Participatory techniques for the design of a new input device

PRESENTATION SUMMARY

Proposed Presentation Length:	40 minutes
Number of Presenters:	1
Topic Category:	Usability method implementation or adaptation
Presentation Type:	Description of a participatory design method
	Topics for People Who Are Experienced in Usability but New to the Topic Topics for People Who Are Experienced in Usability and the Topic Friends and allies
Keywords:	Participatory design, Prototyping, Interaction design
Audio Visual Requirements	A computer projector

ABSTRACT

We present a participatory design method that we have experimented in the design process of a new input device based on handwriting. We will explain how bringing all stakeholders of the product design work together with users through working sessions helped defining the device interaction.

GOALS FOR THE SESSION

Attendees at this session will:

- Understand how participatory method can be integrated in a design process
- Learn about some techniques to bring project participants from different background (for instance usability specialists, hardware engineers, and users) work together to generate creative solutions
- Explore prototyping techniques for non-standard interaction devices

AUDIENCE PARTICIPATION

Attendees will participate through discussions and questions. They will be invited to tell about their own experience in designing input devices and to comment about the proposed method.

HANDOUTS OR OTHER SESSION MATERIAL

Copies of the session slides will be distributed to participants.

YOUR BACKGROUND IN THIS MATERIAL

This project was for us a first attempt of relying on participatory techniques to bring people from different backgrounds, including users, work together on a 3D product design. However design techniques involving user participation have been used in previous projects.

SESSION SCHEDULE WITH TIME ALLOCATION

Number of Minutes	Topic or Event
10	Description of the background project
15	Presentation of the main techniques used in the first participatory design session Open discussion with attendees
15	Presentation of the main techniques used in the remaining participatory design sessions Open discussion with attendees

DETAILED DESCRIPTION OF PRESENTATION CONTENT

Introduction

The presented work situates in the context of a research project involving industrial partners from various domains: accelerometers and magnetometers industry, microelectronics, telecommunication, and software engineering. The project aims to explore the feasibility of a new handwriting device meant to enable people to communicate with computers, PDAs or mobile phones. This “communicating pen” relies on micro-sensors technology for capturing the hand movements [1], and on wireless technology (Bluetooth) for transmitting the result (immediately or later) to the target device.

Our role as usability specialists in this project is to help sharpen the concept, to learn about how exactly the device will turn out to be used, in order to better pin down the functionality and orient its interaction design.

Our approach for integrating user input in the early stages of the design process have been described in a previous publication, as well as methods for analyzing user tasks and deducing functional requirements [2].

Description of the problem

The presentation will focus on the method that we have used in the following stage of the process, which aimed to specify the product functionality and to design the interaction modes. The challenge was to reconcile user requirements with available technical solutions.

The design process involved participants having different backgrounds and competencies: hardware engineers, software engineers, telecom engineers, sociologists and usability specialists. All had their own goals and interests, as well as a particular point of view toward the project. Bridging these different spaces so as to meet the needs of end users and consumers represented a real challenge. However it was the condition for reaching our goal to help designing a usable product.

Method

The idea was to rely on an approach allowing a close collaboration between the project partners and the users. Participatory design appeared to be appropriate, since it is now recognized as a successful approach to the design of interactive technology [4] [5]. Participatory design began in the 1980's in Scandinavia, mainly in the industrial design domain [3]. This approach should facilitate exchanges between all stakeholders involved in the pen design, and help integrating user feedback throughout the process.

Our approach consisted in bringing all project partners involved in the process to work together with user representatives around a pen prototype design. This was realized through participatory design sessions of 2 to 3 hours, during which the design participants worked together to define each pen function precisely and the overall pen interaction modes. These working sessions involved various exercises and techniques such as brainstorming for idea creation, scenario realization with low-tech material, video recording and comparative analysis of solutions.

A first design session was held in order to generate as many ideas and solutions as possible in response to user requirements resulting from a previous user study. The key results of this study were synthesized to the participants at the beginning of the session. Then, we constituted two different groups, each one including representatives of each expertise domain, so as to potentially explore two parallel design directions. Each group worked to create its own first version of a 2D representation of the pen with a special-purpose interactive design tool, and produced a 3D pen mockup, using some low-tech material.

Given some task scenarios, each group had to illustrate how they would interact with the pen to execute the required tasks. They did it with the 3D mockup they had built. Each participant responsible for a particular idea illustrated it by acting the corresponding part of the scenario and by explaining the detail of the interaction with the pen. The action was videotaped so that it could be replayed in the following steps of the design process.

A variety of design solutions answering user requirements resulted from this session. Each one covered a subset of the pen functions. All presented some strengths and weaknesses against the technical performance or the interaction usability.

The following three working sessions were devoted to analyzing each set of solutions corresponding to a given function or a group of functions, and to select the more promising ones. This was realized through brainstorming exercises. After the video illustrating each given solution was played, this solution was examined according to its advantages and disadvantages regarding either the technical or ergonomic aspects. Solutions for which a disadvantage was considered fatal from a usability point of view, or totally incompatible with some technical limitations, were eliminated. At the end of the selection process, either one solution emerged as the best one, or a new solution emerged from a combination of the positive aspects of several others.

Two additional working sessions were held in order to specify a global pen design by putting together in a coherent way all the "function specific" solutions and to validate the resulting overall pen interaction. Again this validation was done by having the participants execute some task scenarios with a 3D pen representation, simulating the interaction as close as possible to the specified one. Techniques such as Wizard of Oz were used.

At the end of the entire design process, the specifications were recorded and summarized through a 2D commented representation of the pen.

Findings or conclusions

One interest of the first exercise which brought participants, including users, exchanging their ideas about the basic functions and the pen interaction, was that multidisciplinary interaction facilitated the collective understanding of all aspects to be considered in the design and leads to a range of alternatives when there is no consensus.

We found that having to act their design ideas was for participants a first usability validation of their abstract choices. They may have imagined an interaction solution which proves to be difficult to execute in practice.

The main benefit of bringing stakeholders of the design work together with users was to make the design converge rapidly toward a solution which was compatible with both technical feasibility and product usability. An additional advantage was that each participant got a better understanding of the others' preoccupations, which will be certainly useful in the remaining stages of the project, especially in usability testing.

The use of low-tech material, made it possible to explore and validate potential solutions without any development effort. However, we found that in this case the material that we used to build the 3D pen mock-up was too limited to allow realistic simulation of some interaction mechanisms. It would appear highly desirable for the UI design community to develop and make available generic 3D prototyping tools.

The next step in the project will consist in prototyping a 3D pen, not necessarily integrating the technology, but implementing the main interaction specifications, in order to validate the design with users through usability testing.

Audience participation

After the main techniques used in each working session have been presented, attendees to the presentation will be invited to comment them relatively to their own experience.

Findings and conclusion will be an opportunity for exchanging with attendees about some other techniques which could been used in design process.

REFERENCES

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