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Smart Table Computer Interaction Interfaces with Integrated Sound

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Abstract

Recently, “smart” table-top touchscreen computers, in which users position themselves around a horizontal computer screen, have been introduced. Although the use of such touchscreen computers is still not widespread, given the growing popularity of multitouch mobile devices (e.g., iPods and iPads, smartphones, etc.), the move to multi-user touchscreens and a horizontal surface is a likely trajectory of the technology. However, before table-top touchscreen computing becomes widely accepted, there are many questions, particularly with respect to sound production and reception, and multi-modal interaction for these devices that need to be explored.

In this paper we provide an overview of a large table-top touchscreen computer setup and describe a simple amplitude panning method for the output of sound amongst four loudspeakers. The paper begins with a background on sound interaction design and follows with a description of an experimental smart table hardware setup for shared use. Its second part is dedicated to an object recognition vision system for global registration of sound sources, tracking of users, and controlling of virtual sound effects. The paper concludes with a consideration of table-top computer oriented sound experiments and a discussion of developed specialized software and GUI components supporting sound experiment control and user feedback registration with portable TabletPC communication devices.

Keywords: Smart-table computer, table-top touchscreen, audio-video interaction, sound interaction design, human-computer interface, object registration and tracking.

1. Introduction

For many decades now, we have experienced our audio-visual media on a vertical screen; our televisions, movie theaters, and computer screens have all presented information vertically in front of us. As such, sound (music, dialogue, and sound effects) for television, film, software, and games has been designed accordingly, with the placement of the speakers and the sound mixing all developed based on this format. Recently, smart table-top touchscreen computers (also known as surface computers, smart table computers, or smart tables), where users position themselves around a horizontal computer screen in a manner similar to sitting around a “traditional” table, have been introduced. Although smart tables have yet to be primarily designed as consumer models, with the growing popularity of multitouch mobile devices (e.g., iPods and iPads, smartphones, etc.), the move to multi-user touch screens and a horizontal surface is a likely trajectory of the technology. Moreover, these devices may well become a part of social entertainment, where families and friends can interact with each other around a table-like surface. Before smart tables become widely accepted, there are many questions that need to be explored, particularly with respect to sound production and reception, and multi-modal interaction, (e.g., the interaction of sound and video cues).

No longer just one person in front of a screen, these computers are designed as multi-user devices. However, this introduces several design issues, particularly with respect to the sound interface (i.e., input/output of sound), that must be addressed. More specifically, where do we position the loudspeakers when there are two people opposite