War Field Spying Robot with Wireless Camera Using Brain Robot Interface

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Abstract - **To develop a robotic vehicle with wireless camera using brain robot interface for monitoring purpose. The robot along with camera can wirelessly transmit real time video with night vision capabilities. This is a kind of robot can be helpful for spying purpose in war fields. A major challenge in two-class Brain Computer Interface (BCI) systems is the low bandwidth of the communication channel, especially while communicating and controlling assistive devices, which requires multiple motion command options in the form of forward, left, right, backward, and start/stop. 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. A wireless camera is mounted on the robot body for spying purpose even in complete darkness by using infrared lighting.**

***Index terms*: LPC2148, BCI Systems, Wireless Camera, Zigbee module**

I. INTRODUCTION

To control the robotic device based on electrical signals of brain. Provide a comprehensive review and comparison of the most important Brain Computer Interface (BCI) systems developed to this day. Brain-Computer Interface (BCI) is a communication system which enables the user to control special computer applications by using only his or her thoughts. Different research groups have examined and used different methods to achieve this. Almost all of them are based on electroencephalography (EEG) recorded from the scalp. The EEG is measured and sampled while the user imagines different things (for example, moving the left or the right hand). Depending on the BCI, particular preprocessing and feature extraction methods are applied to the EEG sample of certain length. It is then possible to detect the task-specific EEG signals or patterns from the EEG samples with a certain level of accuracy.

II. EXISTING SYSTEM

This robot is controlled by human thoughts. No remote control operations are used. It Depends on others how they operate. Muscle contractions are not sensed. Only Brain waves are sensed and these Brain waves are analysis in the systems. Robot controlled by Human thoughts and eye blink commands. Self-controlled and operating facilities are available. Limitation of the system is transmitting the signals to the long distance.

III. PROPOSED METHODOLOGY

A.Brain Wave Analysis

Electrodes are placed on the head. Depending upon the human thoughts brain will produce some electrical waves like alpha,beta,delta etc. All these waves are sensed by brain wave sensors. And it will convert data into packets and it transmit through the Bluetooth medium. Here we using electroencephalogram. It will measure brain activity through voltage measurements by surface electrodes.

B. Matlab Platform

Mat lab platform is used as a Level Analyzer Unit(LAU).LAU will receive the brain wave signals from brain wave sensors. It extracted and process the signals using mat lab platform. Depending upon these control commands the robot will move . The control signals transmit through zigbee module.

C. Spying War Field Using Wireless Camera

Wireless camera is fixed in the robot. It will capture the real time video and transmit to the user end. We can also record these videos. Here we are using night vision wireless camera so night time also we can spy on the war field. Wireless camera is using less power .so it will very useful for war field.

D. Electroencephalography

Electroencephalography (EEG) is the recording of electrical activity along the scalp. EEG measures voltage fluctuations resulting from ionic current flows within the neurons of the brain. In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a short period of time, usually 20–40 minutes, as recorded from multiple electrodes placed on the scalp. Electrode, a conductor through which an electric current enters or leaves a solution or other medium in an electrical device such as a battery, electrolytic cell, or electron tube. In some devices electrodes are also called poles or plates. There are many types of materials used for manufacturing of electrodes which may be dry electrodes, nickel electrodes, Ag/Ag Cl. For this system, Ag/AgCl electrodes are using which may be more effective than any other electrodes. Number of leads used for this system are only three electrodes. The two leads are placed on forehead and another lead which is ground is placed in the right side of the neck. Diagnostic applications generally focus on the spectral content of EEG, that is, the type of neural oscillations that can be observed in EEG signals. Despite limited spatial resolution, EEG continues to be a valuable tool for research and diagnosis, especially when millisecond-range temporal resolution (not possible with CT or MRI) is required. Human brain consists of millions of interconnected neurons. The pattern of interaction between these neurons are represented as thoughts and emotional states. The pattern of interaction between these neurons are represented as thoughts and emotional states. According to the human thoughts, this pattern will be changing and produce different electrical waves.

