DEVELOPMENT OF SMART MULTI-SENSOR SOLUTIONS FOR THE ACTIVE AGEING AND WELL BEING

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Academic Year: 2017/2018

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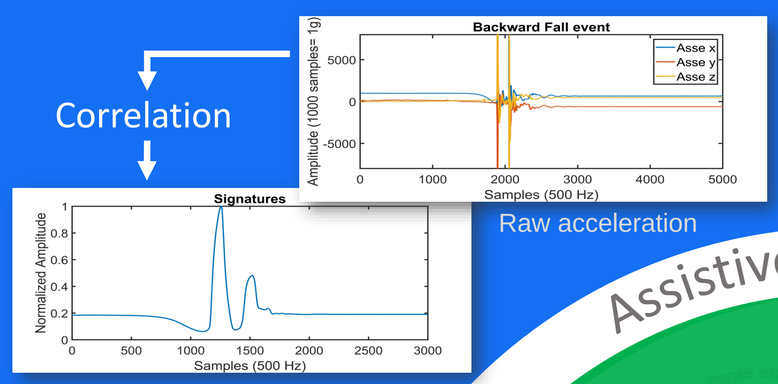
XXXIII Ciclo

Fall Detection and Classification

Falls are the main cause of domestic accidents and the first cause of hospitalization. In 5-10% of elderly patients who fall present fractures, head injuries. In about 1% of patients who fall, a femoral fracture occurs with a 20-30% one-year mortality.
Despite prevention efforts, falls are still likely to occur, and reliable solutions are required to detect and classify falls.

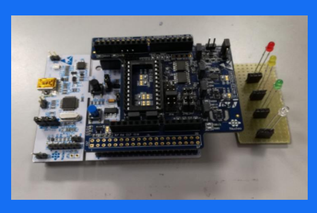
Solution and Methodology:

- Correlation-based classification between signatures and data
- The classification algorithms have been successfully embedded into microcontroller

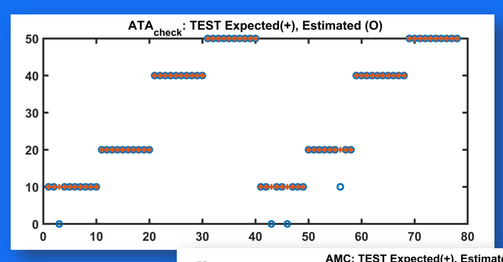


Raw acceleration

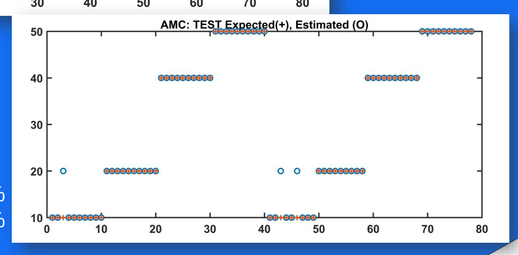
Signatures (FF)



Embedded system



Sensitivity: 93,68%
Specificity: 97,88%



Sensitivity: 97,22%
Specificity: 99,14%

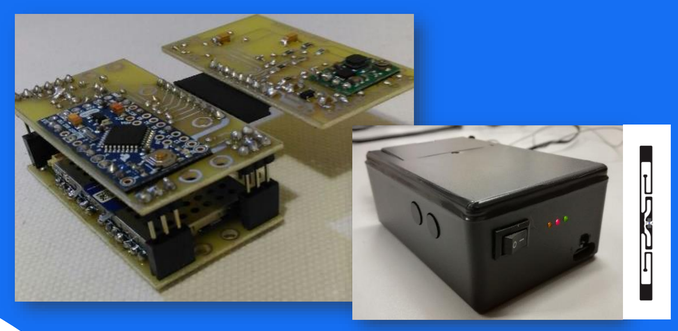
Performance of the classifiers

RFID Based Navigation Aid

People with visual disabilities still may have needs to recognize specific locations while exploring unfamiliar environments. Moreover, they are often challenged by places not designed for their special conditions creating navigation challenges in reaching specific destinations.

