Interface Design – Use of Audio as an Output

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Abstract. This paper analyses a number of audio interface models that are currently in use or being developed. It describes a space for describing various models of interfaces that could be used by both visually impaired (VI) and mobile computer users. This paper is concerned only with the use of audio as an output cue. Visualisation is an increasingly important method for people to understand complex information and to navigate around structured information. Computer-based visualisation techniques often depend almost entirely on high-resolution graphics. There are several situations in which this is insufficient.

1 Introduction

At present, sound is sometimes used in a simplistic manner within Human Computer Interaction (HCI), and has at times been overtaken by the design of complex graphics. Sound is used mainly to direct the users attention to an event. This could be, for example, an error or a program starting or finishing. Visual cues, however, generally guide a user around an interface. In the areas of mobile computing, the disappearing computer initiative and for VI users, it may be useful to increase the number and type of audio output cues being used, allowing them to navigate around a computer more efficiently [9,13]. As an increase in audio cues could help with various situations.

Douglas Engelbart’s idea that organisation’s work can be classified according to a three level classification scheme, levels “A”, “B” and “C”. “Level A” work relates directly to the work of the organisation. “Level B” work helps workers to completed level A work more efficiently. “Level C” work helps level B workers to help level A works do their job. When considered within this context, much of the research in audio interface design can be thought to be level B work.

The remainder of the paper is organised as follows: Sec. 2 describes some design considerations as well as the users who may benefit. Section 3 describes the types of audio that have been developed. Section 4 describes some of the research being undertaken. Section 5 outlines the possible axes for an auditory interface. Section 6 describes four different auditory models. Section 7 includes details of future work and Sec. 8 provides conclusions.
2 Background

2.1 Design Considerations

An interface should have a simple, intuitive layout in order for a user to navigate effectively. The aims of user-interface design include [10]:

1. Time to learn Time taken for a user to become familiar with the interface.
2. Speed of performance How quickly a user can navigate once they are familiar.
3. Rate of errors by user The amount of errors occurring over a given period.
4. Retention over time How well the user remembers the interface.
5. Subjective satisfaction Is the interface liked by users?

At any given time a user should be able to find out what to do, and also know what is happening. Using real world models as interfaces may satisfy the above aims for most computer users.

In order to create an efficient audio interface, it may be necessary to create a new metaphor (a new visualisation) that does not simply mirror what happens visually and translates it into audio cues. An example could be to think of a room metaphor. That room can contain various objects such as programs, files, etc. It may also have doors to other rooms. Alternatively, another visualisation could be to think of the information being arranged similar to that of a star chart or spiders web. A 3 dimensional space where users can see “layers” of information.

2.2 Potential Users

The main benefactors of such a system would include visually impaired (VI) and mobile computer users. This would also be relevant in the disappearing and wearable computer initiatives.

**Visually Impaired Users.** VI users may not be able to benefit from the advanced graphics that are available today. Even though many VI users have some useful sight (around 96% [5]), they have different needs. Carefully designed graphics may be changed in order to create a more usable interface. For example, an increase of font size or a change in colour to give maximum contrast. Care must also be taken not to overload a user, and to create the right balance between useful information and background “noise.” Many guidelines exist aiding in the creation of good design.( [20,11] )

**Mobile Computer Users.** Mobile computers, such as mobile phones or PDA’s, provide a small screen. Often the user will either not wish to look at the screen (e.g. when walking) or not be able to do so (e.g., no lighting available, driving etc.) In the case of the disappearing [4] or wearable computer initiative [19] there may be no screen provided at all. Information may still need to be found quickly and efficiently. The dramatically reduced or lack of screen size introduces the issue of visual clutter, and of over-loading a user. Audio could be used to increase the screen size virtually [16,17].