IV. OVERALL MODULE OF THE SYSTEM

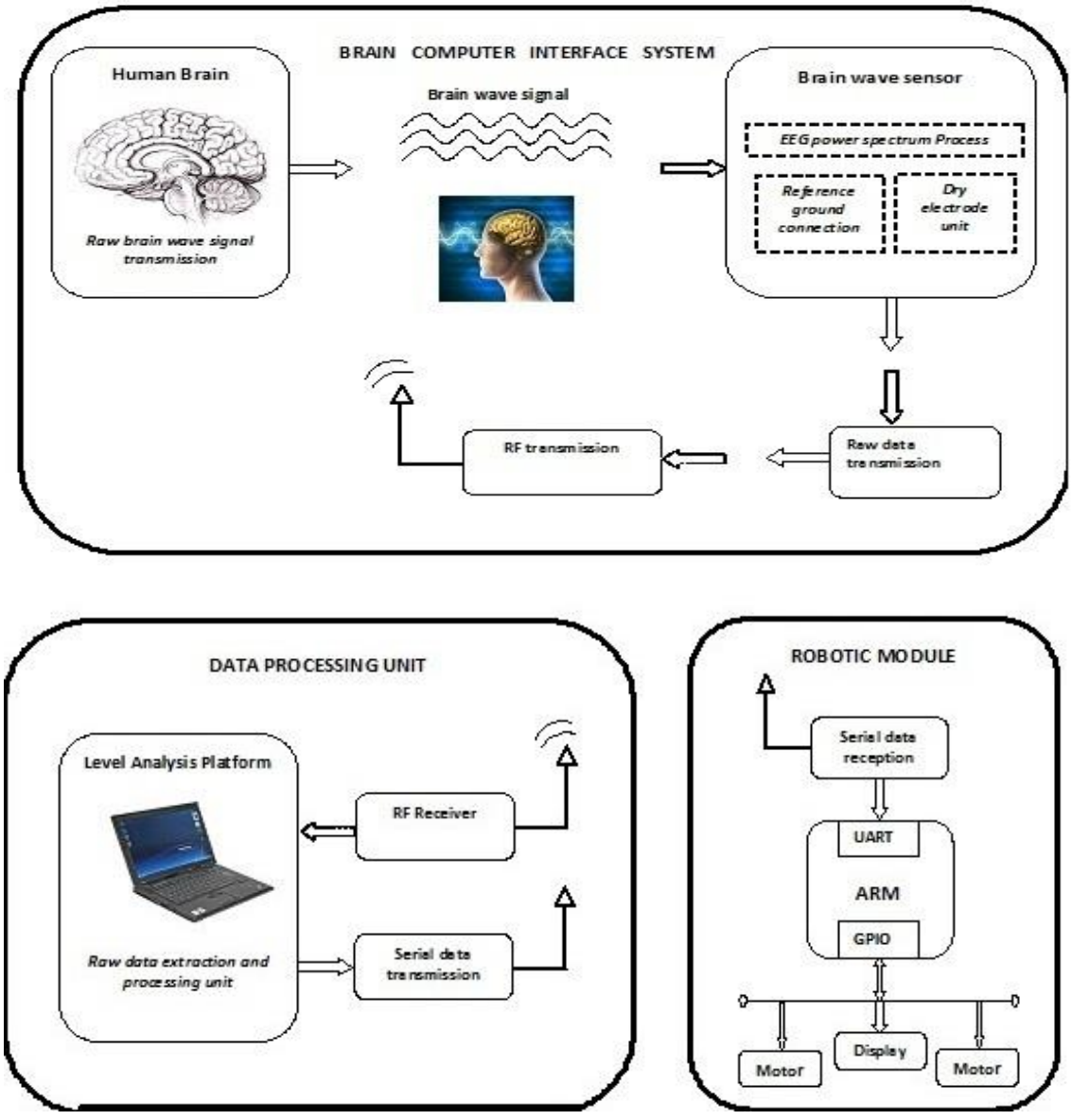
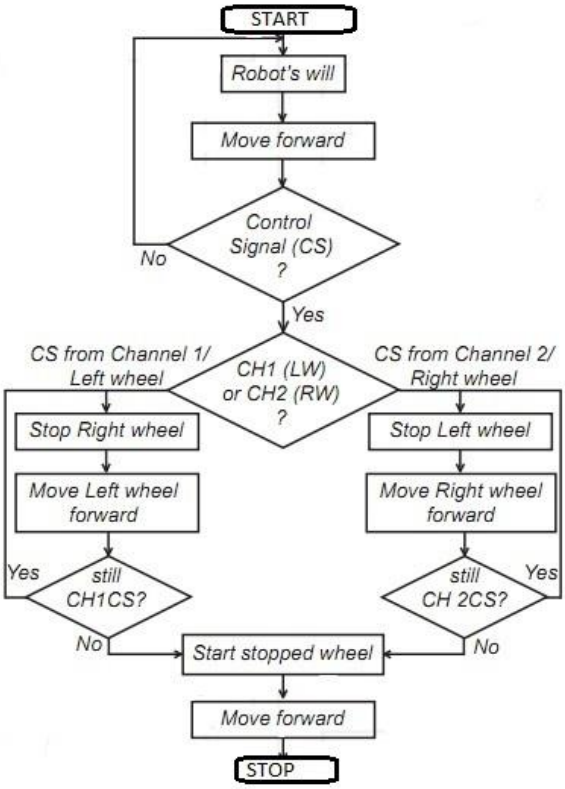


Figure-1: Block diagram of the Overall System

The figure-1 is given above represents the overall system. Brain waves are sensed by sensors and transmitted to LAU through Bluetooth device. The waves are extracting and process the signals using mat lab platform and transmitted these control commands to the robotic module.

