BRAIN CONTROLLED CAR FOR DISABLED USING ARTIFICIAL INTELLIGENCE

M.Muthukumaravel
3rd Year B.E. Computer Science
Panimalar Engineering College
muthukumaravel.muthuraman@gmail.com

S. Siva Shankar
3rd Year B.E. EEE
Panimalar Institute of Technology
sivashankar331@gmail.com

Abstract **- The scope of Artificial Intelligence is steadily increasing in the field of automobile and navigation. The artificial intelligence has grown immensely, such that it can sense human brain activity. Artificial Intelligence has being greatly helping the physically challenged people in the recent times. Using this scope of Artificial Intelligence, our project is based on helping the disabled people to drive cars by continuously tracking their mental thinking. Since these cars will rely only on what the individual is thinking they will hence not require any physical movement on the part of the individual. The car is equipped with a lot of sensors like video, weather monitor, anti-collision etc. The car is also equipped with automatic navigation in case of emergency. This technology will make the disabled, abled. . In the 40s and 50s, several researchers explored the connection between neurology, information theory, and cybernetics. W. Grey Walter's turtles and Johns Hopkins Beast built machines that used electronic networks to exhibit rudimentary intelligence. Several such researchers gathered for meetings of the Teleological Society at Princeton and the Ratio Club in England. Many such researchers want their work to be turned into a machine with general intelligence, called as strong AI, Consisting all the skills above and exceeding human abiliti**es. **A few researches believe that anthropomorphic features like artificial consciousness or an artificial brain will be required for such a project.**

Keywords- ***Biocontol system, 2,Brain-computer Interface, security system, Electromechanical control unit, Automated navigation system***

I. INTRODUCTION

The video and thermogram analyser continuously monitor activities and the environment outside the car. Brain – computer Interface(BCI),which is sometimes called as direct neural interface or a brain- machine interface. This interface helps in providing a direct communication pathway between an external device a human or animal brain(or brain cell culture)and. In one way Brain-Computers, the computers either accept commands from the brain or send signals to the brain(for example, to restore vision) but both is not possible in One-Way BCI. This can be overcome by using Two way BCI's that allow exchange of data between them in both directions but this is yet to be successfully implanted in animals or humans.

The two terms, brain means the brain nervous system of an organic life form rather than the mind .Computer means any computational or processing work ranging from simple circuits to silicon chips(which includes the hypothetical future technologies such as quantum computing).

Once the driver (the disabled person) comes near the car, the security system of the car is activated. Photos of the driver along with the thermographic results of the driver are previously added to the database of the computer for verification purpose. If the video images of the driver match with the database entries in the computer then the security system advances to the next stage. Here the thermo graphic image of the driver is verified with the database information. The doors will be opened only if the above securities checks are verified. The door slides and the ramp is lowered to enable the driver to get in the car with ease. The lower end of the ramp is equipped with flip actuators . Once the driver enters the ramp, the flip actuates the ramp and lifts the driver horizontally. The driver is assist to his seat with the help of robotic arms. As soon as the driver is seated the top of the seat is lowered and EEG (electroencephalogram) helmet, attached to the top of the seat, is suitably placed on the driver's head. A wide screen of the computer is placed at an angle aesthetically which suitable to the drivers viewing angle. Each program can be controlled either directly by a mouse or by a shortcut. For starting the car, the start button is clicked. Once the switch is ON the circuit from the battery to the A.C.Series Induction motors is turned ON.

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II. BIOCONTROL SYSTEM:

The bio-control system integrates signals from various systems and compares them with original data in the database. It comprises the following systems:

1. Brain-Computer interface.
2. Automatic navigation system.
3. Automatic security system.

III(a) .BRAIN – COMPUTER INTERFACE:

To help the new and non-expert user, the Brain-Computer interfaxe will increase acceptance by offering customized, intelligent help and training. Several challenges in the areas of machine perception and automatic explanation occur due to development of such a flexible paradigm. The teams that are involved in this

field have developed a single-position, brain-controlled switch. This switch responds only to the specific patterns that are detected in spatiotemporal electroencephalograms (EEG). This is measured from the human scalp. This initial design is defined as the Low- Frequency Asynchronous Switch Design (Fig.1).LF-ASD.

A fast Fourier transform is used to filter the EEG before being displayed as a three dimensional graphic. The data is then piped into MIDI compatible music programs. Furthermore, other external process can be adjusted using MIDI that can be used in robotics. The experimental control system is configured for the particular task being used in the evaluation. Real Time Workshop generates all the control programs. The Simulink models and C/C++ are also checed using MS Visual C++ 6.0.Mat lab environment is mostly used for analysis of data.

