

Online Help: a Potential Contribution to Universal Access

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ABSTRACT

The paper aims at motivating research on the design of online help (to the use of software), within the framework of the universal design and universal accessibility paradigms.

First, we point out the strong assets of online help for promoting universal access to “smart” artefacts and services provided by the coming world-wide Information Society.

Then, we list the specific research subjects and issues which should be addressed within the universal design paradigm, in order to obtain help systems which satisfy universal accessibility requirements, and thus can effectively contribute to the promotion and implementation of universal accessibility.

The discussion brings arguments into play, which stem from published empirical evidence and experimental results, ours included.

Keywords

Online help, universal accessibility, universal design

MOTIVATIONS AND OBJECTIVES

Universal design represents a fruitful concept and a useful body of experiences, for promoting universal access in the forthcoming world-wide ‘Information Society’. Guidelines and standards (*cf.* [10], [6], [12]) have already been proposed for implementing the concept of universal computer accessibility.

However, crucial ergonomic issues remain to be solved. That is mainly: how to design interactive software which satisfies the utility and usability requirements (i) of *all* standard user categories (*i.e.* novices, occasional users, experts), (ii) in *all* contexts of use, including new contexts and applications (home automation, “smart” artefacts, online services for the general public, mobile computing, etc.), and (iii) which takes into account the specific needs of users with disabilities.

Surprisingly enough, while the second and third issues are the subjects of active research, the first one, which concerns inter-individual cognitive differences, has been overlooked by the scientific community until now. In particular, issues concerning the design of online help¹, most of which stem from the cognitive diversity of users, have not yet been addressed within the framework of the universal design and universal accessibility paradigms.

‘Accessibility’ here means ‘access in the Information Society’, which subsumes the usual acceptance of this term (*i.e.* ‘computer access’). This extension of the scope of ‘accessibility’ makes it possible to merge both concepts into one design paradigm which will be referred to as the **UDUA** paradigm in the remainder of the paper.

The paper aims at motivating research on the design of online help within the framework of the UDUA paradigm.

First, we point out the strong assets of online help for promoting universal access to “smart” artefacts and services available in the future Information Society (*cf.* also the emerging concept of “disappearing computer”). However, in order that these assets may be actually put to use, online help systems must themselves comply with universal accessibility requirements. To meet this requirement, the application of a universal design approach to their design, which has not yet been experimented (at least to our knowledge), can be considered.

Consequently, in the second part, we list the specific research subjects and issues which should be addressed within the framework of the UDUA paradigm, in order to obtain help systems which satisfy universal accessibility requirements, and therefore could contribute significantly to the promotion and implementation of universal access to software.

The discussion brings arguments into play, which stem from published empirical evidence and experimental results, ours included. Our results and empirical data (*cf.* [1] for their presentation) were obtained from the analysis of a corpus

¹ ‘online help’, here and throughout the paper, means restrictively ‘online help to the use of software’. This acceptance excludes task support, namely.

comprising eight oral dialogues² between novice users of a standard word processor (Word) and expert users (or tutors); experts helped novices to achieve a set of predefined formatting tasks through mixed-initiative dialogues³.

Most arguments put forward here apply both to online help and paper manuals. However, we focus on online help, since paper manuals are no longer in current use.

ONLINE HELP CONTRIBUTION TO UNIVERSAL ACCESS

In this paragraph, we discuss the validity of the following two claims:

- First, users, especially novices and occasional users (according to Shneiderman's user categories [9]) cannot learn by themselves how to use a new software efficiently, even though its functions are straightforward, and the user interface "intuitive".
- Secondly, online help may contribute significantly to the implementation of universal access to software applications.

Online Help, a Necessary User Support

Advocates of direct manipulation (*cf.* [9] for instance) promoted the illusion, still common among to-day designers, that users can master the use of a new software by themselves, provided that the user interface is intuitive and encourages exploration of its functionalities. This unfounded opinion may explain why online help has not yet been considered within the UDU paradigm.

However, in the eighties already, some empirical studies showed that users in the general public are unable to gain by themselves a sufficient knowledge of the operation of a new software for achieving the tasks they use the software for. According to [7] for instance, novice users are confronted with numerous cognitive difficulties which they cannot overcome alone. In particular, they are unable to elaborate by themselves a reliable representation of the capabilities and functioning of a new software (or "system image" according to Sutcliffe and Old [11]); erroneous or incomplete representations are the source of many errors (semantic errors) which novices can neither detect nor correct for lack of the appropriate knowledge.

