

# Design and Development of Electroencephalography based Cost Effective Prosthetic Arm Controlled by Mind Waves -A Review

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**Abstract**— There are inexact 6 million crippled individuals. These handicapped individuals are influenced with Different neuro issue. To convey what needs be, one must furnish them with Artificial and Augmented correspondence. For this, Brain-PC interface framework based On Electroencephalography has been created to address this Requirement. Correspondence Has Occurred Between the Brain Thoughts and External Devices. Cerebrum Computer Interface Are the framework that can has customary channel Of Communication (for Example Muscles and Thoughts) That Provide the Direct Communication and control the human mind and a physical hand that interpret the distinctive example of mind activities. It is an amazing specialized apparatus among clients and frameworks. It doesn't require any outer gadgets or muscle mediation to issue directions and complete the association. The principal supposition of task reports the plan, development and a testing copy of the human Hand which tries to be dynamic just as kinematic exact. The conveyed hardware attempts to look like the development of organic human Arm by perusing the signs produced by Mind waves. The Mind Brain waves are detected by sensors in the TGAM and produce Theta, alpha, Delta, beta and gamma signals. At that point this flag is prepared by the Arduino-microcontroller and the development is then created to the prosthetic hand by means of servo Mechanism.

**Key words:** Prosthetic Arm, TGAM, Bluetooth Module HC-05, Arduino, Servo Motors, Electroencephalography, Brainwave

## I. INTRODUCTION

### A. EEG Source Localization: Sensor Density and Head Surface Coverage

In this research paper they showed the exactness of EEG source confinement relies upon a sufficient testing of the surface potential field, a precise directing volume estimation (head show), and an appropriate and surely knew converse system. The objective of the present investigation is to look at the impact of examining thickness and inclusion on the capacity to precisely confine sources, utilizing regular straight converse weight procedures, at various profundities. A few reverse strategies are analyzed, utilizing the well-known head conductivity. New strategy Simulation contemplates were utilized to inspect the impact of spatial examining of the potential field at the head surface, as far as sensor thickness and inclusion of the second rate and unrivaled head areas. Furthermore, the impacts of sensor thickness and inclusion are explored in the source restriction of epileptiform EEG Results: Greater sensor thickness improves source limitation exactness. Also, over all testing thickness and opposite techniques, including tests the second rate surface improves the exactness of source assesses at all profundities Comparison with existing strategies: More

precise source confinement of EEG information can be accomplished with high spatial examining of the head surface cathodes

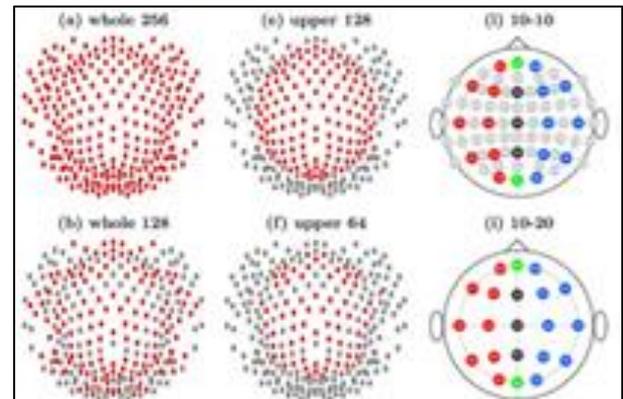


Fig. 1: sampling density and coverage of array

### 1) Limitations/Future scope:

They didn't survey the effect of noncephalic antiquities in the information, and these are especially dangerous for the sensors on the Face. In future research to develop enough individual head models, incorporating cortical surface reproduction with arranged dipole patches, to permit general ends on the breaking points of electrical source estimation when the introduction of the cortex is known

**Conclusion:** The most precise source confinement is acquired when the voltage surface is thickly inspected over both the prevalent and sub-par surfaces

### B. Brain Computer Interfacing: Applications and Challenges.

In This Paper, Cerebrum Computer Interface innovation speaks to a profoundly developing field of research with application framework. Its Contribution in therapeutic field go from aversion to neuronal recovery for genuine wounds, Mind Reading And remote correspondence has their extraordinary unique finger impression in various fields, for example, instructive, self-guideline, generation, showcasing, security just as recreations and Entertainment. It makes a shared comprehension among clients and the encompassing frameworks. This paper demonstrates the application zones that could profit by mind waves in encouraging or accomplishing their objectives. They Also Discuss real convenience and specialized difficulties that face mind signals use in different parts of bci framework. Distinctive arrangements that plan to restrict and diminish their belongings have additionally been inspected.

