Spatial and Cognitive Awareness in Human-Sensors Environments

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projects with children and adults with a variety of disabilities and it will cover national surveys to one-on-one assessment.

Enhancing learning through spatial cognition and awareness

Susan Treichler
Arvada Public School, Arvada, CO, USA

Ms. Treichler is a Special Education teacher working in a public school in Arvada, Colorado. Her focus is on the use of instructional and assistive technology for children with significant cognitive impairments. She will focus on the learning environment, particularly the classroom, and ways learning, cognition, and literacy can be enhanced through environmental management and spatial cognition and awareness. Special emphasis will be placed on arranging and managing the classroom for optimal teaching and learning enhancement; the use of assistive technologies to expand learning opportunities including alternative keyboards and learning softwares, along with specific interventions focused on increasing/enhancing spatial awareness. She has direct experience working students who have multiple disabilities and the confluence of technology and significant disabilities will be highlighted. Historically, educators have focused on teaching functional daily living skills rather than developing reading skills; particularly for children with significant cognitive impairments. Recently, special educators have begun to emphasize that students with significant cognitive disabilities require intensive instruction in order to learn to read. Classroom strategies to enhance visual spatial cognition and visual spatial memory for children with reading impairments will be described with emphasis on specific teaching strategies including analyzing content; developing repetitive cuing; adapting activities and the environment, and supporting the development of appropriate behavioral, communication and learning activities will be stressed.

SPATIAL AND COGNITIVE AWARENESS IN HUMAN-SENSORS ENVIRONMENTS

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General abstract:

Current ICT technologies, as sensor networks and service architectures, allow the development of complex collaborative environments in which humans and sensors/actuators/devices/etc. interact in order to support various tasks. In such environments, the spatial and cognitive awareness in critical, as in next-generation domotic environments. The symposium will address the issues of aging and spatial cognition, assistive technologies for every-day life, disability and rehabilitation with a specific multidisciplinary focus merging psychology, engineering and computer science research areas.

Brain-computer interfaces (BCIs) for next-generation immersive applications

Febo Cincotti
Santa Lucia Foundation, Rome, Italy

The European project SM4All—Smart hoMes for All—aims at investigating a novel service oriented architecture in which humans interacts with sensors and devices through Brain Computer Interfaces (BCIs) used to trigger automatic composition tasks. In this context, various cognitive issues should be addressed and resolved, such as the spatial awareness of the user (quite critical in the case of disabled persons) and the one that the automatic domotic system has about the user himself, etc. In this talk a general introduction to the SM4All project will be given, and then the speaker will go into details of BCIs, of how they can support spatial awareness of the users, of how the system can manage the spatial awareness of the user it needs to have, etc.

Interaction between navigation systems and human users in spatial environments

Christian Freksa
University of Bremen, Bremen, Germany

Car navigation systems encode precise knowledge about spatial environments and they have suitable natural language expression capabilities to convey route instructions to human drivers. Nevertheless, there are numerous reports about incidents in which cars are misled and do not arrive at their destination as intended. What is the problem? The System under consideration consists of three partly independent entities: (i) the spatial environment in which a human car driver seeks a destination; (ii) the navigation system that represents knowledge about the spatial environment and conveys instructions to the human driver; (iii) the human driver who interprets the instructions and controls the car. The alignment between (i) and (ii) has become surprisingly good, in recent years; similarly, the alignment between (ii) and (iii) is quite good, i.e. the spatial knowledge represented in the navigation system is expressed in correct natural language expressions; however, the relation between (iii) and (i) still is not yet sufficiently understood. We will look at two types of problems that can occur in this setting: (1) the human driver interprets the instructions in the context of his or her (local and global) knowledge and perceptual interpretation of the spatial environment; or (2) the driver blindly trusts that the instructor actually guides the driver to the intended location. In this talk, I will look at the relations between the three entities from a representation-theoretic point of view and I will discuss possible approaches to cure these problems.

Novel techniques for voice-based spatial awareness in domotic environments

Maurizio Omologo
ITC-IRST, Trento, Italy

In the workspace of the future, ambient intelligence will be implemented via widespread use of various sensors, among which microphones connected to computers that are unobtrusive to their human users. Towards this end of ubiquitous computing, technological advances in multi-channel acoustic analysis are needed. The long-term goal is the ability to monitor speakers and noise sources in a reverberant environment, without any constraint in the number and distribution of microphones in the space nor in the number of sound sources active at the same time. Moreover, the targeted techniques will enable acoustic systems to become aware of their own characteristics and geometry and those of the environment that they operate in, and will eventually enable advanced space-time processing solutions to take advantage of the additional information provided by the environment's acoustic response. These problems are extremely difficult to tackle, given that