Chapter 32
Affect-Sensitive Computer Systems

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ABSTRACT

Affective computing is the broad domain encompassing all of the hardware, software, and underlying theoretical models underpinning the development of affect sensitive computer systems. Such systems facilitate more intuitive, natural computer interfaces by enabling the communication of the user's emotional state. Despite rapid growth in recent years, affective computing is still an underexplored field, which holds promise to be a valuable direction for future software development. Human-computer interaction has traditionally been dominated by the information processing metaphor, and as a result, interaction between the computer and the user is generally unidirectional and asymmetric. The next generation of computer interfaces aim to address this gap in communication and create interaction environments that support the motivational and affective goals of the user.

INTRODUCTION

Affective computing is the broad domain encompassing all of the hardware, software and underlying theoretical models underpinning the development of affect sensitive computer systems. Such systems facilitate more intuitive, natural computer interfaces by enabling the communication of the user's emotional state. Despite rapid growth in recent years, affective computing is still an under-explored field, which holds promise to be a valuable direction for future software development. Human-computer interaction has traditionally been dominated by the information processing metaphor and as a result, interaction between the computer and the user is generally unidirectional and asymmetric. The next generation of

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This chapter will introduce and elaborate on the field of affective computing. First the background and origins of the field will be discussed. Next the elements of affective computing and affective human-computer interaction will be discussed along with associated concerns and issues. Next, examples of the diverse range of affective computing applications in current and recent development will be provided. Finally, the chapter will present a discussion of future directions for this promising technology, followed by some concluding remarks.

BACKGROUND

Computer usage has traditionally been regarded as a rational activity in which emotions are not involved. This view, however, has been changing as the importance of emotions in all aspects of human thinking, activity and interaction is becoming more apparent. Human interactions do not just include those with other people, but also with their surroundings, including inanimate objects. One such object that has a big role in the day to day life of many people is the computer.

It is not uncommon for a person to spend more hours in a day interacting with a computer than face to face with other people. For this reason it is important to design computers that are user-friendly and easy to use (Preece et al., 1994). One important aspect of this drive towards user-friendliness is that the user should be able to use his or her natural way of interacting rather than having to learn new ways of working (Norman, 1988). The goal of improving the interaction between users and computers requires that emotions be taken into account in this interaction.

The field of HCI has greatly matured over the last several decades since the first conference on human factors in computing systems was held in the early 1980's. Since this time the emphasis within HCI has shifted from a focus on trained systems operators, to analyzing how technology influences the general user. To this end, there has been a substantial amount of attention devoted to the concept of usability, as well as the role of the user in the development of successful interfaces. Usability is simply defined as "the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use" (International Organization for Standardization, 2010). This broad definition sets the stage for the fact that usability is a complex construct that can be influenced by a large number of external factors including context or environment.

In the early 80s, the role of a HCI specialist would be to evaluate interface components such as menus or terminology. As the field progressed, and the specialists came to realize the broader applicability of their work, new directions and specializations were created. The term "user-centered" is extensively used in the field of HCI (Karat & Karat, 2003) when describing approaches to building usable systems. For user-centered design, the main focus is that the needs of the user are used as a way to inform design (Vredenburg, Isensee, & Righi, 2001). This perspective is also sometimes referred to as human-centered design, or human centered computing (HCC). HCC broadly describes the methodology that would be applied to any field that uses computers in any form where users directly interact with them (Jaimes, Sebe, & Gatica-Perez, 2006). Thus HCC aims to integrate human sciences (such as cognitive and affective) into the existing body of computer science and HCI knowledge with a human focus throughout the lifecycle. HCC is said to incorporate social and cognitive sciences more closely than traditional HCI (Foley, 2006).

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