Brain Signal Detection Methodology for Attention Training using Minimal EEG Channels

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ABSTRACT

This project discussed about Mind control is very important for some persons like adventurers, gun shooters , rescue rangers etc. These kinds of persons should know their mind strength to do their work effectively. For every person , the concentration level and meditation level will get change. This project presents an attention trainer in which a human can test the mind strength. Using this experiment it is possible to keep mind concentration as a security for any system activation. So, in future human mind will acts as a key for controlling any device. This whole projects is based on a Brain Computer Interface technique. BCI mainly uses the brain signal

KEYWORDS: *EEG; Robot movement*

I. INTRODUCTION

Human brain consists of millions of interconnected neurons.The pattern of interaction between these neurons is represented as thoughts and emotions. According to the human thoughts , this pattern will be changing which in turn produce different electrical waves.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 Differentiator unit (LAU) will receive the brain wave raw data and it will extract and process the signal using Matlab platform and send to the Attention checker module. The user have to connect the brain wave sensor and need to touch the touch panel. Then the person have to change his mind concentration level. Once if the level reached , then attention checker module will intimate the status and it will ask the security number. By entering the security number, the system can be activated. This can bring a lot of privacy in electronics world.

Block Diagram:

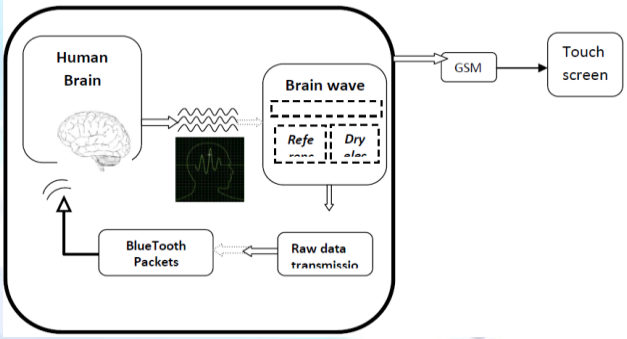


Fig a: Brain computer interface section

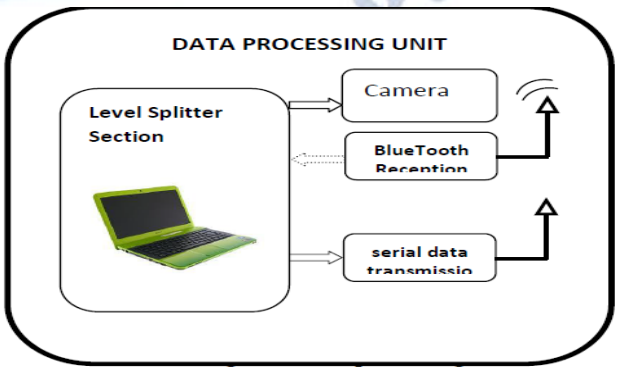
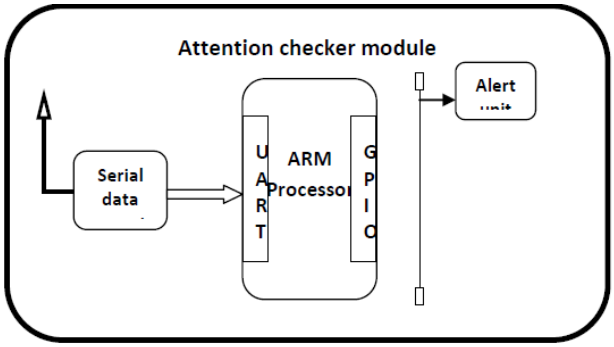


Fig b: Data processing unit



This project work consists of a Processor using ARM7core,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 trying to open the door 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 lock will open without any problem. In case if the blinking levels will cross the set point, then the lock will close .we can compare the owner's blinking levels with stored blinking levels. Now, the owner have to check whether the locking system was opened or not. If the locking system was not opened his concentration level should be very less. We need to increase the concentration levels.

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 neurosky product which is called mindo4Initially we have to take the data from the brain by using neurons postion and should store in the brain wave sensor. The supportable sensor inthe MATLAB is given in the form of the following datafunction

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.

