

Colorado State University Molecular, Cellular and Integrative Neurosciences Center presents:

Cognitive Signals for Brain-Computer Interaction

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Abstract

In a classical brain-computer interface (BCI) users interact with the brain-controlled device in a closed loop, where they deliver continuously mental commands and receive feedback from the device. But, on top of this loop, users are engaged in a higher loop whereby they monitor the quality of the interaction. What if we could recognize the cognitive states of the user while they are interacting with an intelligent device such as a wheelchair and incorporate those cognitive states into the decision-making process? In this talk I'll describe this general framework and describe our work on the recognition of cognitive states such as awareness to erroneous responses of the BCI or intelligent device, anticipation and alarms. I'll also discuss a new framework for semi-autonomous robot navigation based in the Human-in-the-loop approach. In this approach, an intelligent artificial cognitive agent (e.g., an autonomous robot) makes decisions in order to solve a task, while a human user monitors the agent's performance and provides asynchronous, corrective signals that can be used to correct erroneous actions, or to improve the autonomous controller following a process alike to reinforcement learning.

Biography

José del R. Millán is a professor at the Swiss Federal Institute of Technology in Lausanne (EPFL) where he explores the use of brain signals for multimodal interaction and, in particular, the development of non-invasive brain-controlled robots and neuroprostheses. In this multidisciplinary research effort, Dr. Millán is bringing together his pioneering work on the two fields of brain-computer interfaces and adaptive intelligent robotics.

He received his Ph.D. in computer science from the Univ. Politècnica de Catalunya (Barcelona, Spain) in 1992, where he was an assistant professor for three years. He was also a research scientist at the Joint Research Centre of the European Commission in Ispra (Italy), a senior researcher at the Idiap Research Institute in Martigny (Switzerland), and a visiting scholar at the Universities of Stanford and Berkeley.

His research on brain-computer interfaces was nominated finalist of the European Descartes Prize 2001 and he has been named Research Leader 2004 by the journal Scientific American for his work on brain-controlled robots. The journal Science has reviewed his work as one of the worlds key researchers in the field of brain-computer interfaces. Dr. Millán is the coordinator of a number of European projects on brain-computer interfaces and also is a frequent keynote speaker at international events. His work on brain-computer interfaces

has received wide media coverage around the world.