

# DESIGN OF ARTIFICIAL INTELLIGENCE BASED ELECTROMYOGRAPHY (EMG) SIGNAL DETECTION SYSTEM AS A MEANS OF AID IN THE REHABILITATION PROCESS OF STROKE PATIENTS' HAND MOVEMENTS

by Anggun Winursito, Fatchul Arifin, Muslikhin

## ABSTRACT

Stroke disease has become a scourge for the people of Indonesia. Persons with stroke disabilities who avoid death, of course, have quite a tough task afterward. People with disabilities must struggle to recover to their previous state. Rehabilitation or healing processes are repetitive and quite difficult, making sufferers need assistive devices so that they can be done flexibly anytime and anywhere. Many methods have been developed to help the rehabilitation process of stroke patients, ranging from the use of drugs to physiotherapy processes. The rehabilitation process cannot be carried out quickly and forcefully. Another crucial problem in the rehabilitation process that cannot be ignored is the mental psychology of post-stroke sufferers. Based on this problem, the Biomedical, Electronics, and Artificial Intelligence system (BEAIS) research team is trying to design a system for detecting the progress of the rehabilitation process of stroke patients based on Electromyograph (EMG) signals. The system to be built uses Artificial Intelligence (AI) technology which is able to detect the development of stroke patient's muscle movements during the rehabilitation process. An electromyogram is a technique for evaluating and recording the activity of contracting and relaxing the muscles of the arms/legs. The aim of this year's research is to design a rehabilitation monitoring system that is focused on stroke patients for the forearm, so that later the detection system will be used to observe the strength of the patient's finger and arm muscle movements.

The stages of the research were carried out starting from preparation, needs analysis, software and hardware design, development, testing and evaluation. The development of the algorithm is focused on increasing the accuracy of the muscle movement recognition system, which is the main problem for EMG signal researchers. The detection system will be developed based on the previous researcher's development method based on the Neural Network algorithm. The development algorithm was then tested using the cross validation method with the dataset obtained from Kaggle. Hardware will also be designed based on the internet of things as a sender of EMG signal data to a database which can later be monitored anytime and anywhere. The results showed that the development of a detection system algorithm was successfully carried out by designing a system that is resistant to noise. The denoising algorithm using the wavelet transform has been successfully implemented in the detection system. The process of denoising EMG signals using the Wavelet algorithm in general can improve the accuracy of detecting EMG signals that contain noise. The most significant increase in accuracy is seen at low SNR values. The Daubechies 4 (db4) denoising algorithm is the algorithm with the best performance that can handle noise at SNR 2, 3, 5, 8 & 10.

Kata Kunci: *EMG Signals, Stroke, Rehabilitation, Detection*