

IOT Based Mind Controlled BOT

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Abstract—Internet of Things (IOT) based mind-controlled bot is a software-hardware interface that deals with the interconnection between the hardware and the software. In this work, the hardware components are Arduino, Node Mcu etc. The software interfaces are the NI Instruments LabVIEW, html, and many others. Iot based mind-controlled bot is a total amalgamation of hardware and software. The Electroencephalograph (EEG) signals are sent to the LabVIEW software with the help of Neurosky (mind wave gear) by the Bluetooth Module HC 05. Firstly, EEG signals are differentiated into three types—concentration, meditation and attention. Secondly, it can be further differentiated into alpha, beta and delta signals in order to get more precise values. Since, the Arduino cannot take low values the signals are amplified in the LabVIEW software. From this software, the signals are sent to the Node Mcu which is basically connected to the bot. Here, the concentration has been used in order to pick and drop an object. A web page is also created in the IOT platform with the help of LabVIEW software where four buttons are created to move the total bot. This mechanism which can be used for picking and dropping of an object as an arm using neuro-signal can be very useful for any disabled person as it is acting as an artificial hand.

Keywords- Arduino, Artificial hand, internet of things, NI LabVIEW, Neurosky.

I. INTRODUCTION

In this work, the brain signals, basically the EEG (Electroencephalograph) signals have been collected with the help of Neurosky (mind wave gear). Then after collection of the signals, the signals have been differentiated into attention, meditation and concentration in the NI Instruments LabVIEW software. The LabVIEW is used as an interface medium to hardware (Arduino). Since, the Arduino cannot take low values the data are amplified in the LabVIEW software. Here, the concentration signal is basically taken under consideration. If the concentration is above 50% then bot is being instructed for grip operation. Else it is asked to release the object. From the LabVIEW software the data are uploaded to the web server. This web server helps in collecting the real time values. In the web server, four buttons have been created in order to move the total bot. Finally the values from the server are sent to the Node Mcu connected to the bot which helps the bot to move in different directions. Overall, it is an incorporation of IoT in LabVIEW- a new invention in automation and technical field. The entire operation is summarized in fig. 1.

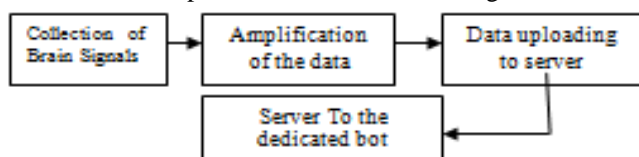


Fig.1: Block diagram of the work

II. METHODOLOGY

Robotic arm is a combination of mechanical and electronic components. In this work, the structure has been used as a total bot. It is able to perform gripping with the help of the values obtained from the graph. Therefore, it is a basic need to the paralysed person.

It collects the EEG signals with the help of wireless EEG collecting sensors. Here, “**Neurosky Mindwave Thinkgear**” is used for the collection of raw EEG signals.

About Neurosky Mindwave Thinkgear: NeuroSky is a device which can sense the brain signals and makes a Brain-Computer Interface (BCI) technology. The NeuroSky Mindwave uses EEG technology to safely measure brainwave signals and monitor attention, concentration, meditation and many other raw signal levels. This senses the analog signal and then converts into the digital and then sends the signal.

After the collection of the raw signal from the human brain neurosky device sends the data to our Laptop/Computer using the Bluetooth technology. Using the wireless communication port our laptop or computer collects the data which is sent by the neurosky. For visualising and processing the data a software interface is required. The software used for the work is “**LabVIEW**”.

Incorporation of LabVIEW in the work: It is a platform by National Instrumentation (NI) to interface between hardware and software according to our needs using various packages provided by VI package manager. In this software the data is acquired and processed using programming logic and control flow diagram.

In the LabVIEW, at first a serial wireless communication is created, so that, through that communication port data can be transferred from the Neurosky. A LabVIEW Neurosky Driver is needed to get the raw signals and make it useful for the work. With the help of this driver, firstly, a think gear create task has to be created and this block will get the input from the communication port. The output of this block has to be connected with the think gear start task which will start taking the signals when the whole operation will start. From this block, the raw brain signals data in digital format can be taken as input for the work.

Description of VI Diagram designed for the work: The Neurosky driver also allows to create a think gear read block which will be helping to determine which type of data is needed for the work. Some examples are: sample attention, sample meditation, raw EEG signals or if needed more precise value of the EEG signal like alpha, beta gamma components of the signal can also be extracted. This particular block also allows checking the output waveform in graphical format which can be seen in fig. 3. The output from the think gear read block is in float form which is not compatible for servo. So, the signal needs to be converted from float value to integer value for that an U16 converter has been used to convert the signal. After the conversion the signal must be amplified so that it becomes useful to run a servo motor. For that a virtual amplifier is used for this purpose. The whole process diagram is shown in fig. 2. After the amplification the data are then uploaded to the webpage which is created and interfaced with LabVIEW. Total movement of the structure is done by the IOT. With the help of Node Mcu the signals are read from the server using some programming. The signal finally achieved by the Node Mcu and further passed to the device and DC motor driving IC to perform the gripping and other movement of robotic arm. The full gadget can also be handled with the help of buttons which is created in our web page using HTML programming.

