A Model based on IoT for improving programming language skills among students

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ABSTRACT—

Internet of things (IoT) is the next Buzz word in Computing. It is going to touch many more facets of our lives. It involves real world, physical objects with embedded computational and networking capabilities communicating with one another without human intervention on the global Internet. IoT can be assumed as umbrella term for interconnected technologies, objects, machines and their services. Due to which objects are communicating actively With Greater connectivity and technological advancement the education have been enriched and expanded. This paper proposes a model for transforming today's education into SMART education with the use of IOT. There are many areas where human activity recognition is done by using different sensors. Now education sector need to be connected with such emerging technology.

The proposed model will help the students to enhance their grasping level while learning without hesitation.

Keywords—— **IoT, Muse, Cognitive energy, Beta waves**

I. INTRODUCTION

The Internet of Things can be predicted as system in which objects can communicate internally or with other machines. The Internet of Things "refers to uniquely identifiable objects (things) and their virtual representations in an Internet-like structure". Internet of Things is essentially a network where physical objects are embedded with electronics, software and sensors to enable data transmission. This data transmission can be done among the manufacturers, operators along with other connected devices. Internet of Things became popular recently in last decade. The idea behind Internet of Things is to make everything on this earth communicative. Scope of Internet of Things is expected to go beyond inter machine communications and offer advanced connectivity between various devices, systems and services.

In line with this the efforts are made through this paper to propose a model for use of IoT in education.

II. EXISTING AREAS OF APPLICATION:

A. *Energy management*

Now days we can observe that all forms of energy consuming devices such as switches, power outlets, bulbs, televisions, etc. are using very high amount of energy. So in order to manage them it is expected that IOT devices should integrate into all of them so that such devices can be remotely controlled or managed via a cloud based interface. This may include: remotely powering on or off heating systems, controlling ovens, changing lighting conditions etc. Moreover IOT already started planning and executing in this area. Fan speed can be controlled by remote. AC machines with ECONAVI intelligent eco sensors detect unconscious waste of energy. It is possible to monitor human location, movements, absence and sunlight intensity. It saves energy efficiently with unremitting relief and convenience by automatically adjusting the cooling power.

B. *Health Care:*

Health Care is a very crucial and sensitive area where IoT is in great demand. The appropriate sensors can be used in patient's beds to detect whether the patient is resting over it or seeking help to get up. These "smart beds" also have features to make adjustment for ensuring the appropriate pressure and support for the patients without taking help of nurses. Thermometers can communicate about the temperature with a single button press. Band-Aid along with the required sensor can indicate whether the wound is healed or not .

C. *Smart Home(Security)*

Gone are the days when companies had to hire security guards to constantly be on watch. Security is not only related to secure from thieves. Now days you can change the temperature, lock the doors, turn off the lights, and even turn on your T.V. while you are away. This all will come along with security benefit. For example if anything is removed then you can get message about the same and you can set further actions to be taken. There are some gadgets available in market which allows you to customize the list of visitors at your home through remote access. This may help you to secure home from intruders even if you are away.

III. PROPOSED AREA OF APPLICATION:EDUCATION

IOT in Education

Over the years we witnessed a huge progress in education by implementing new classroom technologies. It includes computers, projectors, internet, smart boards, As IOT is used in many areas very effectively, it also can be used in education sector especially for the students who has hesitance clearing their doubts. This article is a preliminary attempt for proposing a simple solution which is more focussed towards practical related queries. Predictably there is significant variation in the progress of different students. Very importantly the trainer has to smartly match his teaching frequency with all types of students. The trainer also should be able to help the students individually and cleverly identify the inimical student. Some students might hesitate to share their difficulties. It is very important to understand that at the root of all our thoughts and emotions significant communication happens between neurons within our brains. Through this communication brainwaves are produced. Our brainwaves may vary according to what we're doing, thinking and feeling. Brainwaves are typically broken up into following five bands:

A. **Delta** waves are mostly generated during inmost meditation and sleep. Delta waves hang consciousness. Healing and regeneration are stimulated in this state.
B. **Theta** waves which are associated with sleep, very deep relaxation, and visualization. These types of waves are generated when we are in a dream, bright metaphors, and intuition. This is a twilight state which we experience when we awake or drift off to sleep.
C. **Alpha** waves which occur when relaxed and calm. This frequency range bridges gap between conscious thinking and subconscious mind. This can be called as resting state for brain.
D. **Beta** waves which occur when, we are actively thinking or problem-solving so our mind is diverted towards cognitive task i.e. when cognitive energy is used at most. Depending upon complexity level of task we can find three bands of Beta: Low Beta, Beta and Hi-Beta
E. **Gamma** waves which occur when involved in advanced intellectual activity. These waves relate to simultaneous processing of information from various brain areas.

