

# Bionic hand controlled by EEG signal

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According to the current statistics, the demand for prosthetic and orthotic services in developing countries is increasing, as a total of 80% of the disabled population lives here. Landmine detonations in war-torn countries and poor sanitation contributes to amputations caused by gangrene, diabetes, and other infections .In proportion to the number of amputation rises, need for sufficient supply of prosthetic limbs and qualified personnel also rises. Along with the replacement of limbs; repair, damage, and replacement also account for the increased production and cost of prosthetic limbs. Also, training the subject to use the prosthetic limb is also a time-consuming process. These problems can be solved by using cost-effective and easy to use the prosthetic limb.

In this project, we introduce a novel approach where eye signal extracted from EEG signal is used to control a prosthetic arm.The main framework include:

- 1) Design and fabrication of 3D printed prosthetic arm.
- 2) Extraction of commands from EEG
  - Training the subject to control the blinks
  - Acquiring the command signal in time window.
  - Pre-processing
  - Selection of channels and extraction of pulse coded modulation (PCM) commands
- 3) Translation of commands to tasks to be done by arm
  - PCM commands are transmitted to the arduino
  - Training and Testing

The system consists of a signal acquisition framework and a prosthetic arm. Signal acquisition system consists of a PC, and an emotive epoc headset. Actions to be done are divided into micromechanical tasks, which in turn are mapped as commands. User can access the respective commands from PC and input them accordingly to carry out the particular task.

The transmitter end consists of an emotive headset, and a communication server. The receiver end has decoder for the 14 channels and is stored in buffer. It also has a processing system which can be a PC or mobile phone.

The output is serial output, giving commands based on the micro task. Microcontroller (Arduino nano) act as translator, which breaks the commands to micromechanical movement that controls servo motor in the prosthetic arm.