Brain Controlled Robot Using Mind Wave Sensor

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Abstract-with the arrival of technology, the life of human being has become more advanced with many of electronic devices and automated life which reduces time and energy of the human being. However, that technology is not being used by some people who are physically impaired. Currently, they are using a better technology which gives the ability to move around. But still who are physically impaired may have good intellectual skills like Stephen Hawking and many more great people who achieved great things with their minds. So this is a task for severely disabled patients who cannot convey their messages, these interfaces help them so that they can move around the world using their mind power. We have planned to design a robot which is entirely automated and control using Beta wave (human brain attention) associated with Mind wave sensor which identifies brain signals and also we made utilize of Arduino to control a robot.

Keywords— NeuroSky Mindwave sensor, HC-05 bluetooth module, Motor driver, Arduino.

I. INTRODUCTION

Various patients have insinuated a neurologist to have an electroencephalogram (EEG)[3], which records electrical inspirations from the nerves in the head. "Electro" insinuates the electrical main impetuses sent beginning with one nerve cell then onto the following. These inspirations are the way nerves talk with each other and get information from the psyche. "Encephalo" insinuates the head, and "gram" implies the printed record.

EEG exams are done by putting cathodes on the scalp and seeing what the electrical inspirations look like when the patient is caution, napping, in a stay with a flashing light or occasionally when the patient is asked for that breathe in significantly over and over. Exactly when the EEG is done, no power is put into or removed from the patient. The electrical signs that the mind produces are basically perceived and printed out on a PC screen or a touch of paper.

An EEG [3] chooses the understanding's level of availability or mindfulness is ordinary, anomalies specifically a bit of the brain, inclination to have seizures or squirming and particular kind of epilepsy. As a less than dependable rule a patient may have a tendency to have seizures, however, his or her EEG is conventional at the particular time it is done. That is by virtue of people with a seizure slant may have varieties from the standard that backpedal and forward from hour to hour or typical. In these cases, a repeat EEG or a more drawn out time of EEG watching might be profitable.

II. EXISTING SYSTEM

Brain wave controller was used to control the led to on and off by using sculpture electrodes. But efficient is less and cannot predict the perfect output.

III. PROPOSED SYSTEM

The project is designed to control the robot to move in all directions i.e. front, back, right and left by using Neurosky's Mind wave sensor. In this proposed system mind wave sensor going to take brainwaves as inputs to the system by various parameters like Attention, Meditation and Eye blinking. In this proposed system going to control robot till 10 meters with a very effective speed. Ultrasonic sensor is introduced such that to avoid damages to the robot.

IV. BLOCK DIAGRAM

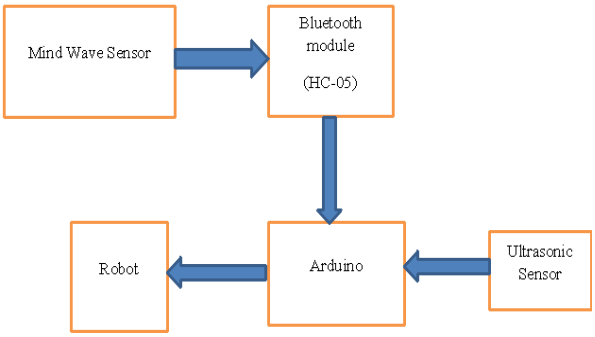

Fig 1.1 Block diagram

This block diagram indicates the brain-controlled robot. Our brain contains many EEG[3] signals (beta waves) and produce in a different pattern according to the actions done by the human beings. These brain signals which are produced from our mind are grasped by the neuro sky brain wave sensor. The beta waves are developed into instructions and forward to HC-05 module. This Bluetooth module interfaces with Arduino and robot which is connected to the Arduino.

V. SYSTEM ARCHITECTURE

1. ARDUINO

Arduino sheets plan utilization variety for combination of chip and controllers. The board may be prepared with 13 advanced and 6 analogs (I/O) pins that might a chance to be interfaced on Different sensors What's more circuits.

