Brain Wave Sensors for Every Body

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Brain Wave Sensors for Every Body

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Abstract:

Electroencephalograph(EEG)is regularly used as a part of a combination coherent fields. Shockingly, business devices are overall amazingly exorbitant, costing an expansive number of dollars. Starting late, devices costing under $200 have been made open. The Think Gear Aisc Model (TGAM) chip , made by Neurosky Inc., is starting now the base exorbitant business EEG device, costing under $100. The paper presents how to control mind waves and examining cerebrum information for doing some usable things in regular day to day existence with this information. Mind information is gathered by a headset with terminals and some EEG hardware.

Key words : TGAM chip , Arduino nano , Bluetooth , Processing program 3.2.1 , Motor.

I. INTRODUCTION

Reading your mind sounds quite freaky. Several brain scanning techniques like fMRI, PET, or EEG are capable to analyze what you are thinking, dreaming, or seeing. This is very top class science you might think. And yes, it is very top class science. Everything is done in research facilities with top of the notch equipment. But suddenly, there is this device, The TGAM is NeuroSky's primary brainwave sensor ASIC module designed for mass market applications,[1]. The TGAM processes and outputs EEG frequency spectrums, EEG signal quality, raw EEG, and three NeuroSky eSense meters attention; meditation; and eyeblinks. With simple dry electrodes, this module is excellent for use in toys, video games, and wellness devices because of its low power consumption, which is suitable for portable battery-driven applications.?

EEG stands for electroencephalography and it as relative inexpensive brain-scanning technique. EEG these.

EEG is typically noninvasive, with the electrodes placed along the scalp, although invasive electrodes are sometimes used in specific applications. EEG measures voltage fluctuations resulting from ionic current within the neurons of the brain. In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a period of time, as recorded from multiple electrodes placed on the scalp. Diagnostic applications generally focus on the spectral content of EEG, that is, the type of neural oscillations (popularly called "brain waves") that can be observed in EEG signals. [2, 3, 4]
that the neurons produce. Scientists have agreed to split these frequencies in different frequency bands. All the frequency bands have been studied intensively and are associated with several states of mind:

- Delta   (1-3Hz): sleep
- Theta   (4-7Hz): relaxed, meditative
- Low Alpha (8-9Hz): eyes closed, relaxed
- High Alpha(10-12Hz)
- Low Beta   (13-17Hz): alert, focused
- High Beta (18-30Hz)
- Low   Gamma (31-40Hz):   multi-sensory processing
- High Gamma (41-50Hz)

EEG is most often used to diagnose epilepsy, which causes abnormalities in EEG   readings. It is also used   to diagnose coma, encephalopathies, and brain death. EEG used to be a first-line method of diagnosis for tumors, stroke and other focal brain disorders, [5]. EEG is measured through electrodes on the scalp. These headsets can have up to 256 electrodes to measure brain activity. They have so many electrodes to read brain activity per brain region. The TGAM has only 1 electrode so the TGAM is not capable to read brain region specific but is therefore pretty cheap. So, if the TGAM can't read all the brain regions, what can it do?

there are many researches deals with how the fuzzy logic rule based algorithm is applied for diagnosing sleep disorders[6,7]. my idea about parsing brain waves and analyzing brain data for doing some usable things in everyday life with this data. Brain data is collected by a headset with electrodes and some EEG equipment. This data is then sent to a microprocessor (Arduino.nano) via Bluetooth. Arduino processes the data with some software and sends meaningful measurements to a PC. The brain data is visualized on PC monitor (or android device) real-time as graphics format which can be analyzed. The brain data will be visualized as many types of waves, Attention, Meditation, Delta, Theta, Low Alpha, High Alpha, Low Beta, High Beta, Low Gamma and High Gamma waves. These waves are mostly complicated patterns but luckily the EEG equipment will process it for us and summarize it as the basic Attention and Meditation values. These values are more stable and usable. Attention value shows the level of concentration and Meditation shows the level of relaxation. So these two values are more manageable and usable for controlling things with your brain. The idea aims to control physical things with these 2 types of brain activity values. We will try to control the speed of a motor remotely with our brain. When Attention values increase (when we concentrate and focus with our brain) the speed of motor will increase. Oppositely we will try to relax our brain to decrease the speed of the motor. *This is a conceptual idea and it aims to show that we can actually remotely control physical things with our brain. A specific EEG reader module is used in this idea* . Neurosky company has developed a simple module called TGAM for the developers who want to work on brain data.

