Front. Cur. Trends. Engg. Tech. Vol. 1(2), *pp.* 71 – 74 (2016)
OPEN ACCESS **ISSN: *2456 – 1185*** Available online: www.fctet.in

Project Design: ELECTRIAL, ELECTRONICS & COMPUTER SCIENCE

An International Open Access Journal

Published by ACET

Artificial Arm for Disabled People using EEG Signal

R. Jayaram[1] and M.Priyadharshini[1]

Abstract-The project represents the prototype design of human arm for people who lost their Limbs. This prototype will give a new lease of life to the people who lost their limbs, by using the brain signals to control the robotic arm. The EEG (Emotiv epoc) sensor is used to design an artificial arm. This sensor captures the EEG waves (Primary Motor cortex), which controls the movement of arm. The data are transferred from Emotiv epoc via Bluetooth. The PIC controller helps to control the servo motor board based on the data received by the Emotiv sensor. The servo motor board connected to the robot arm (elbow, wrist) so that arm controlled by the brain signals.

Keywords: *BR-BUTTON-S3A, EMOTIV EPOC+ 14 Channel Mobile EEG, SERVO MOTORS CONTROLLER=Servo motor control, Servo - Generic (Sub-Micro Size), Controller=Pic 16f877a*
.idea

1. INTRODUCTION

.

Many people in the world of about 30-45% of world's population do not have limbs by birth or lose their limbs due to accident. We are going to design a prototype of human robotic arm which is controlled by human brain signal, so that the designed human robotic arm will act as a human arm so that people can be independent and lead a peaceful life without the help of other people.

The ultimate goal of this work addresses design, Modelling, simulation and control issues for human robotic arm, particularly, to design a robot arm, select and apply different control strategies, so that an applied input voltage with a range of 0 - 12 volts corresponds linearly to an output arm angle of 0 to 180, The designed system should respond to the applied input, two suggested MATLAB function block models with its function block parameters for robot arm design, control selection and analysis purposes to be proposed. Having both electrical and mechanical parameters, a single joint robot arm is an application example of a Mechatronics electromechanical system used in industrial automation with the same technique the human robot arm to be designed [1-9].

Each degree of freedom (DOF) is a joint on Robot arm, where arm can rotate or translate, each DOF requires an actuator, A single joint Robot arm is a system with one DOF that is one actuator, when designing and building a robot arm it is required to have as few degrees of freedom allowed for given application. Here servo motor is used.

The motor system input signal used to provide the control voltage and current to the PMDC motor is a voltage signal. To simplify and accelerate the process of DC motors sizing, selection and dynamic analysis for different applications, using different approaches, different refined mathematical models in terms of output position, speed, current, acceleration and torque, as well as corresponding Simulink models were introduced.

These works are intended for research purposes, as well as for the application in educational process. In performance analysis and verification of a given electric servo motor proper controller selection and verification for desired output speed or angle, a new, simple and user–friendly MATLAB built-in function, mathematical and Simulink models are introduced.

2. HUMAN ROBO ARM DESIGN

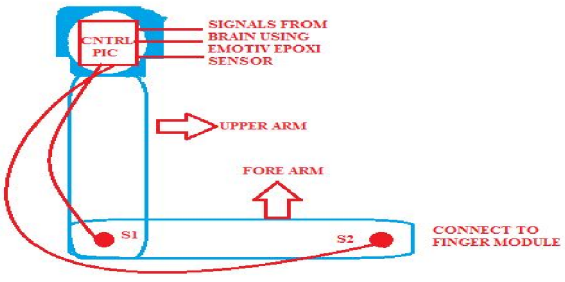


Fig. 1. Robo hand design

Received: 20 July 2016; Revised: 28 August 2016; Accepted: 17 October 2016; Published online: 31 October 2016

[1] Instrumentation and Control Engineering.
Sri Sai Ram Engineering College, Chennai, Tamil Nadu, India

