THE ROBOT CONTROL TECHNIQUE FOR EEG SIGNALS

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Abstract: This project discussed about a brain controlled robot based on Brain–computer interfaces (BCI). BCIs are systems that can bypass conventional channels of communication (i.e., muscles and thoughts) to provide direct communication and control between the human brain and physical devices by translating different patterns of brain activity into commands in real time. With these commands a mobile robot can be controlled. The intention of the project work is to develop a robot that can assist the disabled people in their daily life to do some work independent on others.

Keywords: ***EEG; Robot movement***

INTRODUCTION

Here, we are analyzing the brain wave signals. Human brain consists of millions of interconnected neurons. The patterns of interaction between these neurons are represented as thoughts and emotional states. According to the human thoughts , this pattern will be changing which in turn produce different electrical waves. A muscle contraction will also generate a unique electrical signal. All these electrical waves will be sensed by the brain wave sensor and it will convert the data into packets and transmit through Bluetooth medium. Level analyzer unit (LAU) will receive the brain wave raw data and it will extract and process the signal using Matlab platform. Then the control commands will be transmitted to the robotic module to process. With this entire system, we can move a robot according to the human thoughts and it can be turned by blink muscle contraction.

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BLOCK DIAGRAM:

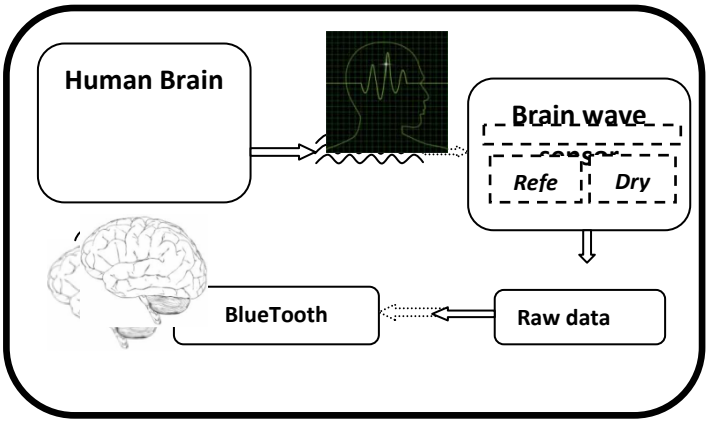

Fig a: Brain computer interface section

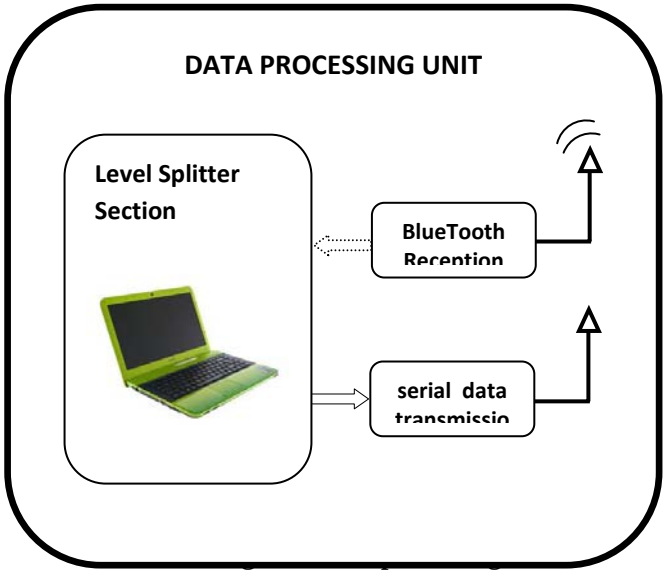

Fig b: Data processing unit

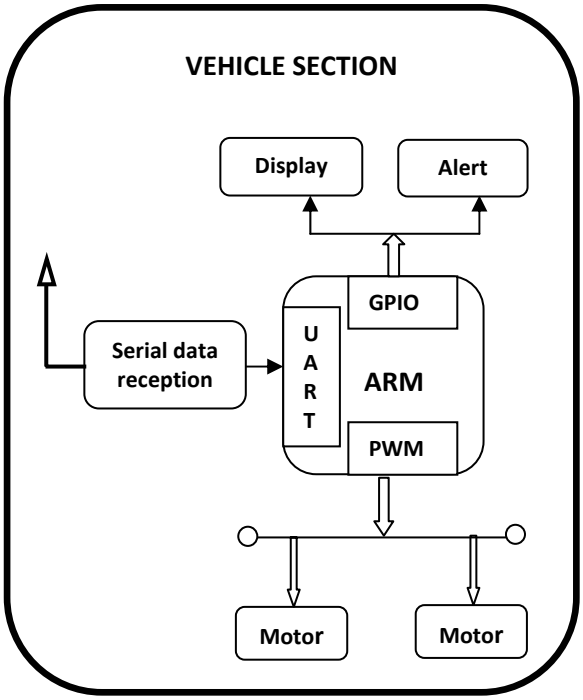

Fig c: Vehicle section

This project work consists of a Processor using ARM7 core, brain wave sensor and alert unit obstacle detection unit as hardware parts and an effective brain signal system using Mat lab platform. In this project initially the person's attention level or else the driver's drowsy level should be found out by the brain wave sensor. Whenever a person is starting the car, the brain wave sensor unit will calculate the blinking level and it will compare with the minimum attention levels of human when ever not sleeping. The blinking levels will equal the set point then automatically vehicle will move without any problem. In case if the blinking levels will cross the set point, then the vehicle will stop and vehicle driver will getting an alert. Most case, we can compare the owner's blinking levels with stored blinking levels. Now, the owner have to check whether the robot move or not. If he is a not walking then the robot will automatically start.. But if he is normal mode then the vehicle will run and there is no alert. Once the car received blinking command it will stop regardless the place. Further, if the owner wants to move the vehicle he has a need to come normal mode. This will helps to avoid the movement during in person.