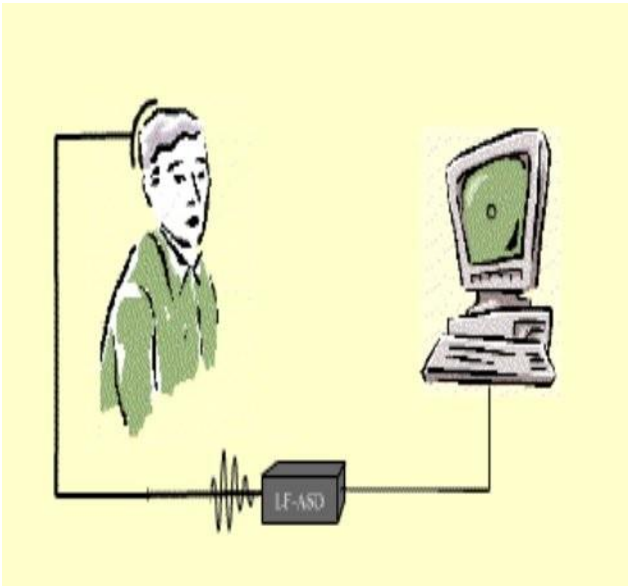

Fig.1 LF-ASD

FEATURES OF EEG BAND:

1. Remote analysis data can be sent and analyzed in real-time over a network or modem connection.
2. Data can be fully exported in raw data, FFT & average formats.
3. Ultra low noise balanced DC coupling amplifier.
4. Max input 100microV p-p, minimum digital resolution is 100 microV p-p / 256 = 0.390625 micro V p-p. FFT point can select from 128 (0.9375 Hz), 256 (0.46875 Hz), 512(0.234375 Hz resolution).
5. Support for additional serial ports via plug-in boar; allows extensive serial input & output control.
6. Infinite real-time data acquisition (dependent upon hard drive size).
7. Real-time 3-D & 2-D FFT with peak indicator, Raw Data, and Horizontal Bar displays with Quick Draw mode.
8. Full 24 bit color support; data can be analyzed with any standard or user.
9. Customized color palettes; color cycling available in 8 bit mode with Quick Draw mode.
10. Interactive real-time FFT filtering with Quick Draw mode. Real-time 3-D FFT (left, right, coherence and relative coherence), raw wave, sphere frequency and six brain wave switch in one OpenGL display.
11. Full Brainwave driven Quick Time Movie, Quick Time MIDI control; user configurable.
12. Full Brain wave driven sound control, support for 16 bit sound; user configurable.
13. Full image capture and playback control; user configurable.

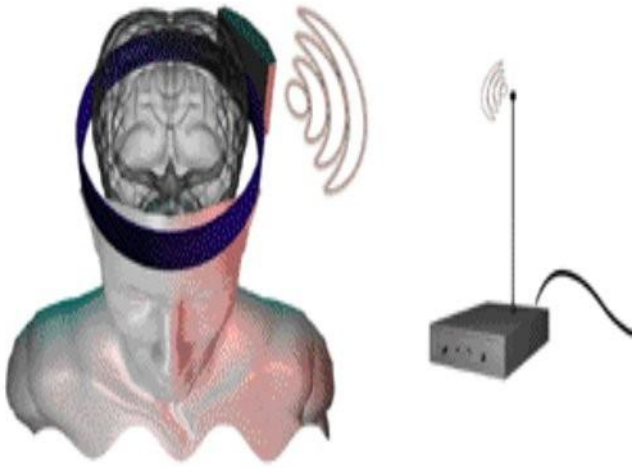

Fig. 2: EEG Transmission

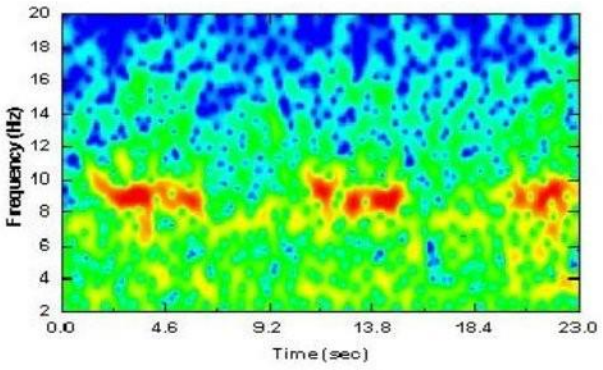

Fig. 3 EEG

III.(a).1.TEST RESULTS COMPARING DRIVER ACCURACY WITH/WITHOUT BCI:

