Physiological Control Systems in Medicine

Overview: This OIT is one of two sponsored by IFAC TC 8.2 "Biological and Medical Systems". It focuses on the **physiological and biological modeling and control areas**, with a particular emphasis, where possible on clinical application and applicability of these methods and models.

Our overall goal in having two large OITs is to have a strong symposium within the overall IFAC 2020 conference meeting. In Toulouse in 2017 we had over 100 papers for these two OITs and a strong attendance across the breadth of work presented.

Session Theme and Rationale: There is growing convergence of technology and demographics as they impact our ability to provide healthcare. Aging populations have increased stress on medical resources with demand starting to exceed availability – a problem in need of the right technologies to improve care and productivity.

As computational, control and sensor technologies advance the potential in application to medical and biological systems has increased exponentially. As a result, there has been an increasingly tight inter-relation between engineering and clinical medicine.

Paper Topics: No topic is off limits, where possibilities could thus include:

- Closed loop systems and clinical application
- Closed loop control of anesthesia
- Multi-scale modeling of physiological systems from detailed or high order models to lower order, very simplified physiological models
- Metabolism
- Artificial Pancreas Systems (APS)
- Cardiovascular modelling for diagnosis and therapy selection
- Lung mechanics in mechanical patient ventilation
- Cellular and macro level pharmacokinetics and dynamics
- The dynamics of decision support systems for antibiotic therapy
- System Identification methods and applications related to the above
- Biomechanics modeling and analysis, including elements of tissue engineering which is emerging as a potentially new area for aspects of this TC.

Overall, this session focuses, broadly, on model-based applications of dynamic systems modeling, control and system identification to clinical medicine, emphasising the novelty in the hardware/software of medical devices. The application areas are broad to provide a robust overview of the field as a whole, but include current and emerging applications, as well as a broad array of potential application spaces.