II . DESIGN AND IMPLEMENTATION

This project uses two important platforms. 1. Coding Platform and 2. Execution Platform. These platforms are discussed below

Coding Platform:

In this project a brain computer interface system is used which will do the key role in the entire operation. For the BCI system, we are using the MATLAB and for brain wave sensor and Processor communication neurosky is used.. The BCI will process in the following way.

For calculating the blinking levels we need to use a brain wave sensor support a neuro sky product which is called mindo4 Initially we have to take the data from the brain by using neurons postion and should store in the brain wave sensor. The supportable sensor in the MATLAB is given in the form of the following data function

connectionId1 =calllib('Thinkgear','TG_GetNewConnectionId');

Initially we need to check that sensor is connected or not. The mind wave sensor software will provide the information about the sensor connection. If the sensor is connected we are entering in to the MATLAB section for checking the blinking levels of person.

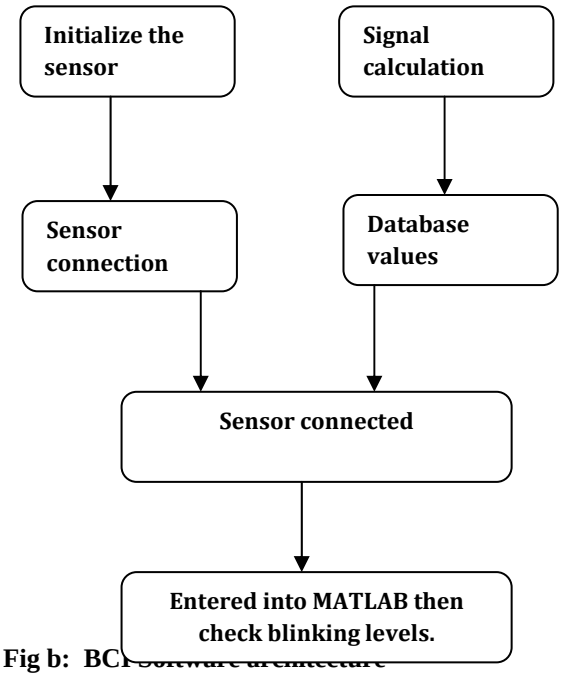

Fig b: BCI software architecture

Once the blinking levels will calculated it will be send to MATLAB. Whenever MATLAB reads an blinking values it will convert into digital values because for micro controller understanding purpose the values should be in digital format. After calculating the blinking values ,we need to check whether it will cross the set point in the database . As an acknowledgement we will get the following help dialogue.

```
if(data_BLINK (j) > 90)
            if(Drive mode == 1)
               fopen(serial One);
               fwrite (serialOne,'Q');
               fclose (serial One);
                  End
```

Then pre-processing will be done within the blinking levels and the database values which involves , Similarity checking and probability finding. Here similarity checking is nothing but the comparison between two blinking values by calculating the change between the input and data base values. Then the result will be shown on the MATLAB.

```
if(data_BLINK (j) > 90)
   %            if(Drive mode == 1)
                 fopen (serial One);
                 fwrite (serialOne,'Q');
                 fclose(serial One);
   %            end
          end
```

Drowsiness, eyes open and eyes closed are closely connected to alpha activity. once sleepiness forces the eyes to shut, alpha waves are strongest

encephalogram brain signals have reported that in sleepiness state alpha activity mainly seems in os space and particularly magnitude of alpha2 wave like a better alpha band (11~13Hz) increases. However, supposing traditional adults have their eyes open notwithstanding they drowse, alpha changes of can't be explain one thing logically.

