GAIT AND POSTURE ANALYSIS IN ELDERLY PEOPLE USING WIRELESS INERTIAL SENSOR.

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INTRODUCTION

One of the consequences of chronic diseases (e.g. Parkinson´s disease, congestive heart failure) in elderly people is the limitation of their motion capacity and a straightforward lack of physical activity. This lost of autonomy has a direct impact on the quality of life of the elders and their caregivers. [1]

By analyzing gait and postures, medical treatments would count with valuable additional information, allowing a better diagnose and treatment assessment. Current instruments to supervise patient's function or mobility are based on the subjective perceptions of the observer. Nowadays, there exist a growing research interest around this issue, and then, motion capture methods and technology have been already developed [2]. The acceleration-based activity monitoring techniques has gain terrain as the right direction to cover these needs, thanks to its compactness and feasible signal treatment.

METHODS

We constructed a wearable electronic device, the sensor-module, able to measure inertial properties of motion: it captures the acceleration produced on its own spatial frame $G = [g_x, g_y, g_z]$, and the angle of rotation of the sagittal plane (frontal rotation). By locating the module in the middle of the subject's thorax, an asserted relation with his/her activity is obtained.

An experiment was prepared and run in order to generate a database of signals intended to establish the type of algorithm to be used as classifier/detector of activities states. The experiments were first run in young and healthy subjects, gathering experience on the handling of the device; afterwards, it was replicated in elderly subjects (+75 years old with no mental or gait impairment). Figure 1 depicts the type of signals extracted during experimentation.

The extracted information was then processed and used in the generation of a decision algorithm supported on regression trees theory [3]. The trees are feed with temporal windows of the signals, specifically with statistical properties of it (e.g. mean, standard deviation, max, min, etc). The regression is accomplished by means of a supervised process that correlates these input properties with previously labelled outputs, i.e., the corresponding physical activities.

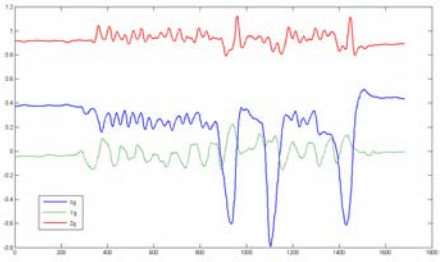

Fig.1 Captured Acceleration Signals to detect elderly people's activity.

RESULTS AND DISCUSSION.

Relaying in the constructed database, two strategies were envisioned by obtaining both, a user-dependent general classification tree for daily physical activity detection and a general gait analyzer to extract spatio-temporal features of the subject's gait.

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