Investigating the Use of a Multi-touch Surface to Support Co-located Group Information Management

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Abstract- Personal Information Management (PIM) involves four major activities: keeping, finding, organising and maintaining information. Group Information Management (GIM) extends PIM by adding the sharing aspect. GIM can be defined as PIM in a public space. GIM is currently supported by non-co-located single user desktop systems. Groups of individuals working on common tasks to achieve shared goals need to coordinate their activities to ensure that no overlapping of work or misunderstandings occur which decrease efficiency. These groups may have to meet face-to-face to discuss and arrange meetings, information discovered and shared information. Multi-touch surfaces have proved successful in aiding collaborative information retrieval (CIR) which is related to GIM. This suggests that GIM can be supported using a multi-touch surface. This research is aimed at determining the effectiveness of using multi-touch interaction techniques to support co-located GIM.

Index Terms - Computer Supported Cooperative Work, Personal Information Management, Group Information Management, Multi-touch, Touch Screens, Human-Computer Interaction.

I. INTRODUCTION

People deal with personal data on various platforms and devices on a daily basis. Cellular phones, tablet computers, notebooks, desktops and other devices contain personal information of their users. Keeping a central location for management and retrieval of personal files and information is becoming increasingly difficult due to information fragmentation, where people need to access and manage related information in separate physical locations with little support from existing tools [1]. Personal Information Management (PIM) aims to address information fragmentation by keeping, finding, organizing and maintaining personal information in an effective manner, allowing a user's information to be available anywhere and at any time. Group Information Management (GIM) extends PIM by adding personal information capability. GIM is currently done in a non-co-located manner by groups and there is no effective platform in which co-located GIM can take place. Co-located GIM aims to allow a group of individuals to effectively manage group information in close physical proximity. Research has shown that little research has been conducted on co-located GIM and highlights the need for more research in this area.

Multi-touch technologies have provided an effective way for people to interact with computer devices. Interactive surfaces which use multi-touch interaction techniques support a more natural and intuitive interaction environment as well as allowing multiple users to simultaneously interact using the surface. The inherently multi-user nature of multi-touch surfaces provides a possible platform to effectively support co-located GIM.

The aim of this paper is to investigate the requirements for GIM and to determine how multi-touch interaction techniques can support co-located GIM. Section II covers related work in the field of PIM, GIM and multi-touch interaction. Section III sets out the requirements for a co-located GIM system and Section IV provides the conclusion and suggestions for future work.

II. RELATED WORK

A. Personal Information Management

Smart phones, tablet computers, notebooks, and other devices have made handling personal information much easier, each in their own unique way. However because each technology is controlled by different companies and has its own user software and operating system, the different devices that people own may not be able to share information with each other possibly because of different file formats.

PIM involves the personal information management activities that people perform on a daily basis. These activities include keeping, finding, organising and maintaining personal information [2]. An important goal in the study of PIM is to address the problem of personal information fragmentation, making all of a user's personal information available at the right time, in the right place, and in the right format. There are various types of personal information. Research in PIM and GIM has focused on the managing and/or sharing of emails, web pages, links (URIs), media (e.g., photographs), calendar data, attachments, references, and other general files such as .pdf, Word, Excel, etc. formats [2,3,4].

B. Group Information Management

GIM builds upon PIM where individuals continue to find, keep, organise and manage their personal information, but may eventually have to share this information, or a subset of it, in a public space [5]. Once personal information has been shared, it becomes group information, since it is no longer solely controlled by an individual. The key aspect of GIM is therefore the sharing of information within groups of users. Information sharing, (or file sharing), is the process of making specific file(s) accessible to a specified entity or group, governed by certain rights (read/write) over the file(s) [6]. Whalen *et al.* states that managing shared access to files is complex in the sense that sufficient access is required to allow collaboration, but at the same time, too much access may cause unwanted exposure of the shared information [6]. Any issue with the file sharing mechanism

decreases security and hinders collaboration within the group.

C. Multi-touch Interaction

The development of multi-touch surface technologies has allowed collaborative activities to be conducted in a more practical and natural manner. Instead of groups of individuals, each working on a separate desktop computer, multi-touch surfaces allow the group to stand or sit down around the surface and collaborate face-to-face in an intuitive manner.

Existing desktop systems do not allow people to collaborate and communicate effectively and efficiently in a co-located environment. Software applications developed for desktop computers are bound to the desktop and are built for individual use and not multiple users. Anslow [7] confirms this in his investigation of whether multi-touch interaction techniques are more effective for co-located collaborative software visualisation than existing single user desktop interaction techniques. Anslow found that visualisation was more effective when team members had full access to the shared visualisation and could synchronously interact with it. Furthermore, team members were more effective at collaborating when they each had control of parts of the visualisation [8].

Isenberg identified general benefits of using a multi-touch surface. Sharing and face-to-face work improved collaboration because team members were able to point to and manipulate documents or searches that they found relevant, and point to documents that their team members could see [9].

These research results suggest that multi-touch surfaces can effectively support co-located GIM. The requirements and methods used in the research are discussed in the next section

III. Requirements Analysis

A. Functional Requirements

To determine the requirements for co-located GIM using multi-touch interaction techniques, the common tasks of GIM were identified by breaking down the definition of GIM into its core fundamentals: keeping (saving information); finding (searching, viewing, and annotating information); organising (sorting, moving and viewing information); maintaining (deleting and editing information); sharing (sending and receiving information). Each task will be implemented in such a manner that allows for effective and efficient cooperative work to be performed. The tasks will be supported by existing and new multi-touch interaction techniques.

B. Prototype

To evaluate whether multi-touch interaction techniques can effectively support co-located GIM, a prototype system will be developed on a 42" multi-touch surface, capable of recognising 32 simultaneous touch points. This allows for a maximum of three to four people to interact with the system at a time. A prototype will be implemented to support all of the tasks mentioned in the previous section. Existing gestural interaction techniques will be modified and new gestures designed to support the tasks identified for co-located GIM.

C. Evaluation

The effectiveness of using co-located, multi-touch, interaction techniques to support co-located GIM on a multi-touch surface will be determined by means of a user study. Data will be collected by means of observation and logging, interviews and questionnaires.

IV. Conclusion & Future Work

This paper identified the need for computer supported co-located GIM. Using multi-touch interaction techniques on a large multi-touch surface was identified as a feasible approach to support co-located GIM. The definition of GIM was broken down into its core components and the requirements of the system were derived from these components.

In future work, a software prototype will be developed implementing multi-touch interaction techniques to support the GIM tasks identified in Section III. The prototype will serve as a proof of concept and an empirical evaluation will be conducted using the prototype to determine if multi-touch interaction techniques can effectively support GIM.

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