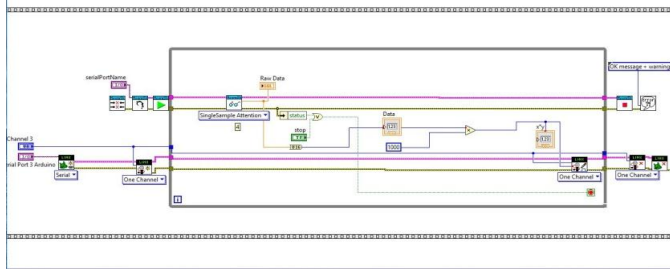


Fig.2: LabVIEW Block diagram

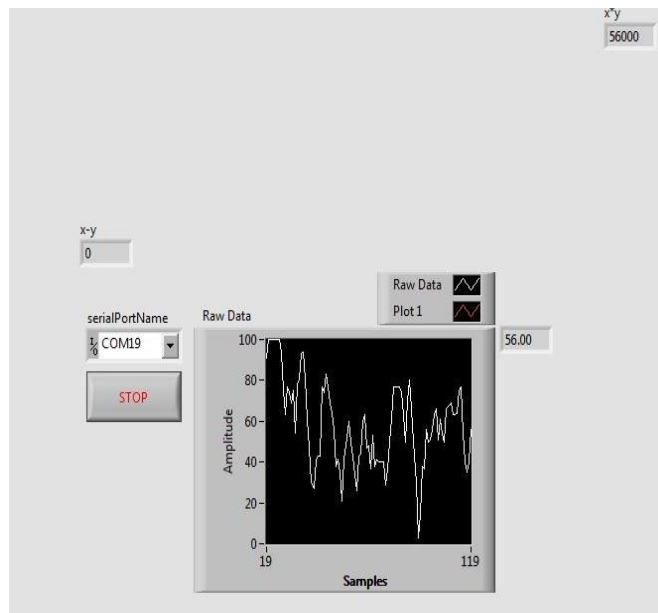


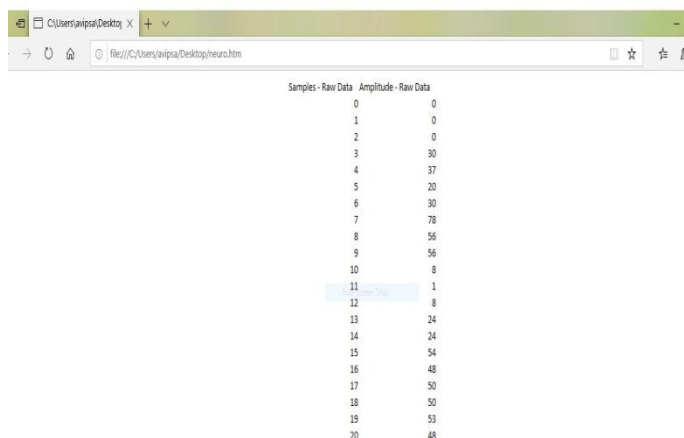
Fig.3:VI diagram (curve of brain EEG signals)

Incorporation of IOT in this work:

1. Internet of things (IOT) describes the way how objects can be connected to the internet. By using IOT those connected objects can be identified by devices.
2. Any device can be connected to the internet by using a simple on/off switch by using IOT concept.
3. Things in IOT can be anything. It can be lamps, cell phones, wearable device etc.
4. IOT system collects the data from surrounding environment. It can collect real time data.
5. Next the collected data is sent to the cloud.
6. After the data collection is done then the software performs processing on the acquired data.

In this work the EEG values obtained from LabVIEW are sent into the data base, which is dedicatedly created for this work. After completion of the data upload on the receiving end the bot which is connected with Node Mcu and other components like DC motors or servo motors which is arranged in such a way that it can act as an independent bot with an object gripper. Node Mcu is further programmed with some programming language to access that data base and collect those data to take as input and to operate the bot accordingly.

In fig.4 the data which is sent to the server is shown in the webpage. In this webpage, two columns are present, first one is the sample raw data and second column is amplitude raw data which is used for the object gripping job for the work.



Samples - Raw Data	Amplitude - Raw Data
0	0
1	0
2	0
3	30
4	37
5	20
6	30
7	78
8	56
9	56
10	8
11	1
12	8
13	24
14	24
15	54
16	48
17	50
18	50
19	53
20	48

Fig.4 Snapshot of values obtained from LabVIEW and sending it to webpage

III. RESULTS AND DISCUSSION

Mainly, the values are taken from LabVIEW software. When the Neurosky device is properly connected via Bluetooth of the laptop or any electronic gadgets and when it is properly placed over the head, then the attention as a numeric value gets displayed. The signal obtained is very low, so for our work need an amplifier to amplify the signals. The amplified values can be observed when raw data signal goes high in the given graph the bot fingers grips any object. When the values go down for a certain pre-determined threshold level (mentioned in the algorithm) the bot makes its finger loose and drops the object. A Database is successfully created in "000freewebhost" server. In Database, as per the requirement a table is created. Successfully, we inserted the values got from the LabVIEW software into the Database. The threshold modification is possible as per the requirement. Data inserted into the Database can be displayed in JSON format.

IV. CONCLUSION AND FUTURE SCOPE

Through this work, the arm can be rotated successfully with full dimension with the help of mind waves. A paralyzed person becomes self-dependent through this work. Hence, the IOT based mind-controlled bot can be used precisely as a noble alternative in household automation.

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