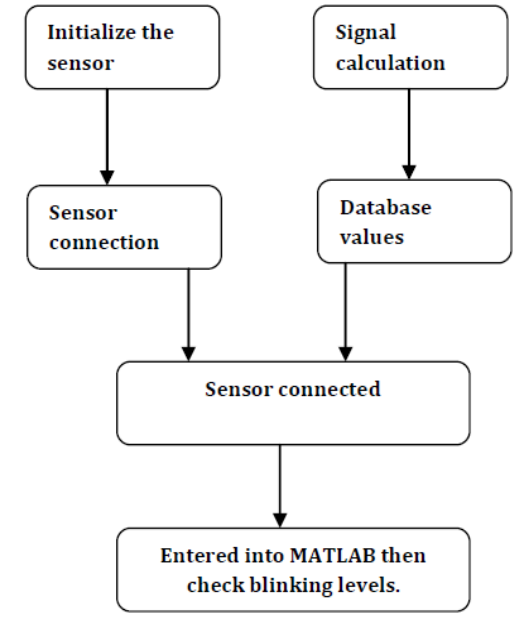


Fig b: BCI Software architecture

Once the blinking levels will calculated it will be send to MATLAB. Whenever MATLAB readsan blinking value sit 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(attn_const>3)

fopen(serialOne);

fwrite(serialOne,'A');

fclose(serialOne);

attn_const=0;
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.

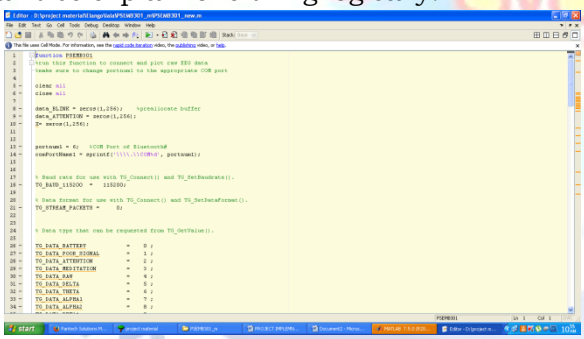


Fig c : BCI running image

Execution Platform:

This half consists of ARM core processor as a main unit, Brain wave device system, Ignition unit, PC , alert section and a show unit. This modules with coming up with and implementation technique is given below.

ARM processor is employed for dominant the system. Here we have a tendency to square measure victimizationthe LPC2148 series, which has 2 UART. In UART0 we'll interface the GPS receiver to induce the orbital info and in UART1 we will interface the computer for image process. Then the ignition driver circuit is connected to the GPIO pin of ARM. Interrupt routine code is employed to visualize whether or not we have a tendency to have gotten any serial interrupt (i.e,) from owner any command is returning or not. For this project we have a tendency to square measure having some interrupt checking commands 'A' and 'M'.The interrupt routine code for command checking is given within the column below.

Once ARM processor receives a command 'Q' through UART1, then the processor can move the motive force circuit. attributable to this the engine are going to be move instantly. Next, if the processor receive a command 'X' , then UART0 receiver interrupt are going to be enabled. So, this worth within the information base can compare mechanically the motive force management unit can stop. This interrupt routine code are going to be checked by the processor endlessly that will increase the potency of the project. These interrupt checking technique must tack the vector address. that the vector address configurations for each UART square measure given below. The Vectored Interrupt Controller (VIC) takes thirty two interrupt request inputs and directly programmable assigns them vectored IRQ. VICIntSelect may be a register that have the management of all interrupt registers. As we have a tendency to square measure victimization the UART0 interrupt and UART1 interrupt we've to simply modify the sixth and seventh little bit of the VICIntSelect register. When facultative for every interrupts separate slot ought to be enabled for process. thus whenever associate interrupt is returning from the device, then ARM processor will directly jumb to the interrupt routine to process the command.. due to this facility ARM will handle the various interrupts from the device and might do the individual functions with none fault.

During this project the engine unit are going to be controlled by a driver circuit. the motive force circuit consists of a driver unit, electrical device and a semiconductor unit. If the automobile is started, the engine are going to be turned ON which implies ARM processor can offer the bias voltage to the semiconductor unit to modify on the relay that successively activate the automobile engine. meantime the processor can check the interrupt routine.

Once if it receives the interrupt 'X' through UART then the processor can cut the bias voltage to the semiconductor unit. So that, the engine are going to be turned off.

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

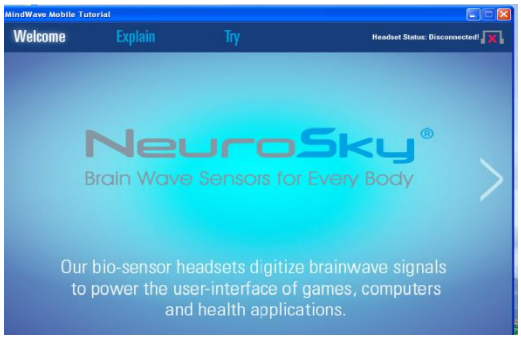


Fig d : Sensor status indicator

III. CONCLUSION

The user have to connect the brain wave sensor and need to touch the touch panel. Then the people have to change his mind concentration level. Once if the level reached , then attention checker module will intimate the status and it will ask the security number. By entering the security number, the system can be activated. This can bring a lot of privacy in electronics world.

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