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Replication Approach of Body Organ

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ABSTRACT:In our growing and developing country, day by day many people are dreaming of some new technology which can help the physically challenged or paralytic patients to replicate the function of their existing homologous (the body parts with same relation, relative position or structure) and analogous (parts which perform similar function but having a different evolutionary origin) body parts. Here, with the help of the EMG(Electromyography) sensors and some pre-programmed procedure the stimulating signals from one part of the body can be utilized to replicate any amputated person's artificial body part applying on the residual portion. As per the statistics of the year 2011 to till now, out of 121 Cr population about 2.68 Cr persons are disabled in India means 2.21% out of the total citizen are paralytic patients. This is an initiative to mitigate the issue to some extent.

KEYWORDS:Paralytic patient, stimulating signal, surface electrode, EMG sensor, Arduino.

I. INTRODUCTION

Amputation is the process of surgical removal of limb. It is generally used to control a disease process in the affected limb, such as malignancy or sometime due to some accidental incidence. Although amputation is not an easy decision, but sometimes there is no alternative and also remains as the most appropriate decision. Amputation is an irreversible process and affects the normal fundamental lifestyle of an individual. There are many challenges in the day to day life of the amputee patient, such as any physical activity, exercises or during sports. The desire to overcome the challenges was born before 1500 BC when people were very much engaged in war and conquisition. This was the time people lost their limbs and which make them incapable of fighting further wars. In today's generation, biomedical engineering has become a boon to all amputee patients. Biomedical engineering deals with all those equipments and devices which act as replacement for body parts, and machines for diagnosing medical problems. The idea of the prosthetic limb came into action before 1500 BC but people of that era usually replaced their leg with some wooden block or some iron hook but after 1500 BC mechanical and later automated leg began to evolve.

II. RELATED WORK

In a study, the movement of some transtibial and some transfemoral amputees are taken into consideration. The study was based on consumption of oxygen when walking on a treadmill, the characteristics of biochemical parameters when walking on plane surface at a self-defined speed. By going through the same process the energy consumption is more significant in transfemoral amputees than that in transtibial amputees [1].In the year of 2005, for the first time some researches were done on powered lower limb orthoses. This is used for rehabilitation aids. Powered lower limb

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orthoses can be used for stopping, turning, avoiding obstacles etc. [2]. In an investigation Mr.Samuel and his colleagues developed a myoelectric driven device that controls the final state for the powered ankle-foot prosthesis. This system takes both myoelectric inputs and sensory inputs. The potential of the prosthetic leg controller was highlighted by the study [3].

