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Smart Cars for Physically Disabled Based on Artificial Intelligence

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ABSTRACT:

This prototype promotes the development of SMART CARS controlled by human brain which could assist the physically challenged people to drive these special cars at their own. As these cars incorporates the trending technology of ARTIFICIAL INTELLIGENCE, it synchronizes and integrates the signals from various sensors and thus these cars rely only on what the person thinks, which does not involve any physical interaction with the car, who drives. Henceforth, these special cars help to transform the disabled into able people who can independently travel across places.

Keywords: EEG- Electroencephalography, Brain-Control interface.

INTRODUCTION:

The activities outside the car are monitored continuously by the video & thermo gram analyzer. There is a direct pathway of communication between an external device and a human brain or animal brain which is known as A**brain-computer interface** (BCI), which is also called a **direct neural interface** or a **brain-machine interface**two types are BCIsnamely one-way BCIs & two-way BCIs.The name itself implies that in one-way BCIs computers can either send signals to the brain or receive commands from the brain and cannot perform both the activities. In Two-way BCIs the information can be exchanged intwo-way direction where information is exchanged between external devices and human brains but it is not been implanted in humans or animals successfully tilldate.The word brain in this definition is meant as anervous system in organic life, on the other hand*Computer* means a device of computations from lesscomplicated circuits to silicon chips where quantum computing is included which is a hypothetical futuretechnology when the disabled driver is near the car,resultsin activating the security system of a car.Initially the database of the disabled driver is collected and fed which includes thermo graphic results and Images of the driver.the security system advances to the next stage if videoimages are matched with the entries of the database. Wherethe verification of thermo graphic image is done with the stored data in the database.after the successful verification the driver passes this stage. Then the door is opened where a ramp is lowered from the floor which also consists of flip actuators in the lower end. When the ramp senses the entry of the driver the ramp is horizontally lifted which

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is actuated by the flip. Then the driver is assisted to his seat by the robotic arms. After the driver is comfortably seated in the car the attachment which is at the top of the seat is slowly lowered and is placed on the driver's head suitably which is called as the **electroencephalogram (EEG).**

A wide screen of the computer is placed at an angle which is gracefully suitable tothedriver. The programs can be controlled by shortcutor by the mouse directly. The car can be started by clicking on the start button.then the circuit is switched ON from thebattery to the A.C. induction motors by the computer.

Electroencephalography

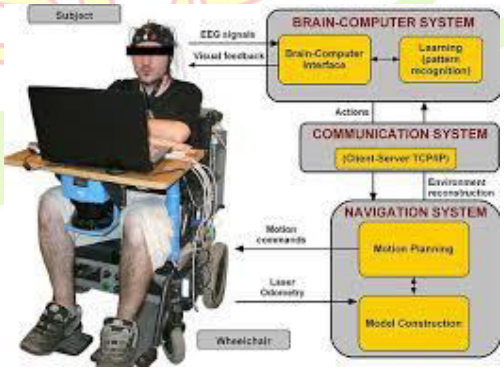
The common practice of diagnosing the assessing human brain activity is called Electroencephalography. The electrical signals which are measured on the scalp induces the cranial activities. It is said to be a complex interaction of chemical signal storage and electrical signal processing in the brain while thinking. The activities of the body incorporates working with certain parts of the brain. For instance, Eye signals processing, which actually takes place in the back of the human brain in the visual cortex. These kind of electrical signal processing might take place in almost all parts of the human body and interwork relating with each other. These electrical signals can be measured with the voltage recorded on the skin. Caps are used for applying electrodes to measure few millionth volts voltage, along with electroencephalography. It is a drawback to use normal vision signals which are complicated in the EEG. When a enormous part of the field is occupied by blinking pattern described in "A Monthly Double-Blind Peer Reviewed Refereed Open Access International e-Journal" IJMIE Volume 2, Issue 5 ISSN: 2249-0558 which is published in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory, May 2012 which details that with a frequency between 8 and 15 Hz, where the electrical signals which are stronger, are induced in the brain. The computer filtered and processed signals could be recorded by the EEG. These signals induced by external, defined stimuli are said to be visually evoked potentials (VEP).

The signals are represented as a map (see figure). The doctors make acomparativediagnosisof the brain activity of an ill person with that of the normal healthy person.

3. BIO-CONTROL SYSTEM

The essential futuristic work ofthe bio control system is to synchronize, coordinate and compare the signals from all the systems in order to achieve the requested task. It categorizes the following systems:

- Brain-computer interface
- Automatic security system
- Automatic navigation system



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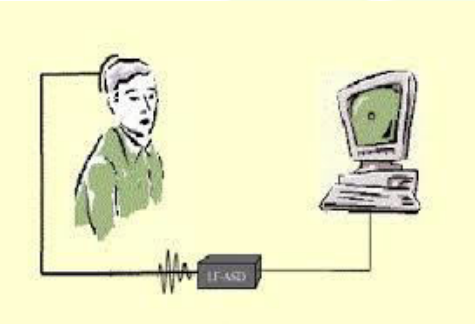
3.1. BRAIN – COMPUTER INTERFACE

The acceptance by offering customized, intelligent help and training, especially for the non-expert user is increased by the Brain-computer interfaces. Such a flexible interface paradigm development leads to several challenges in the areas such as automatic explanation and machine perception. The researching teams under this field developed a single position, brain-controlled switch which can respond tospecific patterns which are detected in spatiotemporal electroencephalograms
(EEG) measured from the human scalp. This initial design is referred to as the Low-
Frequency.



