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AN EEG-BASED BRAIN CONTROLLED DESIGN WITH AN ITINERANT ROBOT

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ABSTRACT

In a brain controlled robot is based on Brain computer interfaces. It contains conventional part to deliver the information between the human brain and devices which are connected to the system with different patterns of brain activity into commands in real time. With these commands a mobile robot can be controlled. An importance of the robot that can assist the disabled people in their daily life to do some work with independent of others. Human brain has millions of unified neurons. The physical system provides identified patterns among these neurons then the system translates the given pattern into a different electrical waves. Each wave is a unique signal representation. The brain wave sensor sense the different electrical waves and convert in the form of digital data then the data converted into packets and transmit to the Bluetooth medium. The MATLAB tool is used to extract the data and process the data with level analyzer unit. The robot module has the control commands according to the human thoughts with the open and close eye movement.

KEYWORDS: Signal Intensity, Delta, FIRDA, OIRDA, Theta, Alpha, Beta, and Gamma

INTRODUCTION

In general, healthy users can activate the robots through a straight input device such as a keyboard, a mouse, or a joystick. These devices are hard to utilize for old or disabled persons. This structure is capable to utilize for assistive robots be able to afford sustain for disabled people in every day and professional life, thus creating an increasing order designed for them. For this reason, a number of particular interfaces like [1] sole switch and eye-tracking systems have been planned. On the other hand, these particular interfaces do not work for some cruelly disabled people with illnesses as an amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), or strokes. So that these people did not convey their intentions as a result, even self-sufficient robots are not yet capable to move cruelly disabled users to preferred locations. In addition to that, people desire to exist in incriminate of their movement as much as probable still stipulation have misplaced most of their voluntary strength control decisions made by self-directed systems be capable of uncomfortable feeling as well as pressure to the users. Hence autonomous systems cannot survive, but it is essential to expand substitute interfaces that can be warned by the cruelly disabled residents for announcement with self-directed systems.

Brain–computer interfaces (BCIs) used to address this challenge [7]. It provides straight communication as well as control flanked by the human brain and physical devices by translating diverse patterns of brain action into information in real time. Signal recordings of brain action monitored by BCIs. It contains invasive or noninvasive. Invasive BCIs need operation to embed electrodes straight on or surrounded by the cortex, but noninvasive BCIs has simple technique. Noninvasive BCIs can use various brain signals as inputs, such as electroencephalograms (EEG), magneto encephalograms (MEG), blood-oxygen-level-dependent (BOLD) signals, and (de) ox hemoglobin concentrations. Practically the invasive BCIs are more convenient with low cost. The BCI system is developed by the EEG signal, this signal is one of the most popular signals to develop preferable letter from a virtual keyboard. This system is used to control the robot based on the EEG signal with BCI system.

The brainwave sensor is used to analyze the EEG signals. An EEG signal is the measurement of electrical pulse in the human brain. This system is operated from the control commands generated from the Zigbee module. The input signal is the recorded and generated EEG signal from the brain through Mind wave sensor in the MATLAB tool.

SYSTEM OUTLINE

The brain controlled robot basically works on the principle of capturing the brain wave signals utilizing it for the movement of robot.