II. OVERVIEW

The TGAM module contains the TGAT, the chip that changed an industry, with the Mattel Mind Flex being named to TIME Magazine's 100 Best Toys of All Time. With more than one million available for use, it is the world's first EEG (electroencephalography) sensor intended for shopper utilize. It associates with dry cathodes required for mass market needs (instead of ordinary therapeutic wet sensors). Its progressed separating innovation takes into consideration high clamor resistance, making the gadget usable for all people and in all settings.

III. METHOD

For testing whether this idea measures my focus, it should give back highly focused scores when I am really focused. So I need to know that I am focused, and I need the real data. some program such as processing (3.2.1) with Arduino software can give me the data. The application is able to read (all) the brainwaves from pc and exports the data to a data-file. It also filters the data and translates it into two scores: "attention" and "meditation". For testing how well this device works I needed to design some tasks which correspond with being in "meditation mode" and "attention mode". I did these tasks while lying on bed to reduce the motion artifacts in the data. First I will look how the individual brainwaves correspond to the given task, and next I will look how the filtered data corresponds to the tasks.

A.MEDITATION-TASK

Shows the level of a client's mental "serenity" or "unwinding". Reflection is identified with decreased movement by the dynamic mental procedures in the cerebrum, and it has for quite some time been a watched impact that shutting one's eyes kills the mental exercises which prepare pictures from the eyes, so shutting the eyes is regularly a viable technique for expanding the Meditation meter level. Diversions, meandering musings, tension, fomentation, and tangible boosts may bring down the Meditation meter levels. What preferable undertaking would you be able to plan over contemplation to discover the reflection wave? Amid my reflection undertaking I rested for roughly 10 minutes with my eyes shut and concentrate on the now, my breathing, and my body. I'd anticipated that would discover some Delta, theta, and Alpha wave action amid my reflection errand

B..ATTENTION-TASK

Indicates the force of a client's level of mental "center" or "consideration, for example, that which happens amid extraordinary focus and coordinated (however steady) mental movement. Diversions, meandering contemplations, absence of center, or tension may bring down the Attention meter levels. For the consideration assignment I was playing consideration amusements on the application "Mind diversions genius". These are mind amusements which require a great deal of regard for show signs of improvement scores. I played the amusement

"consideration preparing" and "partitioned consideration" to ensure my consideration was high.

C.FILTERED DATA

So notwithstanding when I am resting there remains a considerable measure of clamor in the information. Luckily, the TGAM chip - Its progressed separating innovation takes into account high noiseimmunity, making the gadget usable for all people and in all settings-utilize channels to lessen the commotion. After the sifting, the information is changed in two scores; a "contemplation score" and a "consideration score", which are scores on a size of 0-100. So what do these scores say?do these scores say?

III.RESULTS

The principal thing to note is that each time that I wore my headset it took me no less than 15 minutes to interface. As per my applications, the gadget wasn't sitting appropriately on my head. I needed to alter it all the time on my make a beeline for get a legitimate flag. Possibly I have an extremely bizarre head, yet this same issue additionally happened to my companions who attempted it on. Possibly they have an abnormal head too… I believe it's spare to state the EEG headsets should be set painstakingly to get appropriate signs. With the smallest removal EEG-wave movement can be adjusted. So in this manner it is better that the gadget is a tiny bit critical when you put it on your head.

