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London Technology Network
Ideas into Action

UbiMon: Ubiquitous Monitoring Environment for Wearable and Implantable Sensors

Overview

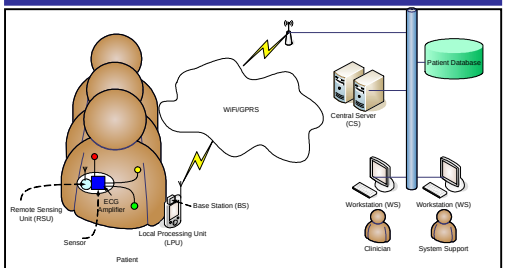
In Europe 900,000 patients die suddenly each year and about 90% of these deaths are caused by an arrhythmogenic event. Disturbingly, many arrhythmogenic deaths can be prevented if continuous monitoring devices, such as ICD (implantable cardioverter-defibrillator) implantation, had been made available when the risk of SCD (sudden cardiac death) was identified.

The aim of the UbiMon project is to develop a ubiquitous environment using wearable and implantable sensors for continuous monitoring of patients under their natural physiological states. Particularly, the project will focus on monitoring patients with arrhythmic heart diseases, and developing mechanisms to detect life threatening events and to predict abnormalities through long term trend analysis. In addition, we will also investigate in parallel the use of implantable sensors for post surgical care, especially in conjunction with minimal access surgery.

Partners

- Imperial College London
- Lancaster University
- Cardionetics
- Medtronic
- Tyco UK
- Toumaz Technology
- Docobo

System Design



- **Sensor**
  Wearable or implantable physiological sensors, such as ECG, SpO_2, temperature sensors, etc
- **Remote Sensing Unit (RSU)**
  Wireless sensor processing unit for controlling the sensor, acquiring the sensor readings, and communicating with the base station.
- **Base Station (BS)**
  Wireless receiver for interfacing between the RSUs and the LPU
- **Local Processing Unit (LPU)**
  PDA like device for gathering and fusing sensor data, processing the readings, detecting of abnormalities, and sending the results to the central server
- **Central Server (CS)**
  Collecting data from all LPUs, sending the data to the database and perform trend analysis
- **Patient database**
  Central storage of patient data
- **Workstation**
  Monitoring terminal for clinicians to analysis patient data and for administrators to perform system maintenance

Objectives

- Techniques for portable communicator interactions with implantable sensors and interventional devices.
- Wearable communicator performing multi-sensor interfacing.
- Automated techniques for integrating multi-sensory data leading to an intervention strategy.
- Preliminary clinical evaluation for management of patients with ischaemic and arrhythmic heart disease.

Technical innovations

- Low power sensor coupling and telemetry suitable for long term implants
- Context aware and adapt to environment changes
- Integrated local processing with remote long term trend analysis
- Multi-sensory fusion and data mining with prediction for critical events

Primary Deliverables

- Novel micro-power circulatory for fully integrated sensory processing.
- Incorporation of ambient sensors, context awareness for improved sensing and episode detection
- Intelligent data fusion and mining for reliable prediction of critical events