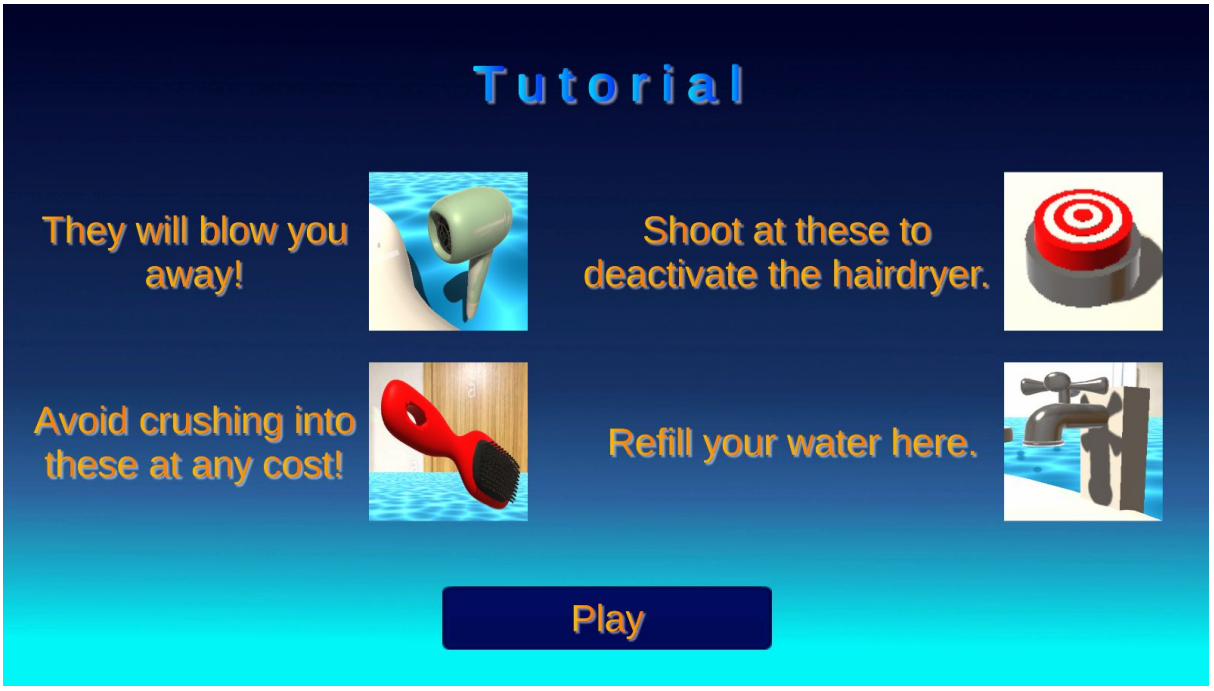
4.9 Progress and changes during the development schedule

For the most part we stuck to our development schedule. We added sound and improved the GUI, we implemented power ups and obstacles and reworked the water shooting mechanics. As for the track generation we initially planned to have the tracks and obstacles spawn separately from each other, however during testing we figured out that the result was too random, so we decided to instead have several different track parts with obstacles already placed on. These track parts can then simply be generated at runtime using the in section 4.1 explained algorithm.

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 on google drive.



We have added a tutorial screen, explaining the game mechanics in a manner that the players should understand it without the need of someone present to explain them.
From here on we've sent the File to people with varying experience in gaming and endless runners followed by a survey so they could evaluate our project.

5.1.2 Procedure

Due to the Corona situation we were not able to do playtesting at the university, therefore we asked friends to play our game via social networks. We created a download link as well as a Google questionnaire that we send to potential participants. The structure of the playtesting looked like this:

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

We did not explain any game mechanics, instead we were interested whether or not the testers would figure it out by themselves. However the main complaint of our first testers was that the fact that water splashes increase your speed was unclear. So we decided to include this information for the remaining testers.

They were asked to play the game for 5min to 10min and see how many points they could score. Afterwards they had to fill out the survey. At the end we had a short discussion about the game experience with each participant.

5.2 Survey

16 People took part in the playtesting and in the survey
The people playing the game have been asked to partake in the survey, after they've playtested the game.