At any rate that is the manner by which it should work. We've found that the level of mental control over the flag differs from individual to individual. The most sensible trial of the gadget's authenticity would be a correlation with a therapeutic gradeEEG. While we have not possessed the capacity to test this ourselves, NeuroSky has distributed the consequences of such a correlation. Their discoveries propose that the NeuroSky chip conveys a similar flag. Obviously, NeuroSky has a huge stake in a positive result for this kind of test. The procurement of mind waves signs will be completed with a headset. In this thought 2 distinct assortments of headsets are utilized. One is made with a quick TGAM module (57600baud transmission rate) and one is made by adjusting a business Mindflex headset which likewise uses a moderate TGAM module (9600baud transmission rate). Both headsets sends cerebrum wave signals by means of bluetooth. The quick headset is utilized to send signs to any Android

cell phone utilizing an open source application called Brainwaves Visualiser which can be found at Google Play store for nothing out of pocket. This application can demonstrate us bright graphical observing of mind flags on real-time. It is utilized to screen real-time cerebrum action. The other slower headset is custom worked for transmitting real-time brainwave signs to an Arduino processor which can process and send to a PC over USB. These signs can be observed on PC screen on real-time representation or can be spared to a document to be prepared later as sessions. The real-time plotting and realistic checking is accomplished by a program called BrainGrapher which is composed in Processing programming. The session recording of the signs to a document can be completed by means of any terminal program, for example, TeraTerm or Terminal.exe. These sessions are spared to a content log document in CSV arrange for later preparing in Excel tables and outlining for examination.
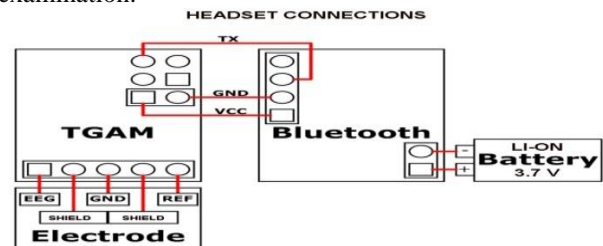
Another system is built for the implementation of actual usage of brain signals to remotely control a mechanical device. As in figure 1 For the purpose, a dc motor with a fan is used to demonstrate the actual controlling of the device remotely with brain signals. The motor speed of the fan is controlled using brain signals (more specifically the Attention values) which shows the level of concentration and focusedness of the brain activity. The more you concentrate or get focused, the more motor speed. Simply this experiment shows that you can actually control the speed of a motor with your brain. The system circuit for the experiment is as follows:
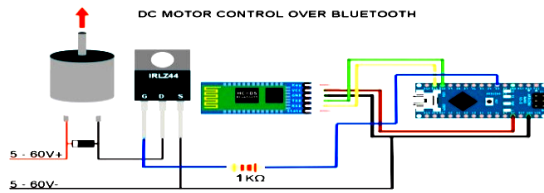
Figure :1 ,brain signals to remotely control a mechanical device

A.THE BRAINWAVES DURING SPECIFIC TASKS

Cut down repeat (Delta, theta, alpha) brainwaves should be more present in the midst of thought, while the higher (Beta, Gamma) cerebrum waves should be more present in the midst of the fixation mind entertainments. In figure 2 you can see the midpoints of each wave between each errand. If you consider what I had expected, this did not look good. As demonstrated by this data my cerebrum was more thought about, also more connected with in the midst of my appearance task.
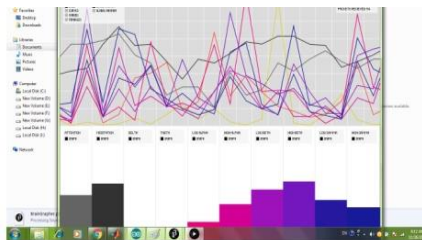

Figure:2,all brain waves on the pc

B.ATTENTION-TASK

While doing my "consideration assignment" the information gives back two scores; a reflection , and a consideration score. In the following diagram figure 3 you can see the progressions after some time. Overall my consideration score was 61.9(SD=14.1) and my reflection score was 59.6 (SD=17.0). In spite of the fact that this was factually unique (T(12545)=73.344,P<0.001), the distinction wasn't that much.