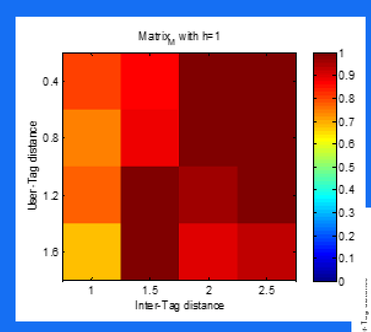
Solution and Methodology:

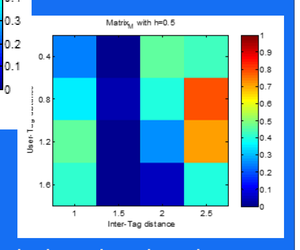
- Development of an orientation system based on RFID technology which may provide help to visually impaired in performing environment exploration and finding specific locations.



Developed device (left). Passive tag (right).

- A multivariate measurement strategy is suggested to fully investigate performances of the system as a function of a set of operating quantities
  - Analysis which aims to assess the system performances in terms of sensitivity and specificity.





Synthetic index showing the overall system performance

Assistive Technology

Goal of the project

The goal of the project is focused on the development of smart multi-sensor solution and advanced paradigms in the framework of Assiste Technology.

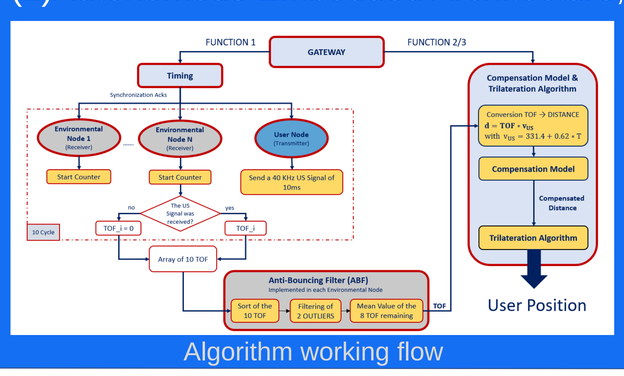
Smart Measurements

Ultrasound Based Localization System

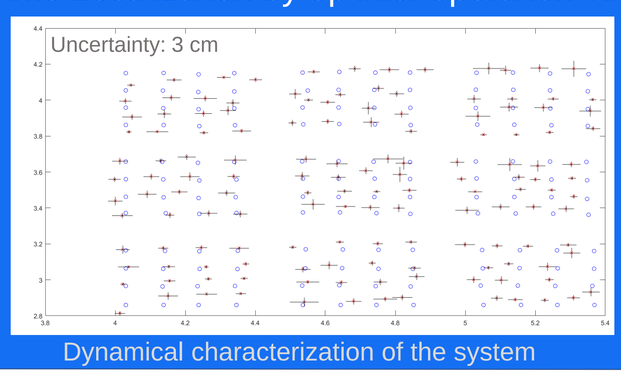
The indoor localization problem, where common satellite-based solution cannot be used, has led the research and the industrial community into the experimentation of always more efficient solutions able to guarantee a good trade-off between accuracy, precision and cost.

Solution and Methodology:

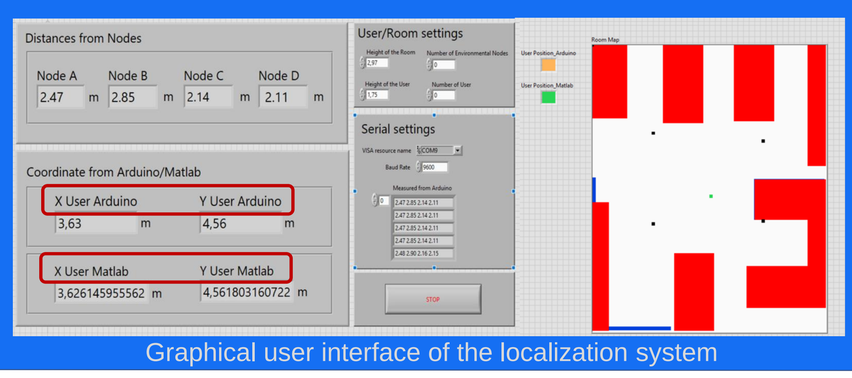
Ultrasound-based localization systems, along with smart trilateration algorithm, offers a good trade-off between cost and accuracy. Using this technology in assistive scenario allow real-time information regarding the presence of obstacle or services. **Advantages** -> (1) Continuous US distance measurement, (2)Autonomous Embedded Architecture, (3) Real-Time Localization by optimal operation Timing.



Algorithm working flow



Dynamical characterization of the system



Graphical user interface of the localization system

Projects where I'm involved in

PROG. N. F/050270/01-03/X32 - SUMMIT - HORIZON 2020 - PON 2014/2020