Designing a multimodal system for a culturally diverse user group

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ABSTRACT

This paper describes a study which explores how multimodal systems should be designed for culturally diverse user groups and what methodologies that can be used to accomplish this. An existing multimodal timetable system was redesigned and evaluated with subjects from two culturally different groups using an approach to multicultural design called Meaning in Mediated Action (MMA). The study indicated that it is possible to define a shared context which can be used as a basis for design which suits a culturally heterogeneous user group. It could also be concluded that the MMA methodology is a useful approach to multicultural design, though it has to be further developed in order to account for all kinds of systems and user groups.

Keywords

Culture, multimodal, diversity, MMA, interface, design, representations

INTRODUCTION

As a result of the explosive development of the Internet and of globalisation in general, there is today an increasing number of computer systems intended to be used by people from different countries and different cultures in their everyday life and work. As a consequence, there is also an increasing need to take cultural issues into account when designing such systems. Studies have shown that the way people communicate with each other varies between different cultures [4]. An implication of this is that users have different communicative expectations when they interact with a multimodal system depending on their cultural backgrounds. The purpose of the study that this paper presents is to explore how multimodal systems should be designed in order to suit a culturally diverse user group and what methods and approaches that should be used for such a design process. In order to investigate these issues, a multimodal timetable system was redesigned and evaluated from a multicultural perspective.

CULTURE AND DESIGN

To take cultural issues into account when designing computer systems is a quite new phenomena in HCI studies and the number of existing studies in this area are because of this, relatively low. Many of the studies that do exist also focus on localising interfaces for specific target cultures. As argued in [2], this kind of approach is inappropriate for the design of systems intended to be *shared* by users from different cultures. Many of the basic assumptions of this kind of approaches can also be subjected to severe criticism. The problems include an over-dependence on guidelines and generalisations, which are insensitive to the actual context of a system. These studies also use an outdated concept of culture, where cultures are seen as homogeneous and bounded systems that are possible to describe by using a set of "cultural variables". However, cultures are not bounded, but instead continuously interacting and changing, which makes them very difficult to describe and measure. As a result of this outdated concept of culture, there is also a tendency to use stereotypes and ignore differences within a target culture. In addition to ethnical and national communities, which these approaches often focus on, people belong to a number of different cultural communities that are based on gender, age, educational background, occupation, religion et cetera.

Meaning in Mediated Action

Meaning in Mediated Action (MMA) is an approach that focuses on the design of systems intended to be shared by culturally diverse users and it also avoids a lot of the problems listed above [2]. The main aim of this approach is to determine a context that is shared by the members of a culturally diverse user group, which can be used as a basis for design. Culturally determined usability problems are seen as problems of understanding, in a given context, the meaning of the representations used to communicate a system's functionality. Representations refer to all elements in a system that has meaning. It can be anything from words and icons used to interaction metaphors or even parts of the system's physical environment. In

order to determine a shared context, the approach seeks to assess the representations that are used in the interface and their ability to mediate user action.

THE EMPIRICAL STUDY

It is assumed in this study that it is useful to model multimodal systems on human communication. However, many of the theories on communication that have been used in the design of multimodal systems, such as Speech Act theory and Conversational Analysis, do not account for cultural relativity [1]. Instead I used the grounding approach to communication [3] as a basis for a redesign of the timetable system. This approach recognises that people belong to several different communities and takes cultural relativity into account. Using the concepts from this approach, two versions of the system was designed, varied with respect to the amount of information provided in the dialogue representations and in the way this information was presented to the user.

Because the MMA approach, described above, seemed to avoid a lot of the problems that many other approaches in the area entailed, I decided to use this approach in order to evaluate the timetable system from a multicultural perspective. However, it proved to be very difficult to apply the MMA methodology to an evaluation of this kind of system. In the original approach, the ability of a system's representations to mediate user action is assessed by comparing the users interpretations of the representations meaning and compare this to their intended meaning. From this it is possible to draw conclusions about particular representations' cultural specificity. However, the mediation between the dialogue representations used in a multimodal system and the user-system communication is a very tacit and implicit process that takes place outside of the users' awareness. This means that it is not sufficient to solely elicit how the users interpret single dialogue representations in order to understand how these mediate the user-system communication. This mediation depends on factors such as the timing and combination of representations as well as the amount of information that is used and how this is presented.