3. BLOCK DIAGRAM

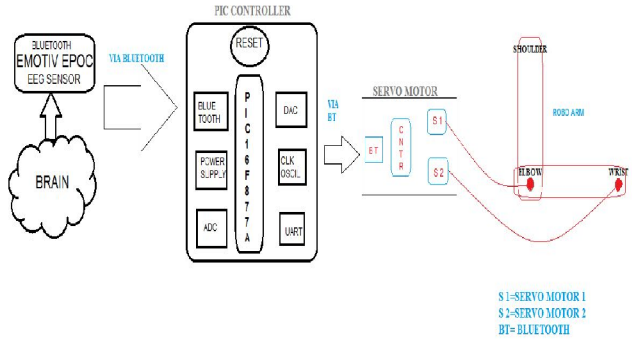


Fig. 2. Block diagram showing the experimental framework

4. HARDWARE AND SOFTWARE

4.1. HARDWARE

- BR-BUTTON-S3A.
- EMOTIV EPOC+ 5 Channel Mobile EEG.
- USB 16 SERVO MOTORS CONTROLLER
- Servo - Generic (Sub-Micro Size)
- Controller=Pic 16f877a

4.2. EMOTIV EPOC

This emotive sensor is fixed on the brain, this sensor senses mainly the primary cortex of the brain which controls, monitors the movement of the limbs in human body.

Fig. 3. Emotiv epoc sensor

4.3. PIC CONTROLLER

The PIC controller used here is PIC16F877A.The function of the controller is to store the EEG signals and control the servo motor based on the EEG signals. Thus PIC controller plays a very vital role in controlling robot arm movement.

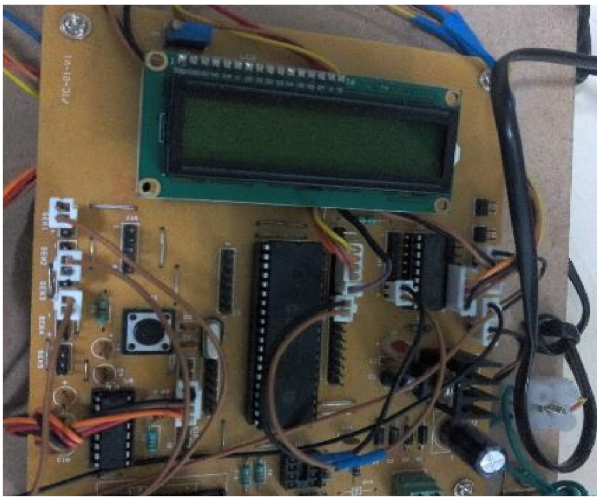


Fig 4. pic board

4.4. BR-BUTTON-S3A

This Bluetooth helps to receive data from emotive sensor and send to pic controller for controlling and monitoring EEG waves.

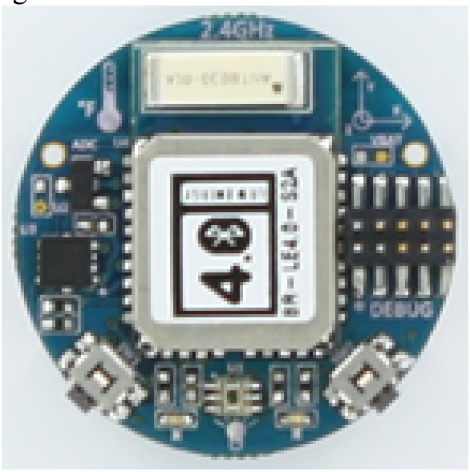


Fig 5. Bluetooth sensor

4.5. SERVO – GENERIC(MICRO SIZE)

This servo motor is small in size which rotates 360 degree and takes input voltage of about 6-9v,the torque is 38.8/44.4 oz-in. (6.0/9V),the body made is metal body.

Fig 6. V-4 servo motor

4.6. SOFTWARE

MATLAB

Here the matlab software used to create blocks in simulink with sim mechanics tool kit to simulate the robot design.

