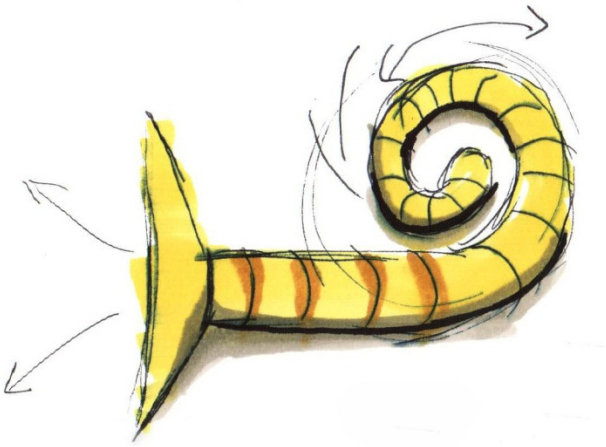
I’ve got the music in me!

Jeroen Rood / s118833



Coach:

Bert Lonsain / Orange

06-02-2012 / 08-06-2012

Team:

Chloe Rutzerveld

Floris Voorhoeve

Gijs de Boer

Experts:

Hans Leeuw

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Introduction

Since the last couple of decades, a steady decline in children playing a musical instrument is observable. Research shows playing a musical instrument has a positive effect on the development of children. It is a shame if this source of enhanced child development remains untapped.

Here the Klankspeeltuin in Amsterdam comes to play. They offer children a place where there can be played with sounds. The idea is to stimulate children to begin playing a musical instrument. The children visit the Klankspeeltuin during excursions or birthday parties. The Klankspeeltuin has sound-producing installations with which children can interact in a special kind of way. This means they can manipulate sounds by dancing, drawing, playing with a ball, or by touching buttons.

At the end, each child receives a certificate which describes that they followed a workshop at the Klankspeeltuin. This should keep the children engaged with the Klankspeeltuin as well as with making music. The parents would be enthusiastically informed by the children, making them aware of the fun and potential of playing a musical instrument.

The problem is that this certificate is just a piece of paper and does not at all represent the Klankspeeltuin's corporate identity. Next to that, the children might not show the certificate to their parents, or this certificate might be too dull. But this giveaway is crucial for making decisions when it comes to keeping engaged with the Klankspeeltuin or starting to play a musical instrument.

The certificate that is given to the children after the workshop.

Objective

The Klankspeeltuin wanted to rethink the idea of the giveaway, making this gadget either more fun for the children and making it suit the corporate identity better. They want a giveaway that keeps the children thinking of their experience at the Klankspeeltuin, and thus perhaps keeps the children interested in playing a musical instrument.

Because the Klankspeeltuin has to give it away, it needs to be very cheap. Having a series of perhaps 8000 giveaways, the desirable price is 50 cents a piece. The target group consists of children at the age of 7 to 12 years old. That means the giveaway should be interactive though not too complicated.

This might require some research in what children of the age of 7 to 12 interests, and what they are capable of. This research pointed out that children are interested in music if there is some musical instrument or someone playing a musical instrument in their close environment. Next to that, children like dancing and other intuitive actions. This was very important, as this encouraged to not design something that had many different interaction possibilities, but to design an intuitive device instead.

The target group is children between 7 and 12.

Children like intuitive actions such as dancing.

Design

Idea generation and Concept development

The design process was started with idea generation by means of a pressure cooker. The team wanted to build a musical instrument with a different interaction and material in mind. The outcomes were acoustic sound-producing instruments made from scrap materials. Some of them were for example a small PVC-drum one could hit with an elastic and a bent piece of paper with holes which produces a screaming sound when blown.

After the pressure cooker the team commenced another round of brainstorming. We didn't come far, as we started completely blank. So we decided to generate some ideas based on the types of interaction, and what sounds this interaction would suit the best or how sounds can be produced this way. Eventually, some ideas were generated on basis of this method. After that brainstorm-session, the possibilities of cheap electronics were explored.

Therefore several cheap sound-producing toys were disassembled. Among these were a giggling stuffed toy, a racing game and an acoustic device making a snoring-like noise. It turned out that these kind of devices are really simple. They either consist of just a few chips, or a really smart construction to get the most sound out of the fewest materials. The acoustic snoring-devices came in three variations, but were virtually the same. The trick was to add a piece of cardboard, or to shorten the length of the vibrating part in the snoring device and another variation was a fact.

