

TRIGGERING A PERONEAL NERVE FOR FOOT DROP PATIENT BASED ON EYE BLINK DETECTION

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Abstract: Foot drop is a gait abnormality which may arise due to peroneal mononeuropathy. Eye blink signal is a result of the contraction of set of muscles. This eye blink signal may be used to restore mobility and freedom in a non-invasive way for the foot drop patient. The present study deals with the implement of low cost, portable and I Blink Controlled Prosthesis for foot drop correction. The eye blink signal was used to generate a directional trigger as a muscle stimulator. The developed muscle stimulator was used to electrically stimulate the peroneal nerve in the affected leg to provide dorsiflexion of the foot for correcting the foot drop in the patients during the swing phase.

Key words: foot drop, eye blink signal, muscle stimulator

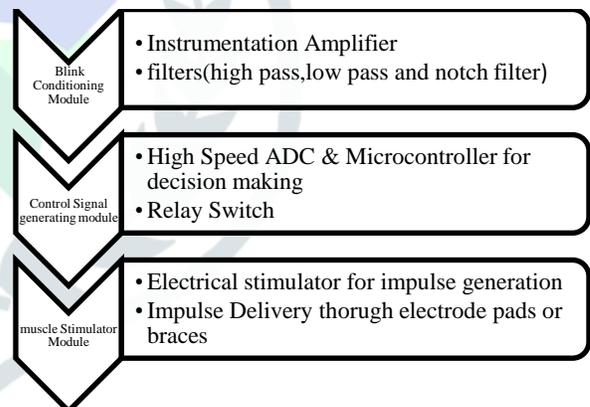
AIM: - Develop a muscle stimulator using eye blink for foot drop correction based on eye blink detection. Develop a muscle stimulator using eye blink for foot drop correction to triggering peroneal nerve based on eye blink detection

Introduction: Foot drop is an inability to lift the front part of the foot it is not a disease. Foot drop or drop foot is an inability to lift the front part of the foot. It happens due to weakness, damage to the common tibular nerve and including the sciatic nerve or paralysis of the muscles in the anterior portion of the lower leg. Foot drop is not a disease.[2] It is characterized by inability or impaired ability to raise the toes or raise the foot from the ankle. Foot drop is a temporary or permanent it's depending on the extent of muscle weakness or paralysis and it can occur in one or both feet. This condition may be corrected by the

using of ankle foot orthosis. The orthosis is a plastic support which is an insert in the shoe that hold the foot at go. It stabilizes the ankle in stance and helps clear toes in sailing. But it lacks control. Therefore muscle stimulator has been used widely to restore motor function in individual suffering from FD. Eye is a very sensitive part of the human body. It is used to direct trigger like peroneal nerve through the eye blink signal.

Methodology:

This proposed device consist of three major parts: 1) Eye blink conditioning module, 2) control signal generating module, and 3) muscle stimulator module



1) Eye blink conditioning module

Eye blink is the contraction of set of muscles. The contraction of muscle during eye blink is recorded using a bio potential amplifier. The duration of the eye blink usually lasts for a fraction of a second [8] A bio potential amplifier was designed. The bio potential amplifier consisted 1) preamplifier 2) band-pass filter and 3) notch filter. The preamplifier was designed using an AD-620 instrumentation amplifier.[8] The gain of the 1st stage and 2nd stage

amplifications of the preamplifier was 90 and 12, respectively. The acquired EMG signals suggested that the strength of the signal was highest when the electrodes were placed vertically. [8] Hence, the measuring electrodes were placed above (~1cm) and below (~2cm) the right orbit. The reference electrode was placed on the forehead of the volunteer.

Block diagram

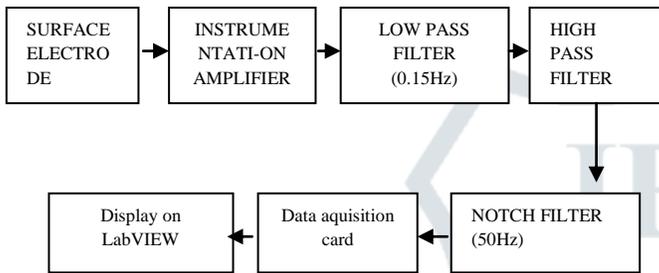


Figure: Blockdiagram of eye blink conditioning module

2) Control Signal Generating Module

This module consisted of an 8-bit ADC LCD interfacing with microcontroller was used for decision making and relay switch. [7] A comparison of the input voltage against a stable reference voltage (V_{ref}) was carried out in the microcontroller (AT89S52).When a person makes a forceful blink and the value goes beyond the set reference, the microcontroller transmits a controlling pulse to activate the relay.[7] All the monitoring and stimulator activation may be confirmed through LCD display connected with the microcontroller.[7]