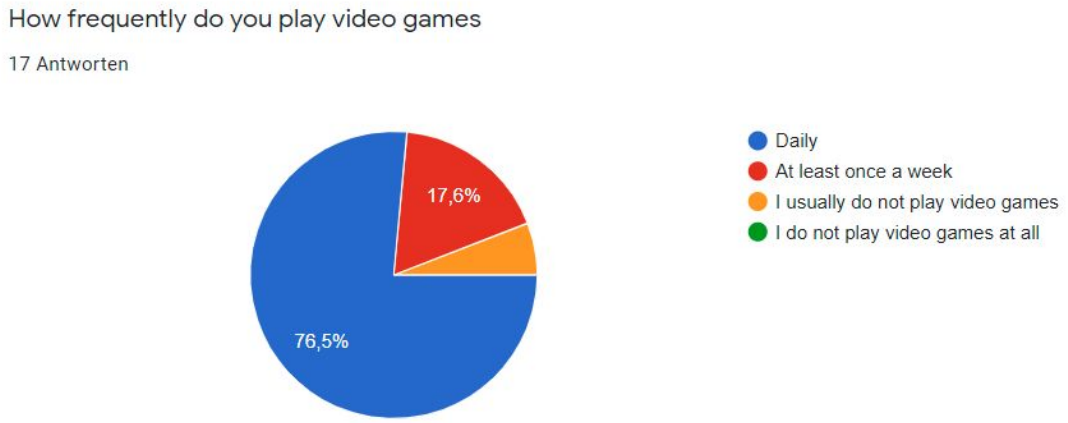
Within the survey we've inquired about aspects of their gaming habits as well as general Information of the player.
We've included a measure to see how often video games, endless runners or racing games have been played to get see if players with little to no prior experience have more troubles learning the game than players with.

The players have also been asked about the game in regards to the theme "Wet&Slippery" and asked them to rate whether it fit the theme in regards to gameplay as well as in regards to the design and visuals.

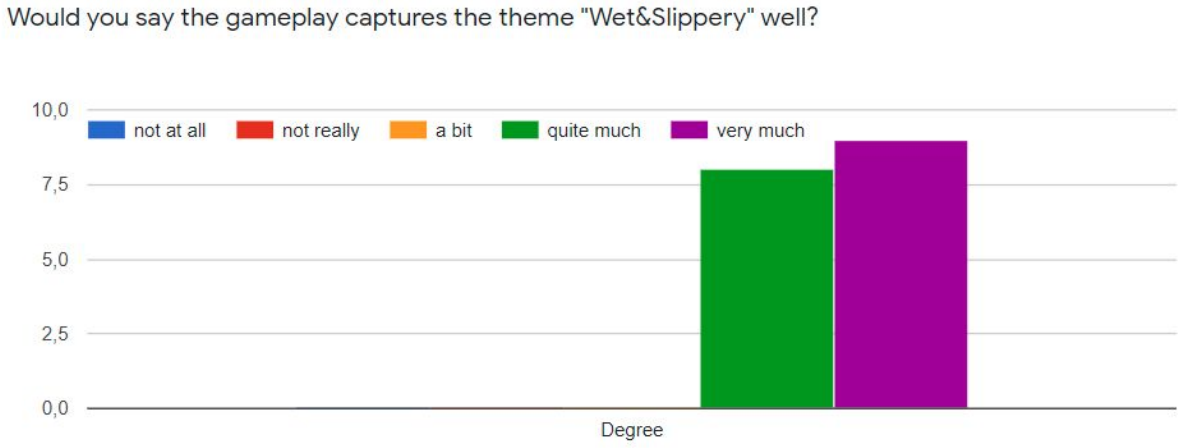
Furthermore we've also included questions measuring the amount of fun the players had as well how intuitive the game with the controls felt.
In the end of the Survey we asked for additional feedback which has not been covered in the survey beforehand which also resulted in good insights.