Mind signals mirror the took care of exercises and controlling conduct of the cerebrum or the impact of the got data from other body parts either detecting or inside organs. Cerebrum Computer Interfacing gives a directing office among mind and outside gear.

BCI applications have pulled in the exploration network. A few investigations have been introduced in this paper with respect to the developing enthusiasm for BCI application fields, for example, restorative, hierarchical, transportation, recreations and excitement, and security and verification fields. It likewise exhibits the different gadgets utilized for catching mind signals.

These account gadgets are isolated into two primary classifications: intrusive and non-obtrusive. Obtrusive class, which requires embedding medical procedure, is typically required for basic deadened circumstances as a result of their higher precision rates accomplished either spatially or transiently. Then again, the non-intrusive class, as referenced beforehand, has been broadly spread in other application fields because of its points of interest over the obtrusive one. Different difficulties and issues acted like an aftereffect of using mind signals have additionally been examined alongside certain arrangements offered by various calculations at different BCI preparing parts

### C. Systematic Comparison between a Wireless EEG System with Dry Electrodes and a Wired EEG System with Wet Electrodes

In This Research Paper They led a methodical correlation of anodes application speed, subject solace, and most fundamentally electrophysiological flag quality between the ordinary and wired Bio semi EEG framework utilizing wet dynamic cathodes and the minimal and remote F1 EEG framework comprising of dry latent terminals

They demonstrated that the signal quality of a wireless dry EEG system is comparable with that of a conventional wet EEG system in a controlled laboratory environment.

### D. Wireless Robotic Hand for Remote Operations using Flex Sensor:

A finger movement catching gadget dependent on flex sensor is utilized as an info gadget to the framework, it gives exact affectability and better outcomes. The fruitful improvement of remote association between the human hand and the automated hand, the remote flag transmission has effectively finished by means of Zigbee gadget. Flex sensor based robot was chosen, to caught the human finger conduct to control the automated framework. At the point when contrasted with other basic info gadgets, this methodology was good with remote medium also. This worked with the remote medium effectively in light of its detecting limit with the quick development of human stance

### E. Design and Manufacturing of a Prototype of a Lightweight Robot Arm

In This Research Paper the point of this work is to produce a model of a lightweight robot arm with a minimal effort spending plan, completely utilitarian. This model is utilized to test and fix the components for driving and controlling. Amid the advancement procedure, a few tests and studies were performed, for example, quality recreations, dimensional impacts after a post-process treatment with CH32CO, change of control parameters to improve the exactness, testing of conduct of transmissions, and so forth. The model must have a low weight by and large and a correct

activity. The outcomes and ends, related with material, fortifications, geometry/state of the parts, and so forth, progress toward becoming proposals for the production of the last lightweight robot arm. The one that won't be model.

The usefulness of the model, closest the genuine one, is the fundamental favorable position come to in the arm-model. This usefulness (developments, compasses of the arm, bolstered burdens, and so forth.) has permitted the simultaneous work of various groups. The advancement time was diminished, and a few practices and setups that should be adjusted for the assembling of the last robot arm were made clear.