3) Electrical stimulator Module

A forceful voluntary blink activated the relay which sent a controlling trigger to 555IC. In monostablemode, 555IC generated a “one-shot” pulse. This in turn, triggered the base of a dual stage CMOS thereby allowing the flow of current. [7]

The strength of the generated current may be tailored by modulating the output of the 555IC.[7] This change in the current induces a voltage in the primary coil of the step-up transformer, which in turn, resulted in the generation of an induced current in secondary coil of the transformer.[7] The output of the transformer serves as the DC pulse required for the electrical stimulation of the peroneal nerve. Stainless Steel electrodes were placed over the skin such that the peroneal nerve was below the electrode.[7]The second electrode was placed 10cm below the first electrode. The neurostimulator delivered 16 to 80 mA current for period of ~250 ms

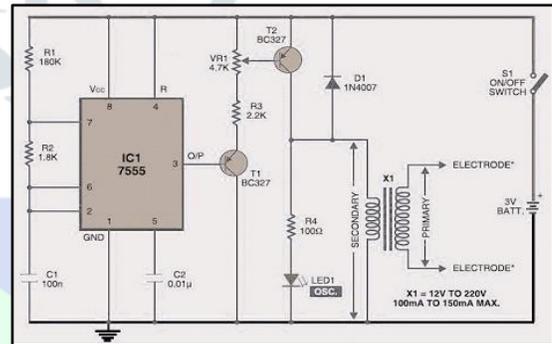
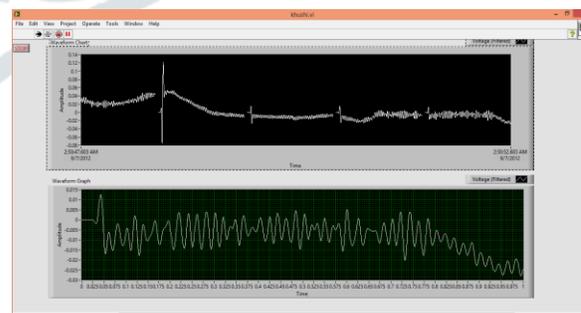
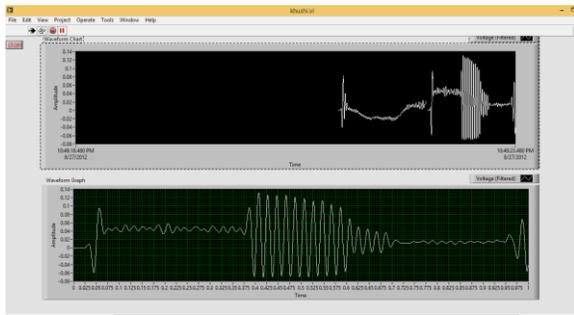


Figure: circuit diagram of muscle stimulator Output

Signals of continues eye blink

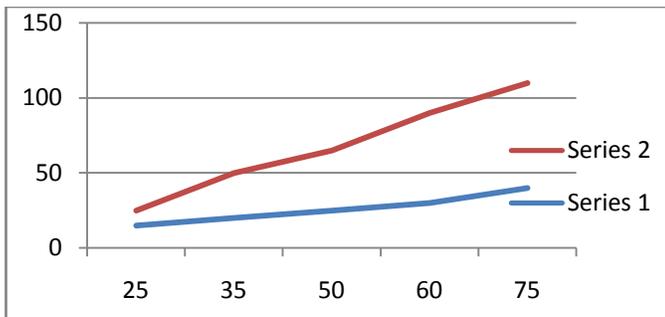


Signal of one time forcefully eye blink



peroneal nerve. This is used for foot drop patient to recover their gait cycle.

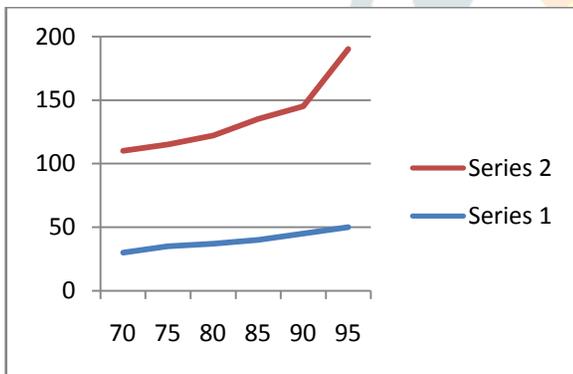
For foot drop patient



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I would like to express my special thanks of gratitude to my teacher as well as our principal who gave me the golden opportunity to do this wonderful project on the topic Triggering a peroneal nerve for foot drop patient based on eye blink detection which also helped me in doing a lot of Research and i came to know about so many new things I am really thankful to them. Secondly i would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.

Paralysis patient



This two graph shows the foot drop condition is recovered by the triggering the peroneal nerve. Current value is depending on damage of muscles. And time duration of patient’s recovery is depending on individual’s savarity.

Conclusion

From the above work we can conclude that we get eye blink signal for real time acquisition and also make the muscle stimulator for triggering a

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