Chapter 9
Game Led HCI Improvements

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ABSTRACT

It is little exaggeration to say that the ubiquitous PC interface is still mired in the technology of the 70s and 80s – the keyboard and mouse. This is despite the fact that technologies ranging from touch screens through speech recognition are quite mature, and other interfaces such as haptic devices have received research attention for over thirty years.

On the other hand, in the past five years the games industry has seen a veritable renaissance in HCI (Human Computer Interface) technology with new styles of interaction and play being supported, and these technologies achieving mass market penetration. Further, these game based peripherals are crossing back over into the larger IT sphere and enabling new "serious" (non-gaming) applications.

This chapter covers these recent advances in HCI technology. It conveys the technological and engineering basis of the key current & successful technologies – for instance discussing the accelerometer, IR, and Bluetooth features of the Wiimote, or the basis of and EEG technology underpinning the recent BCI devices. Further, it discusses why these technologies have proved to be successful, how they are transforming the game industry, and how they are crossing back over into mainstream computing.

INTRODUCTION

Consider the ubiquitous PC – whether windows, mac or linux, and desktop or notebook – found in millions of homes and offices around the globe.

Emerging in the 1980s, today's PCs are thousands of times more powerful[1] than the original 1981 IBM PC. However the methodology and technology for interacting with the PC remains little changed – a keyboard (based on the 19th Century technology of a typewriter) and mouse (invented

in 1963 by Douglas Englebart and his team (Moggridge, 2007)) for input, and an LCD (or in the past CRT) display combined with speakers for output.

Now, in contrast, consider the modern gaming platforms in all their diversity – from the PC, through consoles (the Microsoft Xbox 360, Sony Playstation 3, and Nintendo Wii), handhelds (Nintendo DS and Sony PSP) and the rapidly growing area of game play on mobile phones (best represented by the iPhone and other touch phones). On these platforms gamers use devices ranging from microphones through touch-screens, accelerometers, cameras, gamepads and remotes to sing, strum, dance, swing, and otherwise conduct a range of physical activities – far richer than those afforded by a keyboard and mouse – in order to play their games. Indeed, in the past decade the games industry has seen a veritable renaissance in HCI (Human Computer Interaction) technology with new styles of interaction and play being supported, and these technologies achieving mass market penetration. Examples include the Nintendo Wii – the market dominating console – with its *WiiMote* and gesture based interaction, the Guitar Hero and other instrument playing games, and Singstar – all of which have been hugely successful commercially. Further, new technologies such as several Brain Computer Interface (BCI) products have emerged in the past year (the NCI OCZ, the Emotiv EPOC headset) aimed squarely at, and priced for the games market.

This chapter covers these recent advances in HCI technology related to peripheral gaming devices. It conveys the technological and engineering basis of the key current & successful technologies. Further, it looks at the potential for future developments in this area – in terms of gaming opportunities, but also with regard to serious applications. In doing so, the chapter has several goals:

- Provide a historic perspective on gaming interface technology and how changes in such technology have paralleled (and often led) major waves of change within the game industry.
- Explain the current technologies with a view to their inherent capabilities and limitations. Thus providing an indication of the types of game-play and interaction that can be supported currently and in the near future.
- Identify and delineate the emergence of a gross-motor or whole-of-body approach to game-control; beginning in the mid-2000s, currently exemplified by the Wii's design philosophy, and continuing to capture larger portions of the gaming market.
- Show the potential of employing this gaming technology for "serious" (non entertainment) purposes by highlighting several recent academic and medical initiatives in the area. In other words where gaming HCI has been folded back into the mainstream of Information Technology.

Taking a step back for the moment, it is important to understand what Human Computer Interaction is, and why it is so important in gaming and the wider IT domain. A relatively new field, HCI was founded in 1983 with the following definition – still applicable today: *"The key notion, perhaps, is that the user and the computer engage in a communicative dialog whose purpose is the accomplishment of some task. … All the mechanisms used in this dialog constitute the interface: the physical devices, such as keyboards and displays, as well as the computer's programs for controlling the interaction"* (Card et. al., 1983). HCI is a discipline at the intersection of computer science, engineering, psychology, and cognitive science. Central to HCI is a very a human-centric view of IT and its role. Further, HCI is generally approached from a design perspective so as to make that dialog between human and machine most natural, useful, and informative to the human. An application which does not adequately address the HCI dimension can be a complete

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