ASYNCHRONOUS KNOWLEDGE ELICITATION THROUGH SOFTWARE BASED CARD SORTING IN COLLABORATIVE AND GEOGRAPHICALLY DISPERSED ENVIRONMENTS

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Key words to describe the work: Mobile software, web based software, HCI, Card Sorting, Electronic Knowledge Elicitation, Knowledge Acquisition

Key Results: HCI methods of collaborative knowledge elicitation were investigated, leading to the development of both a web based and mobile software based tool to improve the existing methods.

How does the work advance the state-of-the-art?: A novel approach was developed that augments the level of detail, speed and scale of response to electronic participatory knowledge acquisition in card sorting.

Motivation (problems addressed): Acquiring and analyzing data from traditional individual participatory methods is time consuming and usually requires experts in their respective fields. To our knowledge there are no prior dedicated mobile software knowledge elicitation tools for participatory use in mobile environments.

Introduction

User knowledge elicitation (KE) is used for contextual inquiry and the raising of quality of HCI research [1]. However, as HCI specialists will know from experience, acquiring and analyzing data from traditional individual participatory methods is time consuming and usually requires experts in their respective fields.

Several groups have notably contributed to existing desktop and browser based tools that can aid in participatory electronic knowledge elicitation. Examples include the GUIR team at Berkeley, who has produced tools such as Denim and Silk that are used for eliciting knowledge in prototyping fidelity development and NIST's Web Metrics suite of tools [2] were constructed for web based usability testing on heterogeneous and geographically dispersed users.

Through the development of a mobile software tool we expand on the existing model of participatory electronic knowledge elicitation known formally as the card sorting technique. To our knowledge there are no prior dedicated collaborative software knowledge elicitation tools for participatory use in mobile environments.

Card Sorting

Card sorting is a participant based knowledge elicitation technique for grouping information into categorical domains. It is useful to HCI specialists as a technique for analysing categorisations of domains of knowledge and it is considered one of the best usability methods for investigating a users' mental model of an information space. Current card sorting is done by physically having several cards of information placed into groups by a participant or groups of participants that are physically present. These groups are then given a category name based on the experiment's requirements.

It is expected that the demographic characteristics of participants chosen to take part in card sorting experiments will influence the output quality of the categorisations. For example, expert categorisations of problem domains are often favoured over novice categorisations [3], thus the quality of categorisations from non-expert domains remains to be addressed. Hence modifying the card sorting technique to enable large domains of users who are geographically dispersed is fundamental in improving the state of the art in knowledge elicitation methods. Being geographically dispersed adds the dimension of an asynchronous model of collaborative knowledge elicitation whereby knowledge acquisition is determined independently and correlated at a later point in time.

Developing Our Tool

The software system requirements of our tool when compared with other existing card-sorting tools included minimal installation for both the test administrator and the participant users, and also the

data received from our tool should be sent in a format ready for cluster analysis in a secondary statistical tool.

The web based version of our tool utilizes any desktop PC with a compliant Java virtual machine and a web browser. For the mobile version, our primary choice in hardware consisted of using a Sharp Zaurus SL-5500 Linux based PDA. This platform was considered highly suitable for its development open source features, and the embedded Jeode Java Runtime Environment. Cross platform compatibility ensures broad deployment without overheads for maintenance and recompilation development of the software code.

Wireless network capabilities were tested with D-Link 660W compact flash card adaptor using IEEE 802.11b standards. GPRS connectivity has been tested via Infrared link to a tri-band Nokia GPRS enabled mobile phone. A screenshot of the final mobile version is shown in Fig 1.
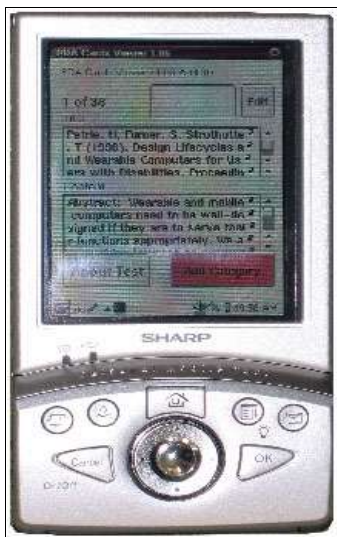

Fig 1. mobile version of the card sorting tool.

Results and Discussions

To prepare the tools for deployment we undertook a pilot test with six HCI specialists in our department and one external engineering specialist.

In this pilot experiment participants were asked to categorize a dummy dataset of 10 cards.

First a pre-test questionnaire was presented to the participants in order to evaluate their current understanding of card sorting and present them with our card sorting technique. This engaged them in initial thoughts on categorisation of the field under test.

The findings from this pre-test questionnaire showed that there was a general understanding of card sorting techniques that were useful for aiding expert categorisation of information.

In our second development cycle we deployed our tool to 20 computer literate geographically dispersed students. We utilized their exposure of computing to categorize 107 academic research papers.

Conclusions

Several key advantages found to augmenting existing methods with mobile knowledge elicitation methods are:

- Data capture can be achieved asynchronously and can be without the requirements for expert presence if conducted remotely.

- Compilation of data values can be either in real-time if a supporting wireless network is present, or compiled on device for cluster analysis.

- Test administration becomes dynamic – an administrator can update new elicitation experiments to in-the-field experimenters and participants via wireless networks.

Furthermore, in electronic knowledge elicitation one must consider the environment of use, e.g. non-wireless network access for remote card-sorting survey capture and data analysis when convenient or alternatively wireless network access for real-time administrated card-sorting surveys.

References

[1] Zaphiris, P., Kurniawan, S.H. User-centered web based information architecture for senior citizens. Proc. of Panhellenic Conference with International Participation on HCI, 2001. 293-298.

[2] Scholtz, J & Laskowski, S. Developing usability tools and techniques for designing and testing web sites. Proc. of the 4th Conference on Human Factors, 1998.

[3] Maiden, N.A.M & Hare, M. Problem domain categories in requirements engineering. International Journal of Human Computer Studies 49 (1998), 281-304.