One of the outcomes of the pressure cooker: a PVC drum, which could be hit by an elastic.

To find out how cheap sound-producing toys work, we disassembled a few, including these snoring pots.

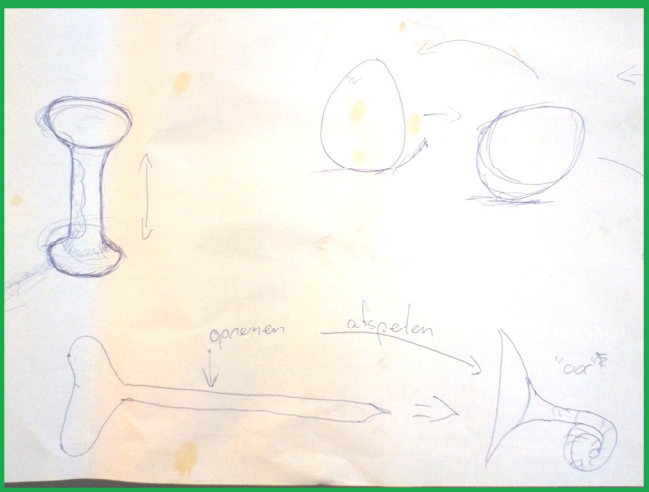
After that, we did another round of idea generation. Among the ideas were sound-producing stepping-mats, beat-building bricks, keychain-guitar and a rolling-up recording device. These ideas were divided up to all of the team members, finally each having two ideas. The idea that is worked out further in this report is the rolling-up recording device. This idea was chosen right after the Mid-Term Exhibition, as it gained the most positive feedback and the client was really enthusiastic about it. This concept also showed more potential as there was also already thought about the possible technologies supporting the device.

Soon, the device earned the nickname “Ge-Oor”, derived from the word “Gehoor” which means “hearing” in English. This recording device would record sound when the tail is completely rolled out. While rolling the tail up the sound would be played back. This is real-time, so the sound is controlled by the way the user rolls the tail. This could be fast, slow or only half-way. The same counts for backwards. Here the sound will be played backwards, until the tail is fully stretched; then the recording will start again.

Then the focus lay on how to make the concept work. How would the user interact with the device? And, how could there be added more dimensions? After iteratively adding and removing more dimensions and ways of interacting with the device, the bottom line is that the strength of the concept lays in its simplicity. So the concept remained a rolling-up recording device.

After that, the shape was defined further. Party blowers were bought and these were observed and disassembled for insight in how these things work.

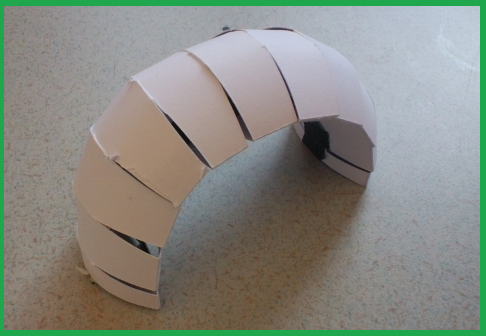
Our second brainstorm. This were either ideas based on the pressure cooker and new ideas. However, these ideas were not satisfactory.



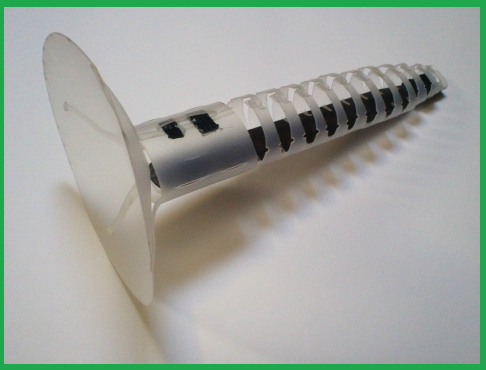
A third brainstorm session. During this session, some final ideas started to pop up including “Ge-Oor”.

The rolling-up of these blowers might serve as inspiration for the final shape or technique. Although other possibilities were considered, the first idea of a ribbed tail, combined with the solid shape of the horn –or ear–, were adopted. Shape experiments were done with cardboard and thick paper. Finally, when the shape of the device was determined, a baseplate was designed and laser-cut out of polypropylene. The first model was then altered for construction without requiring glue and built up. After that the design was tweaked and laser cut.

