ACTIVATION OF NON-RESPONSIVE MUSCLE USING AUTOMATIC STIMULATOR

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Abstract— **Muscle activity dysfunction is an important systemic problem and natural cause of the disease. It is a form of impairment which encompasses reductions in strength and endurance, as well as an increased fatigability. Considering this complexity, no single test could be used to measure and monitor all aspects of the impaired muscle function .The aim of the current review is to highlight current and new perspectives relevant to muscle function measurements within the paralysed population in order to provide guidance for researchers as well as for clinicians. Furthermore, even though muscle strength measurements are important, current evidence suggests that other aspects, such as the endurance and power capacity of the muscle, should also be considered. Moreover, although static (isometric) measurements have been favored, dynamic measurements of paralyzed muscle function should not be neglected as they, in a larger extent than static measurements, are related to tasks of daily living. Activation of muscle using automatic stimulator has already been used in many aspects of rehabilitation medicine as a treatment method. According to the automatic electrical stimulation, we present an electrical muscle simulator which can adjust the amplitude, frequency and wave of electrical impulses to make the function treatment effectively.**

Index Terms—**Muscle Stimulator, Electromyography, Arduino, Paralyzed Muscle, Electrode.**

I. INTRODUCTION

The activation of muscle using automatic stimulator analysis using a non invasive method is a broadly applied approach in paralyzed muscle measurements in human body. The surface electrodes which connected on the surface of the muscle acquire the information about the muscle activity. Then muscle activity read by virtual reality computer and give the data about the activity of muscle. According to the muscle activity automatic stimulator which starts the stimulation which passes to the muscle through electrodes. After studying the activity of muscle and applying the external stimulations on the the surface of the skin is a passive method of electrical response of skin.Electrical stimulation for tissue repair helps reduce swelling, increase circulation, and speed up wound healing. electrical stimulation involves a unit on the body to provide long-term muscle stimulation aimed at preserving function and motor skills Using and surface electrode, automatic stimulator and

microcontroller connected with virtual reality computer to diagnose the paralysed muscle and strokes. Automatic stimulator which stimulates volunteerly after the automatic study of muscle activity through the microcontroller. The microcontroller consist of a data about muscle activity from the lowest level to the peak level, according to the levels of muscle activity the microcontroller adjust itself and stimulates accordingly.

II Stimulator

Electrical stimulation of muscles and nerves to improve recovery of function is used in the following conditions:

(1) after injury to the joints or muscles. It appears that in these cases electrical stimulation can restore motor functions more quickly and more completely then in the absence of this intervention or following voluntary exercise.

(2) Following damage to the central or peripheral nervous system or during muscle diseases; motor functions can be improved by electrical stimulation of muscles or nerves. Electrical stimulation has been most widely used after spinal cord injury. Moreover, particularly designed methods of stimulation of muscles of spinal cord injury patients are able to initiate and control the lost movements. In patients with stroke and head injuries electrical stimulation can also help to restore function.

(3) The consequences of inactivity as a result of long lasting bed rest are also successfully counteracted by electrical stimulation of muscles. Moreover, lack of gravity, such as during space flight, leads to changes of the neuromuscular system that resemble those during bed rest, and these too can be successfully treated by electrical stimulation.

Introduction

Most studies indicate that it is more effective in preventing muscle atrophy when compared to no exercise, isometric exercise of the quadriceps muscle group, isometric co-contractions of both hamstrings and quadriceps groups and combined isometric exercise. In these studies electrical stimulation was carried out using percutaneous stimulation and no invasive methods were necessary. Knee injuries affect 80% of sports people, particularly those engaged in rugby or football and it follows that even in cases where surgery is not necessary, a period of enforced rest will quickly lead to muscle deterioration. A programme of rehabilitation using NMES to strengthen the quadriceps can vastly accelerate the rate of recovery of the leg and its use. Summarises results obtained by various types of stimulation on recovering of function after knee injury.

