Kinesthetic interactivity in interaction design

DECO3850 - Studio Report

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Abstract

This report will cover what kinesthetic interaction is and and the role that user interaction design plays in the design of kinesthetic interactions. This report will also discuss the design and development processes that Team Rogue Learning had gone through to achieve a visual and kinesthetic learning experience through their installation, SpandX.

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Introduction

The concept and prototype for SpandX was produced over the course of 13 weeks by my team, Rogue Learning, as our final piece of assessment for the physical computing and interaction design course (DECO3850). The space we were working in was ‘Future Learning’ and the goal of SpandX is to provide children with a learning experience that would be engaging and outside the bounds of the traditional classroom.

SpandX is an interactive installation that allows users to manipulate a digital solar system by pressing down on a membrane-like surface to alter the mass of the planets. This goal of this installation was to provide a visual and kinesthetic learning experience for grade 3 children to learn about basic concepts of the solar system.

This report will outline the background analysis, design and development process, and my individual contributions in the design and build of this installation. A breakdown of kinesthetic interactions and interaction design will be provided, as well as a brief overview of the kinesthetic interactivity in SpandX.

Background

Interaction Design

Technology is present in every realm of our lives and according to Grudin's historical continuity of interface design (1990), the interface has become more than just a person sitting in front of a screen interacting with a mouse and keyboard, it's become part of a social context in the physical space. Now that the world is condensed with all forms of complex technology, the various forms of interactions that come with it have only grown with the amount of technology. Interaction design is a broad subject, involving a large variety of disciplines, subject matters, and processes but ultimately boils down to the theory and practice of usable interactive products (Henderson, 2002).

What is kinesthetic interaction?

Kinesthetic interaction describes movement of the body and how it affects our experience of the world in the interactions with and through interactive technologies (Fogtmann, Fritsch, and Kortbek, 2008). Movement-based interactions have been the focus of more recent technologies like the Nintendo Wii Fit and the Microsoft Kinect. Technologies like these have created growing interests in movement-based interactive systems that allows for the user's experience to be much more present and tangible by allowing them to move around freely in a physical space compared to navigating around a touch screen-based system with a finger.

Kinesthetic interactivity in SpandX

During the design process of SpandX, we wanted the user to have a different experience from simply just using their fingers to navigate around the solar system which is why we chose to use spandex as the surface they would be interacting with. At the exhibition, we encouraged all our participants to push down on the fabric as hard as they could, this resulted in everyone looking like they were about to fall into the spandex sheet. While I was pleased with having a mode of interaction that required bodily movement, I still feel that there wasn't enough modes of interaction besides just pushing down on a piece of fabric.

Design Process

My team's idea for the theme of Future Learning started with a discussion about our own experiences in learning in school and how dull and sedentary they were. This led to us coming up with ideas that would take students out of the traditional classroom setting and engage in a more interactive experience that did not involve the use of screens. The entire process of concept generation was time consuming and frankly, tiring because of the many disagreements that happened within the team. Despite this, we eventually landed on an idea to have a table with a membrane-like surface that could be manipulated with visuals projected on top.

Since there were already a few installations and projects out there that utilised membrane-like material in conjunction with a Kinect sensor and a projector, we had an idea of how effective this sort of interaction would be. During the refinement of our concept, there were a lot of clashes in opinion and creative differences that caused lengthy roadblocks in our brainstorming sessions. A lot of compromises had to be made for everyone to agree on matters but most of us remained quite realistic with our ideas given the tight schedule that we had.

We chose to go with a space themed installation because of the broad range of topics we could cover. It also helped that everyone on the team were quite interested in space exploration. After this decision was made, we spoke to people in the education industry and learned that grade 3 students are introduced to basic concepts of the solar system in their syllabus, this piece of information really helped us narrowed our focus down to just having the solar system projected on the spandex canvas rather than the entire galaxy and we kept the content simple as well, opting to teach children about the effects of increased mass and how it would affect the solar system.

