

Icescape

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Mobile / IT – Systems Project

In professional life it is not uncommon for one to need to work with other specialists or departments in order to achieve a common goal. For this reason, it is important for students in the university to get started with this dynamic of doing their best to work as a team with people they barely know, in order to adapt their workflow and increase their teamwork capabilities. In the University of Applied Sciences in Hamburg was stated during the Mobile Systems/ IT Systems lecture that the students of Media Systems and Medientechnik had to work together to create a project that unified both the creation of an app and the integration of an Arduino in order to control an IT system utilizing the DMX protocol. Because of the previously mentioned point, the members of this group decided to create the Icescape project, in this paper it will be explained the core concept and ideas behind it.

Core Concept:

The basic idea behind the Icescape project is to create a game that will allow the players to interact with the real world, while having some kind of influence in the game world. The game will be consisted of a field of hexagons on a board that are lit with LED lights. With the help of these hexagons, the game master will be able to use the mobile application in order to create a path from one side of the field to the other, making the hexagons that mark the path glow with a different color. For a few seconds the marked hexagons will be shown to the player in order for him or her to memorize the path. Short after the desired time has passed, all the hexagons will go back to the same color to symbolize that the player can start playing. The end goal of the game is then to get to the other side just by walking a chess piece through the previously marked tiles on the board, while losing if one ever *falls* out of it.

For how the project will be designed it will follow the idea of walking through floating ice without falling into the water. This previously mentioned concept means that the different colored path (probably white) is there to represent ice on which one can walk, while the rest of the field (probably blue) will represent water, in which one should avoid falling.

Knowing how the base concept of the project is going to be developed, the next steps are to define the two principal parts of the project: The mobile application for the game master to manage the game and the IT system for the game to be projected in real life, the following will describe both concepts:

Mobile systems:

For the Mobile Systems aspect a mobile application has to be created. For the purposes of this game the mobile application is strictly for the game master to use in order to control what is happening in the game.



Fig 1: Inspiration for the mobile app

The aforementioned app will have a home screen in which one can see a digital representation of what the game field looks like, similar to what is shown in figure number 1¹. In this home screen the game master can decide how the main path is going to be traced (which will be represented afterwards in the main game field). Whenever the game master has finished making the path, he or she can press a *start game* button, which will soon follow with the projection of the created path in the game field. It is also important to note that if one is playing alone, or the game master doesn't want to make a new path there will be an option to randomize the path that is going to be given to the player.

After describing the main game mechanic, one question still stands and is how the player is going to be tracked in order to know if he stood on the right tile. For this the team thought about several possible ideas that will be discussed below:

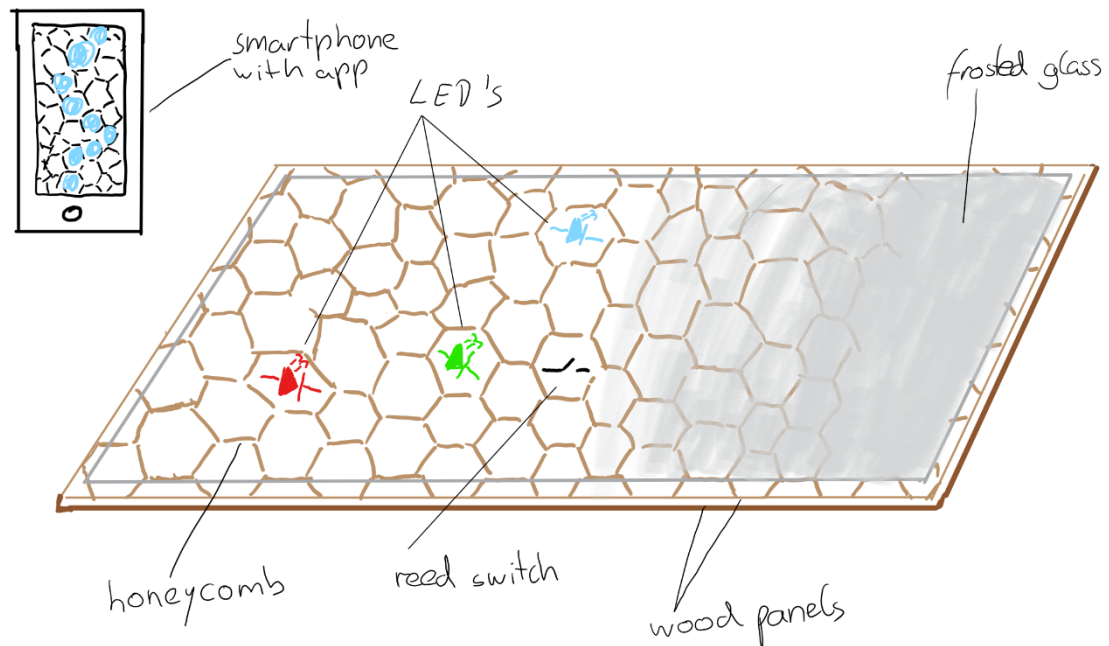
- *GPS*: Utilizing the global positional system integrated in the phone might be a good idea in order to track where the player goes. The complication with this is that the GPS is not extremely precise to the meter, which will be needed in order to know if the player is standing on the right tile. For this option the game master will have to give the phone to the player when the game starts.
- *Sensors*: Another possible option is to use the motion sensors integrated on the phone or external sensors. As for how this sensors will be used is yet to be discussed, but if the sensors are external, one could place several sensors on the field and one on the leg of the player to check where the player is.
- *AR Markers*: Markers can be placed on the game field which will be tracked with the camera on the phone. The game master will also have to cease control of the phone for this option. This is also the least plausible option because the markers need to be well lit and pointing to the markers with the camera might lose the idea of the game.
- *Game master*: The game master could also mark on the mobile app which tile the player has stepped in, if the tile is the wrong one, marking it will trigger a loss for the player (making all the tiles glow red for example). This solution is the easiest one to implement technically but will also be used as a last resource if the other ones don't work.

The application will be developed using *Flutter* as an SDK, therefore also utilizing *Dart* as main programming language. If any additional tools are needed for problems that other open source libraries and plugins can't solve, the application will have plugins developed natively in either *Swift* or *Kotlin*.

¹ Arktis Superspiel. Retrieved from <https://play.google.com/store/apps/details?id=tland.example.arktossuperspiel>.

IT – Systems:

The board:



For the IT-Systems part we will first build the gaming board. For that we will use a wood panel as a base and a second one with honeycombs caved inside on top. Every honeycomb will include one LED (3 colored) and a reed switch. The structure will be topped with a frosted glass.

We will connect the phone and Arduino by Bluetooth and the Arduino and LED lamps by DMX. The Arduino will also control the switches that show which tile the player is standing on. The reed switch will work with a magnet put under the figure that will be used as the player.

Once Player 1 has chosen a path on his phone, Player 2 can move around the figure trying to match the path that was represented on the board. If his move is for example wrong the Arduino gives the signal to turn the LED red. The Player will have one minute to get through the game.

List of materials:

- 52 LED's (at least 3 colored)
- 52 Reed contacts (cables for connection)
- 2 wood panels + 1 thin wood panel to cover the back (50x30cm)
- 1 frosted glass (50x30cm)
- 2 magnets for a small figure
- (Arduino, Smartphone (with Android))