In the light of this, I modified the MMA methodology to better suit the multimodal system. Instead of focusing on single representations and their meaning, I tried to focused on problems in the user-system communication and tried to reach conclusions about the types of representations used from this.

The Study

Eight subjects were used separated into two categories with respect to their ethnicity. One group consisted of native Swedes and the other of people originally from Iran, but now living in Sweden. A so called Wizard of Oz experimental set-up was used, which means that the system's speech recognition and response to spoken input was simulated. The subjects were observed when interacting with the different versions of the timetable system. After this the subjects were interviewed and given a short questionnaire to fill in.

The results

A number of problems in the user-system communication and interaction was identified. These were sorted into three different categories: communication breakdowns during multimodal interaction, communication breakdowns during unimodal interaction and other breakdowns in the user-system interaction. The subjects in the Iranian group had overall more problems in the first category than the subjects in the Swedish group. The problems in the other groups were equally distributed over the two groups.

The breakdowns were then analysed in the light of the data collected in the interviews and the questionnaire. The result from this pointed to that the subjects in the Iranian group expected a more system-initiated dialogue, where the system explicitly signals what kind of input it expects and when it expects it, compared to the Swedish group. The subjects in the Swedish group wanted as fast and efficient communication with the system as possible. From these conclusions it was possible to start to define a shared context, which can be used as a basis for a redesign of the system that will suit both user groups. This shared context consists of suggestions of how the representations used in the system should be modified or designed.

CONCLUSIONS

What conclusions could then be reached from this study? The purpose of the study was to explore how multimodal systems should be designed for culturally diverse user groups and what methods and approaches that should be used for this. Starting with the first of these issues, it is implicit in the MMA methodology that the conclusions that are reached about representations and their ability to mediate user action are limited to the specific system in which they are assessed and to the particular user group used in the evaluation. Hence, it seems that the only thing we learned from this study is how this particular timetable system should be designed for a user group consisting of native Swedes and Iranians

living in Sweden. The usefulness of such knowledge can undoubtedly be questioned, but what do the results really mean if given a closer look?

One of the basic assumptions of the study was that people's communicative norms vary between different cultures, which has to be accounted for when designing multimodal systems. It might however be the case that the established differences between the two groups are caused by something else. A possible alternative explanation is that the subjects in the Iranian simply has a lower proficiency in the Swedish language than the subjects in the Swedish group. A possible conclusion that can be reached from this is that more system-initiated user-system dialogues support users whose proficiency in the language used in the system is beneath the normal. If this is the case, other ethnical groups in addition to Iranians, should be supported by a more system-initiated dialogue. This is more of a speculation than a real conclusion and is something that has to be investigated in future work.

Conclusions about MMA

Th other issue, which was explored in the study, concerned what methods and approaches that should be used for designing systems for culturally diverse user groups. As mentioned above, there are relatively few existing studies in this area to date and many of these also suffers from severe problems and flaws. As described earlier, most of these problems are related to the concept of culture that is used and the relation between the individual and the culture. I choose to use the MMA methodology because it avoids a lot of these problems. As we have seen, it had to be considerably modified in order to be applicable in the evaluation of the timetable system. Why did I despite this use the methodology? By using mediated action as the unit of analyses a natural link is provided between the individual action and the cultural context in which this action occurs. The concept of mediated Action has its origin in the sociocultural approach to mind [5]. A basic assumption of this approach is that people only have indirect access to the world. All actions, both physical and mental is mediated by so called mediational means. How these are formed depends in part on which cultural communities the individual belongs to. When the representations used in an interface are assessed using the MMA methodology, what is really being assessed is how well the representations match the users' mediational means in the context of a specific system.

The original MMA approach focuses, as the name indicates, on meaning. The users interpretations of the representations' meanings are used in order to assess their mediational properties. This study indicates however, that all cultural determined usability problems can *not* be reduced to a problem of understanding the meaning of representations. The approach should not be centred around meaning but instead around mediated action. The main conclusion of this study is thus that MMA is a useful approach to multicultural design. However, it needs to be further developed to MA – Mediated Action, in which the original MMA approach is only a part. The original approach is one strategy for assessing a the mediational properties of a system's representations. Another possible strategy is the one I have used in this study. It is an interesting task for future research to refine this and find other strategies which suits all kinds of systems for all kinds of user groups.

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