



WEB OF SCIENCE

## DEVELOPMENT A SYSTEM FOR JOINT REHABILITATION AND ESTIMATION OF BODY SEGMENT PARAMETERS

CORCIOVĂ Călin<sup>1</sup>, ONU Ilie<sup>1</sup>, LUCA Cătălina<sup>1</sup>, FUIOR Robert<sup>1</sup>

Editor: Constantin MUNTEANU, E-mail: [office@bioclima.ro](mailto:office@bioclima.ro)



Balneo and PRM Research Journal

DOI: <http://dx.doi.org/10.12680/balneo.2021.452>

Vol.12, No.3 September 2021

p: L80

Corresponding author: CORCIOVĂ Călin, E-mail: [calin.corciova@bioinginerie.ro](mailto:calin.corciova@bioinginerie.ro)

1. Faculty of Medical Bioengineering, University of Medicine and Pharmacy “Grigore T. Popa” Iasi, Romania

### Abstract

**Introduction.** Rehabilitation activities should be continuously monitored for analysis by medical staff and provide sufficient information to detect certain deficiencies in the recovery program. Currently there are many researches about home rehabilitation, recovery procedures and techniques for upper limb, but there are still some disadvantages. For example, the current rehabilitation requires complicated devices, requires supervision by qualified therapists, with high costs. Moreover, the data on these devices takes a long time to be sent to doctors for monitoring. The proposed system is designed taking into account the three main stages which are data acquisition, data processing, respectively data recording.

**Materials and methods.** The concept of this project is to design and develop a device that can monitor arm-hand rehabilitation process. This device was designed to be used for patients after stroke or injury related to and monitors arms progress. The data acquisition was by three types of sensors; flex sensor, FSR sensor, and accelerometer. After that data processing was applied using an Arduino Mega microcontroller and ESP Wi-Fi shield. Lastly, the data was logged into PC and being shown online in real-time and stored for further monitoring in an IoT web-based system to allow therapists to diagnose patients any time anywhere.

**Results and discussions.** In this study, the results are organized in three experiments for flex sensor, FSR sensors, and accelerometer. The digital reading values determined at certain angles of the flex sensor that was stuck into the anterior elbow-guard part to indicate arm bending movements. In these experiments, the patient involved in the specific exercise which was stretching and bending his arm four times.

**Conclusion.** This project has advantages which are portable, user-friendly, low power consumption and low cost. Furthermore, this is a robust system for arm rehabilitation that can store data of patients online for future analysis.