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A New Embedded method of Muscle Stimulator with Duration and Intensity Control Using IR TV Remote

Mr. Mohammed Nayyef Gaser
M.Sc. Student,
Baghdad University, Iraq.

Mr. Mohammed Faisal Jasim
M.Sc. Student,
Baghdad University, Iraq.

Abstract:

This paper deals with a new embedded method for an Electrical muscle stimulation (EMS), also known as neuromuscular electrical stimulation (NMES) or electromyo stimulation is the elicitation of muscle contraction using electric impulses and microcontroller. The system provides remote patient monitoring in healthcare field. The primary function of the system aims in designing an Electrical muscle stimulator system which is capable of stimulating the nerves. The described neuron-muscular stimulator stimulates the nerves (neurons) of the part of the body to which the electrodes are attached. It provides relief for headache, muscular pain, or fatigue (due to exertion of muscles) and also revives the frozen muscle which impairs movement. The main function of this electronic instrument is to provide energy to nerve of the muscle and to remove cellulites over. This instrument is interfaced with an IR receiver to control over wireless remote.

Index terms:

Muscle stimulator, PIC microcontroller, TV remote, tsop1738 receiver LCD module.

I.INTRODUCTION:

Technology is being used everywhere in our daily life to fulfill our requirements. We are employing different sensors for different applications sometimes we may even use same sensors differently for different applications. Whatever it may be the final output is life has increased its speed with the technology boosters. We can not only increase the speed of life but also increase security with good ideas to make use of this technology. One of the ideal ways of using technology is to employ it to sense serious health problems so that efficient medical services can be provided to the patient in correct time.

This idea to provide efficient health service to patients Highly interaction in human machine in daily lives has made user interaction progressively very important. Expansion of sensor based advanced technology sophisticated human force and stress along with power conservation with automation system. The controlling device of the whole system is a Microcontroller.

The Microcontroller is programmed using Embedded C language.This paper describes about to build a EMS has received increasing attention in the last few years because of its potential to serve as a strength training tool for healthy subjects and athletes, a rehabilitation and preventive tool for partially or totally immobilized patients, a testing tool for evaluating the neural and/or muscular function in vivo, and a post-exercise recovery tool for athletes.

The impulses are generated by a device and delivered through electrodes on the skin in direct proximity to the muscles to be stimulated. Current stimulator is one of the most commonly used instruments used for diagnosis and treatment of a wide variety of neurological and muscular disorders. It works by forcing electric current into a human system, to elicit information to treat the system. The muscular stimulator circuit generates 150 µs pulses at 80 Hz frequency, which is then given to the secondary of the transformer to generate 60V positive and 150V negative peaks at very low current so that the patient in not subjected to any shock.

The intensity of the current can be varied by changing the resistance which is connected to the pulse generator. Pulse generator is the heart of the circuit involves a micro controller which generates pulse train. The microcontroller is interfaced with an IR receiver. This IR receiver receives the signal from its corresponding IR remote. The other major advantage of this device is the control of intensity. This feature helps us in setting low intensities to the older people.

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Fig-1: Model of IR TV remote based muscle stimulator

II. RELATED WORK:

The idea behind the proposed system is to determine a muscle stimulator with intensity control using IR TV remote. Electric muscular stimulation may be unsuitable for subjects with acute pathologies. It should be avoided in the case of osteoporosis or bone tumors, arterial hypertension, pregnancy, cancer, skin pathologies, pacemakers, or arrhythmia (never apply to the heart), kidney deficiency and under treatment of beta blocking drugs. The impulses mimic the potential coming from the central nervous system, causing the muscles to contract. The electrodes are generally pads that adhere to the skin. The use of EMS has been cited by sports scientists as a complementary technique for sports training and published research is available on the results obtained. Electrical stimulation is also used for re-training muscles that are having trouble contracting.

Though used for various conditions, it is commonly used for people who have had a stroke or an orthopedic surgery. Many times these patients have trouble trying to move a muscle or joint. When the electrical impulse is sent into into the muscle tissue with e-stim, under the appropriate settings, the muscle can contract without the help of the patient. Doing this while having the subject actively try to contract the muscle can sometimes get the brain to re-learn how to contract the muscle on its own.