These party blowers were disassembled for finding out how to make a rolling construction.



Many paper models were made in order to determine the right shape of the baseplate.



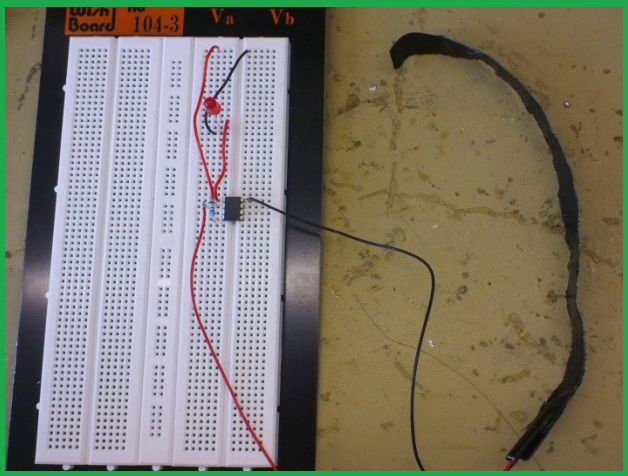
One of the two final polypropylene models.

Design problems and solutions

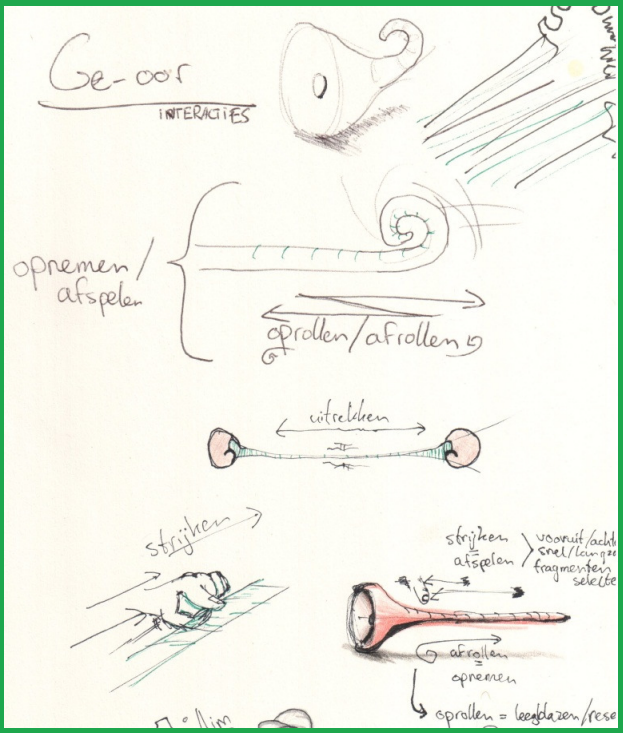
During the design process, a couple of problems were encountered. First of all, the interactions were considered, how there could be added some more. During the Midterm Exhibition some feedback on the concept was won. This was mostly positive, but there were also remarks on how to make it more attractive and to some visitors the concept would seem a bit hard for children to play with. Based on this feedback, it was thought to add new dimensions and challenges to the device, but later on this was reconsidered. The extra interactions would be too chaotic and would weaken the whole concept of rolling-up. So in the end the concept remained a rolling-up recording device.

After that the implementation of technology was a point of struggle. What would make the device function? First, there was thought about a flexible sensor, of which the values would be monitored analogously with operational amplifiers. Then the 'decision' would be made between recording and playing back. However, this failed and would take too much time to figure out. Besides, this concept would then only have the capability of linear recording and playback. The user would have no influence on how the sound would come out of the device.

After that, there was thought of computer manipulation (by means of an integrated circuit on a chip). The computer would monitor the values of the flexible sensor and would 'decide' when to record and when to play. In addition, it would have the capability of playing back real-time; which means that the progress of the playback depends on the degree of rolling up or



The analogous circuit for comparing sensor outputs from the flexible sensor, unfinished.



Some sketches about the possibilities for enhancing the concept.

