KAG
Engineering Project II

Tecnológico de Monterrey

Campus Ciudad de México
Escuela de Ingeniería y Ciencias
Departamento de Ingeniería Mecatrónica

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Background

Nowadays, according to a study carried out by Hospital San Angel Inn, 50% of falls are due to a problem derived from walking problems.

The systems that are used to analyze this Problem are very expensive, not available, or is necessary that the patient needs to be in a closed space for the analysis, also, the calibration of these systems are related to an external reference.

Objectives

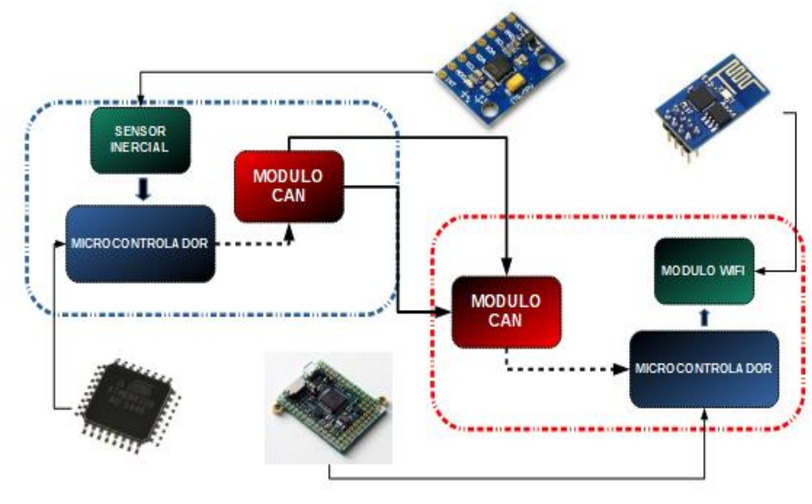
General objective

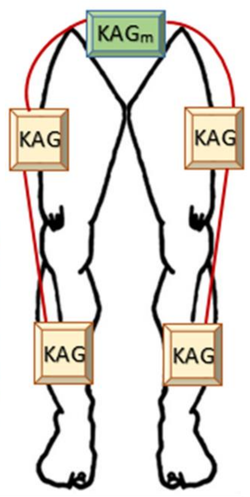
- Design a portable system of acquisition, communication and processing of physiological parameters for the implementation on an exoskeleton.

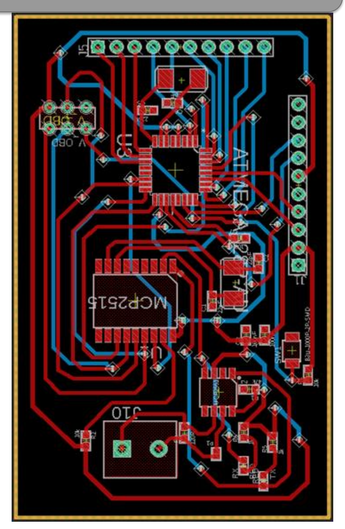
Specific objectives

- Design an electronic system that allows the acquisition of various sensors (inertial sensors).
- Design a general communication network for the acquisition and transmission of data.
- Develop a data reading and processing algorithm for the estimation of the joint range of the knee.