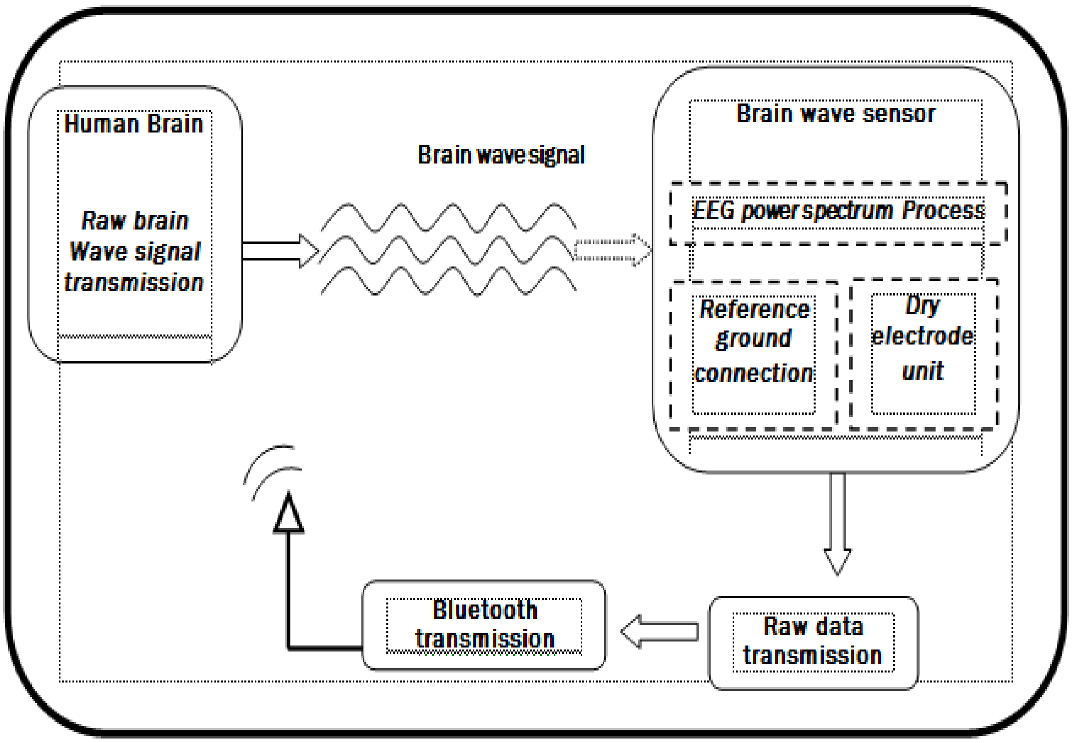

Figure 1: Brain Computer Interface Systems

Disabled Persons cannot move independently with the wheel chairs. The brain wave signal is analyzed with the brain wave sensor level being measured. This robot system is used for multiple purposes and operated from the wireless medium as Bluetooth module and GSM module.

SYSTEM INTENTION

Numerous patients are alluded to a neurologist to have an electroencephalogram (EEG), which records electrical motivations from the nerves in the head. "Electro" alludes to the electrical driving forces sent starting with one nerve cell then onto the next. The input signal generated from the mind through the nerves and convert into the form of data. Then the data is sent to the robotic module. These modules receive the data and transmitted to the ARM processor and control the module according to the patient movement.

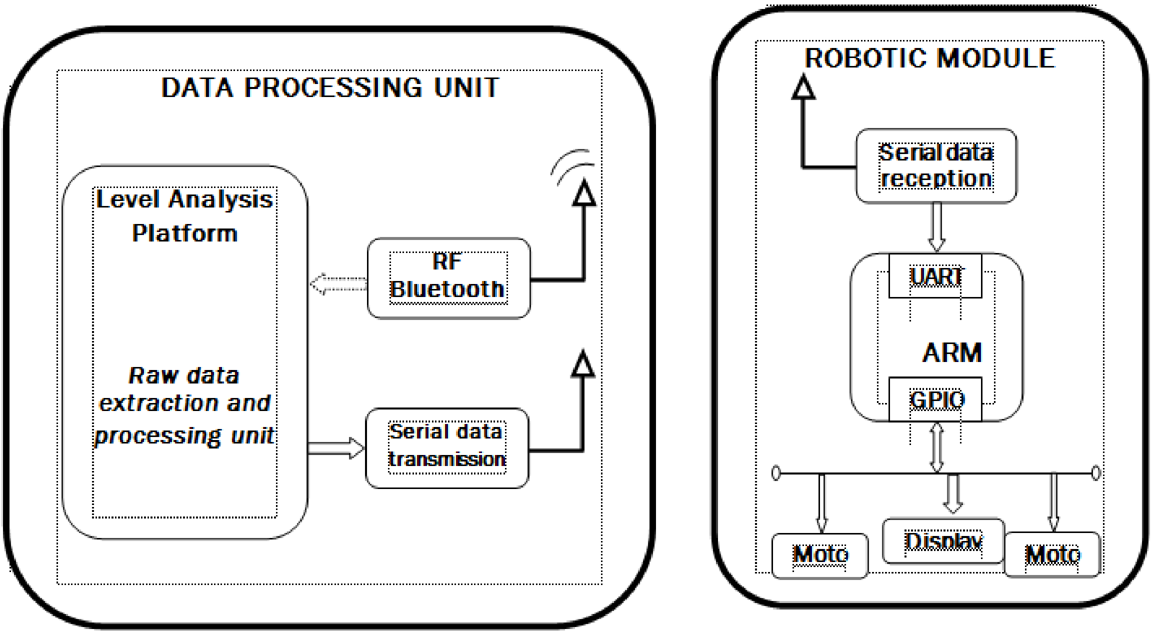

Figure 2: Data Processing Units and Robotic Module

The brain wave signal analyzed by the pattern generated according to the movement of patient. The pattern of interaction between these neurons represented as thoughts and emotional states. A muscle contraction will also generate a unique electrical signal. Brain wave sensor consists of three main parts. They are dry electrodes, signal conditioning circuit and inbuilt RF transmitter.

