Instrumented vest for postural reeducation

Master in electronic and computer engineering

1ST SYMPOSIUM OF APPLIED RESEARCH

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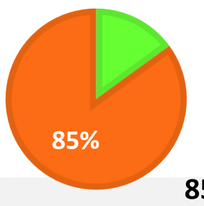
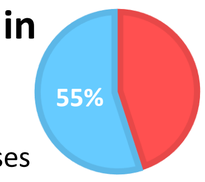
BACKGROUND

The spine is one of the elements of the human body that suffers more injuries and irreparable damage. According to the World Health Organization, 85% of the world population suffers from back pain, pain that accounts for over 50% of physical incapacity, permanent or temporary, among individuals in working-age. The majority of this damage is caused by an incorrect posture which causes changes in the structure of the spine.



85 % World Population suffers from back pain

Causes of disability in the working age



55% Caused by spine diseases

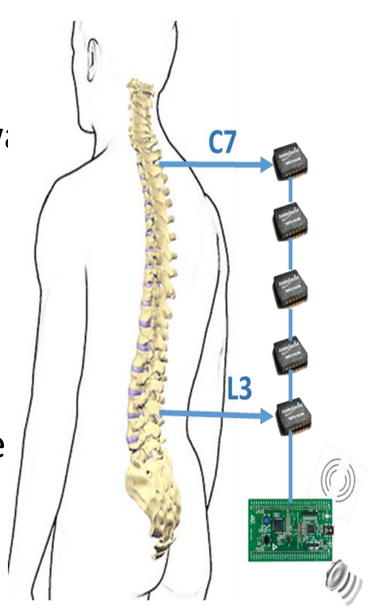
OBJECTIVES

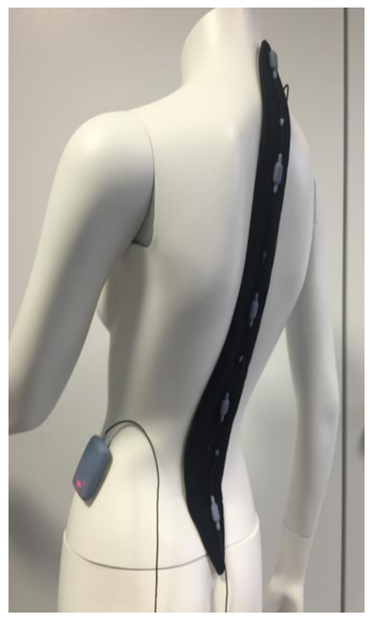
In this sense, the existence of a device capable of evaluating body posture in real time and of simultaneously warning the user of incorrect postures is very important to prevent issues of this sort.

METHODOLOGY

The proposed system consists of an instrumented “vest” for postural reeducation able to provide the user with information regarding posture. The device has a set of IMU sensors strategically placed for better characterization of spine profiles. The sensory is classified by a central processing unit. In this unit, amongst other features, is implemented a classifier whose data wa obtained in another master’s thesis which was developed in parallel with this one. In case of incorrect posture, users will be alerted by an audio signal and vibration.

The wearable system works in stand-alone mode, in other words, it doesn’t need any type of application or external component. However, an API was developed to allow the use of the device for other purposes. In order to demonstrate the API applicability two applications were developed, one for Windows desktop and the other for Android mobile devices. These applications monitor spine in real time, notify the user of incorrect postures and more.

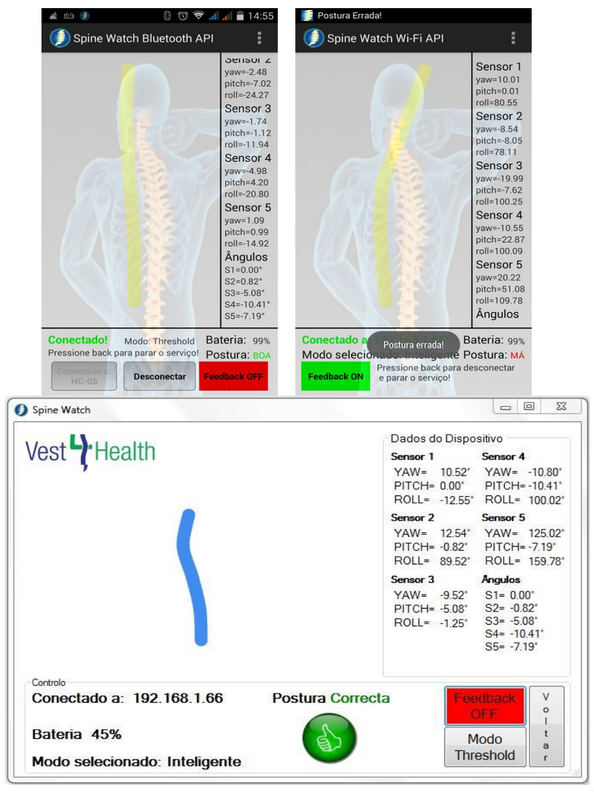




RESULTS AND CONCLUSIONS

The prototype and applications have been tested in class context by 10 individuals at two different moments/days, first without any kind of feedback and then with active feedback. The tests were carried out to demonstrate the usability, the reliability and to debugging any existing errors. The test showed that the system has a high level of reliability in classifying posture and promoting postural reeducation.

All of the subjects present a percentage decrease in the time spent with incorrect posture in the second day of testing when the feedback systems were turned on. In some cases the percentage reached values close to 80%.



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