Grupo de Aplicaciones de Procesamiento de Señales

cujae

Scientific Conference of Students and Young Scientists of Petrozavodsk State University

Talk

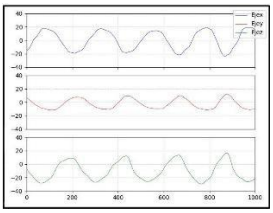
Inertial sensor-based wearable device (wireless sensor network node)

Author: Samuel Casanova Calzadilla

Status: Postgraduate student

Extended Abstract:

- This work is part of an ongoing project addressing the development of a system for daily-life movement and physical activity monitoring. It can be a useful measuring platform for **monitoring diseases caused by aging, for detecting falls or assessing fall risk, for monitoring neurodegenerative disorders, etc.**
- A wireless sensor network based on Bluetooth Low Energy for real-time acquisition, processing, and analysis of data coming from Inertial Measurement Units was designed and built.
- The network system comprises nodes based on the ESP32 microcontroller and inertial sensors (accelerometer, gyroscope, and magnetometer).
- The device is able to transmit data to a computer (as part of a network driven by a computer) or to store data in a SD memory (independent mode).



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Talk

IMU's-Up: Software manager of a wireless sensor network

Author: Mario Bernal Pérez

Status: Postgraduate student

Extended Abstract:

- This work is part of an ongoing project addressing the development of a system for daily-life movement and physical activity monitoring. It can be a useful measuring platform for **monitoring diseases caused by aging, for detecting falls or assessing fall risk, for monitoring neurodegenerative disorders, etc.**
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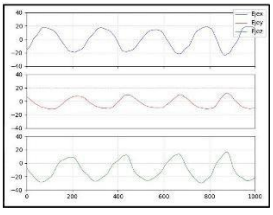
- The network system comprises nodes based on the ESP32 microcontroller and inertial sensors (accelerometer, gyroscope, and magnetometer).
- A software for the network configuration and control, as well as data analysis, was developed.



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78 МЕЖДУНАРОДНАЯ НАУЧНАЯ КОНФЕРЕНЦИЯ

Talk

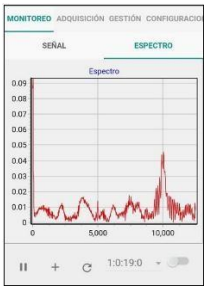
Data-logger (portable equipment) for vibration analysis

Author: Osniel Alejandro García Orihuela

Status: Postgraduate student

Extended Abstract:

- This work is part of an ongoing project addressing the development of a vibration-based machine condition monitoring system. Applications: **condition monitoring and fault detection of rotating machines, electric machine diagnosis, etc.**
- An electronic device for gathering and processing the vibration signal measured by a piezoelectric accelerometer was designed and built.
- The device consists in a module that acts as an interface between the sensor and a mobile phone.
- The signal digitization and storage process is controlled by a software (*apk*) in the mobile phone.



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78 МЕЖДУНАРОДНАЯ НАУЧНАЯ КОНФЕРЕНЦИЯ

Talk

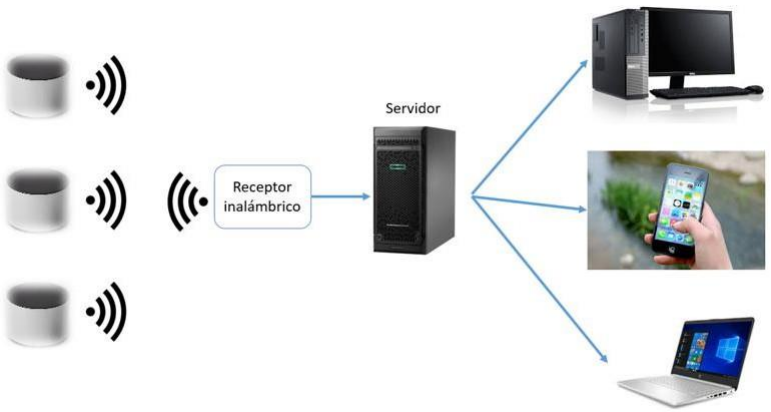
Wireless accelerometer network for machine condition monitoring

Author: Juan Antonio Delís García

Status: Postgraduate student

Extended Abstract:

- This work is part of an ongoing project addressing the development of a vibration-based machine condition monitoring system. Applications: **condition monitoring and fault detection of rotating machines, electric machine diagnosis, etc.**
- This project is focused to develop a wireless accelerometer (MEMS technology) network for machine condition monitoring (*work in progress*).
- Advances on the sensor nodes design and the network communications architecture can be presented.



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Talk

Artificial Intelligence-based modeling for monitoring physical frailty in elderly people using inertial sensor-based wearable devices

Author: Elías Osmany García Alvaredo

Status: Postgraduate student

Extended Abstract:

- This work is part of an ongoing project addressing the **monitoring of physical frailty and cognitive decline in elderly people** using inertial sensor-based wearable devices.
- Purpose: To develop and validate an Artificial Intelligence-based model that relates different degrees of physical frailty with parameters of their physical performance assessed by means of inertial sensor-based wearable devices (*work in progress*).
- Advances on research design can be presented.

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Talk

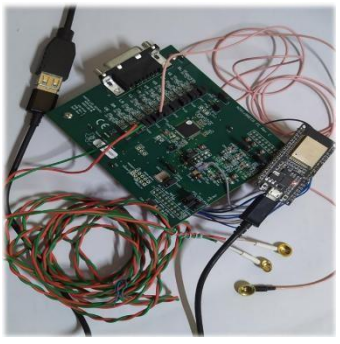
Development of a sEMG probes-based node

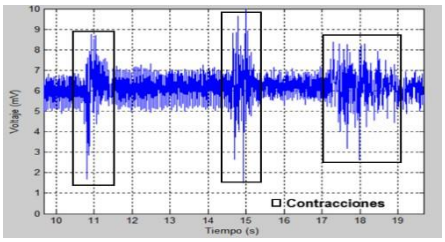
Author: Lisandra Pérez Roche

Status: Postgraduate student

Extended Abstract:

- This work is part of an ongoing project addressing the **monitoring of neurodegenerative disorders, in particular, Amyotrophic Lateral Sclerosis,** by using a wireless sensor network based on inertial sensors and probes of sEMG.
- Purpose: To develop and validate a sEMG probe-based node to be integrated to a wireless inertial sensor-based network (*work in progress*). This will lead to the integration of muscle activity and locomotion information, which can be useful for monitoring neurodegenerative disorders.
- A basic level of the system, comprising developing kits of the major electronic components, has been designed built.





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Talk

Wireless vibration sensor WVS-2: overview and evaluation experiments

Author: Olga Dyachenko

Status: Bachelor student

Extended Abstract:

The WVS-2 wireless vibration sensor is based on ESP32-pico-D4 microcontroller and IIS3DWB MEMS accelerometer. The sampling frequency is 26667 Hz, and the recording frequency band is 2 Hz - 6.3 kHz (along three axes). Up to four temperature sensors can also be connected to the sensor via a 1-wire interface. The primary interface for data output and parameter configuration is Modbus TCP (over WiFi).

The sensor can output the following data types:
a) continuous vibration acceleration data at a sampling frequency of 52 Hz.
b) statistical parameters of the vibration acceleration signal (update period 300 ms).
c) parameters calculated from signal spectra (update period 1.8 s).
d) a 10-second fragment of the original vibration acceleration signal (13333 Hz) recorded along the selected axis at the user's command.
d) states generated by the relay's built-in software modules.

The sensor is configured using a web interface, which is available for 5 minutes after rebooting.