Development process

The development process of our installation piece started once we had decided on the components of our project which were the spandex surface, Microsoft Kinect, and a projector. We had our first prototype by our mid-semester break, which was a sheet of spandex wrapped around two poles with the Kinect facing it. This was enough for us to come up with a base code that could register and calculate the depth for when the spandex is pressed on. I found this rough prototype to have been extremely useful also gave us the chance to test our base code to see if it was actually picking up on any presses and experiment with different ways of presenting the spandex sheet.

Fig.1 - Initial prototype

Our second prototype was constructed after we found the table frame at Reverse Garbage. This put us ahead of our schedule and gave us the opportunity to test early on a proper table surface. By the time we had our second prototype, our Unity program was up and running, giving us the chance to experiment with projections and test out different placements of the projector to achieve better results. This also helped us refine our Unity program by eliminating any unnecessary elements that couldn't fit on the table surface and prioritising the visualisations of the planets. We found that the table needed to be of a certain height for the projector to completely cover the surface, so we built platforms to have the table elevated. Watching the physical components come together was a very satisfying and having the opportunity to build things was very fulfilling. These were some of the best times of

the semester because it always felt like there was a sense of community in the workshop and a sense of camaraderie within the team since we all wanted to achieve the same things.

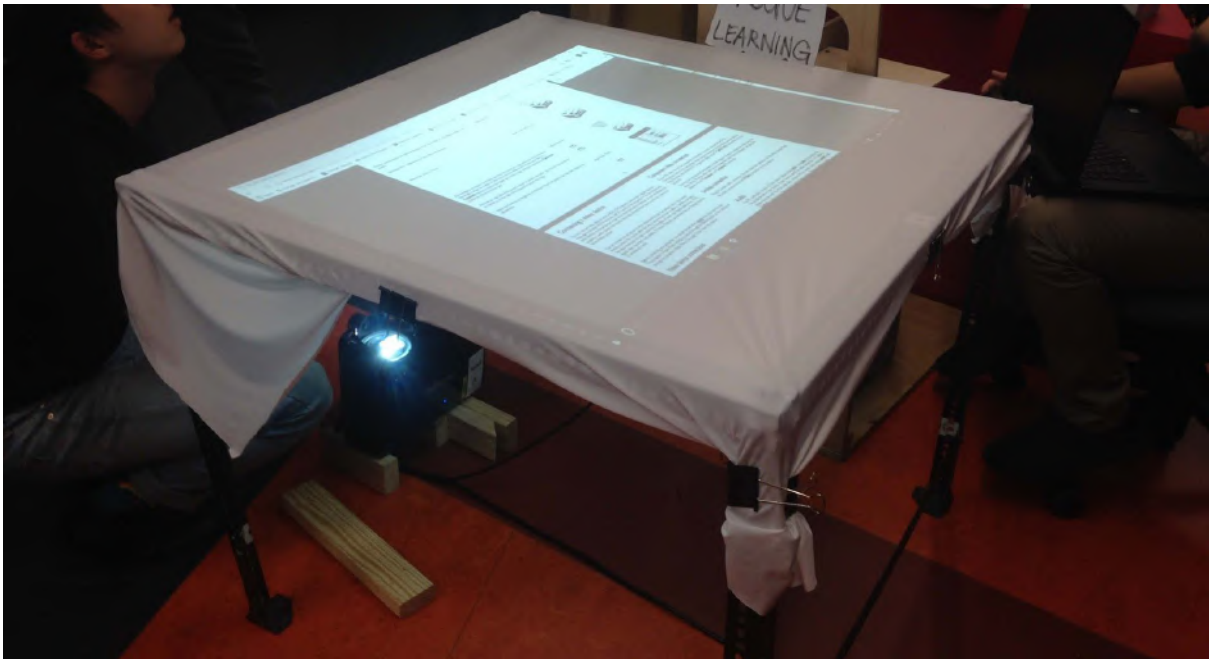

Fig.2 - Testing our second prototype

Individual achievements

In the design and build of our SpandX installation, my role was mainly focused on the physical aspect of the installation, the prints that would accompany it, as well as a bit of branding for our installation. Our initial plans for SpandX was a rectangular shaped table, however, after looking into group activity tables used in schools, having a circular surface seemed to be easier for children to gather around and creates a much more inclusive experience. I drafted up plans for the construction and researched what materials would be best for us to use. These plans were later altered after we found a table frame at Reverse Garbage that could be easily modified into what we wanted, immediately cutting down construction time and putting us ahead of our schedule. For the rest of the construction, I worked on making our installation look for presentable by painting the platforms jet black, adding boards to the sides of the table to hide what was under it, and sewed a cover to hide any of the table's imperfections.

