Interface for Automatic Acquisition and Processing of Nutritional Data and Physical Sport Quality Monitoring
(Semester and/or M.Sc. Project)

Contact Person: Prof. David Atienza (david.atienza@epfl.ch)

Project Description

Recent advances in microelectronics technologies have gone a long way towards the miniaturization and power efficiency of processing elements, radio transceivers and sensing structures of a large array of biological and physiological phenomena. In this context, it has become plausible to capitalize on these technological breakthroughs to deploy the low cost, low power, miniaturized, yet, smart sensor nodes/platforms needed to enable truly wearable, mobile and autonomous personal health monitoring systems. These sensor nodes should be able to sense various physiological quantities, process and communicate sensor data with other nodes, and with on-body or remote base stations. Furthermore, to bridge the gap between the local nature of the data acquired by each individual monitoring devices in these sensor nodes (accelerometers, pulsometers, GPS, etc.) must be globally leveraged to achieve a global and integrated monitoring capability for human beings. These inherently resource-constrained systems, with very low-power consumption and limited monitoring capabilities, coupled with the harsh operating conditions and stringent autonomy requirements, pose important design challenges to provide system-level designs for personal health monitoring systems and high-level monitoring applications.

Therefore, the purpose of this project is to develop, in cooperation with the High-Performance Physical Training Center of Polytechnic University of Madrid (INEF-UPM), a software application, database and website support to perform a complete monitoring and daily analysis of the energy in-take and consumption of different types of individuals’ activities (very active, less active, passive, etc.) for weight and obesity control. This application must provide a complete graphical user interface (GUI) and website interface for the on-line visualization by physiologists and dieticians of the evolution of the monitored individuals, as well as interfaces to update in the software application which is the daily energy consumption from the accelerometers and pulsometers used during the physical activity sessions in the gym.

Tasks of the Student

The tasks expected by the student developing this project the following ones:

- Study of monitoring requirements of the different individuals during their daily activities, and develop a user-friendly GUI for the physiologist and dieticians controlling the daily evolution (calendar interface).
- Study of the input formats for the GUI application coming from the accelerometer and pulsometer used by the monitored individuals.
- Development of algorithms for daily energy consumption analysis based on the incoming information, as well as an on-line website interface accessible to physiologists and dieticians.
- Validation of the developed algorithm, and application and web interfaces with real data coming from individuals being monitored by INEF-UPM.

Requirements

This project involves knowledge of various aspects of digital system designs. Its requirements are enumerated below:

- Advanced programming knowledge of C++/Java code, databases and GUI development.
- Good knowledge of website design and I/O interfacing.