Cognitive inter-individual diversity⁴ is so high that designers cannot take it into account. Therefore, the implementation of the designer's representation of the task domain (in the form of software functions) cannot coincide,

or at least be compatible, with the mental representations of a large community of users such as the general public.

So that beginners have to "learn" and assimilate the representation of the task domain implemented by the designer, that is the semantics of the available functions. Or, they have at least to adapt their behaviours to it.

Our study confirms this empirical finding, in-as-much as it suggests that the major difficulty encountered by novice users is to establish the necessary relations between their intentions/goals and the software functions or procedures they have to execute in order to achieve them. One half of the verbal exchanges between subjects and experts were focused on the clarification of these relations. This result demonstrates the gap between the mental representations of the task domain which novices evolve, and the software functions implementing the designer's own representation of the task; then it points to the inadequacy of the semantic representations of the software functions that novices build.

In addition, our results show that the use of so-called intuitive interaction techniques, such as direct manipulation, is a source of difficulties and errors for novice users. Some subjects had difficulty in manipulating the mouse (in particular, "drag and drop" actions), and in using menus or dialogue boxes which compensate for the expressive limitations of the office metaphor. Almost one third of the subject-expert information exchanges concerned such difficulties which were also the origin of many syntactical errors.

More generally, these results suggest that the design of intuitive human-computer interaction is a difficult aim to achieve. One can even wonder whether it is possible to design really intuitive user interfaces, that is interfaces which require no learning or adaptation effort from the novice user.

It should be noted, finally, that even experts need online help to spare them the exploration (by trials and errors) of the semantics of a new function, to assist them in optimising their interaction with the software, and to remind them of syntactic details.

To conclude, online help is a necessity for all users, whatever their skills, knowledge, cognitive capabilities and type of use. To be accessible to all potential users, future "smart" artefacts and services will have to include online help facilities capable of adaptation to inter-individual cognitive diversity mainly.

Online Help and Universal Accessibility

Online help is not only a necessity. By definition, it has the potential to improve software accessibility significantly.

For instance, without appropriate online help, novice and occasional users, especially in the general public, might reject a new software after a few trials, or even shy away from using it. The following observation may explain such behaviours. The authors of [7] observed that novices might

² Dialogues lasted on average half an hour each.

³ This study (its results, ...) will be subsequently referred to as 'our study' ('our results', ...).

⁴ This high diversity characterizes users' cognitive capabilities, as well as their knowledge, skills, previous experiences, and current objectives/intentions, which all influence their representations of the task domain.

experience stress, a major source of errors, during their first interactions with a new software.

By definition, flexible online help could prove very useful for increasing software accessibility. It should indeed have the intrinsic potential to help users with a great diversity of cognitive profiles to overcome the difficulties they are confronted with while discovering a new software or function.

However, these potentialities are still to be exploited. Before initiating research in this direction, it is necessary to solve specific research issues, which can be summarised as follows: how to design help systems which are effectively accessible to every potential user in any context of use, or in other words, how to apply the UDUA paradigm to the design of online help systems? We detail these issues in the following paragraph.

TOWARDS DESIGNING ACCESSIBLE HELP SYSTEMS

Universal Design and Online Help

Surprisingly enough, the standard definition of universal design precludes adaptation as a means for implementing this concept, since it restricts explicitly its scope to: “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialised design.”(cf. [5]). Therefore, the seven principles which have been established to guide the implementation of this definition are useless for the design of accessible online help systems, that is systems which have to adapt to the great inter-individual diversity and intra-individual variability of users’ cognitive behaviours; they can only be applied to the extent that they are compatible with the implementation of adaptation.

Obviously, a restricted set of stereotypes (cf. the taxonomy of user models proposed in [11]) or a few user categories⁵ cannot represent accurately the extent of inter-individual cognitive diversity. Adaptive models have only the potential to represent individual cognitive user profiles accurately.

In addition, help systems have also to adapt to the progress of the current user in his/her use of a new software, so as to take account of the intra-individual cognitive variability inherent to learning situations. Such adaptation implies the capability of eliciting his/her current knowledge and skills.

Finally, online help has to evolve according to the evolution of the current user’s intentions and goals during interaction, by reason of the specific attitudes and requirements of users – especially novices and occasional users in the general public – with respect to online help. Empirical studies dating back to the eighties [3] indicate that most novices concentrate, from the start, on achieving the tasks which motivate their use of the new software, instead of first focusing their efforts on learning how to use it efficiently.

