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Wearable Component Based Navigation Assistance For Physically Challenged People

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Abstract - Since the contraption of EEG have steady attempts been made to give meaning to the oscillating signal recorded. This has resulted in the ability to detect a wide range of different psychological and physiological phenomenon. The goal of this paper is to be able to recognize different emotions in EEG by the use of a computer and signal processing. By recognizing it the human being Machine Interface (HMI) is developed for a machine to react to humans emotions. This paper deals with the brain wave detecting feeler that would sense and transfer the EEG signal through the wireless Bluetooth conduit. The EEG waves are sensed and the spectrogram of that wave is feature extracted for further analysis. By creating the proposal of the spectrogram of the waves from the EEG to categorize the emotion of the person under study. According to the sentiment of the person the piece of equipment would react. In this machine would react to emotions like attention, meditation and eye blink etc. Machine reacts in the way like if the person is under attention then it makes the automaton to move to the fore and the same way for eye blinks we would add some more controls like making the robot move right or left side.

Key Words **Brain Machine Interface, Zigbee Technology, Mind Wave Mobile, EEG.**

1. INTRODUCTION

In 1924 Hans Berger, a German neurologist, record the first electro encephalogram (EEG) from a human being. An EEG shows the harmonized neuronal motion from a expanse of a intellect, recorded by an electrode as an oscillating signal reflecting the electric latent from the set of neurons to be found in close proximity to the electrode. This recording was in the untimely days only suitable for detecting hefty differences seen in the pattern produced, such as epileptic seizures, because the quality of the recording instrument and the fact that one had to manually inspect the waveform produced in sort to make out changes in the rhythms of the brain. These subtle changes have been recognized to encode for cognitive processes such as choosy consideration, working memory, mental calculations, as well as specific cognitive states and different types of behavior. It also explore brain-computer interfaces (BCI) in order to find commonly used computational methods for elucidation and examination of data that stems from brain activity, and to recognize what different types of systems that exist. And it could also be used to automate homes for the physically handicapped people.

1.1 Brain Sensor:

Attention

The Attention meter indicates the intensity of a user's level of mental "focus" or "attention". Its value ranges from 0 to 100. Attention level increases when user focuses on a single thought or an external object, decreases when distracted.

Blink Detection

The Blink Detection algorithm provides an indication whenever the user blinks. A privileged number indicates a "stronger" blink, while a minor number indicates a "lighter" or "weaker" blink.

Signal Quality

Indicating the captured brainwave signal quality is good or bad. Based on that users can decide whether the brainwave signal is usable or not.

Meditation

The Meditation meter indicates the level of a user's mental "calmness" or "relaxation". Its value ranges from 0 to 100. contemplation level increases when user relaxes his/her mind and decreases when he/she is uneasy or stressed.

Sensor contact on/off

Determines whether a headset is being worn by detecting whether the sensor and reference are contacting a conductive surface, such as skin. Because various regions of the brain produce EEG signals, cerebral electromagnetic movement is conventionally collected using the international 10–20 electrode placement system (10–20 System), which involves attaching electrodes to 37 locations on the cranium. Although this routine facilitates the observation of all EEG signal changes, basically applying this method to students is extremely inconvenient and impractical. Because a person's emotions, psychological state, and attentiveness are governed by various parts of the brain in the forehead region, observing the EEG signals from this area is a practical method for decisive whether students are attentive.

1.2 EEG Waves

These electromagnetic waves are used as electroencephalography (EEG) signals. Without training, humans are generally unable to have power over fluctuations in their EEG signals. Therefore, the use of EEG signals to determine whether students are wisdom thoughtfully is viable. Based on the frequency range, EEG signals can be divided into the following five wavebands list-behavior=unordered prefix-word= mark-type=disc α activity: electromagnetic waves ranging between 8 and 13 Hz in frequency, and among 30 and 50 μV in amplitude. This type of periodic wave is produced in the parietal and occipital regions of the brain when in a state of awareness, calm down, or at rest. When thinking, blinking, or otherwise stimulated, α waves fade away. This is known as an alpha slab.

β activity: electromagnetic waves ranging between 14 and 30 Hz in frequency, and flanked by 5 and 20 μV in amplitude. This type of motion occurs in the frontal region when people are conscious and alert. These waves are predominantly noticeable when a person is thinking or receiving sensory stimulation.

θ activity: electromagnetic waves ranging between 4 and 7 Hz in rate of recurrence, with an amplitude of less than 30 μV. This activity first and foremost occurs in the parietal and temporal regions of the brain. Such waves are produced when people experience arousing pressure, interruptions of realization, or deep physical relaxation.

δ activity: electromagnetic waves ranging among 0.5 and 3 Hz in frequency, and between 100 and 200 μV in amplitude. In a conscious state, most adults exhibit almost no δ activity; as an alternative, this activity occurs when in a cavernous sleep, unconscious, numb, or lacking oxygen.

γ activity: electromagnetic waves ranging among 31 and 50 Hz in frequency, and between 5 and 10 μV in amplitude. current studies have originate that γ activity is related to discriminatory attention. Other studies have also tinted that this activity is related to cognition and perceptual activity.

Along with more precise recording equipment, observed studies of EEG, and the availability of adequate computational authority in modern computers, came the rise of the ability to detect even more faint changes in the electric potential recorded.

