



## UPPER LIMB REHABILITATION SYSTEM THROUGH sEMG

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### Abstract

**Introduction.** Globally, in 2013, there were 6.5 million deaths due to a stroke, making this disease a second leading cause of death after ischemic heart disease. About 5 million patients remain with varying degrees of permanent disability, 26% of attack survivors need daily care, 30% walk assistance and 26% in need of long-term care. Help to carry out certain daily activities becomes the main need for 30% of stroke survivors. Hemiparesis is the most common consequence, observed in about 60% of cases. In rehabilitating upper limb functions, multiple techniques have been used to improve performance following a stroke, by strengthening the affected limb and using the assistive device.

**Material and method.** The proposed system is a non-expansive robotic type, following the basic anatomical and physiological characteristics. The basic components of the system are the Arduino type control unit, which takes the signal from the EMG module, an accelerometer and the 5 force sensors located on the robotic arm to analyze the degree of force it will have when it catches an item. As a higher force is applied to the sensor, its electrical resistance increases. These values from the sensors and the EMG module will return a set of values, these being read by the control unit that controls the control part of the servo-motors that determines the movements of the affected hand fingers. Through a continuous exercise it is observed if the patient manages to regain some of the mobility of the limb. (Fig.1).

**Results and discussions.** After comparing and processing the data, the results indicated that the device has an important role in recovering people with motor dysfunction of the upper limb because it can take over a number of activities that the patient currently performs. Through the EMG mode, it will be possible to analyze the electrical activity of the arm muscle in order to subsequently operate the servo-motors.

**Conclusions.** The prototype is a complex system that uses a robotic system controlled by means of controlled servo-motors and sensors, recommended for patients who have suffered a stroke and who need rehabilitation. Uses a control architecture for dexterity, gripping and handling of various objects made by hand.

**Key words:** *hand rehabilitation, pressure sensors, EMG, microcontroller*

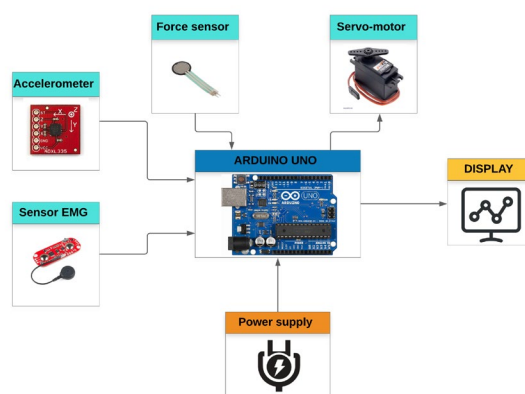


Fig. 1 Device block diagram