
PLENARY SESSION

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Talk Title: **CONTROL OF WEARABLE ROBOTIC DEVICES**
Challenges, Design and Experiments

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Abstract

Assisting disabled and elderly people in daily activities using wearable devices has gained a particular interest these last decades due to the highly increasing rate of dependent people. The rise in life expectancy is set to continue; combined with the decrease in birth rates, this should accelerate more the aging of the population. Consequently, this will certainly have a great impact on the development of assistive wearable devices.

Thanks to the latest advances in portable device technologies in terms of compact/miniaturized design, low cost and energy consumption, their wearability has known an important development.

Indeed, human wearable devices such as exoskeletons, wearable bio-sensors and wearable stimulators are no more considered as fiction science. Furthermore, this field is attracting more and more researchers from different communities (mechanical design, sensors, actuators, control design, etc) in the last decade.

In terms of data measurement, different sensing systems are often used in wearable devices, namely EMG (muscular activities), IMU (human posture), Force sensors (contact with the ground), etc. Commercial wearable products are expected to emerge and grow considerably in the few coming years within the context of network-connected objects. The enhancement of disabled/elderly people's abilities in their daily activities is a key point stimulating design of these systems, with a tendency to low weight and high efficiency devices. These factors are closely related to the success of wearable device technologies and will have a straightforward impact on the comfort, security and autonomy of the user.

This talk will be focused on wearables robotics challenges, recent advances in this field, and some proposed control solutions for exoskeletons. The proposed control solutions will be illustrated through numerical simulations as well as real-time experiments.

BIOGRAPHY

Ahmed Chemori received his M.Sc. and Ph.D. degrees, both in automatic control from Polytechnic Institute of Grenoble, France, in 2001 and 2005 respectively. During the year 2004/2005 he has been a Research and Teaching assistant at Laboratoire de Signaux et Systèmes (LSS – Centrale Supélec) and University Paris 11. Then he joined Gipsa-Lab (Former LAG) as a CNRS postdoctoral researcher. He is currently a tenured research scientist in Automatic control and Robotics for the French National Center for Scientific Research (CNRS), at the Montpellier Laboratory of Computer Science, Robotics and Microelectronics (LIRMM). His research interests include nonlinear (adaptive and predictive) control with special emphasis on their real-time application in fields of robotics (under actuated robotics, parallel robotics, underwater robotics, humanoid robotics and wearable robotics). He is the author of more than 85 scientific publications, including international journals, patents, book chapters and international conferences. He co-supervised 13 PhD theses (including 6 defended) and more than 35 MSc theses. He served as a TPC/IPC member or associate editor for different international conferences and he organized different scientific events (e.g. PKM 2016 Summer School and WIR 2017 workshop). In 2017 he has been visiting Huazhong University of Science & Technology and China University of Petroleum as invited professor. He has been as invited plenary/keynote lecturer for various international conferences.