Inactivity of other joints of both upper and lower limbs are likely to have similar effects on the muscles involved in movement of these joints as that described for quadriceps, i.e. they become atrophic, produce less force and are fatigable. Their recovery is likely to be more complete and faster if electrical stimulation is used both during and after immobilisation.

When specific parts of the body need to be immobilised for long periods of time in a cast or brace due to a fracture of bone, tears of ligaments or tendons, in order to allow healing of the damaged area to take place, stimulation of the muscles by placing self-adhesive electrodes under the cast or brace or into the opening of the cast will prevent development of the detrimental changes and help to follow a more intensive rehabilitation regime later on.

Unfortunately, these approaches and avenues of treatment are not sufficiently explored and not used frequently enough in spite of the fact that recent knowledge about the ability of muscle to respond to electrical stimulation.

Electrode Pads

The figures that follow will indicate suggested placement layouts of electrodes. Commercially available electrodes come in a variety of shapes and materials. Re-useable electrodes are normally carbon graphite. They need to be thoroughly immersed in water so that there is adequate conductivity in order for the impulses to penetrate the skin and give a comfortable effective stimulation. They will also need to be held in place by stretch straps of differing lengths to accommodate various body areas.

Self adhesive electrodes are also available and are extremely practical as a coating of sticky conductive gel is used on top of a wire mesh or thin flexible carbon pad, thus eliminating the need for water or straps. In the figures illustrated, the electrode shape is round with a pad diameter of approximately 7 cm for body stimulation and 2.5 cm for the face.

There are also square, rectangular, and oval electrodes of varying sizes commercially available. The essential element to remember when selecting an electrode is the purpose of its application. A smaller electrode will send the impulse to a narrow specific area, whereas a larger electrode will diffuse the signal over a wider area, making it generally more comfortable and easier to reach motor points. A 7 cm diameter or square electrode for body stimulation and a 2.5 cm circle for face has empirically been shown to be the best combination of size versus comfort for general electrical stimulation use.

III HARDWARE SPECIFICATION

Hardware specifications are Ardunio Uno, Atmega328 Microcontroller, Body Stimulator, Biokit Electromyography.

Arduino Controller Board

Arduino is associate American Standard Code for Information Interchange file hardware and computer code package company, project and user community that styles and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its product are accredited underneath the wildebeest Lesser General Public License (LGPL) or the wildebeest General Public License (GPL), allowing the manufacture of Arduino boards and software package distribution by anyone. Arduino boards are offered commercially in preassembled type or as homemade (DIY) kits.

Arduino board styles use a range of microprocessors and controllers. The board's area unit equipped with sets of digital and analog input/output (I/O) pins which will be interfaced to numerous enlargement boards ('shields') or breadboards (For prototyping) and different circuits. The board features serial communications interfaces, as well as Universal Serial Bus (USB) on some models that also is used for loading programs from personal computers. The microcontrollers may be programmed victimisation C and C++ programming languages. Additionally, to victimisation ancient compiler tool chains, the

Arduino project provides AN integrated development surroundings (IDE) supported the process language project.

