Informatik-Oberseminar

Fachgruppe Informatik

Lehrstuhl für Informatik 10

RHEINISCH-WESTFÄLISCHE TECHNISCHE HOCHSCHULE AACHEN

EINLADUNG

Zeit: 28. Juni 2011, 13:00 Uhr

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Lehrstuhl für Informatik 10

Titel: A Language of Tactile Motion Instructions for Physical Activities

Abstract:

Athletes benefit from immediate and frequent feedback on their performance during training. Therefore, coaches try to provide instructions and feedback over multiple sensory channels before, during, and immediately after an exercise: they explain and demonstrate how to move the body, and they move the athletes' bodies into correct position. In many situations, however, athletes only receive feedback after performing an exercise because they are spatially separated from their coaches. Also, they do not experience tactile feedback through the coaches' hands.

To overcome these limitations, this work proposes and investigates artificial tactile stimuli for providing instructions and feedback on performance in realtime. These tactile signals are called tactile motion instructions. They stimulate specific body locations to communicate how to move and how to adjust the posture. Empirical studies that were conducted in static and in active situations informed the iterative design and the evaluation of a general set of tactile motion instructions that can represent body movements in an intuitive way. These instructions can be perceived and recognized with high accuracy in situations that are cognitively and physically demanding. In particular, they can lead to faster response times to move the body than spoken instructions conveyed over earplugs.

Tactile motion instructions constitute a simple language where sequentially triggered instructions can guide athletes during sequences of body movements. Using snowboarding as an example, a field study conducted with snowboarders who experienced tactile motion instructions while practicing a new riding technique demonstrated that this tactile language could help athletes to learn motor skills.

This work is the first investigation into the intuitive interpretation of full-body tactile stimuli that can instruct how to move the body during physical activities. The insights into the perception and recognition of these stimuli in stationary and in active situations lead to guidelines for designing tactile motion instructions. Besides sports training, the findings from this research can be applied to various domains where immediate feedback on incorrect posture is typically missing or impracticable, such as to prevent injuries in unsupervised situations during daily physical activities, or to enhance rehabilitative exercises for regaining lost motor skills.

This dissertation also presents a custom-built wearable and wireless sensor and actuator system. This system enabled the design of tactile motion instructions and their evaluation in real-world conditions, and demonstrated that sensing and classifying posture and body movements while snowboarding is possible in realtime. This system resulted in the first wearable assistant for snowboard training that automatically provided tactile motion instructions during descents.

Es laden ein: Die Dozenten der Informatik