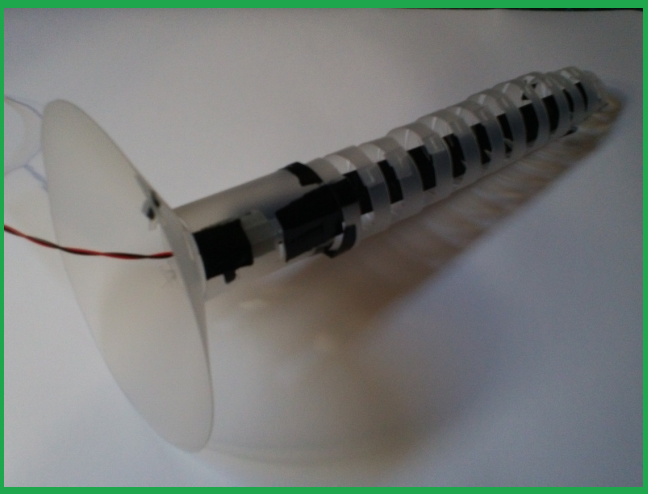
down. This way, slow and fast play back as well as backwards would be possible. This would also be much more fun to do.

The choice of material was another issue. The first models were made out of thick paper. Having interacted and played around with it (bending, rolling up and out, throwing), the paper showed to wear off quickly. A plastic would be the best option, considering its flexibility and sturdiness. The coach suggested polypropylene, for its degree of toughness and flexibility. The price of this plastic would be considerably low as well.

Another problem was the actual shape. The Klankspeeltuin preferred a building kit for the children as a baseplate of one material. The first shape that was laser cut fitted on a baseplate, but required glue to finish the device. This is not ideal as it could become a mess and chances were the stiff material it was planned to be made of would crush the connections. The baseplate was redesigned and improved. Now, all elements are able to be hooked into each other. The inspiration came from plastic packaging.

Considering the interaction, this is very straightforward, but so far only little distinction is made between recording and playing back. Since playing back can also be done backwards, there is a chance that one will accidently trigger recording again while playing. To bypass this, some noticeable resistance can be added at the point the recording is triggered. Think of a clicking wristband, also known as “ClickClacks”. This is a bend metal sheet which will roll up when it is bent one way, but will keep straight if bent the other way. This way, the user will accidently trigger the recording mode fewer times.

An example of the clicking wristband. (image courtesy: http://www.promoplanet.nl/klik-armband-teneriffa.html)



A handmade model of polypropylene, for determining the shape of the base plate.

Technology

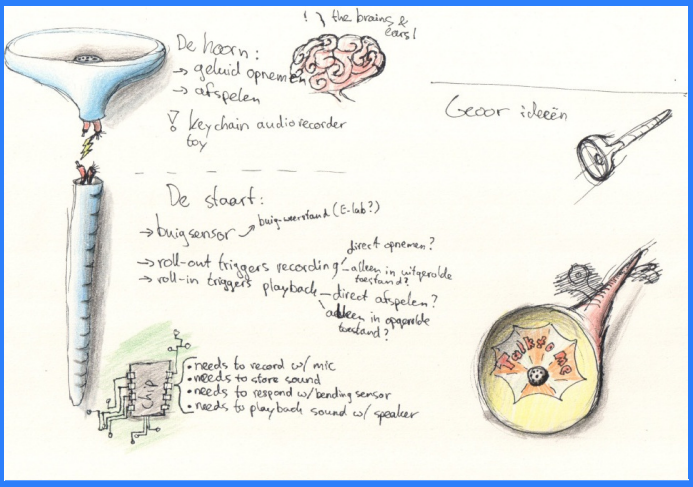
Current Issues

The technology behind the concept is quite sophisticated. The device needs to be as cheap as possible and at the same time be able to fulfill the entire concept. A prototype was not made.

The actual technology would be as cheap as possible. The goal would be to program a chip to do the processing that is required. Besides, a flexible sensor would be present to monitor the rolling in and out of the tail. Three more requirements are a speaker, a microphone and a power supply. To make the construction cheaper, the speaker might be replaced with a vibrating element, think of a speaker without a cone. The horn of the device could then function as a cone for the speaker. This way, the speaker takes less place and could as well be cheaper.

A problem is that the flexible sensor which is used is a variable resistor which fluctuates a lot. This makes the processing really hard. It is hardly possible to have a smooth playback as the output of the sensor controls the progress of the playback.

The current issue is that the prototype is not finished. It was not possible to round up a working prototype, and instead a video illustrating the concept has been made.