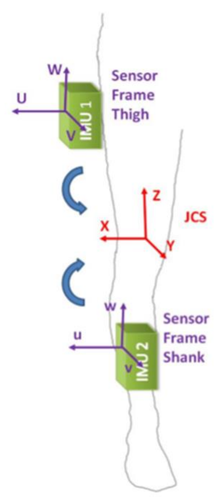
Solution design

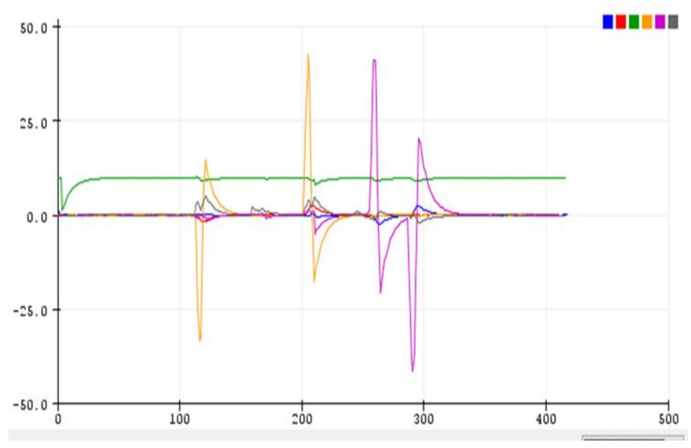




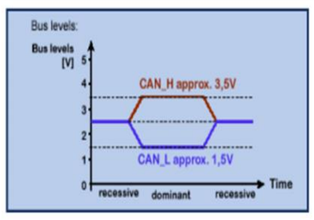


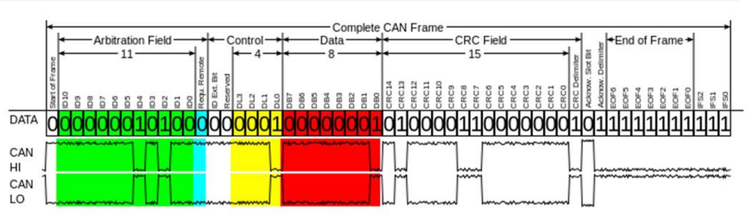
Pre-processing



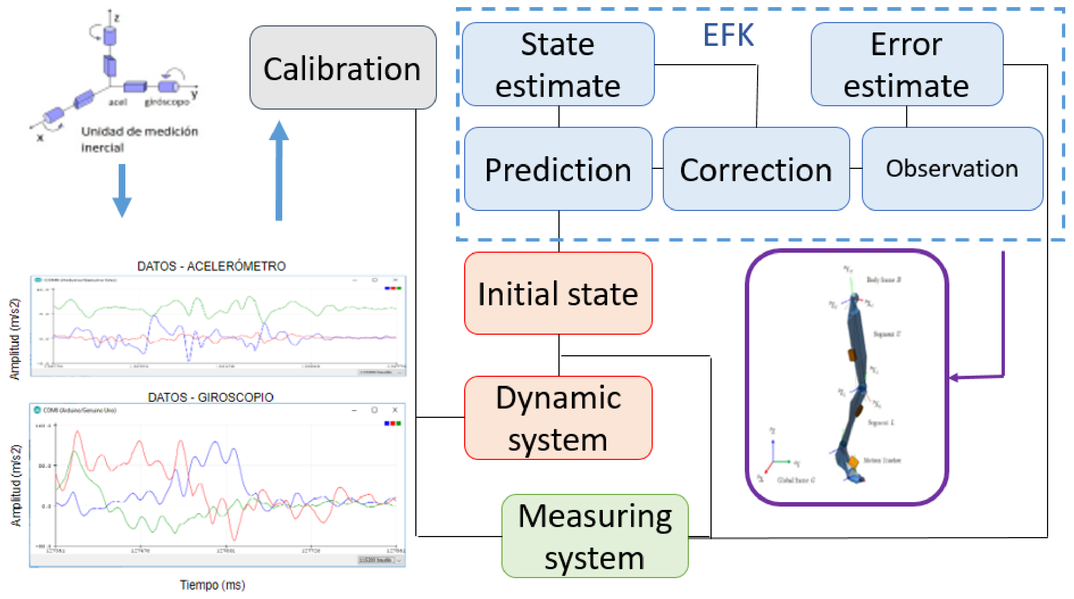


Communication

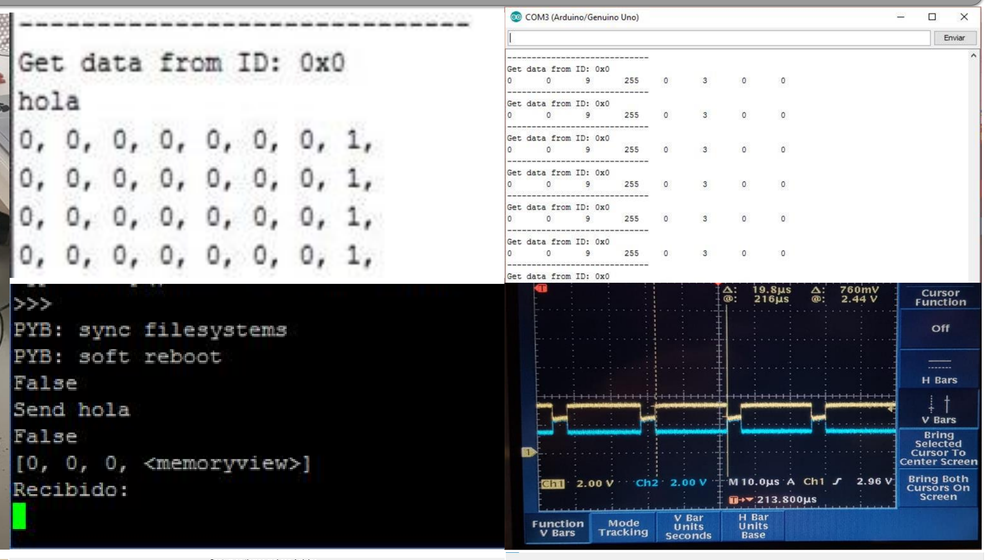


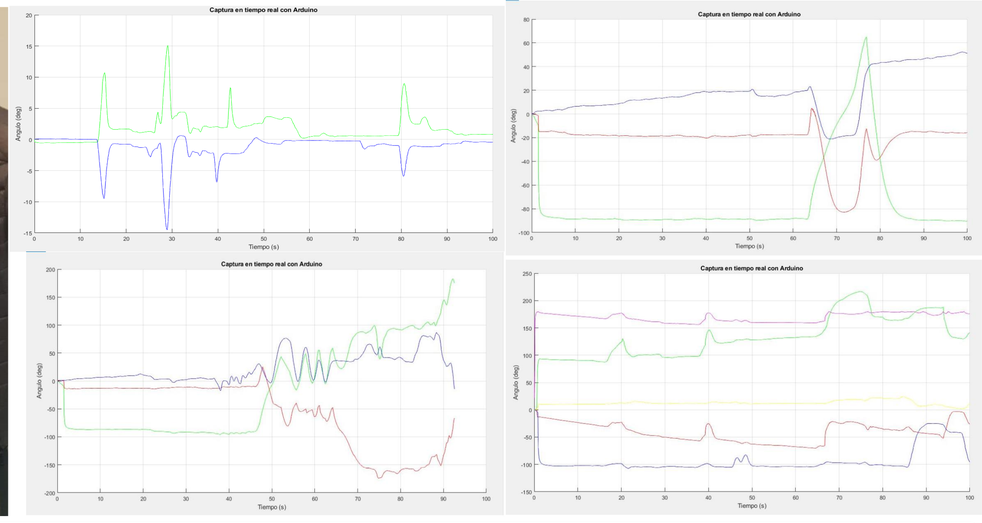


Processing



Results





Future work

- Compare and validate the response of the system propose with a reference system like vicon cameras.
- Optimization of the data processing algorithm in the Pyboard 1.1.
- Wireless transmission of the data processed.

Ethical dilemmas

- The long processing time can generate wrong results in the estimation of the parameters of knee joint range measurement.

Conclusions

- An electronic system was designed and built successfully, that allows the acquisition and communication of data from various sensors.
- An algorithm was developed successfully, that allows the acquisition, communication and processing of data from inertial sensors, giving as a result the knee angle.
- Tests were carried out implementing the Kalman algorithm on the acquired data of inertial sensors.
- The system designed was **96.14% cheaper** than the current ones in the market.