Projects for Smart Sensor Network Systems

Luigi La Blunda (M.Sc.)
Frankfurt University of Applied Sciences
Research Group WSN & IoT
Faculty of Computer Science and Engineering
Mail: l.lablunda@fb2.fra-uas.de
Phone: +49 69 1533-3942
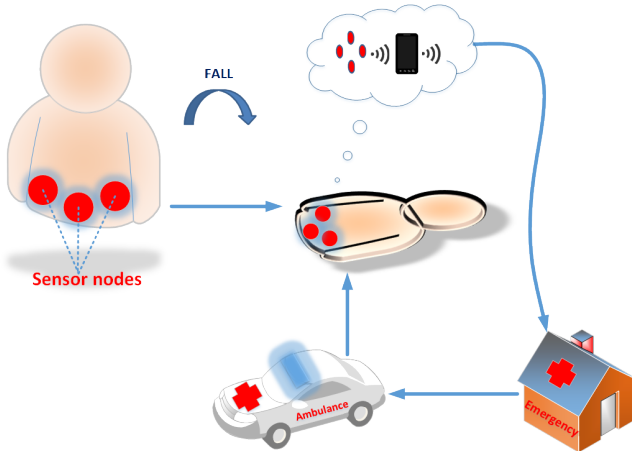http://wsn.fb2.frankfurt-university.de/

Agenda

Introduction

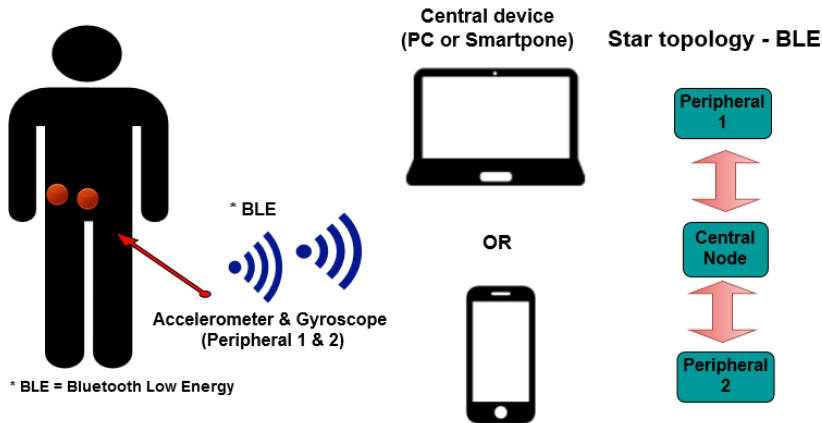Project 1 - Fall-detection based on acceleration & gyroscope data

References

Introduction

- Solution → Monitoring of vital signs & motion parameters via a wearable sensor network called "Body Area Network"

FALL

Sensor nodes

Ambulance

Emergency

Escalation scheme

Project 1 - Fall-detection based on acceleration & gyroscope data

Central device (PC or Smartpone)

Star topology - BLE

* BLE

Accelerometer & Gyroscope (Peripheral 1 & 2)

* BLE = Bluetooth Low Energy

OR

Peripheral 1

Central Node

Peripheral 2

Concept structure of fall-detection

Project 1 - Fall-detection based on acceleration & gyroscope data

The following hardware components are required for the project:

- 2 x TI CC2650 SensorTag (Peripheral 1 & 2)

- Integrated accelerometer & gyroscope (MPU9250) → TI CC2650 SensorTag

- TI Debugger DevPack

- For the central device two possibilites:
    - If PC is used → 1x TI CC2650 Launchpad as dongle
    - If smartphone is used → only smartphone is required

Project 1 - Fall-detection based on acceleration & gyroscope data

- **Task description:**
  - Build up a star topology network based on Bluetooth Low Energy (BLE)

  - Two CC2650 SensorTags are placed on the hip and are acting as peripherals → Sending periodically (millisecond interval) acceleration and gyroscope data to the central device (PC or Smartphone) via BLE

  - An application for the central device (PC / Smartphone) should be developed with the following requirements:
    - Connect simultaneously to multiple peripherals via Bluetooth Low Energy
    - Receive sensor data (accelerometer & gyroscope) in real time
    - Data analysis & data visualization → Fall-detection

References I

📄 L. La Blunda; M. Wagner, *Fall-detection belt based on Body Area Networks*, May 22-24th 2016: ISOB 2016, Leuven- Belgium

📄 L. La Blunda; M. Wagner, *Threshold-based fall-detection in form of a wearable belt*, June 27-29th 2016: 3th Spanish-German Symposium on Applied Computer Science, Cádiz- Spain

📄 Vigilio ,*Vigilio S.A. - Vigilio S.A.Solutions*, Online: http://www.vigilio.fr, Access-Date (12 February 2016)

📄 Q. Li; J.A. Stankovic; M.A. Hanson; A. T. Barth; J. Lach; G. Zhou, *Accurate, Fast Fall Detection Using Gyroscopes and Accelerometer-Derived Posture Information*, 3-5 June 2009: BSN 2009

📄 N. Pannurat; S. Thiemjarus; E. Nantajeewarawat, *Automatic Fall Monitoring*, 18 July 2014: Sensors 2014

📄 A. K. Majumder; I. Zerin; M. Uddin; S. Ahamed; R. Smith, *SmartPrediction: A real-time smartphone-based fall risk prediction and prevention system*, Proceedings of the 2013 Research in Adaptive and Convergent Systems, Pages: 434-439