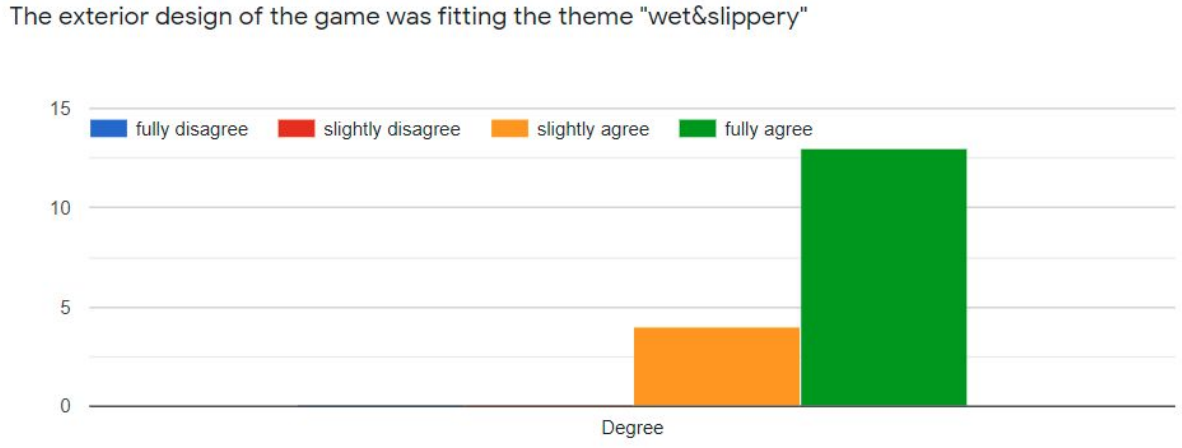
5.3 Results

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

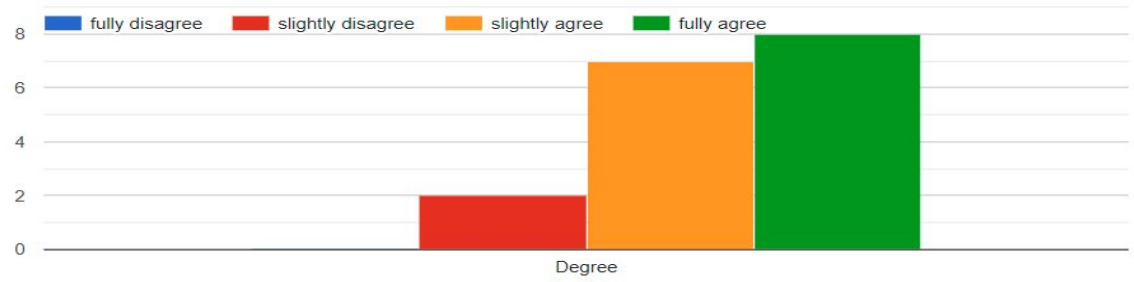


The players all agreed that the gameplay as well as the exterior design were fitting the theme “Wet&Slippery”.





The music/soundeffects were fitting

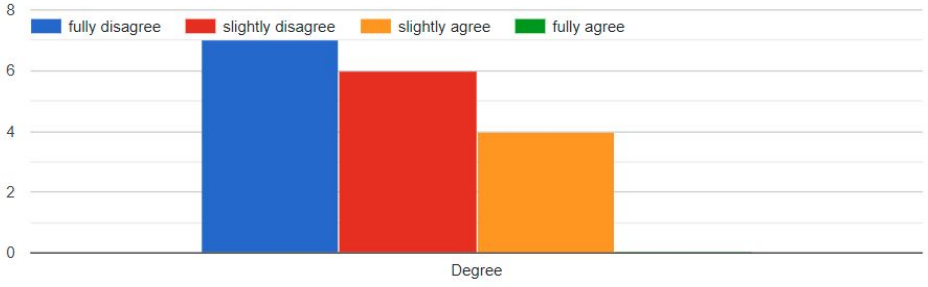


While most people slightly or fully agreed that the controls were intuitive and easy to control, we've still had quite a few mentioning that they slightly disagree. Given the previously mentioned fact that most of our test players have a lot of experience playing video games one might assume that it's even less intuitive than the first look at the statistics might expect. This might be due to the fact that we forgot to add one of the control mechanics in the tutorial: The explanation on how you accelerate. This also gets apparent on the numerous comments on it in the extra feedback section.