Microcontrollers normally programmed utilizing modifying dialects inserted c's.

- Microcontroller: ArduinoUNO needs microcontroller known as ATMEGA328. It needs an inside memory of 32KB. The operating extent of it may be from 3. 3V should 5V. It could store that information significantly when the energy supply may be removed due to its NAND streak memory. It needs a whole from claiming 28 pins.
- It needs splendid highlights about cosset productivity, low energy scattering, modifying lock for security purposes, and consistent counter for the differentiate oscillator.

  The inputs from the brain are given to the Mind wave sensor in the form of attention. These attention levels are monitored on the serial monitor of the Arduino software. To check the values of attention on serial monitor, the Mind wave sensor must be connected to the application. Different states of attention give different attention levels. Based on these attention levels of scale from 0 to 100, we need to program different values of Attention to move the robot in different directions such as lest, right, forward, backward. All the components which we use in this project are connected to the Arduino and can be controlled by programming.

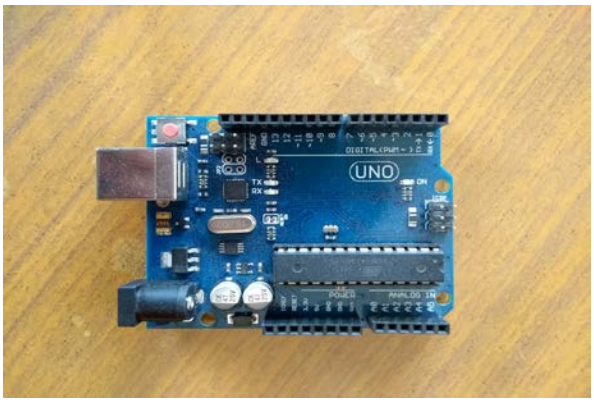

Fig 2: ARDUNIO

2. MIND WAVE SENSOR

BCI (Brain Computer Interface) [1] changes over different sorts of cerebrum development into summons ceaselessly. It controls the external devices by human cerebrum as it goes about as correspondence between human personality and contraptions.

ALGORITHM:

Toward those end goals that perspective at those neuron blazes in the cerebrum, those brainwaves need aid the minimal electrical signs discharged. NeuroSky's BCI[1] headway meets expectations Eventually Tom's perusing checking these electrical principle thrusts for a cerebrum sensor.

The neural signs from cerebrum are the commitment to our Think Gear chip and interpreted with our ensured Attention and Meditation estimations. The think electrical patterns and learned interpretations are then yielded as mechanized messages to the PC, toy, or phone[4], empowering you with perceive your brainwaves on the screen alternately utilization your brainwaves with sway those gadget's immediate.

ATTENTION:

It exhibits those levels for a mental purpose for merging of the wearer. Its view ranges from (0-100). This can be observed in serial screen utilizing Arduino through which we camwood system what's more. Control the gadget utilizing brainwave sensor. The Mind wave sensor is to be associated with PC to check the consideration levels on the serial screen. Dissimilar estimations from claiming attention camwood chance to be altered to move those robots (device) have done Different bearings i.e., Left, appropriate, forward Furthermore Previously, reverse.

THINKGEAR TECHNOLOGY:

ThinkGear is the advancement inside each NeuroSky thing that enables the contraption to interface with the wearers' brainwaves. It fuses:

- The sensor that touches the temple (forehead).
- The contact and reference centers arranged around the ear cushion.
- The inbuilt chip that methods the more stupendous and only bulk of data.

ThinkGear chip[7] evaluates those crude brainwave designs, those attentions, and the thought levels. The surveyed respects are yield Eventually Tom's perusing those ThinkGear chip, through the headset, should a pc.