V. FLOW CHART



Robot will move forward upto the control signals occurs. If control signals occur depending upon this signals, it will turn right or left. If control signal is from channel 1, the right wheel will stop and left wheel only rotates.so it will turn right side. If control signal is from channel 2, the left wheel will stop and right wheel only rotates.so it will turn left side. Still control signals occurs means the robot will rotate again and again. If control signals are not occurs it will again move forward .

VI. HARDWARE IMPLEMENTATION

A. Microcontroller- ARM LPC 2148

The LPC2148 microcontrollers are based on a 32 and 16 bit ARM7TDMI-S CPU with real-time emulation & embedded trace support, that combines the microcontroller with high speed flash memory ranging from 32 kB to 512 kB.128-bit wide memory interface and a unique accelerator architecture enable the 32-bit code execution at the maximum clock rate. A serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTs, SPI, SSP to I2Cs, and on-chip SRAM of the 8 kB upto 40 kB, make these devices very well suited for the communication gateways and protocol converters, voice recognition, soft modems, and low end imaging, providing both large buffer size and high process power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines. ARM architecture is a based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanisms are much simpler than those of micro programmed Complex Instruction Set Computers.

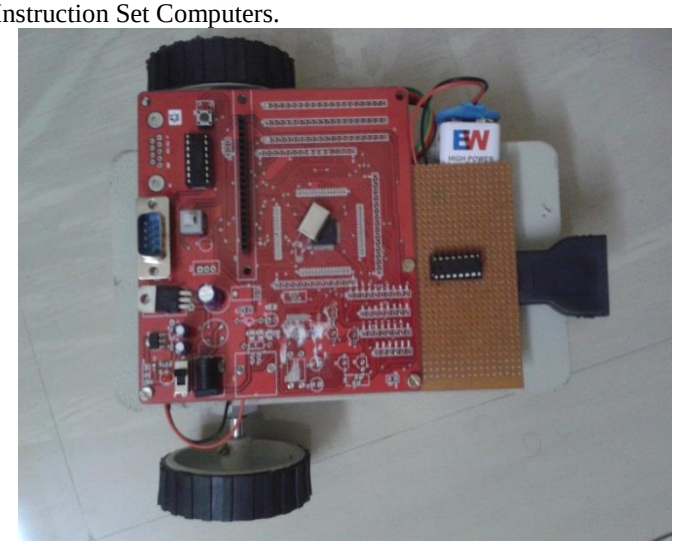


Figure-2: Robotic module

B. ZigBee Unit

ZigBee and IEEE 802.15.4 are protocol standards that provides the network infrastructure required for wireless sensor networks applications. 802.15.4 defines physical layer and MAC layers, and then ZigBee defines the networks and application layers. For sensor network applications, key design requirements revolve around long battery life, low cost, small footprint, and mesh networking to support communication between the large numbers of devices in an interoperable and multi-application environment.

C. Brain Wave Sensors

The emotions and behaviors are the communication between neurons with in our brains. Brainwaves are produced by electrical pulses from masses of neurons communicating with each other. Brainwaves are detected using sensors which placed on the head. They are divided into the bandwidths to describe their functions (below), best thought of as a continuous spectrum of consciousness; Delta is being slow, loud and functional - to Gamma is being fast, subtle, and complex. It is a handy analogy to think of Brainwaves as musical notes - the low frequency waves like a deeply penetrating drum beat.

Figure-3: Brain wave sensor

VII. SOFTWARE IMPLEMENTATION

A. OrCAD-Oircuit Design

OrCAD Capture CIS is designed to reduce production delays and cost overruns through the efficient management of components. It reduces the time searching existing parts for reuse, manually entering the part of information content, and maintaining component data. Users search parts based on their electrical characteristics and OrCAD Capture CIS automatically retrieves the associated parts.It is Flexible and scalable, the solution is quickly implemented. OrCad Capture CIS is ideal for individual design teams or multi-site teams who need to collaborate across multiple locations. It provides access to information so designers can use preferred, lower cost, and in stock parts.

B. KEIL IDE's

Keil Software publishes one of the most development tool suites for ARM software, which is used throughout industry. For development of C code, their Developer's Kit product includes to their C51 compiler, as well as an integrated 8051 simulator for debugging. A demonstration version of this product is an available on their website, but it includes some limitations. The C programming language was designed for only computers, though, and not for embedded systems. It does not support direct access to the registers, nor does it allow for reading and setting of single bits, two very important requirements for 8051 software. There are several very important limitations in the evaluation version of Keil's Developer's Kit that users need be aware of when writing software for the 8051. The Keil C compiler has made some modifications to another wise ANSI-compliant implementation of the

C programming language. These modifications were made solely to facilitate the use of a higher-level language like C for writing programs on microcontrollers.