The controls were intuitive and easy to control

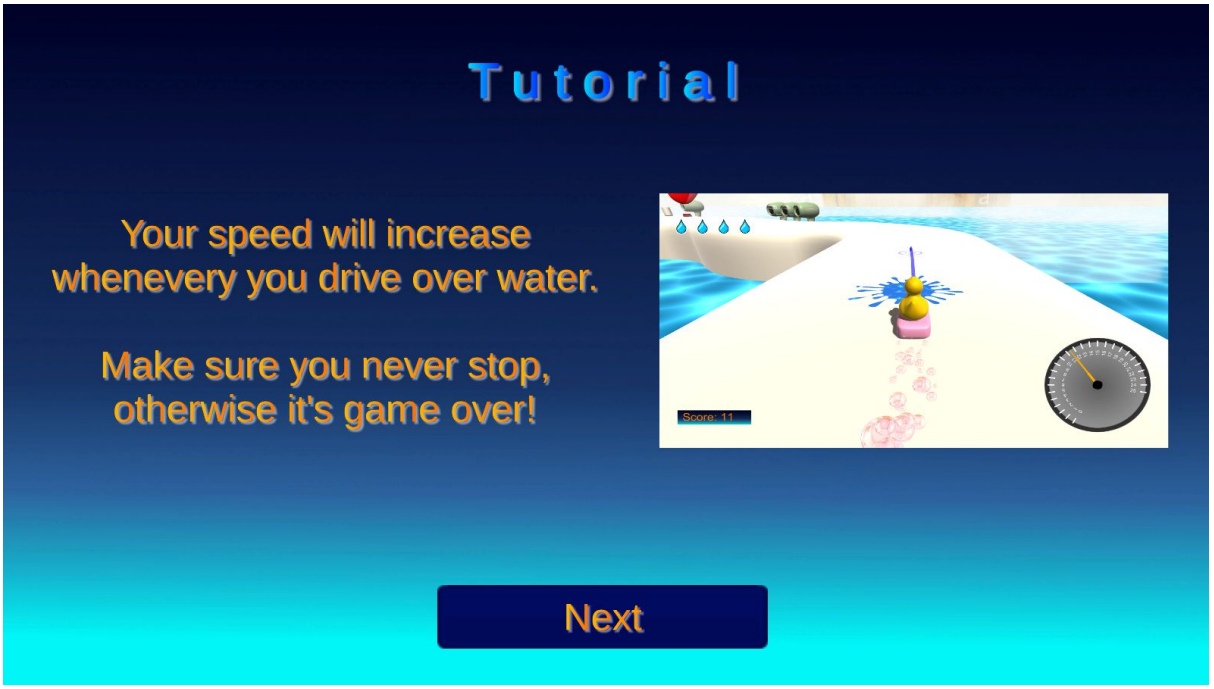
Most tested players have been satisfied with the difficulty and the death rate of the game while others think you die a bit too fast. This might be either because of bad balancing, or also because of the lack of explanation of the acceleration mechanic. Which might lead to many preemptive deaths.

I died way too fast



5.4 Improvements

One point, which bothered many players, was that it wasn't clear at the beginning what the water shooting did. Other players complained that they didn't know why they slowed down. This was missing in the tutorial. But even though it wasn't included, the players mostly understood intuitively, that the water increases your speed without any help. Therefore it was only confusing at the beginning, but didn't present problems further down the line for most players, some did not figure it out until after we told them after the test.