- ThinkGear chip yields the accompanying sort of data:
- Raw tested wave esteems (128Hz or 512Hz, dependent upon gear)
- Signal low-quality estimations

Meter estimation about consideration also contemplation, EEG[3] band control esteem to a delta, Furthermore gamma thus.

HOW TO USE THE MINDWAVE SENSOR:

- Headset ought to wear such-and-such those sanctuary sensor arms will be on the cleared out arm side.
- Rotate the sensor arm from its base by 900.

- For the sensor to gather the signs from the temple, the sensor must reach the brow. The elastic ear circle ought to be settled to rest behind your ear.
- Clasp the ear-clip on the ear ligament. Ensure the two metal contacts inside the ear-clip achieve the ear fold.
- Those sensor tips ought to will chance to be agreeable, so remain done firm position.
- If the signal isn't gotten amid use, take after the above advances legitimately to affirm the correct association.

WIRELESS CONNECTION TROUBLESHOOTING:

On the off opportunity that the headset detaches thus due to Emulating reasons, take after those underneath steps.

- Other applications are to be shut that are as of now associated with Mind wave.
- The Mind wave headset ought to be associated with the gadget.
- Low battery: it is spoken to toward red light. Supplant the battery. The accused battery is spoken should in blue light.
- See to it that ThinkGear connector is running and empowered on the off chance that if the ThinkGear isn't working legitimately.

Fig 3: NeuroSky mind wave sensor

3. HC-05 MODULE

HC-05 is a Bluetooth module [7] used for serial communication. It uses V the Bluetooth module consists of MASTER/SLAVE configuration for data transmission. HC-05 is a 36 pin package module with UART interface communication with Arduino. It can be operated at very low power 1.8V.

Hc-05 uses CMOS technology for serial communication with Arduino and it consist V2.0 USB port for configuration of the module. The MASTER/SLAVE controls the data flow in the Bluetooth for receiving and transmitting of the data to the board.

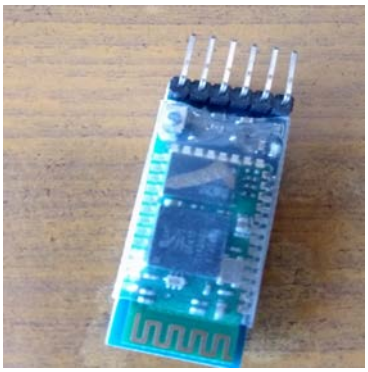

Fig 4: HC-05 module

4. MOTOR DRIVER

L298N is a dual bridge module which may be used to control those pace What's more the directions of the robot. The L298N motor driver consists of two bridge connection which controls the four stepper motors. The L298N motor works with (5V-35V) power supply to the drivers. The module also consists of 5V regulator to control the power supply on the Arduino board. L298N is less expensive and more reliable when compared to other module.

L298N consists of four inputs and four output pins to controls the motors with Arduino. L298N motor driver is also capable of working in low power supply.

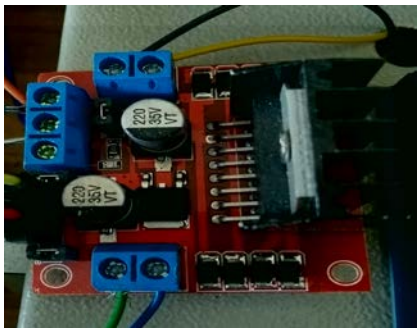

Fig 5: L298N motor driver

5. ULTRASONIC

Ultrasonic sensor is a electronic device which measures distance to the object by using sound pulses. It measures distance by sending out a sound pulse at a specific frequency and listening for that sound wave to bounce back.

