ABSTRACT

The nervous system is a vital system in the body. The information which is received by the sensory nervous system will be integrated to the brain which is then transmitted to the motoric nervous system to control the body movement. There are many diseases attack this motoric nervous system. As a result, patients will suffer the paralysis on one or more parts of their body. To help the mobility, patients require an assistive tool. The tool that is mostly used is a wheelchair. For the patients who also have paralysis on their hand, the conventional wheelchairs no longer help. There are many methods to solve this problem such as the use of voice, eyes muscle signal, cornea detection, and other ways to control the wheelchair movement. Now, many researchers develop the bioimpedance measurement system. This bioimpedance signal will change which depends on the motion of the body. Because of that phenomenon, the potential use of this bioimpedance signal for control signal is so big. Therefore, this final project will design the new method to control the electric wheelchair movement with bioimpedance signal.

To measure the bioimpedance, a sinusoidal current source 0.5mA_{rms} with 50kHz frequency is injected to the body (back). The voltage change is detected and processed in order to obtain the output voltage range about 0 to 5 Volt. With thresholding method, this voltage is classified as some control signal for wheelchair movement. In order to keep the stability of the movement, the PID control will be applied. The parameters existed in the PID controller are set in such a way to obtain the fastest response without oscillation. Then, motion planning will be applied to these controllers to reduce the shock effect when the motor works. The measurement results that the bioimpedance changes on trapezius muscle about 4.352\Omega, the initial impedance is 188.735\Omega, and impedance of the muscle contraction is 184.383\Omega. From all of the device test result, this final project successfully designs the control system of wheelchair based on bioimpedance with 16 times succeed from 20 times of test.

Keywords: electric wheelchair, bioimpedance, PID control