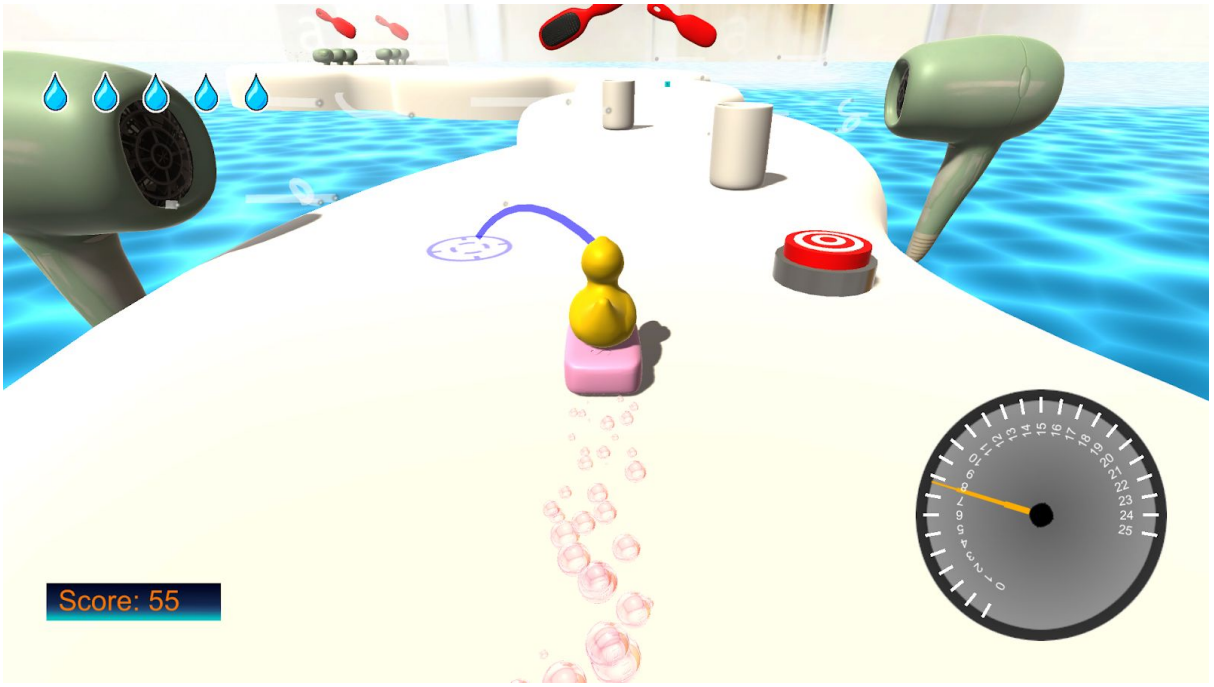
6. Conclusion

6.1 The Final Product

Our game is an endless auto runner where the user plays a robber duck that glides on a soap through a bathroom styled environment. The player can shoot water onto the ground to make the soap more slippery and therefore increase their speed. Once the player falls into water, hits an obstacle or has no more speed left the game is over.

Several obstacles like hair dryers, swinging brushes and cups have to be avoided. Hair dryers will blow the player off the track, swinging brushes will launch the player off the soap and into the water and crushing into cups is also not a good idea. The user can deactivate the hair dryer by shooting water onto switches, but be careful with your water usage, as you also need water to increase your speed. If you lose too much speed you will stop and it's game over.

The goal of the game is to score as many points as possible therefore surviving as long as possible and going at a high speed as much as possible is advised as you get points by how far you advance in the auto generated track and driving over water will increase your point multiplayer. At the end of one round the player has the opportunity to enter their score into the highscore list.



6.2 Personal Impressions

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

Marco: The level generation, the water shooting and the slippery mechanics proved to be quite a challenge. Our first version of the water shooting was working but not looking to good on the visual side. In the track generation we had to switch to a semi-procedural algorithm with predefined track parts as the result for the fully procedural algorithm, where we placed each item separately didn't work to well.

Wacken: The ramps didn't work well, as you would always fly much too far, especially with the random track generation. Ramps would have been not really fun or didn't work at all.

Sahin: Considering the things I implemented myself it was definitely trying to get the player controls running in a slippery yet controlled way.

Albert: We had to try a few different approaches before we got the water splashes to look the way we wanted. There were many problems with water showing up on faces where it shouldn't.

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

Marco: At the start it was very difficult to come up with an idea that was realistically programmable within the given amount of time. However the further we got with the project the more I enjoyed working with a theme that is not as generic as other themes in the past. It did point us into a direction without taking too much freedom from us.

Wacken: It was interesting and open. It's easy to have an idea which is still unique.

Sahin: I felt it was a little bit too limiting in regards of gameplay choices. However given the games that sprang for it. There were more options than expected.

Albert: I really liked the theme. "Wet and slippery" conjures a distinct feel of gameplay while at the same time being very open for interpretation.

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

Marco: I really enjoy having an overall theme, because it limits the scope just enough to reduce the amount of game ideas to a point where you can start discussions about game ideas very early and get to a compromis very fast.