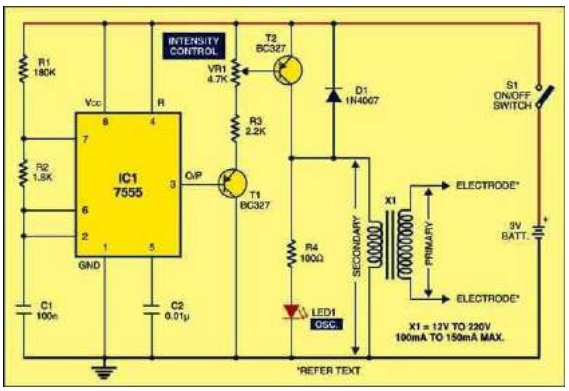
4.1.2 Atmega328 Microcontroller

Arduino Uno could be a microcontroller board. It's a fourteen digital input/output pins (of that vi are often used as PWM outputs), via analog inputs, a sixteen megacycle ceramic resonator (CSTCE16M0V53-R0), a USB association, an influence jack, an ICSP header and a push button. It contains everything required to support the microcontroller; merely connect it to a pc with a USB cable or power it with an AC to DC adapter or battery to urge started. Within the worst case situation we will replace the chip for a couple of greenbacks and begin once more. "Uno" means that one in Italian and was chosen to mark the discharge of Arduino package (IDE) 1.0. The Uno board and version 1.0 of Arduino package (IDE) were the reference versions of Arduino, currently evolved to newer releases. The Uno board is that the 1st in a very series of USB Arduino boards, and also the reference model for the Arduino platform; for an intensive list of current, past or superannuated boards see the Arduino index of boards.

The ATmega328 may be a single-chip microcontroller created by Atmel within the mega AVR family (later chip Technology non-inheritable Atmel in 2016). It's a changed Harvard design 8-bit reduced instruction set computing processor core. The Atmel 8-bit AVR RISC-based microcontroller combines thirty two computer memory unit ISP non-volatile storage with readwhile-write capabilities, one computer memory unit EEPROM, 2 KB SRAM, twenty three general purpose I/O lines, thirty two general purpose operating registers, 3 versatile timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byteoriented 2-wire serial interface, SPI interface, 6-channel 10-bit A/D convertor (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal generator, and 5 code selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves outturn approaching one unit per megahertz

Stimulator

Here is a circuit that stimulates nerves of that part of your body where electrodes are attached. It is useful to relieve headache and muscular pain and revive frozen muscles that impair movement. Though it provides muscles stimulation and invigoration, it's mainly an aid in removing cellulitis. The system comprises two units: muscular stimulator and timer. shows the circuit of the muscular stimulator.



Muscular stimulator circuit

IC 7555 is wired as an astable multivibrator to generate about 80Hz pulses. The output of IC1 is fed to transistor T1, whose emitter is further connected to the base of transistor T2 through R3 and VR1. The collector of transistor T2 is connected to one end of the

secondary winding of transformer X1. The other end of the secondary winding of the transformer is connected to ground.

4.2.2 Circuit operation

When IC1 oscillates, transformer X1 is driven by the pulse frequencies generated to produce high voltage at its primary terminals. Separate electrodes are connected to each end of the primary winding of transformer X1. Diode 1N4007 (D1) protects transistor T2 against high-voltage pulses generated by the transformer.

Using potentiometer VR1 you can control the intensity of current sensing at the electrodes. The brightness level of LED1 indicates the amplitude of the pulses. If you want to increase the intensity level, replace the 1.8-kilo-ohm resistor with 5.6 kilo-ohms or higher value up to 10 kilo-ohms.

X1 is a small mains transformer with 220V primary to 12V, 100/150mA secondary. It must be reverse connected, i.e., connect the secondary winding to the collector of T2 and ground, and primary winding to the output electrodes. The output voltage is about 60V but the output current is so small that there is no threat of electric shock.

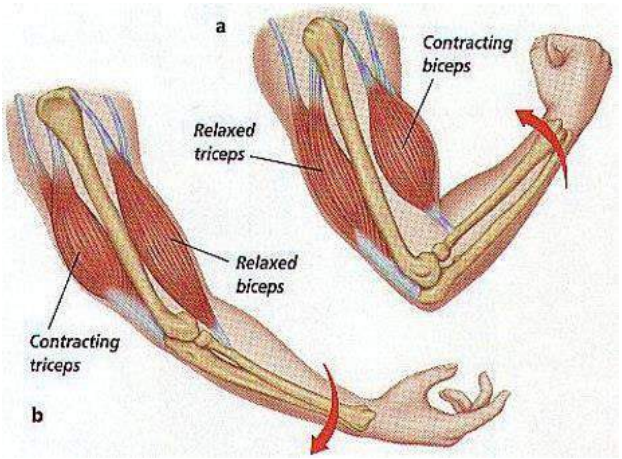
Electrodes are made of small, thin-gauge metallic plates measuring about 2.5×2.5 cm2 in size. Use flexible wires to solder electrodes and connect to the output of the device. Before attaching metal electrodes to the body, wipe them with a damp cloth. After attaching the electrodes to the body (with the help of elastic bands on Velcro straps), flip switch S1 to activate the circuit and rotate the knob of intensity-Control preset VR1 very slowly until you feel a slight tingling sensation

