TaPS - Tangible Personal Spaces

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INTRODUCTION

Tabletop systems are more and more used for multi-user purposes, although there is only one shared space. When multiple users are working on an tabletop system, every user should have room for his personal documents, without giving any other user full access to it. This reflects the real life scenario of an conference table.

RELATED WORK

There are several approaches to solve this problem on tabletops. One approach makes use of glasses, used in augmented reality (AR) and virtual reality (VR).[2] [1] Here every user gets a pair of glasses with an transparent, integrated display. On this display information will be overlayed to augment the real world. It is easy to see, that every new user coming to the table has to wear such glasses to get his private view. Similar approaches uses shutter glasses, known from computergames.[6] This is an older approach, which could not establish. With new hardware and higher displays refresh rates better versions of shutter glasses appeared.

In the next approach a polarizing revolver is used to polarize light in different ways for each user.[4] Here the users have to wear glasses too. This system is sensitive for every change of the viewing angle. Users without glasses will see all other users images overlapped.

Another approach uses optics and small projectors integrated in the table to project an holographic image directly above the tables surface.[3] This approach is very promissing, though there is no haptic feedback and the user is unsure, if the touches are detected. This is solved by giving more visual feedback, which showed the fingers actual detected position.

One approach is to use mobile devices like phones or PDAs as a personal space. In this approach the devices also could be used to control the table using gestures.[5]

Furthermore there are approaches using an lenticular lens foil.[7] Here the concept of a flip-image is used to constrain the viewers field of vision. This approach does not need any extra devices. Because the foil is bonded with the table and a very accurate calibration is necessary, it is not possible to change the position of the user.

CONCEPTION

In my work I will implement an tangible personal space on tabletop systems. For this, I will develop an widget, which forms the personal space and can be placed freely on the table to display the users personal documents or some individual information. I will implement different versions of the widget. The first version will consist of an lamella approach. This will be an easy implementation with wich the other implementations will be compared. The lamella approach will simply block the vision in several directions. Another implementation will use the lenticular lens foil to check the constrained angle of vision. The lenticular lens will function as barrier and does only allow to look at the image from several angles. The last implementation will use an fly-eye-lens foil, which will expand the barrier effect to two dimensions. I will test the resolution shortening in this implementation in usertests.

The widget should not affect the touch ability of the tabletop system, which will also be tested in usertests.

ORGANISATION

In the first month I will do deeper literatur reviews on my topic and build the first prototypes. The prototypes will be coarse and function as a proof of concept.

After this I will spend up to four month for implementing hardware and software on the used system. I will use the DIA-cycle for this. The DIA-Cycle consists of design, implementation and analysis. I will do usertests after each cycle.

Concluding I will do an final evaluation and analysis of all achieved results. For usertesting I will choose every day tasks. For this phase i plan to use one month.

Creation of the diploma thesis will be continuously. I will integrate all received results after each finished phase. In the last month I will spend more time to analyse the usertests an integration of results into my work.

REFERENCES

1. M. Agrawala, A. Beers, I. McDowall, B. Fröhlich, M. Bolas, and P. Hanrahan. The two-user responsive workbench: support for collaboration through individual views of a shared space. *SIGGRAPH '97: Proceedings of the 24th annual conference on Computer graphics and interactive techniques*, Aug 1997.

2. H. Benko, E. Ishak, and S. Feiner. Vita: visual interaction tool for archaeology (demo). *ETP '04: Proceedings of the 2004 ACM SIGMM workshop on Effective telepresence*, Oct 2004.

3. L.-W. Chan, T.-T. Hu, J.-Y. Lin, Y.-P. Hung, and J. Hsu. On top of tabletop a virtual touch panel display. pages 1–8, Aug 2008.

4. S. Sakurai, Y. Kitamura, S. Subramanian, and F. Kishino. A visibility control system for collaborative digital table. *Personal and Ubiquitous Computing*, 13(8), Nov 2009.

5. A. S. Shirazi, T. Döring, P. Parvahan, B. Ahrens, and A. Schmidt. Poker surface: Combining a multi-touch table and mobile phones in interactive card games. *MobileHCI'09*, pages 1–2, Jun 2009.

6. G. Shoemaker and K. Inkpen. Single display privacyware: augmenting public displays with private information. *CHI '01: Proceedings of the SIGCHI conference on Human factors in computing systems*, Mar 2001.

7. R. Smith and W. Piekarski. Public and private workspaces on tabletop displays. *AUIC '08: Proceedings of the ninth conference on Australasian user interface*, 76, Jan 2008.