For the prints, I designed the 'Design Iterations' posters and the brochures that contained information on our installation. For the posters, I went with a dark grey and white colour palette and went with a blueprint-like style with the illustrations. For the brochures, I wanted it to have a sleeker look since guests would be taking them home, so I went with a starry background that went with our theme. Unfortunately, there was a slight misunderstanding at the printer's and so they turned out a little larger than expected. This was not a big issue though and I thought that our larger sized brochure stood out from everyone else's mini A6 sized ones. I had our team logo 3D printed to turn into badges to wear on the day of the exhibition and prepared candy-filled baubles painted to look like planets. We received plenty of compliments on our team badges and candy baubles.

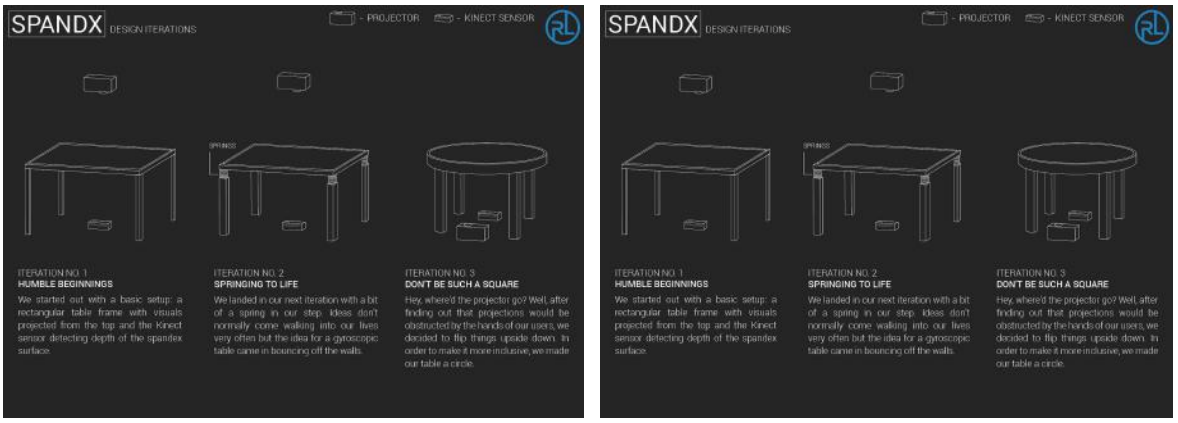

Fig.3 and Fig.4 - 'Design Iterations' posters

Fig.5 and Fig.6 - Front and back of the brochures

Conclusion

The change in landscape for technology has led to increased amounts in interaction with devices and machines, this puts interaction design as one of the most important factors in determining the success of a product in the market. This increase in tech has also increased the development of kinesthetic interaction in interactive systems, creating better user experiences in tech.

While SpandX sought to achieve full body movements in kinesthetic interaction, this was not fully achieved as the experience was lacking in a full range for bodily movement. This was due to the tight timeframe we had to deliver our installation as mentioned above. Despite this, SpandX still provided users with an interesting learning experience that was not remotely like the traditional classroom setting.

References

Fogtmann, M. H., Fritsch, J., and Kortbek, K. J. (2008). Kinesthetic Interaction - Revealing the Bodily Potential in Interaction Design. In Proceedings of the 20th Australasian Conference on Computer-Human Interaction: Designing for Habitus and Habitat, pp. 89-96.

Grudin, J. (1990). The computer reaches out: the historical continuity of interface design. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Seattle, Washington, pp.261-268.

Henderson, A. (2002). Interaction Design: Beyond Human-Computer Interaction. Ubiquity, 2002(3), Article no. 6