Effects:

"Strength training by NMES does promote neural and muscular adaptations that are complementary to the well-known effects of voluntary resistance training".

This statement is part of the editorial summary of a 2010 world congress of researchers on the subject. Additional studies on practical applications that came after that congress pointed out important factors that make the difference between effective and ineffective EMS. This in retrospect explains why in the past some researchers and practitioners obtained results that others could not reproduce. Also, as published by reputable universities, EMS causes adaptation, i.e. training, of muscle fibers. Because of the characteristics of muscle fibers, different types of fibers can be activated to differing degrees by different types of EMS, and the modifications induced depend on the pattern of EMS activity. These patterns, referred to

III.HARDWARE DESIGN OF PROPOSED SYSTEM:

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with

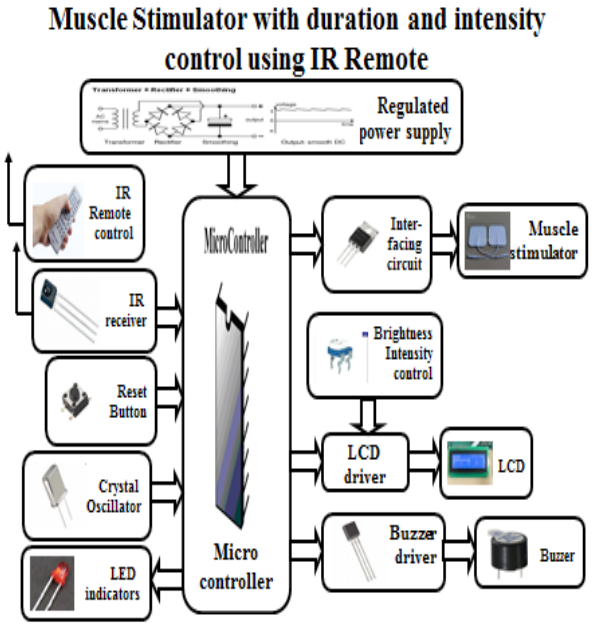

Fig-2: Block diagram of the proposed model

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as protocols or programs, will cause a different response from contraction of different fiber types. Some programs will improve fatigue resistance, i.e. endurance, others will increase force production. various devices, controls the data and thus finally gives the result. In this paper we presented an advanced wireless TV remote based intensity control of muscle stimulator. The controller processes the data which received from TV remote receiver tsop1738 and displays the status on to the LCD display unit. The micro controller is also interfaced with few LED indicators to provide the health status of the device. The proposed working model related block diagram as shown below-

a. TV remote receiver:

TSOP1738 is an Infrared (IR) receiver which is widely used in large number of electronic products for receiving and demodulating infrared signals. The received demodulated signals can be easily decoded by a microcontroller. TSOP stands for "Thin Small Outline Package." it's a surface-mount memory packaging from Intel. Features of the TSOP include the following: JEDEC and EIAJ standard dimensions, it's the smallest leaded package form factor for flash, 0.5 mm (19.7 mil) lead pitch, reduced total package height, 1.20 mm maximum, gull wing formed leads, and supports future flash density and feature growth. Intel's TSOP package is offered in 32-lead, 40-lead, 48-lead and 56-lead versions in JEDEC and EIAJ registered standard dimensions.

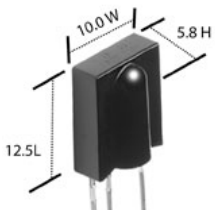

Fig-3: TSOP1738 IR receiver

b. Microcontroller:

The microcontroller used in the proposed system is PIC which stands for Peripheral Interface Controller given by Microchip Technology to identify its single-chip microcontrollers. PIC microcontrollers are very successful in 8-bit microcontrollers. This project makes use of an onboard mini computer, which is usually termed as micro controller. It acts as heart of the project.

This onboard computer can efficiently communicate with the output and input modules which are being used. The controller contains some internal memory to store the program code. This memory is also used to dump some set of assembly instructions into the controller and these help for the functioning of the controller. The crystal oscillator speed that can be connected to the PIC microcontroller ranges from up to 20Mhz. Using the CCS C compiler usually 20Mhz oscillator will be used. The cost of the microcontroller is also very cheaper. The 20 MHz crystal oscillator should be connected with about 22pF capacitor.