C. Flash Programmer

Flash programmer is used to fuse the built hex code into the Microcontroller . This ISP Programmer can be used either for in-system programming or as a stand-alone SPI programmer for Atmel ISP programmable devices. The programming interface is compatible to STK200 ISP programmer hardware so the users of STK200 can also use the software which can program both the 8051 and AVR series devices.

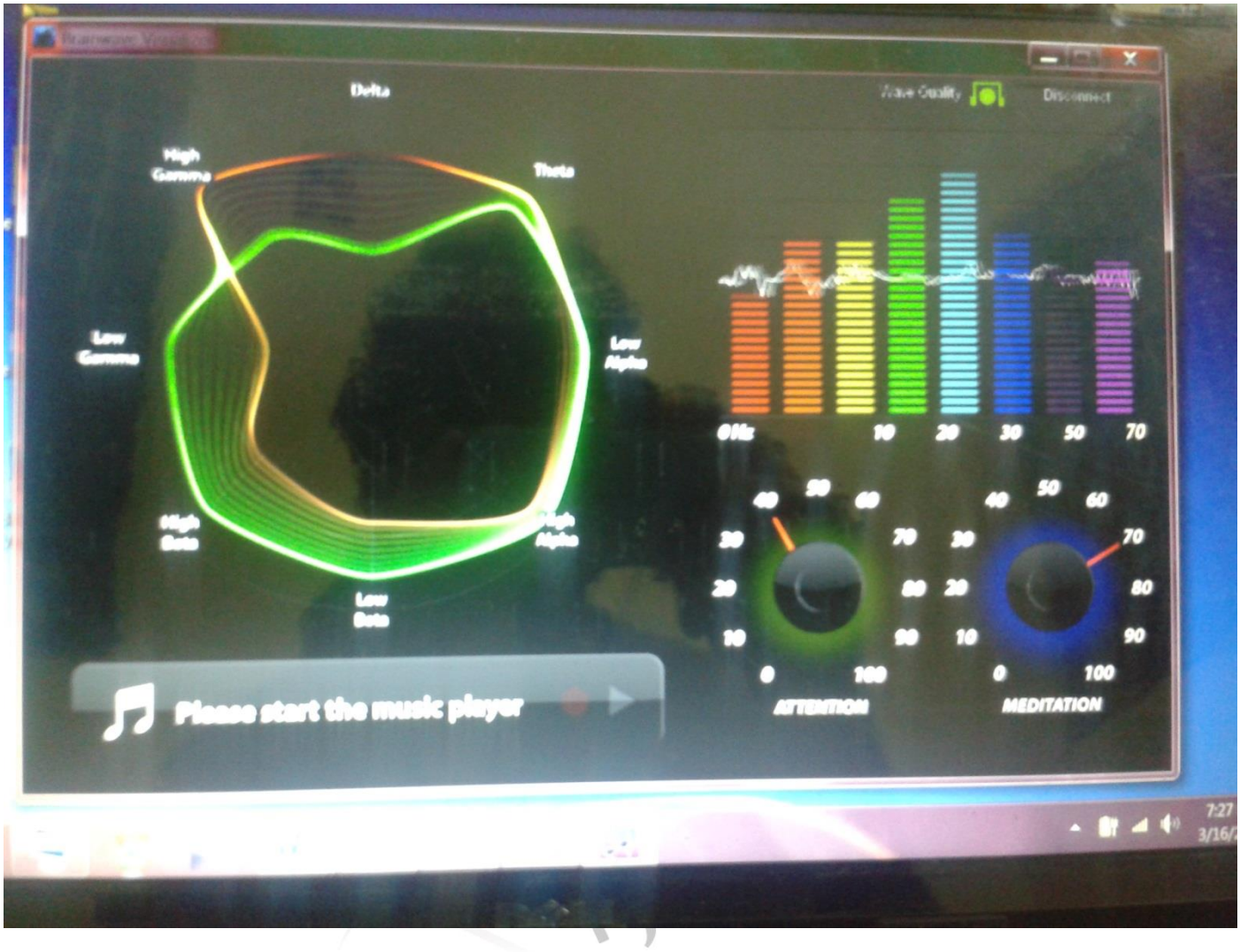


Figure-4: Brain wave analysis

VIII. CONCLUSION

The first step results were verified successfully with the expected output of the robot moves depending upon the control commands. Sense the brain wave signals using brain wave sensor and converted the signals into the control commands using mat lab platform. Then the control commands will be transmitted to the robot 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. Also we can do the image transmission through wireless camera. So, that we can monitor war area. And spot out the enemies battle during war field. Wireless camera is transmit the entire video to the user end.

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