Designing sound for peripheral alarms

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Abstract— **The aim of this paper is to examine the use and function of a specific peripheral, auditory system invented by a Danish web engineer.**

This specific, peripheral system is called "Chat on Watch" (COW), and is used as an alarm in a crowded office. In many ways this alarm differs from other alarm systems. We want to investigate how and why this peripheral, auditory system nevertheless works as an efficient alarm in this office.

First we describe COW and how it works. Secondly we discuss whether the sound of the COW system is logical and therefore usable when it comes to draw attention to something important. Finally we sum up advantages of these kinds of systems. Our focus is thus the specific case COW.

Index Terms — **auditory alarms, peripheral information, non-speech alarms.**

I. Introduction

A web engineer in a major Danish web-portal invented COW the fall of 2001. This Danish web-portal takes care of a widely used chat. The chat-crew's office is a rather small room. About 20 people are working there at the same time, which fills the room with constant background noise. The noise makes some working situations difficult: You can have difficulties hearing e-mail arriving. People move around all the time helping or just chatting with each other. To use sound as a source of information might not be ideal in this "sea of noise".

On the web engineer's desk are two computer-screens. He always uses both at the same time: this is a smart way to look at both the source and graphical representation at the same time when he is making web designs. His other important job is to watch over all the worldwide chat servers. These servers are graphically represented on a screen-picture. This representation is rather big because it is necessary to show all information and eventual errors regarding a specific server. The servers do not demand constant attention; typically half a working day goes by without it needing any attention.

The server representation fills out space, and it would not be possible to make room for it on his screens. A third screen beside the two others would take up too much space. So instead he placed a third screen four meters behind him. Then he made an observation program. This program warns him if something goes wrong with the servers.

He designed a program in which he incorporated the server-monitoring system. If everything was all right with the servers, a page with cow-spots was shown on the screen. No sound at all. Now, if he has to pay attention to the servers the sound of a cow is heard.

The more severe the damage is the more desperate the COW sounds.

II. Choosing the right sound

Since he does not need to look at the surveillance system all the time, he created a peripheral, auditory alarm with a distinct sound. A sound one certainly would not expect to find in these surroundings would be a sound from the countryside.

The sound of a cow might seem like a strange choice for a person working with computers in a hi-tech open-plan office. However, using a non-standard set of sounds in a place filled with beeping noises provides him with a good tool for distinguishing his personal sound from all others. Besides, everyone at the office knows that this sound is connected to server problems *and* this specific employee.

One could argue that COW adds more noise to an already noisy environment, but it is important to emphasize that COW is silent most of the day.

The design of COW must be seen in the context of a dynamic, tolerant, youth dominated working space, and as such the design might not be appropriate for more traditional work places.

Contextual speech alarms present a big problem: It is quite hard to tell what is being said if you are at a distance (Wickens, 1998). This problem is eliminated by the use of variations of the moos in the COW system.

III. Simplicity vs. the complex

COW seems as the perfect example of a well working peripheral, auditory system: It is not noticeable when everything is all right with the servers. But when something is wrong COW communicates how severe the damages are.

Other people have been interested in this way of getting response from a peripheral, auditory system.

In the article "Designing Audio Aura" Michael Baer and Jason B. Ellis (1998) describe their project "Audio Aura" (AuA). The AuA system is actually meant for a working place such as a crowded office. The goal of AuA is to provide information about other employees' doings: Where are they? What are they doing; are they just chatting away or drinking coffee.

Each employee is provided with active badges and a set of wireless headphones. Different auditory cues, which are tied to all employees' physical actions in the workplace, are represented with different kinds of sounds. As you are walking around in the office or just sitting by your desk different sounds occur in your headphones. You have to interpret the sounds and then it is up to each employee how to react to this information.

The sounds in this system are the sounds of waves, seagulls or short bell melodies. It is meant for people to come together when they have a break in their busy workday.

Baer and Jason's project may seem to be a bit problematic. First it is not very practical to run around with earphones, since these earphones exclude all auditory information such as speech. Secondly this system is excessive in planning and use. But their idea of creating an auditory way to orientate is interesting and very relevant to the discussion of COW.

Of course one cannot classify COW as a social, auditory cue but on the other hand it mimes some of the aspects described in the AuA-project. As mentioned earlier the office is filled with sounds. People in such a room use these sounds as cues. But in the AuA system the sound is linked to one person, the opposite is seen with COW, which is supposed to get everyone's attention.

IV. Moo – a non-speech sound

We know that the use of sound in graphical computer interfaces such as the 'critical stop' alarm in the Microsoft Windows® environment, but it is more seldom that we encounter the use of sound as the primary source of information. Of course there is the alarm-clock telling us to get up in the morning or the fire alarm telling us to get out of a building because its on fire, but such alarms only tell us one thing. A fire alarm does not inform us about the extent of the fire.

A series of experiments conducted by Stephen A. Brewster and his associates point to the possibility of using sound as a tool for navigating through hierarchical information for example on a website. This way of using sound is obviously different from our case but some of the more general conclusions seem able to aid us in our description of the COW system.

Auditory systems come in handy in environments with no visual 'contact' e.g. if an operator is monitoring more than one screen or is away from the system. Furthermore there is a limit to how much information visual displays can hold.

One of the major benefits of an auditory system based on non-speech sounds is that it is capable of providing information with multiple meanings. By using non-speech systems with correlated sounds e.g. variations of the moo; it is possible to clarify what the sound is related to, and how urgent the problem is. Another great feature of non-speech sounds is that they are not language dependent.

Brewster's work and COW have some common features. First, they are both based on non-speech audio messages and secondly, they both deal with hierarchical information. Brewster's system uses sound to indicate the depth within a menu structure. In the COW system the variation of moos indicating the degree of the damage, correlates with Brewster's system hierarchy.

V. Conclusion

The simplicity of the COW system is a vital reason for the system's success. It is based on just five variations of a 'moo', but had the system been more complex it would probably have been necessary to create a more advanced system e.g. based on compound sounds, as it is the case in Brewster's system of earcons. Where the *hierarchical earcons* in Brewster's system are based on variations in rhythm, pitch, dynamics etc., the more simple COW system is using variations of the moo.

The simplicity of the COW system makes it quite easy not only for the daily user, but also for his co-workers, who soon learned not only the meaning of the sounds, but also understood the variations of the sounds. Still, if other people need to learn how to react to the alarm it only requires a minimum of training. As Brewster points out: the simplicity is critical to the users ability to remember the *meaning* of each sound.

Other advantages of COW's are that the system is rather simple, cheap, does not require a lot of equipment and above all is easy for others to use.

The latest update in the COW system includes use of sms messages to the web engineer's vibrating cell-phone.

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References

[1] Baer, Michael; Ellis, Jason B., *Designing Audio Aura* in *CHI*, april, 1998, pp. 566-573.

[2] Brewster, Stephen A., *Using Nonspeech Sounds to Provide Navigation Cues* in Computer-Human Interaction, Vol. 5, No. 3, September 1998, pages 224-259.
[3] Wickens, Cristopher D., *An Introduction to Human Factors Engineering* 1998, pages 113-131.