Body Movement as a Modality for supporting Positive Experience in HCI

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Abstract
The aim of my research is to create technology that can support a positive experience in its user. Body movement appears to be a promising medium for this goal: it supports cognitive processes, regulates emotions, and mediates affective and social communication. I am currently pursuing three lines of research looking at body movement as a medium to induce, recognize and measure the quality of experience of the user. This paper presents my line of research and briefly reports on experiments done in these directions.

Keywords
Body movement, engagement, computer games, healthcare, social and emotional experience.

ACM Classification Keywords
H5.2 User controllers, H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Research Interests
In contrast to affective facial and vocal expressions, affective body movement has received little attention in the study of positive experience in HCI. A reason for that is the sheer complexity and variability of postural language. However, it has been shown that body

movement supports cognitive processes [1], regulates emotions, and mediates affective and social communication [2]. As such it is a very important communication channel that technology should exploit for creating a more positive experience in its users. I am currently pursuing three lines of research: 1) body movement as a modality to affect or change the quality of experience in a person; 2) body movement as a way to measure the quality of experience in a person; and finally 3) how to create technology that exploits such aspects of body movement to create a more positive experience in its user. I am currently investigating these issues in two areas: computer games and health-care environment. The motivation for choosing these two areas is twofold: 1) multimodal technology is becoming cheaper and ubiquitous in our social life; 2) in both areas emotions play an important role in modulating one's experience. Computer games are becoming a means for addressing larger issues where emotions play a very important role in creating a positive experience, e.g., education, health and social issues. In the health environment, emotion has been recognized as one of the critical aspects that can affect the recovery of a patient. However, for various reasons (e.g., time, cost and skill), health practitioners do not pay sufficient attention to emotional cues and this often leads to wrong diagnoses and negative consequences on the recovery of the health of the patients. In the next sections, I briefly summarize the work I am doing in these areas.

Affecting the experience of the user

I have carried out a set of experiments [3,4,5] to understand how body movement requested and afforded by new game controllers affect the quality of experience of the player. We distinguish between five types of body movements listed in the table below and we explore their relation with the 4 factors identified by Lazzaro [6] as the main reasons to play games. Our results show that each type of body movements can facilitate the emergence of the next type of movements in the table if the controller (and the game) affords it thus modifying the resulting game experience. The results show that when game controllers afford natural types of body movement (natural to the scenario of the game), the player transitions from a pure attention-based and hard fun experience [6] to a more affective and social experience.

Body movement	**Description**	**Lazzaro's factors**
Task-control	necessary to control the game	Hard fun
Task-facilitating	facilitating the control task nut not required to play the game	Hard fun
Task(role)-related	typical of the role defined by the game scenario	Easy fun
Enjoyment and emotional expressions	expressing affective states related to or induced by the game experience	Emotional factor
Social behavior (attention seeking, synchronized movement, etc.)	supporting social interaction	Social factor

When the controllers do not require and do not afford natural body movements, we observe a complete lack of movement other than those necessary to facilitate the control of the game; on the other hand, when the controllers require and afford body movements that are natural to the game scenario, we observe movements that are related to enjoyment (e.g., dancing) and social interaction even though those movements may interfere with game performance. This interaction between body movement and quality of engagement is

affected by factors such as culture [7], personality and expertise that can inhibit or facilitate the readiness of using body movements. Introversion for example may enhance a sense of self-awareness that in a social context may inhibit the desire to move without a real request from the environment.

Recognizing the quality of user's experience

In previous work [8,9,10], I showed that the recognition of basic emotional expressions expressed by postures can be grounded into the low level features describing the configuration of the posture and local dynamics describing changes between postures. This led us to design and implement a system that incrementally learns to recognize affective states. The system was tested on the six basic emotions and showed very high performance comparable to that of facial expression recognition. We are now testing this system in a natural setting (not acted emotion) where the expressions can be more subtle and mixed, e.g., in computer games played with full-body movement controller (e.g., Wii). We are also applying our method to automatically discriminate between different communicative roles of body movement [11]. The context of this study is patients with chronic pain. Studies in non-verbal behavior and pain have shown that movement in patients conveys three different types of information: the physical reaction to pain; the affective experience related to pain (e.g., fear of pain); and the search for empathy and attention of solicitous others (e.g., a partner or a practitioner). While we are still at very preliminary stage in this study, our aim is to create a computational model of body movement able to separate such components. The model could enable the creation of technology to support patients in self-directed rehabilitation programs.

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