1. Able-bodied subjects using imaginary movements could attain equal or better control accuracies than able-bodied subjects using real movements.
2. Subjects demonstrated activation accuracies in the range of 70-82% with false activations below 2%.
3. Accuracies using actual finger movements were observed in the range 36-83%.
4. The average classification accuracy of imaginary movements was over 99%

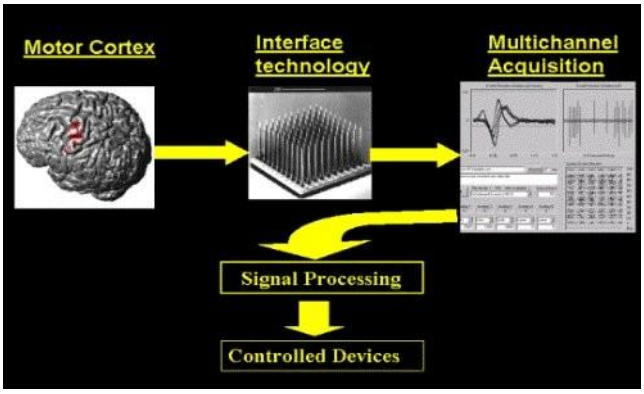

Fig.4 Brain-to- Machine Mechanism

The impulse of the human brain is the principle behind the whole mechanism which can be tracked and even decoded. The Low-Frequency the motor neurons in the brain are traced using the Asynchronous Switch Design. An impulse, when the driver attempts for a physical movement, is sent to the motor neuron. These motor neurons are used for carrying the signal to the physical components such as hands or legs. Hence we decode the message at the motor neuron to obtain maximum accuracy. The eye movement of the driver is monitored by observing the sensory neurons.

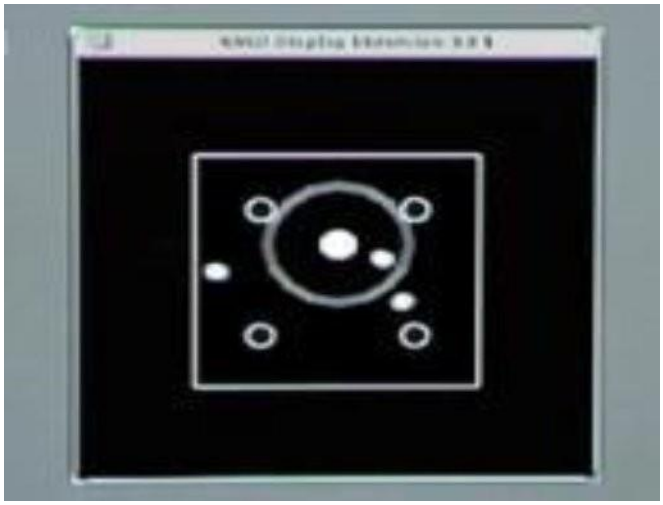

Fig.5 Eyeball Tracking

The cursor on the screen moves in the same direction as the eye moves. It gets brightened when the driver concentrates on one particular point in his environment. The sensors, which are placed at the front and rear ends of the car, send a live feedback of the environment to the computer which has a virtual map of the environment. Based on the eye movement the steering wheel is turned through a specific angle by electromechanical actuators. The angle of turn is calibrated and is based from the distance moved by the dot on the screen.