Construction & testing

Assemble the timer with a separate switch and a 9V DC battery in the same cabinet as the stimulator. Tape the electrodes to the skin at opposite ends of the chosen muscle and rotate VR1 knob slowly until you sense light itching when the muscular stimulation circuit is powered on. At the same time, flip switch S2 to start the timer for counting the time. At the end of the timing cycle, the piezobuzzer beeps. Each session should last about 10 minutes

Electromyograph

Electromyography (EMG) is a diagnostic procedure that evaluates the health condition of **muscles** and the **nerve cells** that control them. These nerve cells are known as **motor neurons**. They transmit **electrical signals** that cause muscles to **contract** and **relax**. An EMG translates these signals into **graphs or numbers**, helping doctors to make a diagnosis.



The electrical activity picked up by the **electrodes** is displayed on an **oscilloscope**. An **audio-amplifier** is used so the activity can be heard. EMG measures the electrical activity of muscle during **rest, slight contraction, and forceful contraction**. Muscle tissue does not normally produce electrical signals during rest. When an electrode is placed, a brief period of activity can be seen on the **oscilloscope**.

Measurement of EMG

Surface EMG assesses muscle function by recording muscle activity from the surface above the muscle on the skin. Surface **electrodes** are able to provide only a limited assessment of **muscle activity**. Surface EMG can be recorded by a pair of electrodes or by a more complex array of **multiple electrodes**. More than one electrode is needed because EMG recordings display the **potential difference** between two separate electrodes.

PROPOSING SYSTEM

In this method, it is most efficient researching and successful method to treat the paralyzed and to monitor the muscle activity of a human. EMG can be used to sense isometric muscular activity where no movement is produced. This enables definition of a class of subtle motionless gestures to control interfaces without being noticed and without disrupting the surrounding environment. These signals can be used to control a prosthesis or as a control signal for an electronic device such as a mobile phone

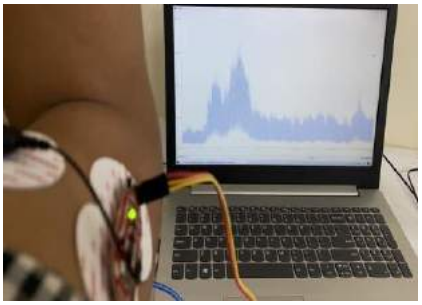
It seeks to advance man-machine interfaces by directly connecting a person to a computer. In this project, an EMG signal is used to substitute for mechanical joysticks and keyboards. Using this automatic system the microcontroller read the muscle activity by its own and produce stimulations concerned with the activity of muscle. In other hand it is not mandatory for the patient to go to hospital. It is quite easy and friendly operations under treatment methods

IV RESULT

The electronic data basis were searched for paralyzed bed rest patients.Studies were assessed with the Quality in prognostic method of therapeutic measures.

According to the complete study of muscles:

1. The contraction and response of muscles takes place in external stimulation is supplied.
2. Naturally electricity is produced by the muscles are studied.
3. A paralyzed muscles cannot send or receive any impulses from the motor units, this disconnectivity of muscle fibres can be connected.
4. Thus, the automatic stimulator can induce and increase the sense of receiving and sending response in the muscles.
5. Nevertheless, due to its clinical and prognostic value, measuring and monitoring paralysed muscle function should be a part of the routine assessment of people with several ailments.
6. In order to achieve this goal, standardized and clinically feasible measurement protocols, as well as normative values and predictive equations are needed.
7. current evidence suggests that other aspects of paralyzed muscle function such as the endurance and power capacity of the muscle should also be considered.



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