Here the ideas of how the concept should work are illustrated.

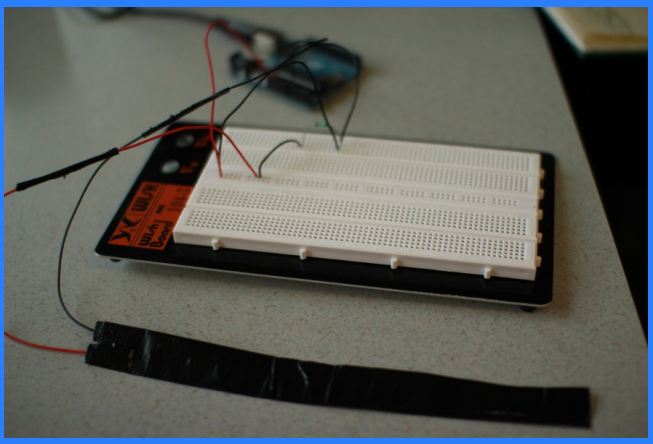
A video was made to illustrate how the concept would work.

Project Goals

The first attempt of a prototype was made with an analog system. This system consisted of a voltage divider where a flexible sensor was included and a pair of operational amplifiers that switched between circuits. The circuits could be connected to a recording device as the controls for recording and playing back. Little knowledge on how to build such a circuit and a higher priority to elaborate on the concept itself caused the prototype to remain unfinished. Since it was only a part of the actual concept, it was back then of less importance than working out the concept itself.

The last set up is a flexible sensor, connected to a computer. This is not a functioning prototype, as time was rare . Since the process of working out the concept took a lot of time, the technology behind it would be easier to adjust when a piece of software runs on the computer while an important part of the technology is present. In this case, the flexible sensor with a voltage divider connected to an Arduino which is connected to the computer. If on the other hand the hardware would have been completed in its final shape and the concept might undergo drastic changes, the hardware would require drastic changes as well. This prototype also has down sides. For example, the development of the prototype is also dependent on the knowledge for different programming languages or libraries.

The prototype that has been worked on is a flexible sensor connected to an Arduino which is connected to the computer. The computer runs a piece of software that can communicate with the Arduino, as well as can process the output and control the playback of a sound fragment with this.



The technical setup of the last prototype, a voltage divider connected to an Arduino which communicates with a PC.

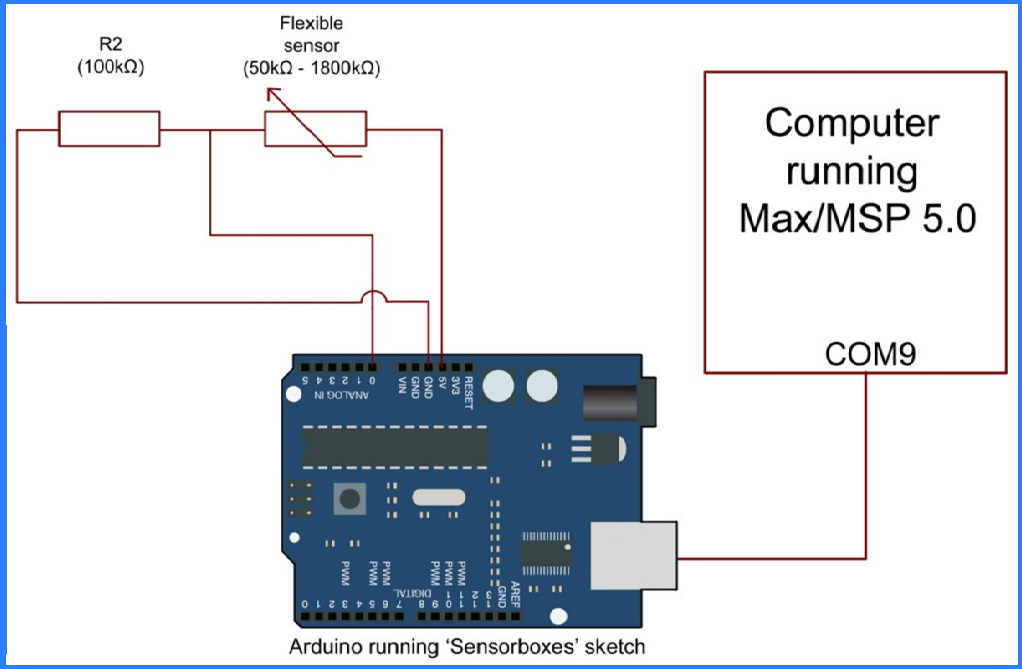
Technical Configuration

The last prototype is made in the following configuration.

