Bridging the Real and the Virtual: Low and High Fidelity Tabletop Prototyping

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ABSTRACT

In this paper the creative design process of a collaborative content creation application on a multi-touch surface is presented. Based on a series of three low fidelity tests sessions using different techniques, the design of a high fidelity application prototype was informed. The research is approached from the designer's point of view and presents a process of how a designer can be involved in a multi-touch design process without having to go through technical development first. The paper concludes with the added value of this approach from both the designers' as the developer's point of view.

Author Keywords

Multi-touch, Prototyping, Fidelity, Testing, Design

INTRODUCTION

The research presented was done within the context of the MuTable research project. The focus of this project was how tabletop surfaces could be used within a public setting such as a museum, a school or a public library. Existing tabletop related research in that context often focuses on media consumption (browsing photographs, etc.) [4]. In the MuTable project however, the aim was to focus on collaborative content creation. This focus was set by a central use scenario, in which adolescents are asked to work together at a tabletop for school-related work. Students search for content (text, pictures, video, etc...), and integrate it into a presentation. In this way, the scenario integrates searching and browsing for content with the creation of new content as a final outcome.

In order to create the described application a close collaboration between a design team and a development team was set up. This paper will describe the design process starting from a context study to a high-fidelity, working product.

NATURAL USER INTERACTION & PROTOTYPING

Although multi-touch tabletop surfaces and natural user interaction have received a lot of attention from both the industrial and the academic world [3], a step often seems to be missing in the user-centred design process of these devices, more specifically in early prototyping. Most often the development is done directly on the final hardware, using a "design by doing" approach [2]. This approach is

mostly very valid, as with regard to multi-touch technology and interaction, directness and visual interactivity are at the core of the experience and the interaction. On top of that, the interaction directness of natural user interfaces makes it quite hard to apply commonly used lo-fi prototyping techniques such as paper prototyping or Wizard-of-Oz prototyping [1]. However, when a multi-touch application is created directly on the final hardware, it intrinsically means that the designer(s) involved need to master a technical environment in order to (i) create and build the hardware and (ii) develop the software to be tested [2]. Obviously, if both elements are present, this is still no guarantee for a successful application. This technical barrier is in some teams quite hard to overcome, also the technical restrictions often have the characteristic of limiting the creativity of a design team already before any development has been done. In order to overcome both these 'limitations' related to multi-touch development, a number of prototyping alternatives have been explored in the Mutable design process, mixing contextual inquiry (observing user behaviour) with low-fidelity prototyping.

METHOD

Three different prototyping methods were used. Starting from a very 'open' contextual study, more prototype elements of the eventual interface were introduced.

User Observation – contextual investigation

Before any interface design was done, a context study was set up in order to gain insight in how collaboration amongst adolescents happens today. In this initial user observation phase, a collaboration with a local secondary school was established. Two classes of approximately 15 students were asked to make a presentation on a specific subject, leaving the choice between a paper and a PowerPoint presentation up to the students themselves. The collaboration between the students was logged in a diary study, in which students logged all (collaborative and non-collaborative) work on the presentation. This context study ran over a period of two months. The aim of the diary study was to gain insight into the tools used by the pupils and the way they worked together.

Lo-Fi Prototyping 1 – tangible interface elements

Parallel to the contextual investigation, several cardboard mockups of the most crucial interface elements were

created. The focus was on creating a menu structure that gives enough guidance to the users but does not necessarily relate to a traditional WIMP-based interface. The interface elements were created using tangible materials like cardboard and pieces of rope (figure 1). By using tangible material to create a “natural user interface” it enabled the team to make the link to how objects were manipulated in real life and how they could be transposed to the digital realm. These interface elements were tested in an informal way in order to evaluate the ideas created.

Figure 1 : Tangible interface elements

Lo-Fi Prototyping 2 – Tabletop prototyping

Secondly, a low-fidelity tabletop prototype allowed the design team to focus on high-level user interaction: to observe how groups of users interact with each other, the material available, and the surface they work on in a controlled environment. The prototype involved a table at which test users were asked to collaborate (figure 2). They were asked to create a presentation on a given subject, using physical materials such as an analogue typewriter, material to paste, to draw, etc. To make sure prototype fidelity was high (mimicking the operation of a computer system), a number of restrictions were imposed. For instance, the material to be used for the creation of the presentation was available in a separate, hidden material repository, so participants did not know what to expect beforehand. Additionally, all materials had to be left on the table (not on the floor, etc.) mimicking screen real estate on a tabletop.

Figure 2 : Lo-fi tabletop setup

Hi-Fi Prototype – Functional tabletop

In a last phase, the elements learned during the low fidelity tests were transferred to a fully functional touch table. The challenge here was to match the ideas gathered during the low fidelity testing with the technical limitations of the multi-touch hardware. Using this prototype, formal testing was executed in both a lab environment and in context.

Figure 3 : Overview of the final hi-fi application

RESULTS

Although the low fidelity prototypes increased the length of the development cycle, it allowed people with a background in design to fully participate in the development of a functional multi-touch application. The contextual investigation provided mostly functional requirements for the design. Working with the tangible materials to create interface components proved to be very valuable since it enables thinking about how objects are manipulated with hands in the real world. Finally the lo-fi tabletop prototype provided insight in how the global user interaction and tabletop organisation had to be approached.

DISCUSSION & CONCLUSION

We reported on the design process of a multi-touch application which focuses on collaborative content creation. Using three different low fidelity techniques the final design was informed. It was found that due to using pushing the low fidelity tests in the development cycle more creative ideas were explored on the high fidelity version, this both concerning high level interactions (like screen organisation) interaction design and visualisation.

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