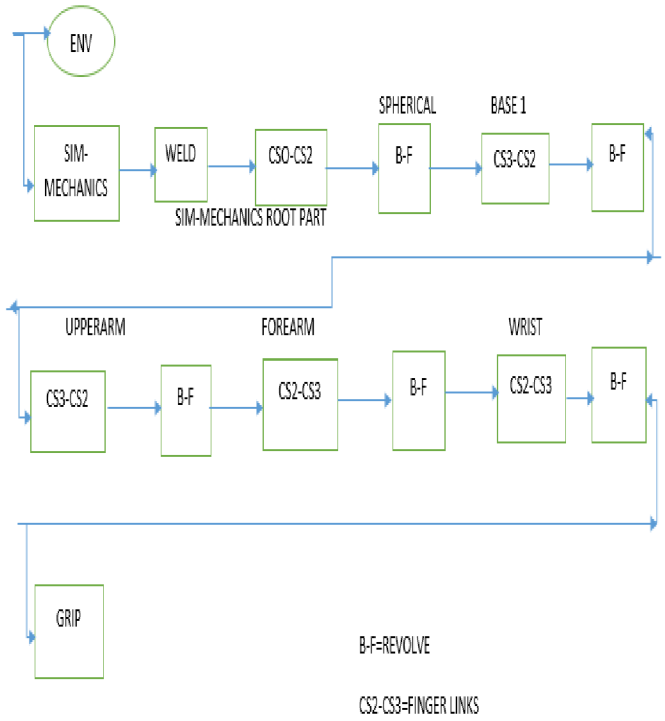


Fig. 7. Matlab simulation block

Grip block

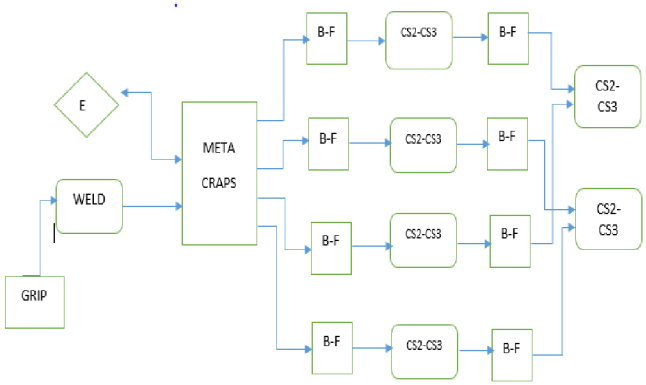


Fig. 8. Matlab simulation grip block

PIC C COMPILER AND MPLAB IDE

PIC C compiler provides a platform for debugging the program before transferring the program to pic controller. MPLAB IDE provides as a software tool to simulate it.

