Position Paper INTERACT'99 Workshop

'Making designers aware of existing guidelines for accessibility'

The need for a 'universal accessibility' engineering tool

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Introduction

The countries of the European Union generally want to enhance self-support for the elderly and disabled and consequently strive for accessibility of 'mainstream' Information and Communication Technology (ICT) for these inhabitants. The 'universal accessibility' approach is advocated as a possibility to include all user groups in the software development process.

The European Union supports research in this area, for example by funding the project ‘Assessing the Awareness of the Design for All Approach’ (AADAA consortium, 1998).

However, the 'universal accessibility' approach is not as widely spread in the design community, as it should be. Several reasons have been identified. First, the phenomenon that 'universal accessibility' products are perceived as dull by the designers creates serious problems for the acceptance of the 'universal accessibility' paradigm. This might, however, be a self-fulfilling prophecy. Second, the cost of involving elderly and disabled users in software development can be higher than for involving the rest of the population. On the other hand, a broader perspective comprises also the advantages of the 'universal accessibility' approach: The involvement of elderly in the design process often results in better products for all kind of users so that the overall utility of this approach is high (Gleiss et al., 1995). Furthermore, the number of potential users of the 'universal accessible' product also increases so it might very well be a good investment. Third, the extra constraints on design possibilities are another objection. However, it could be that the constraints force the designers to be creative, bringing about new ideas that enrich the total design space (Newell & Gregor, 1997). In sum, the three problems of dullness, design costs and design constraints can be solved by evoking positive attitudes, widened cost-benefit analyses and creative design solutions. However, to realise 'universal accessibility', the corresponding human factors knowledge should be incorporated into the design practice. Currently, designers take insufficiently account of human-factors knowledge on elderly and disabled (Neerincx, 1998). This paper provides a cognitive engineering approach to solve this problem.

Foundations of human-factors knowledge

Although there is a lot of human-factors knowledge on elderly and disabled (Craik & Salthouse 1992; Fisk & Rogers, 1997; Vanderheiden, 1997) current knowledge is insufficient to realise 'universal accessibility'. There is a vast variety of different guidelines but the status and origin of these guidelines is often unclear. Sometimes guidelines of different origin even contradict each other. Besides, in spite of the large amount of guidelines there are still blind spots in essential areas. It is clear that the human-factors foundations should be improved. Practical theory and empirical research is needed to create a *complete* and *sound* set of guidelines. A problem of current guidelines is that it is hard to translate the guidelines to specific user interface characteristics. How should a designer, for example, implement the guideline ‘minimise demands on spatial memory’ (Czaja, 1997)? A more supportive guideline would be for example: 'chunk information in a Web-site according to the user task hierarchy to minimise demands on spatial memory in order to improve navigation performance' (based on Miller, 1956; de Groot, 1966). To be able to provide such supportive guidelines practical theories are needed that comprise the mutual effects of user interfaces, human cognitive processes and HCI outcomes (Figure 1).

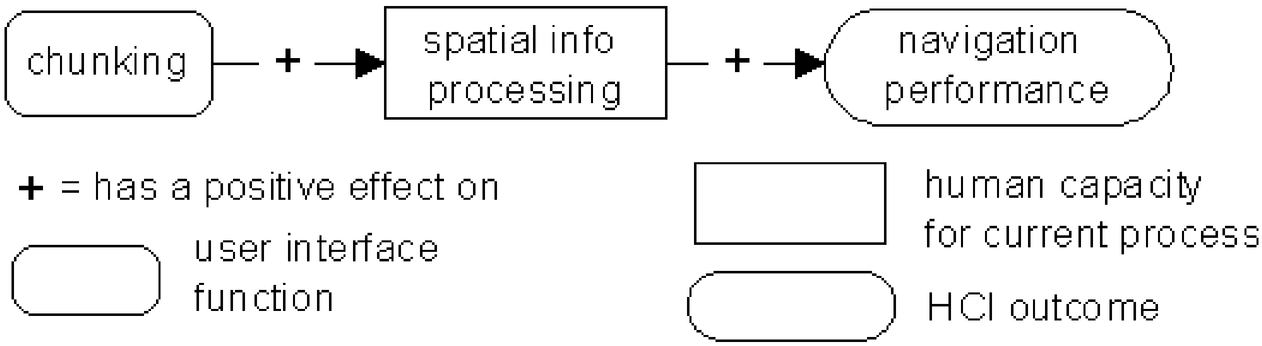

Figure 1: A practical theory on the effect of a chunking function in the user interface.

On the basis of a practical theory concepts for user interfaces can be developed e.g. for chunking of information. With these interface concepts the theory and corresponding guidelines can be tested. In the course of one of our projects we developed a support function for web-based services which ‘chunks’ the information provided by a web-based service based on human information processing theory. Currently we are testing the support function (Neerincx et al., 1999).

When a complete and sound foundation of human-factors knowledge has been established it is important to maintain and improve these foundations by adding design and use experiences. Once the foundations are laid it is important to focus on another issue. How do we make the acquired knowledge accessible to the designers?

Accessibility of human-factors knowledge

The current body of human-factors knowledge is insufficiently addressed. One of the reasons is the vast variety of guidelines. A search on the Internet for guidelines applicable to web-design for example provides the designer with hundreds of hits. This problem will be addressed by creating the human-factors foundations mentioned in the previous section. The current lack of clear examples will also be taken care of in the foundations. Each guideline should be accompanied by a prototypical example of how the demand can be satisfied. In our view two important issues remain:

- the mismatch between guidelines and design procedures
- the designers lack of experience in the use of the guidelines

These issues indicate a need for techniques to address guidelines in specifications and assessment. Our proposal is to develop a universal accessibility engineering tool, which incorporates the guidelines, examples and experiences in a usability engineering framework. This framework will be used to indicate *when* and *how* a specific guideline should be applied.

Universal Accessibility Engineering Tool

Software development is an iterative process in which the artefact is specified in detail more-and-more and specifications are assessed more-or-less regularly to refine the specification, to test it, and to adjust or extend it. Cognitive engineering methods should provide guidance in this process in order to optimise usability. First, based on the users' goals and information needs, the system's functions and information provision are specified (i.e. the user interface task level). Subsequently, the control of the functions and the presentation (i.e. the user interface communication level) of the information is specified (Neerincx, 1998).

A cognitive engineering tool should be constructed to support such a human-factors contribution, for example in the form of an electronic handbook. The handbook should present the right guidelines and techniques at the right time. Clear examples and relevant experiences should accompany the guidelines. Specification and assessment techniques should also be provided by the electronic handbook. It should be easy to attune the handbook to a specific domain and it should provide an adaptive interface that enables hiding irrelevant information. Flensholt et al. (1999) provide an example of an electronic usability handbook that is based on these usability engineering principles for payload interfaces for space laboratories. In a similar way, a handbook will be developed to support the design of 'universal accessible' software.

Conclusions

The dull image, the economic cost and the constraints of 'universal accessibility' are problems that need to be resolved. We believe, however, that by improving the foundations and accessibility of 'universal accessibility' principles an important step can be taken in promoting it to designers. By offering them an electronic handbook with applicable guidelines, specific examples, specification techniques, assessment techniques and experiences, the foundations and accessibility of human-factors knowledge can be greatly improved. A sketch of a support tool for the 'universal accessibility' approach was presented at the workshop.

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