Without a theme discussions often take very long because there is no limit.
There is also no breakpoint in terms of how many new ideas you can brainstorm and talk about.

Wacken: It's always difficult to get a great idea. Therefore restriction are often a help, to get something. With no limitations, it would probably take a really long time, if you don't have an idea already. Also limitation increases creativity (Silent hill fog effect and many NES games)

Sahin: No. I am pretty sure a theme is always helpful. Having no limitations in such a project is more of a hindrance than it is helpful.

Albert: I think themes challenge us to think outside the box and do something, that we would not even have considered otherwise. It's also always interesting to see how other teams approach a topic.

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

Marco: In my opinion our team worked very well together, there is nothing negative about how we handelt the task given to us. The only problem is as always the extremely limited amount of time you can invest into the project.

Wacken: Focus more on the project. I did too many projects this year that I could not completely focus on any, but had to split my attention over many different ones. I probably could have made the game process a bit faster and streamlined with my project management knowledge, if I would have the time to completely focus on it.

Sahin: I think it turned out pretty well, the only thing that was bothering me was that there were many weeks with no implementation and rather only planning (in the beginning).

Albert: I would definitely try to make a less physics based game. It sounds nice at first to let the physics engine make the gameplay for you but it took lots and lots of tweaking to get where we are now. And it still goes wrong sometimes.

Q: What was your greatest success during the project?

Marco: For me personally it was the water shooting, because implementing shooting into an auto runner is not a trivial task considering that the player is already occupied with dodging obstacles we had to balance the shooting quite a bit to make it fell easy and useful for the player.

Wacken: I feel that this is one of the first project where I could actually manifest my ideal of having a small core of a fun game loop and building interesting challenges

around the main mechanic, which I always want to do, but still often is killed by feature creeps. We had almost no feature creeps and the game processed in a good way.

Sahin: Felt really good when the track generation worked out as it was expected and it stopped getting spawned within other tracks anymore.

Albert: In the beginning our game world was very sparse and didn't look that good. So I tried my hand at creating effects with particle systems and shaders and I think I managed to make something that looks far better than before.

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

Marco: Absolutely, I believe that our game captures the theme of "wet & slippery" perfectly. The game mechanics feel very well balanced and I want to argue that in comparison to other auto runner games our project offer the player more immersive experience.

Wacken: As mentioned before I'm quite satisfied with the project progression, but of course as for almost any project, more time could have improved the project even further.

Sahin: Yes, I think the project worked out quite well and really captures the theme. So I am happy with the final result.

Albert: I think we created something solid in the scope of our course. Many of my projects before suffered from feature creep and didn't get finished, but with this one we hit all our marks.

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

Marco: While the project plan did give us an overall guideline on what to do at what stage of the development process, the exact time when one milestone was achieved did differ from the initial plan quite a bit.

Wacken: The plan was more used as a guideline, as projects, especially game projects, are constantly fluctuating as new design ideas emerge and old ones are abolished. Therefore we could generally hold the rough outline from our milestone, but the final project from our plan is of course different then the one we actualized.

Sahin: We used the plan most of the time as a guideline. While we tried to abide most parts of it, it did happen that we implemented some features later than intended as well as other features earlier than intended.

Albert: Project plans more often than not collapse when colliding with reality. In the beginning we tried to adhere somewhat but we soon noticed that we would fare better on a dynamic schedule with frequent meetings to track progress.

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

Marco: I'm doing this course for the second time and I believe that the course is fine as it is. Having to present the next milestones always gives you a goal to work towards and being able to work and finish a bigger project during the semester is a great reference for future job application.

Wacken: I like the idea of a physical prototype, but only in certain cases where it makes sense. The necessity for a physical prototype was interesting, as we developed a new kind of game, which could have been a board game in its own, but did almost nothing for improving our understanding of our game and we couldn't test, if our ideas would work, which at least in my opinion is the main point of making a prototype.

Sahin: I think the physical prototype is an interesting concept but definitely has its limitations, especially in everything that requires realtime interaction of some kind. Other than that I think the course went really well with the organization.

Albert: Organization was very good. The goals and milestones were clearly defined. The course suffered a bit because of it's pure online nature, but that's outside of anyone's control.