5. MATLAB SIMULATION RESULTS

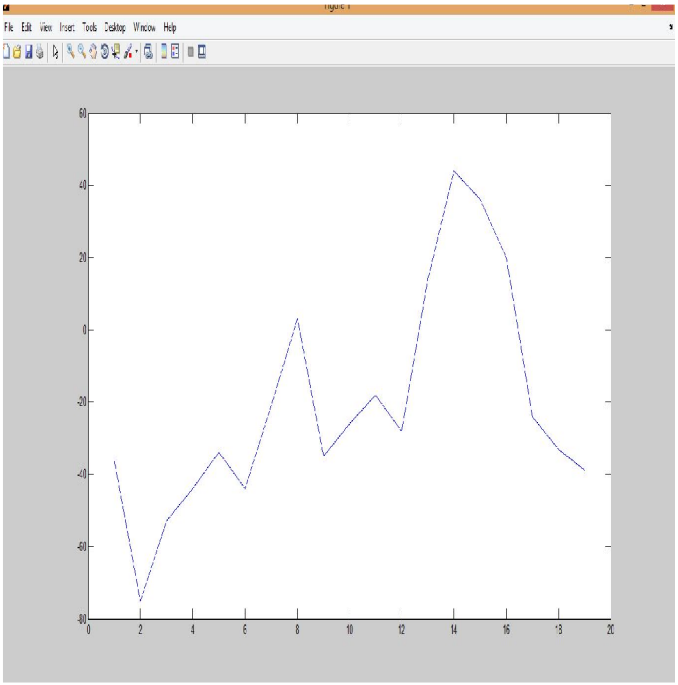
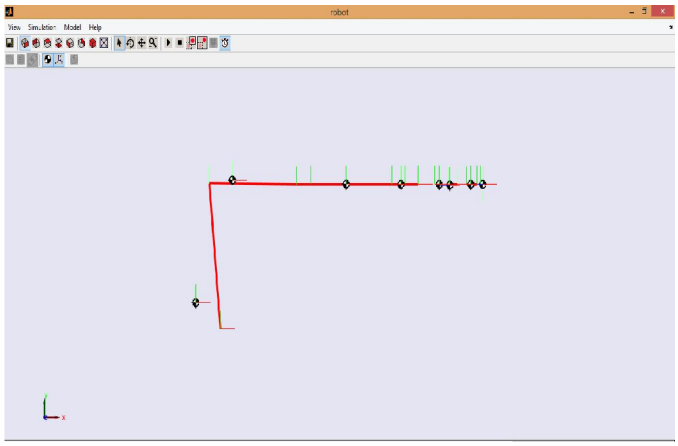
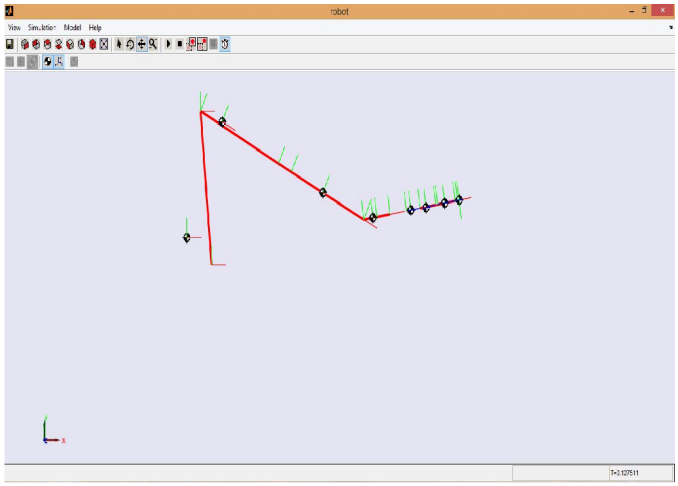
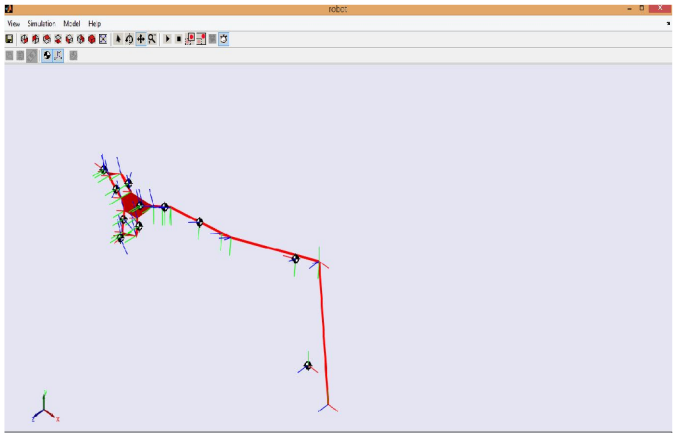


Fig 9. Matlab plot show arm movement







6. CONCLUSIONS

This experimental setup helps for people who lost their limbs and this prototype will make them act independently.

REFERNCES

[1] Chun Htoo Aung, Khin Thandar Lwin, and Yin Mon Myint, Modeling Motion Control System for Motorized Robot arm using MATLAB, World Academy of Science, Engineering and Technology 42 2008.

[2] Ahmad A. Mahfouz ,Mohammed M. K., Farhan A. Salem, Modeling, Simulation and Dynamics Analysis Issues of Electric Motor, for Mechatronics Applications, Using Different Approaches and Verification by MATLAB/Simulink (I). IJISA Vol. 5, No. 5, 39-57 April 2013.

[3] Norman S. Nise, Control system engineering, sixth edition, John Wiley & *Sons,* Inc, 2011.

[4] Farhan A. Salem, Modeling controller selection and design of electric DC motor for Mechatronics applications, using different control strategies and verification using MATLAB/Simulink, Submitted to European Scientific Journal, 2013

[5] M.P.Kazmierkowski, H.Tunia "Automatic Control of Converter-Fed Drives", Warszawa 1994.

[6] R.D. Doncker, D.W.J. Pulle, and A. Veltman. Advanced Electri-cal Drives: Analysis, Modeling, Control. Springer, 2011.

[7] Grzegorz SIEKLUCKI,Analysis of the Transfer-Function Models of Electric Drives with Controlled Voltage Source PRZEGL ˛ AD ELEKTROTECHNICZNY (Electrical Review), ISSN 0033-2097, R.88NR7a/2012.

[8] An educational MATLAB m.file applied to PMDC motor controllers design comparison, selection and analysis Ahmad A. Mahfouz, Farhan A. Salem

[9] B. Shah, Field Oriented Control of Step Motors, MSc. Thesis, SVMITB haruch, India, Dec. 2004.