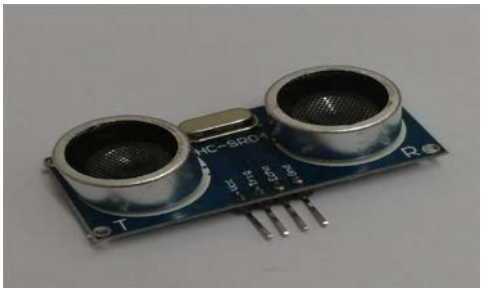

Fig 6 Ultrasonic Sensor

By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

VI. IMPLEMENTATION

The figure 8 shows the flow chart of the brain controlled robot. We need to connect the sensor to the brain. Then, interface Mind wave sensor to the Bluetooth. Based on the different values of attention, program the Arduino to control the robot in different directions such as left, right, forward, and backward.

Fig 7: Interfacing sensor with robot

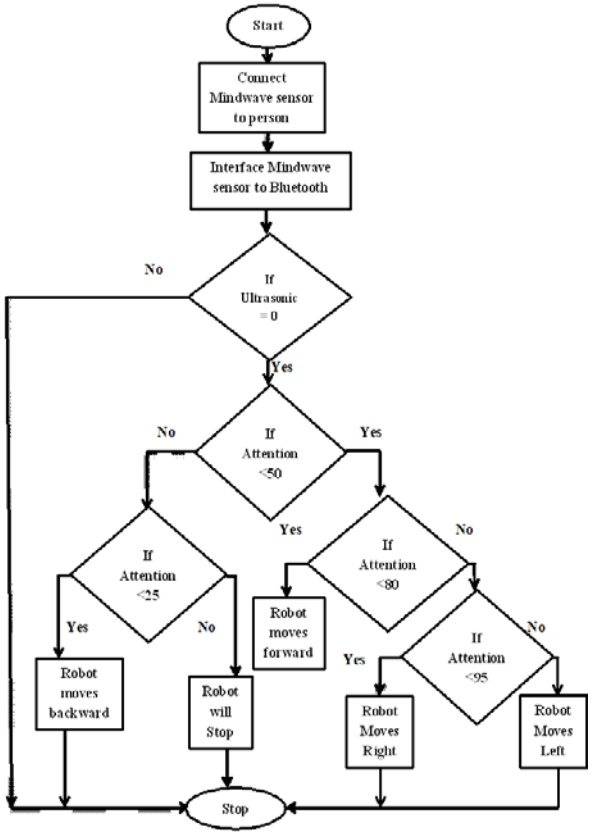

Fig 8: Flow chart

VII. EXPERIMENTAL RESULTS

Fig 8 represents the attention levels of a person who is wearing the mind wave sensor. According to the attention levels our robot will move in that direction.

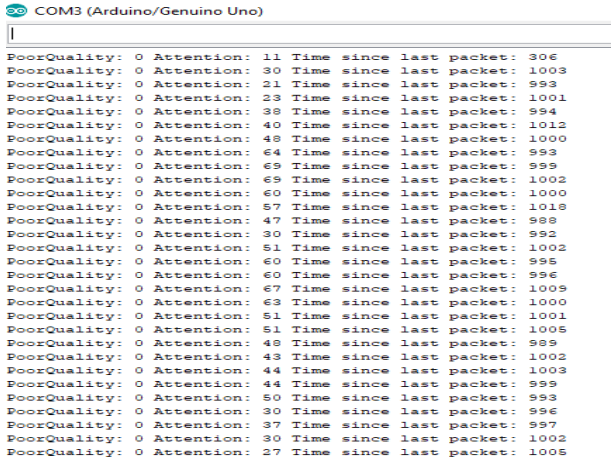

Fig 9: Attention values on serial monitor

VIII. CONCLUSION

The main idea in the implementation of this project is to interact brain signals with a computing device using neurosky mind wave sensor. From the above test results we try to show the different attention levels of brain in relaxation state and in concentration state. So when the attention level is between 0-24 then the computing device moves backwards, 50-79 then the computing device moves forward and etc.

IX. FUTURE SCOPE

In future our project can be extended to control the home appliances and industries by using our brain signals.

X. ACKNOWLEDGEMENT

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