III. METHODOLOGY

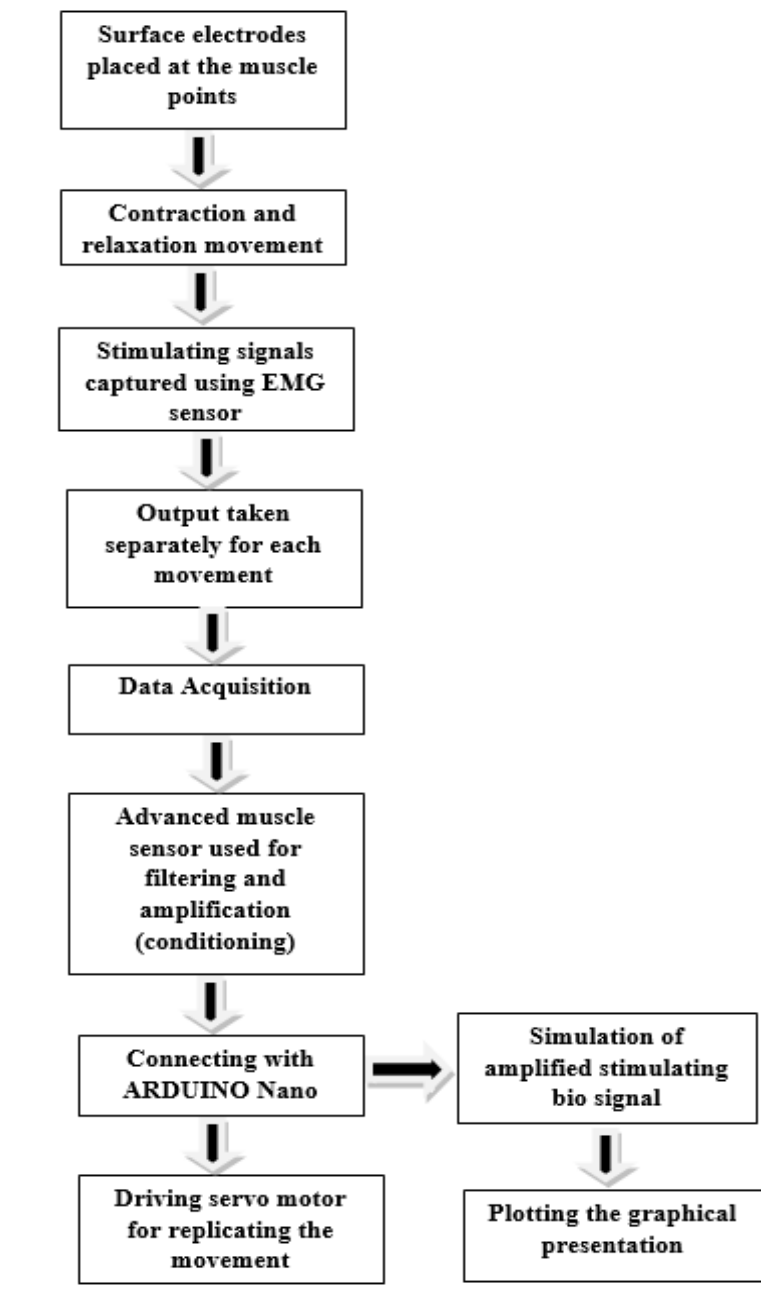


Fig. 1: Workflow of the System Replication

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In this prototype design, using EMG sensors and bio-electrodes the replication of human's leg or any part can be done [4][5]. The surface electrodes should be placed at the proper muscular points so that it can capture the signals (small magnitude). The filtered signal is then amplified within EMG muscle sensor v3.0 myo-sensor[6][7] which increases the amplitude of the signal because the recommended voltage for Arduino Nano[8][9] is 6-20 Volt and EMG signal received from human muscle is in the range of 50 micro volt to 30 milli volt. The frequency range is 5 Hz and 450 Hz. The amplified output is then fed to the analog pin of Arduino Nano interfacing board. Here, for simplification of circuit, Muscle sensor (advanced v3.0)[10] has been used. This advanced technology can easily do filtration and amplification of the bio-signals. The captured signals are then filtered and amplified to be passed. It is given to Arduino interfacing board (the open source electronics platform, easy to use hardware and software connector, programmable device). The acquired signal is then processed in LabVIEW (Laboratory VirtualInstrumentEngg. Workbench) [11] platform for graphical analysis and is linked with the hardware implementation that will behave as an artificial limb for the amputee patients. The graphical representation of the signals may differ with respect to the patients' age, height, body weight and his/ her habits(food habit ,fitness etc.) because the produced signals depend on these properties of a human [12][13]. The graphical analysis can help to predict the nature about the signal as it is already mentioned above that the signals vary with many qualities.