There are 5 input/output ports on PIC microcontroller namely port A port B port C port D and port E. Every single port has different based functionality. Most of them can be used as general I/O ports. The microcontroller uses Harvard architecture which separates both Program and Variable (data) memory interface. This facilitates fetching of an instruction and the operation on data/accessing of variables simultaneously.

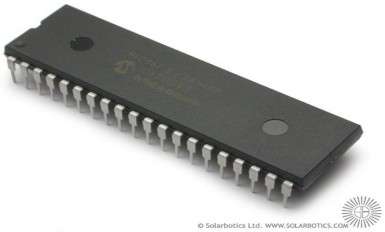

Fig4. Microcontroller

c. LCD Display module:

One of the most common devices attached to a micro controller is an LCD display. A liquid crystal display is special thin flat panels that can let light go through it, or can block the light.

Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 LCD displays. It means that 16 characters per line by 2 lines were displayed and 20 characters per line by 2 lines were displayed, respectively.

Liquid crystal displays are usually abbreviated as LCD's. These displays are often used in battery-powered devices, such as digital watches, since they require very little amount of electricity consumption.

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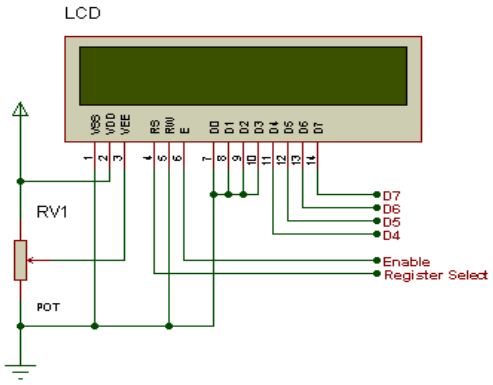

Fig.5. LCD module.

d. Buzzer:

The paper related to finger based voting system uses a buzzer module for audible alerts when any wrong finger print was detected. The buzzer or beeper is an audio based signaling device. It is mainly designed as mechanical, electromechanical, or piezoelectric. There are many typical uses of buzzers and beepers which include alarm devices, timers and also based on confirmation of user inputs such as a mouse click or keystroke.

IV.CONCLUSION:

An existing new method of a TV remote control based intensity and duration control of a muscle stimulator device using PIC microcontroller. The system also monitors the intensity and duration for the EMS Electric muscle stimulator system and displays the monitored status onto the LCD module. Future scope- This system can be extended using GSM. The GSM module will send the information regarding the status of EMS device to the respective doctors directly. The wireless communication distance can be increased using zigbee, Wi-Fi, Bluetooth etc.

Fig.6. Buzzer.

for controlling the intensity or duration of the muscle stimulator device. During the healthcare monitoring if any patient health condition is critical, then send an emergency notification message to the physician by using Zigbee technology.

Using more sensors related to healthcare monitoring such as heat rate sensor, MEMS Accelerometer sensor, ECG pulse sensor, temperature sensor and Humidity sensor which is controlled by microcontroller and fetched data from sensors. Remaining work will be planned to use Zigbee for send data from sensor devices to PC using HyperTerminal.

REFERENCES:

[1]http://en.wikipedia.org/wiki/Electrotherapy

[2]http://www.electroschematics.com/2083/electronic-muscle-stimulator//

[3]http://www.oxfordreference.com/view/10.1093/oi/authority.20110803095745911/

[4]https://www.oxhp.com/secure/policy/electrical_stimulation_for_the_treatment_of_pain_and_muscle_rehabilitation.pdf/

[5] Deepshikha Goyal, Jai Bhaskar, Parvinder Singh. (2012)."Designing the Low Cost Patient Monitoring Device (LCPMD) & Ubiquitous based Remote Health Monitoring and Health Management using Tablet PC."2nd IEEE International Conferences on Parallel, Distributed and Grid Computing. pp.7-

[6]Wan-Young Chung, Young-Dong Lee and Sang-Joong Jung. (2008, Aug 20-24)"A Wireless Sensor Network Compatible Wearable U-healthcare Monitoring System Using Integrated ECG, Accelerometer and Spo2."30th Annual International IEEE EMBS Conference Vancouver, British Columbia, Canada. pp1529-1532

[7] Fida Hasan Md. Rafi, Md.Manirul Islam etal., (2012,Dec 20-22),"Microcontroller Based Health Care Monitoring System Using Sensor Network".7th international conference on electrical and computer engineering, Dhaka, Bangladesh.