When we are doing any kind of intellectual tasks, the Beta brainwaves control our usual state of consciousness. Beta waves exhibit an action in which we are alert, attentive, engaged in problem solving , decision making and in focussed mental activity.
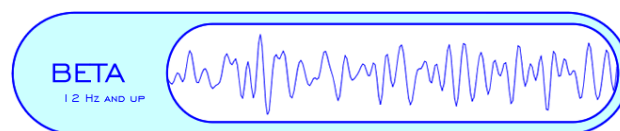
[1] *BETA waves (Frequency 12 to 30Hz)*
Source:http://www.brainev.com/core/research-benefits/Brainwaves.aspx

We can make the utilization of beta waves for helping the students to solve the difficulties in confronting the knowledgeable activities. The Electroencephalogram(EEG) can be used to measure the brain waves of the students. The observation from EEG can predict about the students using more cognitive energy (Cognitive energy is related to conscious intellectual activities such as thinking, reasoning, solving) on a certain topic so that the trainers can understand who is trying harder to solve the problem. The trainer can then more focus on that student's need.

Muse can be used for improving logical thinking of students while solving programming language assignments in Computer Laboratory.

What is Muse?

Muse is a type of headband which is used to sense the brain activities and also called as a tool for brain fitness. The Muse is used to measure brain signals similar to the heart rate monitor that is used to sense our heartbeat.

Muse has seven sensors such as:

– Two sensors are situated on the forehead
– Two sensors are placed behind the ears
– Three reference sensors used to detect and measure the activity of your brain

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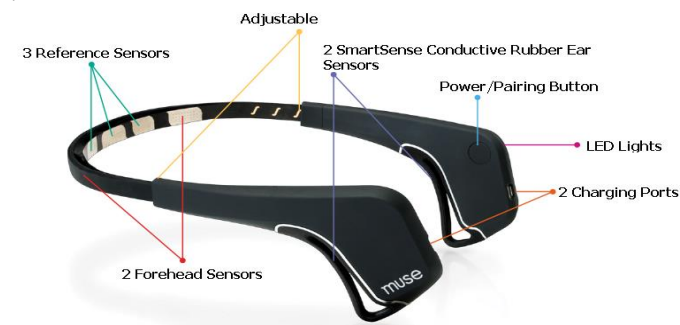
[Muse Headband] *Source:*
http://www.choosemuse.com/what-does-it-measure/

Muse is a product available in the market which measures your brainwaves as you meditate on different topics. It is also proposed that Muse could provide insight into students' cognitive activity using EEG (Electroencephalogram). With EEG the electrical activity in your brain can be noticed using small, flat metal discs attached to your scalp. When you are unconscious, your brain cells connect via electrical impulses and are active at all the time. Identifying which students are expending a higher amount of cognitive energy on an exercise, would allow trainers to dedicate attention to students who need it – not just those who ask for help the loudest. We consider programming subjects like C, C++, Java in which the students have to apply their own logic to write and execute the code. While thinking about the logic of a program students use their cognitive ability. In such situation if some students who are getting stuck while thinking, the sensors fitted in Muse can be used to sense the beta waves produced out of that student's brain. And if the trainer could receive a proper intimation for the same with an application, timely guidance can be provided for such students.

As per the proposed model beta brainwaves of the students will be captured by EEG technology embedded in MUSE headband. Illustration and analysis will be done by Muse app. Final analysed report of cognitive energy usage will be visible to trainer.
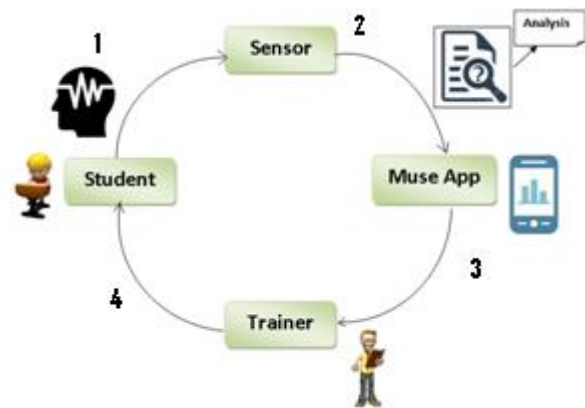

Fig: Proposed model: use of IOT in education

1. Students beta brainwaves will be captured by EEG technology embedded in MUSE Headband.

2. Muse app will illustrate and analyse the information (brainwave pattern) received by headband.

3. Muse app will generate the analysed report which includes the variation in cognitive energy usage of student. The report will be then sent to trainer via Bluetooth.

4. Depending upon the cognitive energy usage report trainer will approach student before he/she call for help.

Analysis of brainwaves can be retrieved from app in form of various graphs.

[Fig:The breakdown from one Muse sessions: fluctuation of alpha waves during meditation analyzed by MUSE app.]

Source: http://venturebeat.com/2014/09/16/is-mindfulness-and-less-stress-worth-299-the-muse-makes-a-case-review/

We can observe from the graph that MUSE App analysis exhibits different states of mind : Active, Neutral and Calm depending upon the fluctuation in attention. Percentage for calm, neutral, active represent the proportion of time spent in respective mind state during the session.

As above graph describes how alpha brain waves are being analysed same way we can measure Beta wave patterns for every student depending upon efforts taken for solving the problem. Such analytical information will illustrate cognitive energy usage.

IV. CONCLUSIONS

The article proposes a Muse headband to be used by students at the time of doing programming assignments and Muse android app which can be installed in trainer's handset. It will help trainer to know that which student is facing problem in solving lab assignment. This Proposed method will be very useful for the students for getting timely help.

Presently the proposed model is based on Bluetooth connectivity. In future it can be extended further using wireless network.

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