The flexible sensor is placed in a voltage divider with a 100kΩ resistor, in order to get different voltage values for different sensor values. The power is provided by the Arduino (indirectly by the computer via USB). The Arduino is also measuring the voltage over the flexible sensor. These measurements can be read by the computer in Max/MSP. A special Max patch enables the computer to read the values from the Arduino and process them. This way the play back of the sound can be controlled. The computer also hosts the speakers and a microphone, which would be utilized in the prototype.

This prototype would be worked out in its entirety if there was more time to study the programming interface as well as the host program Max/MSP 5.0. It would have taken too much time to finish this concept, whereas for the exhibition something should be made to show the concept.

A schematic of the setup of the final prototype.



Users

Project Focus

The target group of users are children between the age of 9 to 12 years old. The goal was to find out what the children like to do the best, and how many of them actually plays a musical instrument. This would all help in making a device which is easy understandable for the children as well as making it enough fun to play with.

User Research Findings

The user research that was done, was performed as a user survey. This way the user was taken into account even from the start of the project and as well serve as inspiration for the generation of ideas.

For this project, some user research was done as inspiration. Schools were visited, where musical lessons were attended. Besides, music school lessons were attended as well, where children already played an instrument. The children in primary school classes were with about 20. The music school lessons were with smaller groups as well as individual.

During the primary school visit, we found that children love to dance or be active in another way. Being passive (i.e. playing computer games) is less attractive at that age. Besides, learning surprisingly complex things such as lyrics of a song is going fast if the child has fun doing so. The music teacher also stated that making music is Here we found out that children pick up new techniques fairly quickly. Next to that, the children associated music with physical actions such as going up or down when the tones in the music went higher or lower. That means connecting producing certain sounds with certain interactions that show logical relationship with it would strongly improve the device that was going to be designed.

The music lessons that were visited had some outcomes as well. The lessons pointed out once again that children are very capable of learning techniques, for example for playing a musical instrument. Playing together turned out to be somewhat harder, as good coordination was needed by means of a

During the school visit, we found out children like to perform intuitive actions like dancing. This also seems to help them learn very complex things.

conductor in order to succeed. This means that a child is able to learn how to work with a device, which gives to opportunity to make it more challenging. Although, it should ideally be easy to learn but tricky to master. As the target group is 8- to 12-year-olds, the device should not be to tricky to master, as the children need to be able to play with it without having to struggle in order to even understand the device.

Besides, a workshop given by the Klankspeeltuin was visited. This workshop resulted in the following conclusions. First of all, children liked playing with sounds a lot. This was universal, but what was observable as well was that when the easier it was to get instant (good-sounding) results, the more the experience was fun to do for the child. This once more confirmed that the device should give fast results as well as give the child the impression it has control over the sounds the device produces.

At the Klankspeeltuin, the children liked the installations which yielded the easiest results the best.

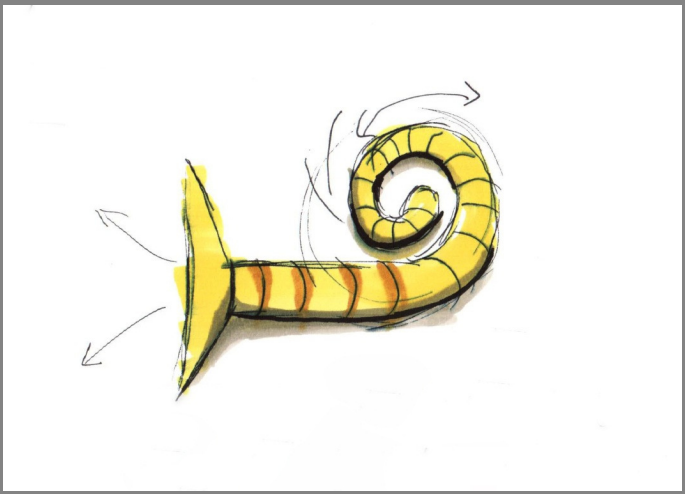
Process result

The end result is a concept called ‘Ge-Oor’. It is a rolling-up recording device, with which the interaction of rolling up and out is controlling the sound which is recorded. The device is shaped as a horn with a tail. The tail is flexible and thus able to roll up.

