ABSTRACT

Post-stroke patients who experience disturbances in motor function can inhibit their daily activities. Range of Motion (ROM) exercises can help the healing process. The purpose of this study was to design an upper limb exoskeleton for patients to be able to carry out independent rehabilitation so they become confident in accordance with the standard Range of Motion (ROM) and monitor the progress of the patient's exercise remotely. The advantages of this proposed method include that it does not require a lot of cables, wireless communication, and the motor used is capable of lifting heavy loads. The developmental exoskeleton arm consists of an aluminum mechanical arm, high torque motor, ESP32, and a GY-521 sensor. The data collection method is by repeating the flexion-extension movement 10 times whose movement speed is adjusted to the pendulum movement on the metronome application whose value is 20 bpm. The data on the ESP32 master read by GY-521 sensor will be sent via bluetooth. Furthermore, the ESP32 slave will manage the received data and drive the mechanical arm motor. The data is taken using the tera term application. The highest RMSE value is 11.26^{o} and the lowest is 5.91^{o}. The results showed that the average RMSE value is 7,83^{0}. The average of gyroscope STD value is less than 1 and error value of three samples baud rate is 0%. The results of this study can be implemented for the rehabilitation of patients for the upper arm with a design that does not require cables and uses wireless communication.

Keywords: Upper Limb Exoskeleton, Range Of Motion, ESP32, Sensor GY-521, Flexion - Extension