IV. EXPERIMENTAL RESULTS

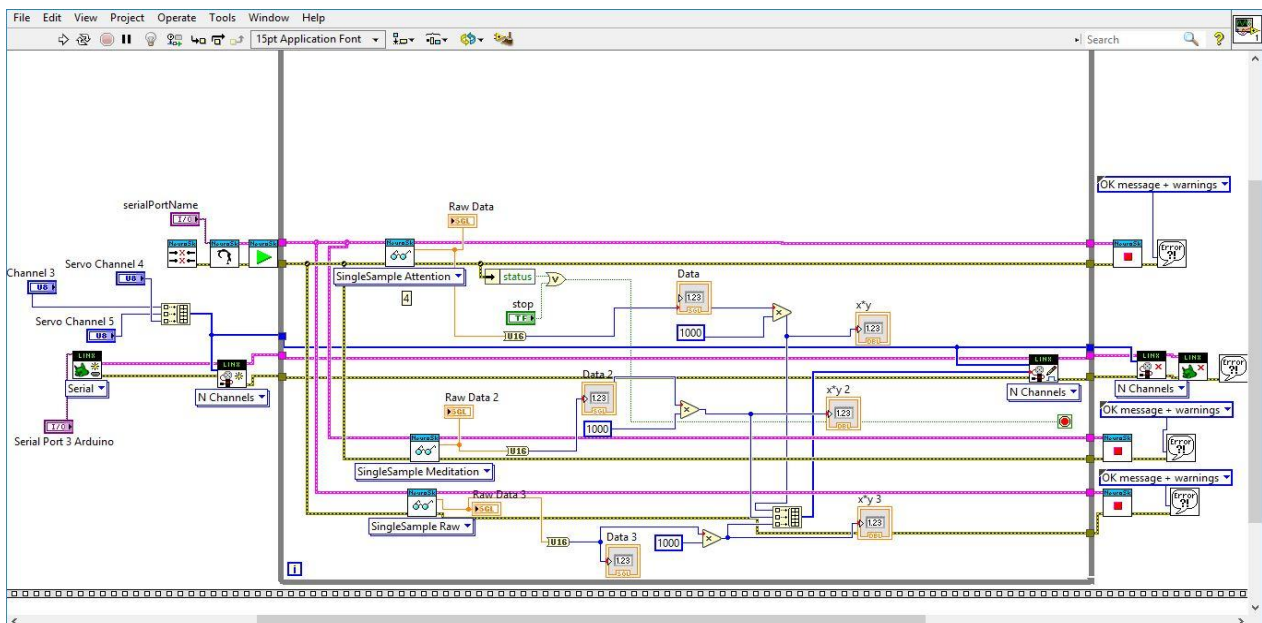


Fig. 2.LabVIEW output for the Proposed Method

The above mentioned LabVIEW diagram represents the simulation of the bio signal acquired from muscles during different types of movement. Here, the overall virtual processing of the signal is presented.

V. CONCLUSION

The total system is a wearable development and applicable for the physically challenged or paralytic patients or amputee patients. Paralytic patients can get more comfortable life by applying this method. The system can be

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implemented by using the potential generated from muscle movements during exercise as the power supply of the system. It can be controlled with wireless connection. This idea can make a movement towards the developed country, which have the power to reduce the number of differently abled persons.

REFERENCES

- [1] Schmalz T, Blumentritt S, Jarasch R. Energy expenditure and biomechanical characteristics of lower limb amputee gait: The influence of prosthetic alignment and different prosthetic components. *Gait posture*. 2002; 16:255–63.
- [2] Daniel Ferris, Gregory Sawicki, and Antoinette Domingo (2005) Powered Lower Limb Orthoses for Gait Rehabilitation. *Topics in Spinal Cord Injury Rehabilitation: Fall 2005*, Vol. 11, No. 2, pp. 34-49
- [3] Samuel Au, Max Berniker, Hugh Herr, 'Powered Ankle-foot prosthesis to assist level-ground and stair-descent gaits', Volume 21, Issue4, May 2008.
- [4] Eart E. Vanderwerker, JR, M.D., "A Brief Review of the History of Amputations and Prostheses" *JACPOC* 1976 Vol. 15, Issue No. 5.
- [5] Bryce, George, "A Short History of the Canadian People", 2009.
- [6] O. Fliegel, M.D. and S.G. Feuer, M.D., "Historical Development of Lower-Extremity Prostheses", Brooklyn.
- [7] Putti, "Historic Artificial Limbs", New York, 1930.
- [8] Ann Arbor Mich, J.W. Edwards, "Artificial Limbs: A Consideration of Aids Employed in the Practice of the Orthopaedic Surgery", Vol.2, pp.2.3.5.10. 1960, American Academy of Orthopaedic Surgeons.
- [9] Shufeldt, R.W, "Improvements in Artificial Limbs since the Civil War", 1918.
- [10] Kim M. Norton, "A Brief History of Prosthetics".
- [11] Kathleen Talbot, "Using Arduino to design a Myoelectric prosthetic", 2014.
- [12] W Bara-Jimenez, M Aksu, B Graham, S Sato, M Hallett - *Neurology*, 2000 - AAN Enterprises.
- [13] E Raffin, J Mattout, KT Reilly, P Giroux - *Brain*, 2012.