⁵ *c.f.* for instance, the classification of users in terms of their computer knowledge proposed in [9].

The authors of [3] ascribe the reluctance of novices to consult online help to this “motivational paradox”.

To overcome such an attitude, help systems have to implement user support strategies which promote “learning by doing” (cf. [2] and the first principle of the minimal manual in [4]); that is, online help should help novices to learn and master the use of a new software through helping them to achieve the tasks they are bent on carrying out, or in other words, through cooperating with them. Our results suggest that human experts/tutors apply such strategies:

- One half of the experts’ speech acts are:
 - attempts at helping the novice to achieve his/her goals and tasks or to plan his/her activity,
 - or assessments of the effects of his/her actions on the interface, with respect to the progress of the current task.
- Less than one third of the experts’ speech acts are general, non procedural explanations concerning the software functioning or the semantics of its functions.

Therefore, adaptation appears as a key concept and a mandatory requirement for the design of accessible online help systems. However, adaptivity, that is the appropriate evolution of the software “cognitive” behaviour under the influence of the interaction context, is a difficult concept to implement⁶. The main difficulty is to design reliable algorithms for eliciting and interpreting accurately the contextual information (*i.e.* dynamic knowledge) needed to provide novices with appropriate adaptive support, hence to improve the accessibility of online help systems.

In the next paragraph, we outline some major specific issues that researchers should address in the near future, so as to provide designers with efficient guidelines and methods for designing adaptive online help systems.

Towards Adaptive Online Help

The trace of the user’s actions constitutes the main source of contextual information available to online help systems. How to infer, from such raw data, the dynamic knowledge required for achieving adaptivity is still a crucial research issue.

Sophisticated artificial intelligence techniques (uncertain reasoning, truth maintenance, etc.) have been implemented for modelling, from the analysis of the interaction history, the novice’s progress in learning how to use a new software efficiently. However, the resulting prototypes (cf. [8] for instance) are too complex and unreliable for meeting the standard utility and usability ergonomic criteria.

It seems even more difficult to identify accurately the intentions which motivate users’ actions, goals and tasks. Approaches based on pattern recognition techniques or statistical learning are basically inadequate, for the following reason mainly.

⁶ This may explain why adaptation was excluded from the objectives of the universal design paradigm.

Cooperation with the user in order to promote “learning by doing” implies the capability to identify the user’s current intention and the task in progress as early as possible, that is after the first elementary action(s) he/she carries out to achieve them. Early identification of the user’s current intention is also necessary for the prevention of errors, which requires the capability to anticipate the user’s next action or sequence of actions; it is also necessary for the correction of semantic errors.

However, early accurate identification is often impossible, by reason of the intrinsic ambiguity of the basic software functions, especially in the case of toolkits⁷.

The only alternative approach is to induce users to state their intentions before they attempt to achieve them. Our empirical data suggest that human experts often resort to dialogue for eliciting the intentions of novices. The implementation of this approach and the assessment of its ergonomic quality are research subjects worth investigating.

Finally, appropriate online help strategies are yet to be designed; that is, strategies which help novices to learn how to use a new software efficiently, while assisting them in carrying out the tasks which motivate their use of the software. The elicitation and implementation of the strategies adopted by human experts/tutors in similar interaction contexts might prove adequate for taking up this longstanding scientific challenge, which was first issued in the eighties (cf. [4]). We are currently focusing the analysis of our empirical data on this elicitation.

CONCLUSION

The aim of the discussion presented in this paper is to outline the potential contribution of online help to the promotion of universal access to the coming Information Society.

We first argued that online help, a necessary functional component of any software, may prove useful for overcoming cognitive obstacles to universal access, provided that help systems themselves are accessible for all users, especially the general public, in all contexts of use.

Then, we discussed the claim that the standard definition of universal design is not applicable to the design of accessible online help systems. Our argumentation in support of this claim is twofold. On the one hand, this definition excludes adaptation from the scope of universal design. On the other hand, adaptivity is necessary for overcoming cognitive inter- and intra-individual variability which constitutes the major obstacle to online help universal accessibility.

Finally, we outlined some major research issues pertaining to the design of usable adaptive help systems. In particular, efficient strategies are needed to infer, from available contextual information, the dynamic knowledge necessary to achieve flexible adaptation of online help to the

evolution, during interaction, of the user’s current intention and knowledge (of the software operation).

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⁷ For instance, one cannot infer from the selection of a graphical object on the screen, which software function the user wants to apply to this object.

