Multi-User Usability Guidelines for Interactive Wall Display Applications

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ABSTRACT
Large interactive wall displays for multi-user interaction are readily available today. However, little is known about the specific aspects influencing usability for applications supporting several users interacting simultaneously and co-located with wall displays. Our research aims to name these aspects and develop a set of usability guidelines for this type of applications. These guidelines should support designers and developers in the design phase and ensure a high usability of the application. In order to archive this, we analyse literature and conduct usability studies. In this paper we present a first set of usability guidelines derived from literature focusing on aspects specific to multi-user interaction. One example is to consider bystanders, offer those who are not directly interacting valuable information and ensure readability for them.

Author Keywords
multi-user; interactive wall display; usability; guidelines

ACM Classification Keywords
H.5.2. Information Interfaces and Presentation (e.g. HCI): Ergonomics, Style guides

INTRODUCTION
Today interactive displays are readily available due to technological progress [14] and falling costs [3]. This enables the development of multi-user interfaces which are spreading in industry and research [18]. Several users may interact synchronously and co-located with an application running on a large multi-touch wall display. This poses several challenges for designers and developers of such applications, as the specific characteristics of the setting differ largely from desktop PCs [4]. Therefore, guidelines and standards for desktop applications cannot be directly applied to multi-touch applications. Guidelines, standards and style guides are tools to ensure good usability of a system [16], but do not exist for applications running on large public displays [1] nor (to our knowledge) for the semi-public context. Which factors are

influencing the usability of a multi-user application? With our research we aim to answer this question and develop usability guidelines for multi-user applications running on large interactive wall displays, focusing on a semi-public context.

Our methodology for developing these guidelines is based on the research approach of Paddison & Englefield [11] who suggest two methods for developing usability heuristics: 1. research-based: analysing literature and deriving heuristics based on this analysis, and 2. evaluation-based: summing up evaluation results in order to derive heuristics. We combine the results of a literature analysis with usability studies focusing on aspects unique to multiple users interacting simultaneously with the display. Identification of the aspects unique to multi-user interaction will be done in the literature study complemented by a multi-user usability study of our existing MeetingMirror application [5]. In this paper we present the intermediate result of the first step: a set of usability guidelines derived from literature.

RELATED WORK
Somervell et al. [15] developed usability heuristics for large screen information exhibits. These heuristics mainly support the evaluation of a system, while our research targets the design phase aiming at supporting the developers of this type of applications. Furthermore, this set of heuristics does not focus on multi-user and multi-touch aspects. The guidelines for public displays developed by [1] are also targeted at the evaluation. Yuill & Rogers [18] list aspects relevant to the design and evaluation of collaborative multi-user applications. This research focuses on archiving a good collaboration whereas we target usability. Furthermore, Microsoft published a guideline for developing applications for their Perceptive Pixel display [7]. Industrial guidelines are optimized and targeted for their specific product and cannot be easily applied to other systems and devices [4]. Furthermore, the guidelines lack in empirical evidence and their development is not transparent to the reader.

FIRST RESULTS
The analysis of relevant literature is ongoing, nevertheless we want to provide a first set of guidelines derived from this work:

- Do not use audio as it might be distracting to others [15].

- Consider users not directly interacting with the screen, offer additional value to them [8].

- Keep different interaction zones in mind, adjust font-sizes accordingly and ensure readability [10].

- When using personal workspaces, keep their space limited as not to disturb others and obscure their content [13].

- Do not clutter common space [6], keep it tidy and automatically remove unnecessary items.

- Consider accessibility when placing e.g. buttons [18, 7].

- Disable switching the whole view by a single user [17].

- Non-modality: offer always all functions to the users [12].

- For accessibility reasons rather use context menus instead of placing menus on a fixed position (e.g. bottom or top of the screen) [7].

CONCLUSION

In this paper we motivated the research on usability guidelines for multi-user applications on large interactive wall displays and presented a first set of recommendations based on literature. In our future research we will conduct usability studies focusing on special aspects of the multi-user interaction. Research questions we are currently addressing in our controlled lab studies are focused on readability (continuing the research of [10]) and audio in a multi-user setting.

Regarding the readability the research questions are: Which text moving direction (horizontal or vertical) obtains highest readability in a multi-user scenario? Are there differences to a single-user scenario? Is the walking direction of the user influencing the favoured text moving direction? What are the most readable font-sizes for the different interaction zones [9], can the calculations by [2] be verified for full HD and 4k resolution?

Regarding audio we plan to conduct studies on the following research questions: Is reactive auditive feedback in a semi-public multi-user scenario perceived detrimental? What is the influence of the volume? Should sound of videos be played on a semi-public screen in a multi-user scenario, or is it perceived as disturbing by other users? Answering these questions will be a first step towards refining the presented first set of guidelines.

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