

Dynamic Audio: Interactive Environments' Sound Design

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1 Context

In the last 15 years, the appropriation of the sound language by hypermedia did not show significant advances. In the year of 2001, Bishop and Cates (2001) pointed out that books on interface design rarely discuss the use of sound, and when they do, the frequently discussed use is the use of text narration on the screen. In 2007, Follet (2007) pointed that education and professional training in interface design and UX design is essentially based in the area of visual design, still maintaining relations with printed media, and that interface design doesn't have any basis of sound design content. In 2014, Collins and Kapralos (2014) reinforced this argument by saying that many teachers who teach interface design don't have knowledge to teach sound in their subjects. According to the authors, there are limited resources for teachers to feel apt to instruct students about sound. For this reason, interface design students often complete their academic degrees without following a single class related to sound and interactivity.

While the integration of text and graphics is a familiar and common occurrence in the interface design field, the use of sound is still unknown and rarely considered. As a consequence, the application of sound into HCI devices, both in web and desktop environments, as well as in tablets and smartphones, is still characterized as an incipient and underutilized practice. According to Liljedahl (2011), the development of web interfaces has traditionally put emphasis on graphics, and the predominance of visual stimulus has made users - and developers - to take the absence of sound stimulus as a standard. These circumstances have contributed to users get used to a general unimportance of sound, and start to make negative associations with the auditory experiences present in interfaces.

In the year of 1996, Stuart (1996) pointed that the use of technological resources in hypermedia was restricted only to the visual modality. According to the author, studies in audio aren't that appreciated, even audio being an element that brings quality to the content, facilitates accessibility of information and makes it more attractive, in addition to its low cost of production, distribution and use. Ten years later, according

to studies by Susini et al (2006), there were no significant advances in sound. The author points out that in the design market there is an overvaluation of visual communication, and due to its limitations, products and services in design can often present inconsistencies when other sensorial properties become relevant, as in the case of sound and tactile information. Rocchese et al (2008) indicate that this exaggerated emphasis on visual displays has limited the development of interactive systems that are able to make a more adequate use of the auditory modality. The author claims that despite its promising and already recognized importance, the study of sound in interface design haven't been established as with occurs in the graphic design. Consequently, the use of sound in interactive applications has been placed in the background, and non-musical sounds have been accepted as byproducts of technologies, rather than being exploited for their intrinsic value. As a result, a universe of non-sounded or acoustically polluted interfaces has been tried out - and being rejected by users, interface designers, and programmers.

According to Alves and Roque (2011), the sound design to interface remains unexplored, and the absence of a group of knowledge on this subject contribute to the maintenance of this situation. An obvious sign of the lack of a relevant amount of knowledge in the field is the unavailability of clear guidelines or good practices on interface sound design. However, portable devices such as tablet and smartphone demonstrate that the tactile process and the haptic requirements advance as technology, while the sound and its cognitive functionalities still remain little explored in the field of Human-Computer Interaction.

2 Method

According to Bar-B-Q (2003), the sound stimuli present in the interactive systems can be classified as direct interactive audio and indirect-interactive audio. However, Collins (2008) points out that the group of sounds belonging to the interface domain can be classified as dynamic audio, and divides them into interactive audio and adaptive audio. As such concepts are in agreement with each other, and in order to minimize the possibility of ambiguity of the nomenclatures, the categorization of the terms direct interactive and indirect adaptive sounds is assumed, both belonging to the dynamic audio group, as proposed in the following figure:

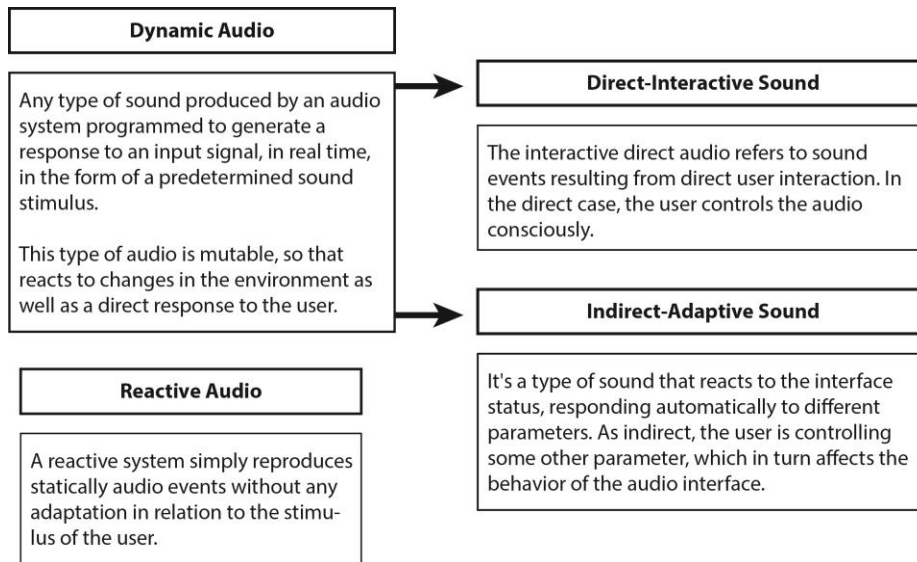


Figure 1: Terminological proposition: dynamic audio, direct interactive, adaptive indirect and reactive.

To Collins (2013), an essential part in the approach of sound and interface is often neglected: the user. Although it is relatively simple to specify distinct interactive structures in the interface, it is complex to deal with the experiences resulting from the interaction between the platform and the user. In this context, the interaction with sound is fundamentally different from its simple hearing. At its most basic level, interaction alters the ways in which individuals relate to sounds, because it creates a distinct experiential relationship from the simple hearing: interacting with sound is fundamentally different from just hearing it. The central issue, therefore, focuses on how interactive environments' users process the acoustic events that happens inside the interface domain, that is, how sound stimuli are capable of transmitting specific informations related to immersion, navigation, flow. In this sense, Cancellaro (2006) points out that the big question that involves the use of sounds in interactive systems is no longer the technical challenge of applying these sounds in the application programming platform. Technological and cost barriers to integrate sounds in interfaces have disappeared - the focus must be directed to sound as an information transmitter.

The duration of a given interface state is complex to determine, since each user manipulates it according to their interest. Therefore, the user experience is a crucial factor that influences how will be the interactions with the sounds in the interface. In order to sound design actually integrate with interface design, the most appropriate solution is to give users full control over the sounds, making the dynamic audio approach consonant with the User Experience Design principles.

3 Conclusions

Interactive environments offer a new and rather unique field of study that requires a revision of old theories so that a coherent approach between sound design and interface design can be realized. However, interactive environments are very different from traditional forms of media, and in many cases the use of theories from other fields may not correspond to the completeness of possibilities and features that apply in the interface domain. In this context, the applications of sound on interactive platforms differ from those used in traditional linear media, as occurs with music and cinema. In the field of HCI, the importance of sound is mainly focused on its ability to capture the user's attention at different cognitive levels, and achieve a communicative process. Sufficient scientific and technological knowledge already exists to start thinking about sound as one of the main dimensions of the environments in which we live - whether being physical or virtual. This means overcoming the presence of sound as noise and promoting an attitude oriented to the auditory channel as the bearer of information, appropriating the sound stimuli to transmit messages systematically.

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