Asynchronous Switch Design (LF-ASD)

Asynchronous Switch Design
(LF-ASD)

Before being displayed as a three dimensional graphic the EEG is filtered and run through a fast Fourier transform. The data is then piped into MIDI compatible musicprograms. After which other external processes, such as robotics can be controlled by adjusting the MIDI.The particular task being used in the evaluation is configured by the experimental controlsystem.All the control programs from Simulink models and C/C++ using MS Visual C++6.0 are generated by the Real Time Workshop. The data analysis is mostly donewithin environment of mat lab.

3.1.1. TEST RESULTS COMPARING DRIVER ACCURACY WITH/WITHOUT BCI

1.Equal or even better control accuracies can be attained by the Able-bodied subjects using imaginary movements than able-bodied subjects who use real movements.

2. With the false activations below *2%*,in the range of 70-82% the subjects have demonstrated activation accuracies.

3. In the range of 36-83% the accuracies using actual finger movements were observed.

4. The range of average classification accuracy of imaginary movements was about *99%*.

Brain-to- Machine Mechanism

The principle behind thewhole mechanism is that the impulse ofthe human brain can be tracked and evendecoded. The Low-FrequencyAsynchronous Switch Design traces the motor neurons in the brain. When thedriver attempts for a physical movement,he/she sends an impulse to the motorneuron. These motor neurons carry thesignal to the physical components suchas hands or legs. Hence we decode themessage at the motor neuron to obtainmaximum accuracy. By observing thesensory neurons we can monitor the eyemovement of the driver.

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THE WORKING PRINCIPLE

- The main idea behind these smart cars is that the impulse of the brain can be monitored and can be decoded.
- In the brain, there are motor neurons present inorder to help with our motions. When a person wants to move he/she sends an impulse which is detected by these motor neurons present in the brain. These motor neurons are responsible for carrying the signals to the corresponding physical components such as hands/legs. Thus maximum efficiency can be achieved if these motor neurons are tracked.
- For monitoring the eye movement of the driver sensor neurons are observed by the computer.

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3.2. AUTOMATIC SECURITY SYSTEM

The electro encephalograms of the driver decides upon if thedriver is capable of continuing his drive. That is the EEG of the driver is noted continuously. And if it drops less than 4HZ then it can be inferred that the driver is in an unstable state. If this situation arises then a warning message is given to the driver and a reply is awaited before continuing the drive. If the reply is received then automatic driving mode is set on.in case the reply is not received then the destination is known by means of prompting the driver before the drive.

3.3. AUTOMATIC NAVIGATION SYSTEM

As this is based upon the technology of artificial intelligence, it helps in storing every route, the car travels in the database and any route can be easily retrieved from the database. The advantage of this is that the shortest route to the destination is identified from the list of route available in the database and that route is taken. Also with the help of traffic monitoring system which is provided by am satellite radio the computer can be driven automatically there by making it more efficient. There are also availability of video and anti-collision sensors which helps the driver by continuously feeding him with information about the surrounding environment covering a distance of about 180m,which satisfies the need.

3.4. EYEBALL TRACKING

As the eye of the driver moves, automatically the cursor on the screen also moves which leads to brightening of that area when the driver concentrates on a single particular point in his/her environment. The sensors that are placed at the front and rear ends of the car, send a live feedback of the surrounding environment to the computer. Based on that the

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steering wheel is turned through a specific angle with the help of theelectromechanical actuators. The angle of turn is decided from the distance moved by the dot on the screen.

Interface design

A. Requirements

With the free drive controller and BrainChooser alike, design of interface is essential for BC usability. Important aspects we focused on were

_ The executed actions must be stable and smooth,

_ falsely classified brain patterns must be handled robustly,

_ Safety of both the executed maneuvers with respect to physical limitations present and to the surrounding area,

_ there must be minimal necessity of actions for the maneuvers

Two solutions were developed and tested on the closed Tempelhof airfield, for which we designed a demonstration

B. Free Drive

In this mode the operator is capable of accessing the speed controland steering. Operator's decisions are continuously monitored to prevent accidents. The computer immediately stops the car if there is any chance of imminent collision or if the car is about to leave the free drive mode.

PROPOSED SYSTEM

The special interfaces provides facility to synchronize with highly sophisticated technological system such as autonomous vehicles. As these cars are integrated by smart system of artificial intelligence which facilitates the disabled driver to acquire control of the car's major feature of driving using involving any physical interaction. Even if it is not assured to be deployed for public usage, this proposal can enable the disabled people to effectively drive these cars at their own without indulging any physical movement and to command the vehicle in relatively small and closed areas.

On account of making the travel easier for the disabled, organizing and changing the routes of travel with the BCI an exceptional feature to the vehicle which makes them to become more mobile. Also the routes that are travelled earlier are stored and made as a record and used again when a need arises. Apart from this, the optimal route to reach a destination is also determined. In addition, the use of the Brain Chooser eliminates the inaccuracy of brain controlled cars working in open traffic and increases the precision.

Furthermore, it is more desirable to research more brain patterns in the future. This may enable the disabled driver to give more commands such as turning on or off the lights, or setting theonboard navigation system to the desired location by thinking alone.Also when the person gets distracted from driving for long hours, then the car automatically shifts to auto driving mode. In rare cases, when the driver critically goes to unstable state, then the car halts from moving further.

4. CONCLUSION

The proposal gives a glimpse of existing feature of brain-interface.

With the increase in advancements of the BCI, numerous advantages can be claimed. They are (i)more

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accurate car control (ii)more effective velocity control and steering control.

When all these above mentioned constraints gets satisfied and if the estimation of the cost becomes effective, then a massive revolution in the society of disabled people occurs which extinct the differences between the abler and the disables.

Thus the integration of bioelectronics with Artificial intelligence, smart automotive is important to deploy efficient and futuristic cars, which shall be developed soon helping the disabled inevery aspect in the field of transportation

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