

6th International Conference on

Theoretical and Applied Physics

May 16-17, 2019 | Rome, Italy



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Wearable brain-computer interface for augmented reality based inspection in industry 4.0

In the last two decades, Augmented Reality (AR) has gained great interest in the technical-scientific community and much effort has been done to overcome its limitations in daily use. Main industrial operations where AR is applied are training, inspections, diagnostics, assembly-disassembly, and repair. These operations usually require the user hands to be free from the AR device controller. Despite hands held devices, such as tablets, smart glasses can guarantee hands free operations with their high wearability, provided that their input does not require hands. The combination of AR with a brain-computer interface (BCI) can provide the solution. BCI is capable of interpreting human intentions by measuring user neuronal activity. In this talk, most interesting results of this technological research effort, as well as its further most recent developments, are reviewed. In particular, after a short survey on research at University of Naples Federico II in cooperation with CERN, the presentation focuses mainly on state-of-the-art research on a wearable monitoring system. AR glasses are integrated with a trainingless non-invasive single-channel BCI, for inspection in the framework of industry 4.0. Average accuracy is 80% at 2.0 s of latency. A case study at CERN, for robotic inspection in hazardous sites, is also reported.

Biography

Pasquale Arpaia completed his Master Degree and PhD in Electrical Engineering at University of Napoli Federico II (Italy), and he is also a Professor of Instrumentation and Measurements. He is also Team Manager at European Organization for Nuclear Research (CERN). He is Associate Editor of the Institute of Physics Journal of Instrumentation, Elsevier Journal Computer Standards & Interfaces, MDPI Instruments. He is Editor at Momentum Press of the Book Collection "Emerging Technologies in Measurements, Instrumentation, and Sensors". In last years, he was scientific responsible of more than 30 awarded research projects in cooperation with industry, with related patents and international licences, and funded four academic spin off companies. He acted as scientific evaluator in several international research call panels. He has served as organizing and scientific committee member in several IEEE and IMEKO Conferences. He is plenary speaker in several scientific conferences. His main research interests include digital instrumentation and measurement techniques for particle accelerators, evolutionary diagnostics, distributed measurement systems, ADC modelling and testing. In these fields, he published several books, and about 280 scientific papers in journals and national and international conference proceedings. His PhD students were awarded in 2006 and 2010 at IEEE I2MTC, as well as in 2016 and 2012, 2018 at IMEKO TC-10 and World Conferences, respectively.

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