ST7: Sensors and Algorithms for Human Motion Analysis and Classification (SAHM)

Organizing Chairs:

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Abstract:

In recent years, we have witnessed the massive development of and the growth of interest in **body-worn sensor systems** for addressing challenging applications in, e.g., healthcare, wellness, physical medicine and rehabilitation. Great advancements in the fields of micro-electromechanical systems (MEMS) sensors, embedded computing, wireless communications have offered excellent opportunities to develop a new generation of body-worn sensor systems.

Many sensors, including inertial sensors, magnetic sensors, barometric altimeters, and force sensing resistors have been considered for integration in body-worn sensor systems. Currently, they represent the most useful alternative to the **optical motion capture systems** (OMCS) that are the *de facto* standard for capturing human motion.

To bring the full potential of body-worn sensor systems into reality, it is fundamental to dispose of powerful computational methods that allow exploiting the massive sensory information from body-worn sensor systems for, e.g., **sensor fusion** for pose estimation and kinematic analysis, **automatic classification and quantification of physical activity**, **estimation of energy expenditure** incurred during a particular physical activity, **locomotion analysis** when walking is performed over surfaces with different inclines and properties, **wellness evaluation** and **performance improvement in sport**.

The aim of this special track is to offer a snapshot of current research activities by leading experts worldwide. Particular emphasis will be on the use of computational methods of machine learning and data fusion, alone or in tandem with state-of-the-art methods of biomechanical signal processing. Contributions addressing the challenges of large-scale deployment are also solicited.

Topics of interest:

We invite submissions to the **SAHM** special track with original (unpublished and not currently under review) and novel contributions in inter-disciplinary areas including (but not limited to), the following:

Technologies

- **Data acquisition**
  - Magneto/inertial sensing
  - Aiding sensing, e.g., air pressure sensors, on-board cameras
  - Soft sensing, e.g., insoles, smart textiles
  - Mobile devices, e.g., smartphones, smartwatches
- **Computational methods**
  - Sensor fusion
  - Biomechanical modeling and analysis
  - Machine learning and pattern recognition

Applications

- **Motion disorders and musculoskeletal impairments**
  - Stroke
  - Parkinson's Disease
  - Multiple Sclerosis
  - Ageing and falling risks
- **Posture and gait analysis**
  - Gait analysis
  - Slips, Trips and Falls
  - Assessment of rehabilitation programs, objective evaluation and translation of clinical scales to objective measurements
- **Fall detection and prevention**
  - In-home monitoring
  - Pre-impact fall detection
  - Fall-risk minimization technologies
- **Sport, wellness and self-care**
  - Sensors for sports injury minimization and performance enhancement
  - Development of training tools
  - Skill evaluation
  - Activity monitoring
  - Measurement and quantification of physical behaviors

TPC Members:

- Michael Angermann, German Aerospace Center, Germany
- Rod Barrett, Griffith University, Australia
- Laura Contin, Telecom Italia, Italy
- Ahsan Khandoker, Khalifia University, UAE
- Daniel Lai, Victoria University, Australia
- Andrea Mannini, Scuola Superiore Sant'Anna, Italy
- Marko Munih, University of Ljubjana, Slovenia
- Marimuthu Palaniswami, The University of Melbourne, Australia
- John Staudenmayer, University of Massachusetts, USA
- Simon Taylor, Victoria University, Australia