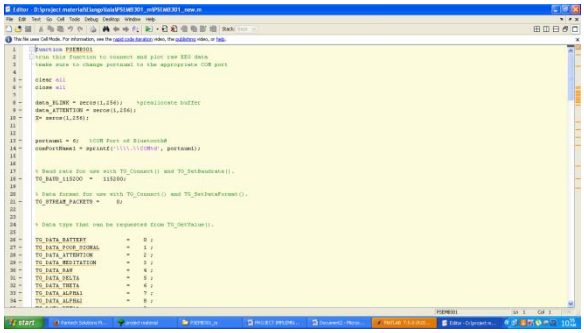

Fig c : BCI running image

Execution Platform:

The LPC2926/2927/2929 consists of: An ARM968E-S processor with real-time emulation support An AMBA multi-layer Advanced High-performance Bus (AHB) for interfacing to the on-chip memory controllers

Two DTL buses (a universal NXP interface) for interfacing to the interrupt controller and the Power, Clock and Reset Control cluster (also called subsystem). Three ARM Peripheral Buses (APB - a compatible superset of ARM's AMBA advanced peripheral bus) for connection to on-chip peripherals clustered in subsystems. One ARM Peripheral Bus for event router and system control.

The LPC2926/2927/2929 configures the ARM968E-S processor in little-endian byte order. All peripherals run at their own clock frequency to optimize the total system power consumption. The AHB-to-APB bridge used in the subsystems contains a write-ahead buffer one transaction deep. This implies that when the ARM968E-S issues a buffered write action to a register located on the APB side of the bridge, it continues even though the actual write may not yet have taken place. Completion of a second write to the same subsystem will not be executed until the first write is finished. The ARM968E-S is a general purpose 32-bit RISC processor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of microprogrammed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective controller core. Amongst the most compelling features of

the ARM968E-S are: Separate directly connected instruction and data Tightly Coupled Memory (TCM)interfaces Write buffers for the AHB and TCM buses

Wireless Platform:

a)BCI system:

The main purpose of the current chapter is to review recent advances within the EEG field. to grasp these developments it'll initial be necessary to detail the physiological basis of the EEG signal. after, vital problems related to knowledge acquisition, signal process, and quantitative analyses are going to be mentioned . the most important portion of the chapter are going to be dedicated to reviewing rising supply localization techniques that are shown to localize EEG activity while not postulating a priori assumptions concerning the amount of underlying sources. As we are going to discuss, maybe the best advancements within the EEG field within the last 5-10 years are achieved within the development of those localization techniques, especially once utilized in concert with high-density EEG recording, realistic head models, and different purposeful neuroimaging techniques.

.The time unit temporal resolution of electroencephalogram permits scientists to analyze not solely fluctuations of electroencephalogram activity (i.e., increases/decreases) as a operate of task demand or subject samples however conjointly to differentiate between practical repressive and excitant activities.low frequencies (e.g., delta and theta) show massive synchronal amplitudes, whereas electroencephalogram frequencies (e.g. beta and gamma) show tiny amplitude owing to high degree of asynchrony within the underlying somatic cell activity. In adults, the amplitude of normative electroencephalogram oscillations lies between ten and a hundred (more ordinarily between ten and fifty; Niedermeyer, 1993). within the following section, a quick review of varied electroencephalogram bands and their supposed practical roles are going to be given. The review of the muscular and physiological basis underlying the generation of varied electroencephalogram oscillations

Fig d : Sensor status indicator

III. Conclusion

This project work uses a brain wave sensor which can collect EEG based brain signals of different frequency and amplitude and it will convert these signals into packets and transmit through Bluetooth medium in to the level splitter section to check the attention level. Level splitter section (LSS) analyses the level and gives the robot

movement for the person who is sitting in the wheel chair.

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