Dry electrodes are used to absorb the brain waves. This signal is analog in nature. For further processing these analog signals should be converted to digital form. Then the converted signal conditioned by the signal conditioner. It transmitted to the RF transmitter in the form of data packet. The Bluetooth transmitter receives the data packet and sent to the MATLAB tool with M script or math script program for the process of brain wave

SCREENSHOT OF GRAPH (BLACK: BLINK LEVEL, RED: ATTENTION LEVEL)

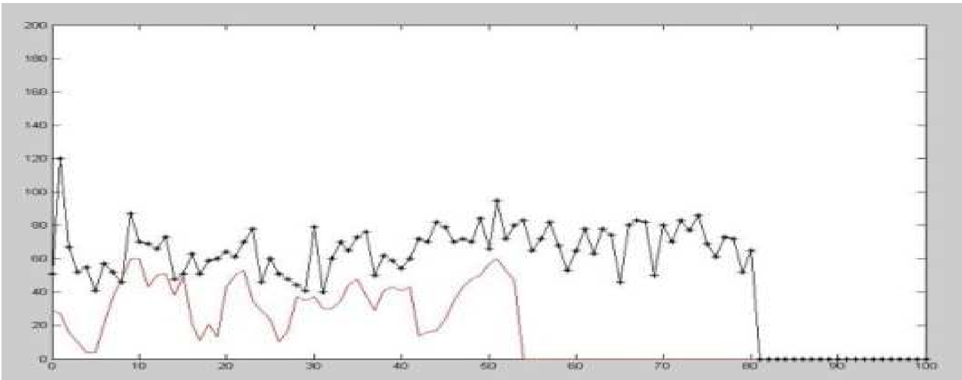

Figure 3: Blink Level Vs Attention Level

The output of the MATLAB tool measured in the form of attention and blinking. This process is explained from the flow chart representation. It represents the operation of data processing and robotic module. Based on the eye movement the attention level measured. It compares with the threshold level then the robot will move according to the attention level.

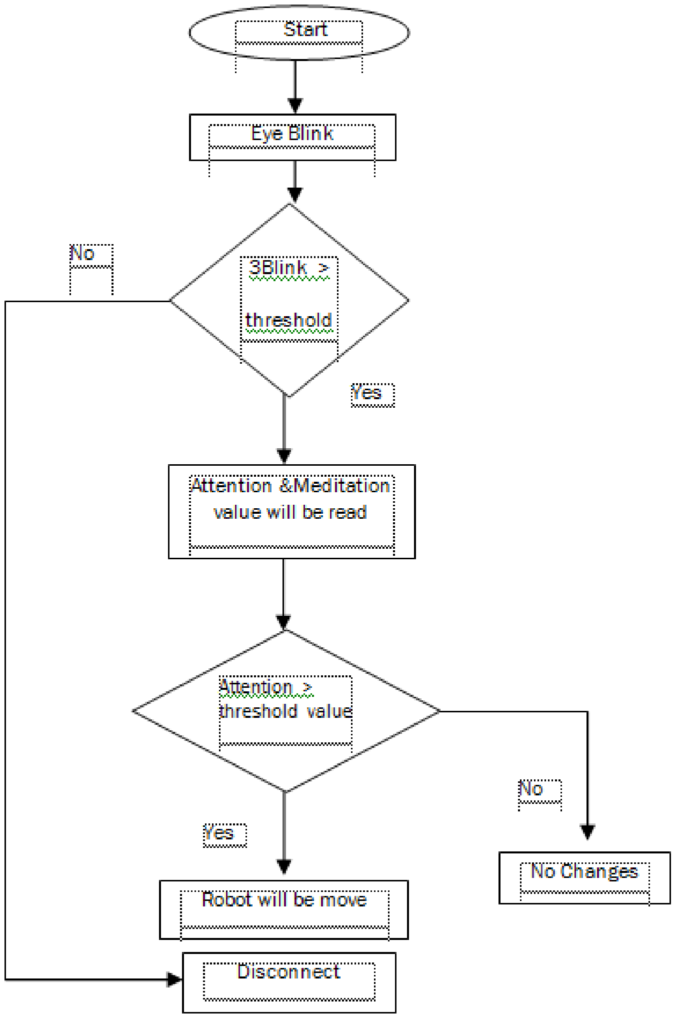

Figure 4: Flowchart for an Itinerant Robot for EEG-Based Brain Controlled Design

CONCLUSIONS AND FUTURE ENHANCEMENT

The signal generated by brain was received by the brain sensor and it will divide into packets and the packet data transmitted to wireless medium. The MATLAB tool is used to process and extract the data from the Level analyzer unit. Then the instructions will be sending to the home section to operate the module. Based on the attention level and threshold level the robot can be moved. Finally the robotic and data processing module operate the system with effective manner. The research and development of brain-controlled mobile robot have received a great deal of attention because they can help bring mobility back to people with devastating neuromuscular disorders and thus improve their quality of life. The BCI system performances have to be improved by making the brain-controlled mobile robots used in real-world situations.

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