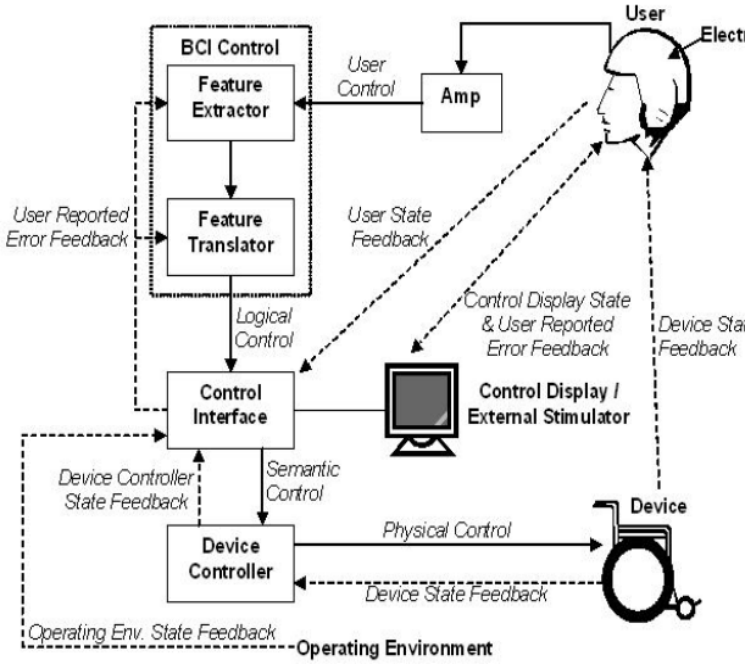

Fig.6 Electromechanical Control Unit

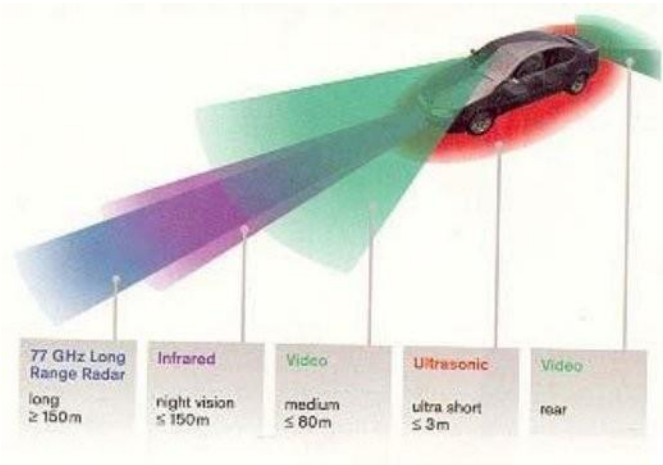

Fig.7 Sensors and Their Range

III.(b).AUTOMATIC SECURITY SYSTEM:

The EEG of the driver is monitored continually. The driver is predicted to be in a unstable state when the EEG drops below 4 HZ. A confirmation message is given to the driver and it waits for sometime to continue the drive. A confirmed reply that is based on prediction activates the program for automatic drive. If the driver is doesn't give a reply then the computer prompts the driver for the destination before the drive and the journey will taken care by the automatic navigation system.

III.(c)..AUTOMATIC NAVIGATION SYSTEM:

As the computer. is based on artificial intelligence it automatically monitors every route the car travels and stores it in its map database for future use. The map database is analyzed and the

shortest route to the destination is chosen. With traffic monitoring system provided by xm satellite radio the computer drives the car automatically. Video and anti-collision sensors mainly assist this drive by providing continuous live feed of the environment up to 180 m, which is sufficient for the purpose.

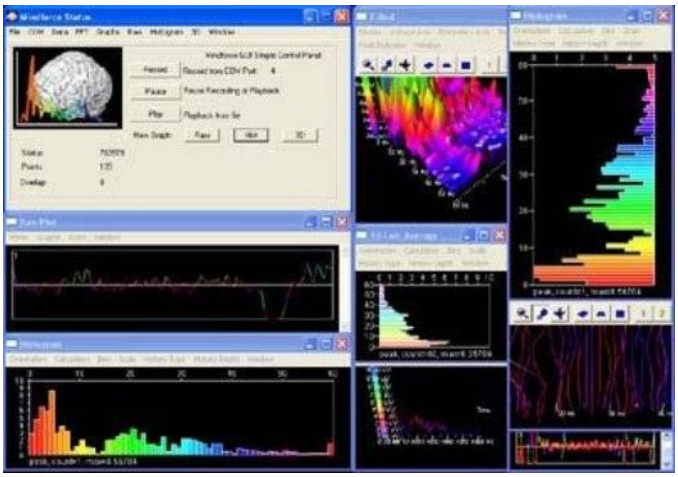

Fig.8 EEG Analysis Window

ADVANTAGES

The main advantage is self driven transport for people with physical disabilities.

The advanced features of this car includes

- Global navigation system
- Anti -collision
- Weather forecasting system
- Car security system

DISADVANTAGES

1. Its not cost effective.
2. It can carry only one person
3. Multi operations cannot take place
4. It hard to take action on the spot

SPECIALTY OF THE CAR

Once the driver (disabled) nears the car. The security system of the car is activated.

Robotic arms assist the driver to his seat, As soon as the driver is seated the EEG helmet is placed on the drivers head

Images as well as thermo graphic results of the driver are previously fed into the database of the computer.

IV. CONCLUSION:

When the above requirements are satisfied and if this car becomes cost effective then we shall witness a revolutionary change in the society where the demarcation between the abler and the disabled vanishes. Thus the integration of bioelectronics with automotive systems is essential to develop efficient and futuristic vehicles, which shall be witnessed soon helping the disabled in every manner in the field of transportation.

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