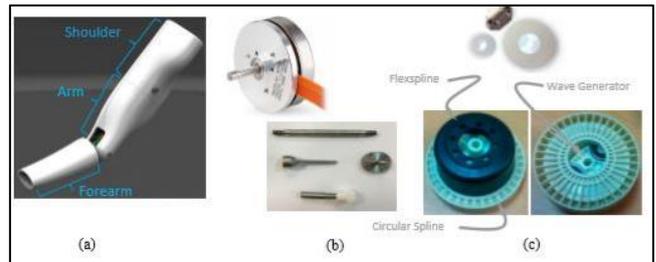


Fig. 2: (a) Image Of The Light Robot Arm (b,c) components of robotic arm

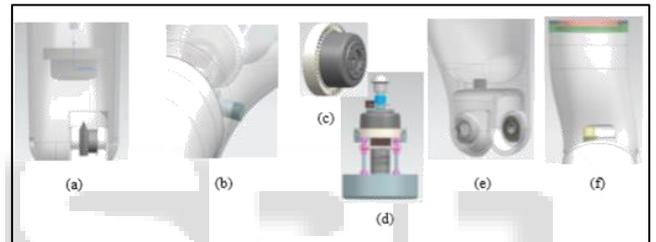


Fig. 3: Examples of 3D models of parts and components for the robot arm

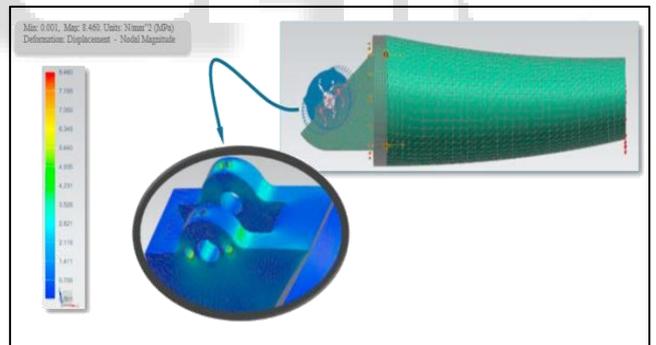


Fig. 4: Structural analysis of the arm-forearm joint

### F. "Real Time EEG Based Cognitive Brain Computer Interface for Control Applications via Arduino Interfacing

In This Research Paper Their Objective Is to translate a cognitive activity of human subjects captured via electroencephalography (EEG) into action. Neural driven BCIs are picking up significance while giving help particularly to crippled/physically secured patients so as to reestablish a valuable life. An endeavor has been made to outline intellectual movement of human subjects that includes intentional single eye squint with particular neural initiation by means of electroencephalography (EEG). The varieties have been caught at frontal channels of cerebral cortex. The acquired high occasion related possibilities have been customized to interpret an eye flicker activity into directions to produce dynamic high at Arduino yield amid intentional

eye flicker. It is used to control the on-off occurrences of interfaced LED through minimal effort Arduino board. The created model has been conveyed in Arduino utilizing Simulink to give adaptability while controlling yield gadgets. These discoveries exhibit the plausibility of proposed calculation in growing progressively intuitive Brain Computer Interfaces continuously situation to help restoratively tested individuals with extreme engine issue.

The technique embraced have the capacity to offer patients with serious engine neuron issue an elective methods for correspondence and authority over their condition by means of uses for neurorehabilitation of engine and intellectual capacities

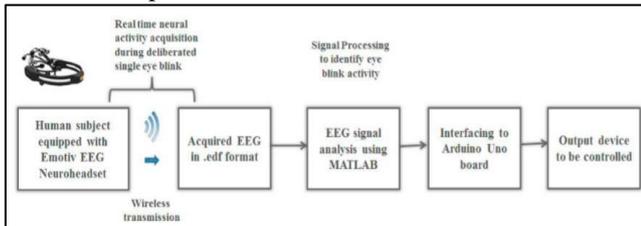


Fig. 5: Block Diagram for real time acquisition and cognitive analysis of EEG signal during intentional eye blink