[8]http://www.engineersgarage.com/contribution/wireless-atientheartbeat-and-temperature-monitoring-system?page=2

[9]http://healthcare.analog.com/en/patientmonitoring/segment/healt .html?gclid=CLaTy6fUx7kCFeFfpgodZxwAAg

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

[10] Xiang-dong JIANG, Yu-Liang TANG etal., "Wireless Sensor Networks in Structural Health Monitoring Based on Zigbee Technology", National High Technology Research and Development Program of China (2007)

[11] Media Aminian, Hamid Reza Naji.(2013)."A Hospital Healthcare Monitoring System Using Wireless Sensor Networks."Health and Medical Informatics.[Open Access].4(2).

[12] Takuji Suzuki, Hirokazu Tanaka, Shigenobu Minami etal., "Wearable Wireless Vital Monitoring Technology for Smart Health Care." 7th International Symposium on Medical Information and Communication Technology (2013)

[13] "SHAPE survey results to the general public," in Proc. Annu. Congr. Eur. Soc. Cardiol. Vienna, Vienna, Austria, Sep. 2003.

[14] F. Zannad, N. Agrinier, and F. Alla, "Heart failure burden and therapy,"Europace, vol. 11, no. 5, pp. 1–9, Nov. 2009

[15] V. Roger, A. S. Go, D. M. Lloyd-Jones, R. J. Adams, J. D. Berry, T. M. Brown, M. R. Carnethon, S. Dai, G. de Simone, E. S. Ford, C. S. Fox, H. J. Fullerton, C. Gillespie, K. J. Greenlund, S. M. Hailpern, J. A. Heit, P. M. Ho, V. J. Howard, B. M. Kissela, S. J. Kittner, D. T. Lackland, J. H. Lichtman, L. D. Lisbeth, D. M. Makuc, G. M. Marcus, A. Marelli, D. B. Matchar, M. M. McDermott, J B. Meigs, C. S. Moy, D. Mozaffarian, M. E. Mussolino, G. Nichol, N. P. Paynter, W. D . Rosamond, P. D. Sorlie, R. S. Stafford, T. N. Turan, M. B. Turner, N. D.Wong, and J.Wylie-Rosett, "Heart disease and stroke statistics—2011 update: A report from the American Heart Association," Circulation, vol. 123, no. 4, pp. 18–209, Feb. 2011.

[16] F. Alla, F. Zannad, and G. Filippatos, "Epidemiology of acute heart failure syndromes," Heart Fail. Rev., vol. 12, no. 2, pp. 91–95, Jun. 2007.

[17] C. Berry, D. Murdoch, and J. McMurray, "Economics of chronic heart failure," Eur. J. Heart Fail., vol. 3, no. 3, pp. 283–291, Jun. 2001

[18] A. Bundkirchen and R. H. G. Schwinger, "Epidemiology and economic burden of chronic heart failure," Eur. Heart J. Suppl, vol. 6, no. SD, pp. 57–60, Aug. 2004.

[19] J. Ross, J. Chen, Z. Lin, H. Bueno, J. P. Curtis, P. S. Keenan, S. L. Normand, G. Schreiner, J. A. Spertus, M. T. Vidán, Y. Wang, and H. M. Krumholz, "Recent national trends in readmission rates after heart failurehospitalization," Circ., Heart Fail., vol. 3, no. 1, pp. 97–103, Jan. 2009.

[20] S. Stewart, "Financial aspects of heart failure programs of care," Eur. J. Heart Fail., vol. 7, no. 3, pp. 423–428, Mar. 2005.

[21] F.McAlister, S. Stewart, S. Ferrua, and J. J.McMurray, "Multidisciplinary strategies for the management of heart failure patients at high risk for admission: A systematic review of randomized trials," J. Amer. Coll. Cardiol., vol. 44, no. 4, pp. 810–819, Aug. 2004.

[22] E. Seto, "Cost comparison between telemonitoring and usual care of heart failure: A systematic review," Telemed. J. E-Health, vol. 14, no. 7, pp. 679–686, Sep. 2008