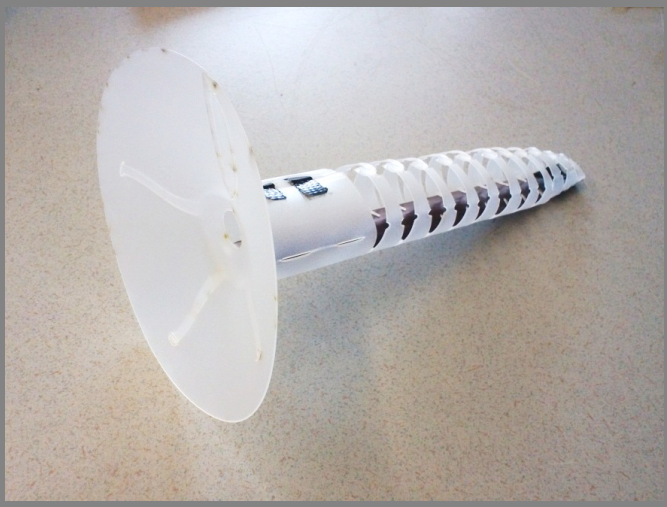
During the process the technologies which would ‘make it roll’ were considered. Though not finished in a working prototype, a view of what could be inside has been created. This comprises a flexible sensor, a speaker and microphone, an IC which is able to process recorded sound and lets the output of the sensor control it. Besides, improving the interaction could be done by adding a spring metal plate which rolls op or keeps steady with a firm click.

The target group, kids between the age of 8 to 12, has been taken in consideration as well. As they have to play with the device, it has to be straightforward, yielding instant results and yet be interesting enough to keep them engaged with the Klankspeeltuin. Because the concept is quite straightforward and built on an intuitive interaction it’s easy understandable. Combined with the sound recording and interactive playback, it is interesting enough to keep the children engaged with it for a while.

This result is visible at the Exhibition, as some sketches on the poster, as a description in this report and a video simulation of the concept. Besides, the actual handout is designed as it would be handed out to the children. The poster is attached in the appendix.



A sketch of the final concept, illustrating the rolling in and out of the device.

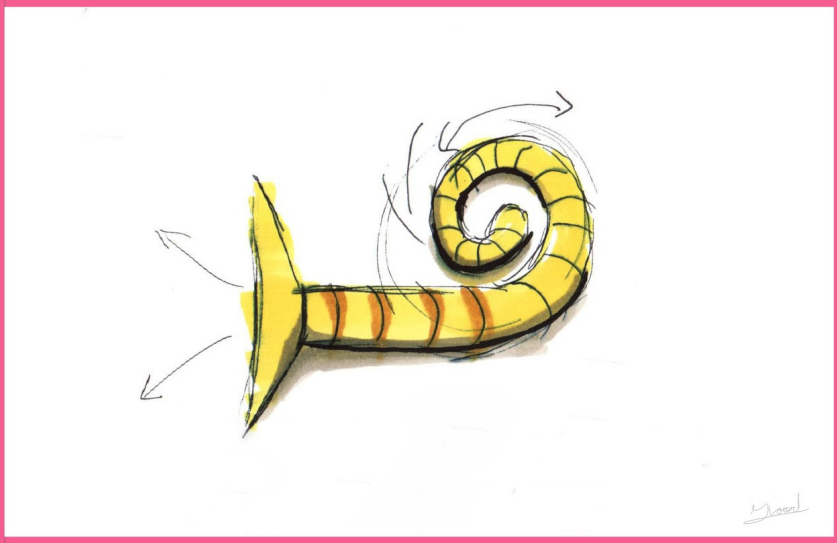


One of the final polypropylene models, here with the sheet-metal spring inside.

Appendix

PLAYFUL INTERACTIONS

GE-OOR



JEROEN ROOD
S118833

I've got the music in me!

B1.2

Coach: Bert Lonsain
Students: Gijs de Boer // Jeroen Rood // Chloe Rutzerveld // Floris Voorhoeve

The poster of the final exhibition.