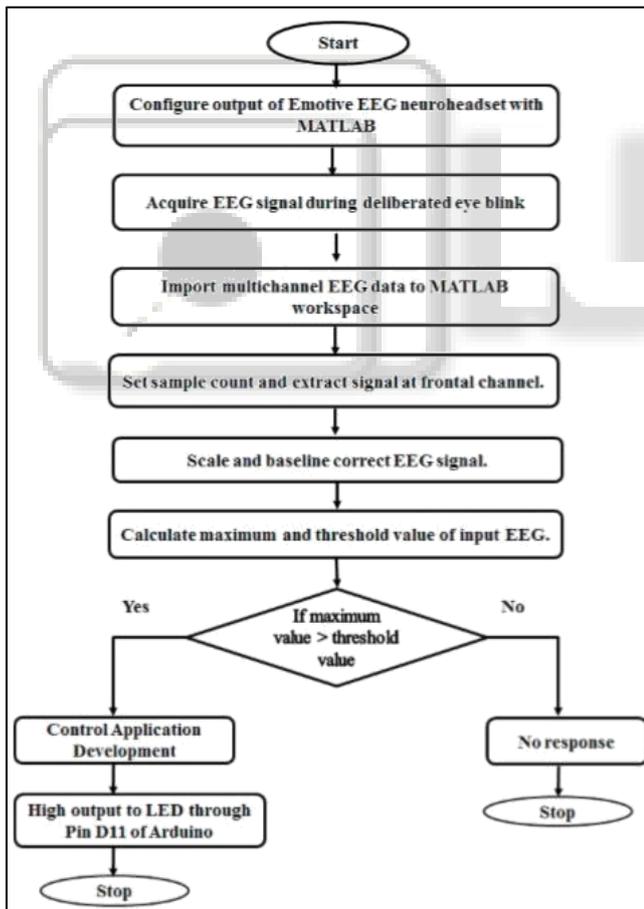


Fig: 6 Algorithm to use eye-blink EEG to control on-off instances of LED

### G. Mind Controlled Wheelchair

The Objective of This Paper Is to Develop a Wheel Chair for Disabled People by Using Mind Control

The paper manages building an electric wheelchair from a typical wheelchair and the improvement of a BCI framework (Brain-Computer Interface) between the electric wheelchair and the human cerebrum. The objective populaces for the mind-controlled wheelchair are the patients who are deadened underneath the neck and can't utilize customary wheelchair interfaces. A versatile EEG headset, MCU and firmware flag handling together encourage the development of the wheelchair by preparing the client's cerebrum action and eye squints' recurrence. This paper reports the making of an expense efficient arrangement, later expected to be circulated as an extra change unit for a typical manual wheelchair. A Neurosky Mind wave headset is utilized to get EEG signals from the cerebrum. This is a marketed adaptation of the Open-EEG Project. The flag acquired from EEG sensor is handled by the ARM microcontroller FRDM KL-25Z, a Freescale board. The microcontroller takes choice for deciding the heading of movement of wheelchair dependent on floor recognition and impediment shirking sensors mounted on wheelchair's footplate. The MCU indicates ongoing data on a shading LCD interfaced to it. Joystick control of the wheelchair is likewise given as an extra interface alternative that can be browsed the menu arrangement of the undertaking. Watchwords: Brain-Computer Interface (BCI), Open Electroencephalography (EEG), Microcontroller Unit (MCU), Firmware Menu System.

### II. CONCLUSION

After Reviewing the Papers I Found That the prosthetic arm utilizes Arduino Uno stage consistently to dissect the approaching EEG signals and guide them to proper activities. This framework comprises of two imperative areas. The first is brainwave headset given by Mind wave sensor and the other one is Bluetooth module which is utilized for gathering of the signals. signal procurement is finished by Bluetooth module. The other segment is Arduino which process approaching information and guide into the mechanical arm. Mind Sensor and Arduino will be interlinked with the assistance of Bluetooth remote correspondence and then again, the mechanical arm or counterfeit arm is associated with the Arduino.

The consideration and contemplation level is the parameter to control the three activity of the arm. These qualities can be grouped into two distinct extents. For these two territories, a particular activity is set. These activities will be performed by the Arduino as indicated by the approaching crude EEG signals. According to the Signals and Microcontroller Servo Motors Will Give a Require Force to Close and to Open the Fingers of Prosthetic Arm

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