2. Problem Definition

As physically handicapped people could not move and access the wheel chair by moving their body movement or they need to use minimum energy to make the wheelchair move.

The sensor that could sense the biological change in the human body must be considered for the which does not give much pressure on the human movement is taken care of in choosing the sensors.

2. Solution Techniques

2.1 Implementation

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The EEG waves are sensed and the spectrogram of that beckon is feature extracted for further analysis. By creating the plan of the spectrogram of the waves from the EEG to categorize the emotion of the person under study. According to the sentiment of the person the machine would react. In this project machine would react to emotions like attention, meditation and eye blink etc .Machine reacts in the way like if the person is under attention then it makes the robot to be in motion about frontward and the identical way for eye blinks we would add some more controls like making the robot move right or left side.

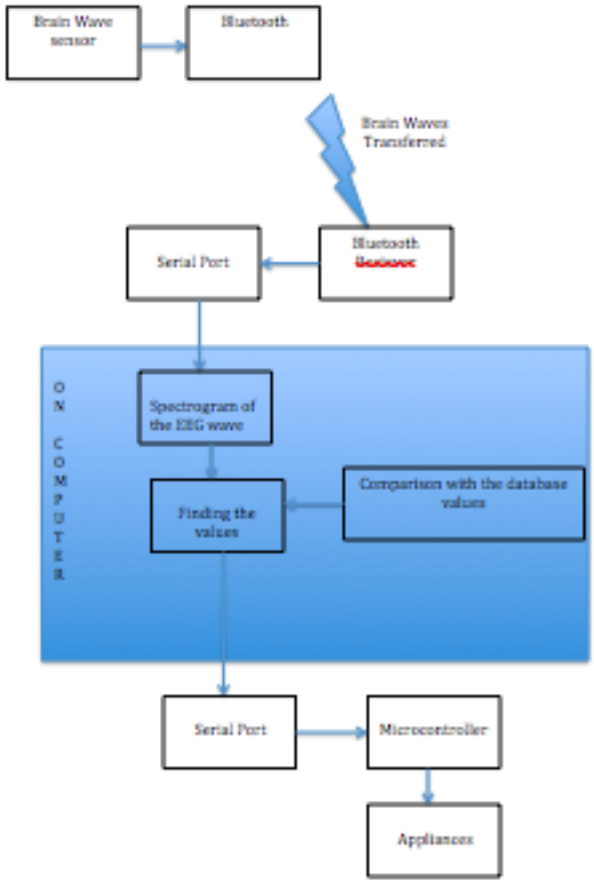

Fig- 2.1 : Block Diagram

3. Results And Discussion

Matlab Signal Processing Toolbox

Matlab Software :

Matlab software with the thinkgear driver is used for getting the values from the Mind Wave Mobile.And a GUI is developed to access the data and display the results.

Keil Compiler

The 8051 microcontroller needs the compiler to develop the code in C and get the hexadecimal values to run the logic on the 8051 microcontroller

Hardware Used:

Brain Wave sensor

Microcontroller 8051

8 bit Microcontroller with 4KB flash memory and 128bytes random memory and 12MHz to 24Mhz crystal oscillator speed.

Bluetooth with serial interface

10 meter range Bluetooth for accessing the brain wave data to the PC

5V relays

Switching the motors will be done by using these relays.

Execution Steps:

The components would be collected .The brain wave sensor would be procured from Neurosky, Microcontroller, Wheeled Robot.

The Software like Matlab, Keil Compiler and the Flash programmer has to be learnt.

Assembly and testing of the hardware and software. The required hardware and software are as given above. The Brain wave based setups with all the components are assembled. In this the machine would react to emotions like attention, meditation and eye blink etc .Machine reacts in the way like if the person is under attention then it makes the robot to move forward and the same way for eye blinks we would add

some more controls like making the robot move right or left side.

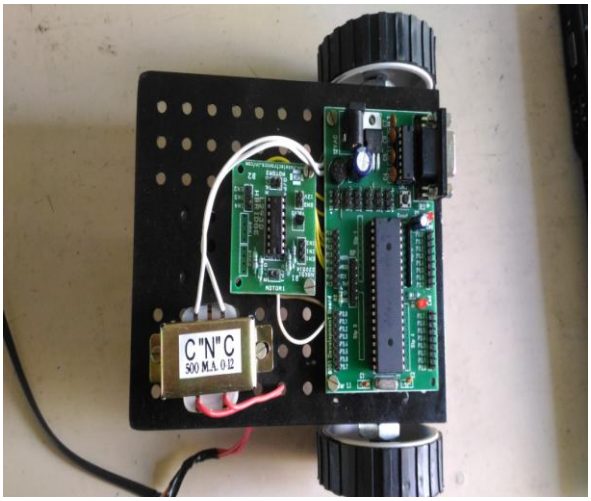

Fig-3.1: Wheeled Robot

4. CONCLUSIONS

The Brain Wave Sensor based implementation of the automation is carried out to assist the physically handicapped to have the complete control of the home appliances without any much movement of the body parts. This has been realized by emergent the Mat lab code and the output is connected to the Microcontroller and the appliances are switched ON and OFF automatically.

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