Figure:3, attention wave

C.MEDITATION-TASK

In the midst of the thought undertaking my brainwaves were more unmistakable figure 4,my thought score was 39.8 (SD=18.2) and my appearance score was 61.4 (SD=9.7), T(50900)=-240.379, p<0.001. That seemed well and great. In any case, over the period of my appearance I had the slant that my insightful state extended. Regardless, I couldn't find this at all in the data.

Figure 4, meditation wave

IV. DISCOURSE

The unfiltered rough data from the TGAM chip does not look good. Despite when I was resting and didn't move a muscle, there was an overabundance of uproar in the unrefined data. In any case, the TGAM chip itself in like manner does not ensure that it can do that (solitary the application did). So the filtered "thought" and "consideration" scores (done by the application) would affirm the workings of the device much better. Likewise, this filtered data looks like to store a few information! The cases which my brainwaves showed up in the midst of the reflection undertaking were one of a kind in connection to the thought task. In the reflection errand the complexities between the scores were clear, however on the thought task it wasn't. Potentially I got sucked into some semi-intelligent state while doing a diversion extraordinarily locked in. Does that sound sensible?

V. FUTURE CONCEIVABLE OUTCOMES OF PERUSING BRAINWAVES

Scrutinizing brainwaves has a huge amount of intriguing components. The essential thing what you can do with EEG headset is to control fundamental things with your mind, for example turning on a light. For doing this you have to consider every option "I have to turn on the light". The EEG-headset does not read your mind, but instead it picks up from your mind outline how you consider turning on a light. In time, the headsets take in progressively and a more noteworthy measure of your mind example and you'll have the ability to control things better with your mind. The second thing what you can do with EEG is to get some answers concerning singular limits. For example; theta-wave activity is associated with better memory union. Entertainer's Alpha-brainwaves are higher when they listen to music diverged from ordinary people. In addition in tip best sportsman, alpha development is higher, and more specific in certain mind areas than in learner sportsman. If that doesn't empower you, there is something many allude to as Neurofeedback. With Neurofeedback your brainwaves are appeared to you direct (or roundaboutly with a development) and the goal is to affect your brainwaves, with the target to assemble execution or the cover reactions. Many reviews have been done with Neurofeedback. One review exhibited that with planning individuals made sense of how to smother Theta-wave development achieving that they performed better on a thought endeavors. Neurofeedback planning might be valuable to simplicity scholarly handicap and depletion. Moreover for fibromyalgia-patients neurofeedback might be valuable. Regardless, an impressive measure of studies are less positive. Neurofeedback-planning fail to support mental shortcoming inside children with ADHD. A couple concentrates showed that while individuals could adjust their brainwave activity, their execution did not change. Despite the way that examination has exhibited some empowering potential results, with business use we are far starting there. Brainwave activity is as often as possible cerebrum area specific and a business device like mine is a singular cathode device, and in this way not prepared to gage a specific personality region. EEG-headsets used as a piece of research can have up to 256 cathodes and can gage specific personality locale. In like manner, wet anodes are used as a piece of research which are at present better than the dry cathodes of most business devices (however less easy to use).

VI. CONCLUSIONS

All and all, as it anticipated that would, the TGAM chip is skilled measure the differentiation among thought and examination up to some degree. In light of the commotion in the estimations, and the single-cathode it is not yet possible measure particular brainwaves precisely. In any case, Neurosky in like manner did not ensure that the TGAM chip can gage correct brainwaves, so there is no one to blame. Until further notice the TGAM chip is just an instrument for direction and science look into where you can use your inside and reflection to play a beguilement. As I would see it, the right scores are touchy to demonstrate the level of thought or consideration. Regardless, I ought to state that Neurosky had the boldness to start another, astoundingly entrancing locale for the change of business EEG-headsets. Later on, new headsets will give continuously and better cathodes and will thusly be better. What is sitting tight for us?

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