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# BRAIN AND EYE BALL CONTROLLED WHEELCHAIR FOR DISABLED PEOPLE WITH GSM

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**ABSTRACT**

*An automatic wheelchair is a mobility aided devices for persons affected by moderate, physical Disabilities, and chronic diseases. Many people with disabilities do not have the ability to control the powered wheelchair using a vertical handler and hand movements as it is tougher for the person to move. In this project, there will be a wheelchair model, which will contain an in-built microcontroller and eyeball sensor, brain wave sensor is used to move the wheelchair in all direction. Also obstacle detection (Ultrasonic) sensor will be connected to give necessary feedback for proper operation of the wheelchair system.*

**Key words:** Eyeball sensor, Brain Wave sensor, Ultrasonic sensor, Microcontroller

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## 1. INTRODUCTION

A handicapped person with disabilities needs a wheelchair to perform functions that require him or her to move around. He can do so manually by pushing the wheelchair with his hands. However, many individuals can have weak upper limbs to operating too tiring. Hence, it is desirable to provide them with a motorized smart wheelchair that can be controlled by bio-signal and non-biosignal approach. There is different type's wheelchair available nowadays which discussed next. EMG (Electro Mayo Gram) measures electrical currents that are generated in muscles during its contraction. The EMG observed is the sum of all the action potentials that occur around the electrode site. EMG signals can be used for a variety of

applications including clinical applications, HCI &interactive computer gaming EOG (Electro Oocula Gram) technique are very useful for persons who born with any congenital brain disorder or for the who are suffer from severe brain trauma. EOG signals records the potential difference between retina & cornea of the eye. When the eyes are rolled upward or forward or downward positive or negative pulse generated. As the rolling angle increases, amplitude of pulse also increases & the width of the pulse is in directly proportional to the eyeball rolling process[2]. Non-bio signal based devices provides 100% accuracy & require less training for patients. In general, non-bio signal based techniques which make use of joystick control, sip-n-puff control, tongue control. Touch screen, voice actuated and head movement tracking [3]. Accelerometer based wheelchair, we have an acceleration sensor that is also known as tilt sensor. When we tilt the object, the values registered by sensor are changed and these values are given to microcontroller. Depending on the direction of the tilt, microcontroller controls the wheelchair directions as LEFT, RIGHT, and FRONT & BACK [4]. Stair climbing wheelchair exists at present can be grouped into 3 categories: - continuous stair climbing wheelchair, intermittent-stair climbing wheelchair and auxiliary stair climbing wheelchair. Continuous stair climbing wheelchair has only one set of supporting device, the wheelchair relies on this supporting device for continuous motions. In intermittent stair climbing wheelchair the process of climbing stairs of is similar to the people climbing up and down stairs, it is also called walking stair climbing wheelchair. It needs assistance to help realize the function of climbing stairs. Stair lift requires wide stair way which is very expensive [5].

## 2. DRAW BACKS OF PRESENTLY AVAILABLE WHEEL CHAIRS

Most significant technical issue in the currently available wheelchair is cost versus accuracy. Also, in present system it is difficult to monitor surrounding conditions. There is also no wheelchair available till date of bed lying patient. No wheelchair available for mentally challenged people also. Above all other important aspect to consider is the physical barrier that additional requirement on strength & durability of wheelchair.

## 3. PROPOSED MODEL

The aim of this project is to use wheelchair automatically for moving forward, left & right using EEG sensor. EEG will record the brain's spontaneous electrical activity over a period of time through multiple electrodes placed on their scalp. In addition to that the eyeball sensor does the process of controlling the wheelchair by observing the eye gesture of patients. The signals from the brain is called as EEG signals(analog signals) is converted into digital by using ADC[6]. The movement of eye ball is sensed by the EEG sensor.

## 4. METHODOLOGY

Eye-tracking involves the 'tracking of eye movements'. It has been perceived to be a very accurate platform for building of rehabilitation technologies. Not all eye tracking devices can correctly measure and identify the different types of eye movements and not all eye movements can be correctly measured.IR (infrared) technology plays important role and by the movement of eyeball it is going to sense by the brain. The brain wave is produced by the EEG sensor which is placed on the scalp of the head. The brain wave is generated by neuron. Here we going to use only Three type of electrode (positive, negative & ground) electrodes. The voltage ranges from 1uV-100uV. This generating voltage is called EEG signals. Electroencephalogram is an example of non-invasive technique of detecting brain activity. The microcontroller (AT89S52) output is depends on the eyeball movement and sensing process by EEG signals. The obstacle detection is possible here. The obstacle is detected by the ultrasonic sensor which is placed on the bottom at front side of the wheelchair. At the same time when obstacle is detected wheelchair will automatically goes to OFF state and

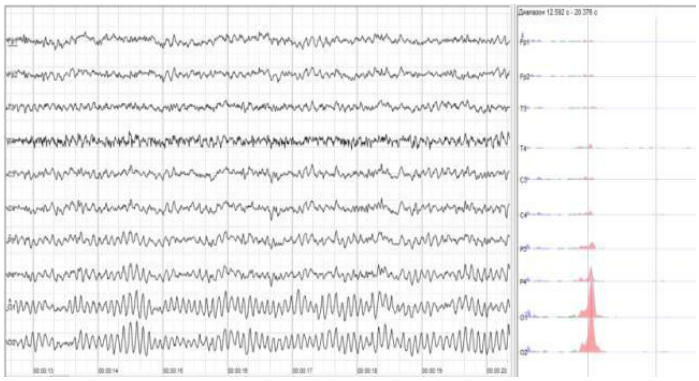
message is send by using GSM (global system for mobile communication) to the relative persons.

## 5. HARDWARE MODULE

### EEG (Brain wave) Electrodes

The first human EEG recording obtained by Hans Berger in 1924.

It is an electrophysiological monitoring method to record electrical activity of the brain. It is typically noninvasive, with the electrodes placed along the scalp, although invasive electrodes are sometimes used in specific applications. EEG measures voltage fluctuations resulting from ionic current within the neurons of the brain. EEG is most often used to diagnose epilepsy, which causes abnormalities in EEG readings. It is also used to diagnose sleep disorders, coma, encephalopathies, and brain death.



### Human EEG with Prominent Alpha-Rhythm

A routine clinical EEG recording typically lasts 20-30 minutes (plus preparation time) and usually involves recording from scalp electrodes.

### Mechanism – EEG

The brain's electrical charge is maintained by billions of neurons. Neurons are electrically charged (or "polarized") by membrane transport protiens that pump ions across their membranes. Neurons are constantly exchanging ions with the extracellular milieu, for example to maintain resting potential and to propagate action potentials. This process is known as volume conduction. The electric potential generated by an individual neuron is far too small to be picked up by EEG or MEG.

### Eyeball Sensor

Eye ball sensor is a sensor which is used to sense the movement of eye. Eyeball sensor which is chip of hands free pointing device and telemedicine system which is remote diagnosis and data transmitting system. Technical field the present invention relates to an eye tracker which does not require peripheral devices through imaging process of a user's eye images, can be implemented using chip and can perform an image processing of a pixel level, thereby ensuring high operating speed. An eye tracker according to the present invention can operate in two modes. The first mode is a function of detecting a location at which a user stares by accurately finding the center of the pupil of a user's eye. The second mode is a function of converting the eye's images, which are obtained by a CMOS image sensor, into a digital signal through a correlated double sampling (CDS) circuit and an A/D converter.

## 6. GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATION)

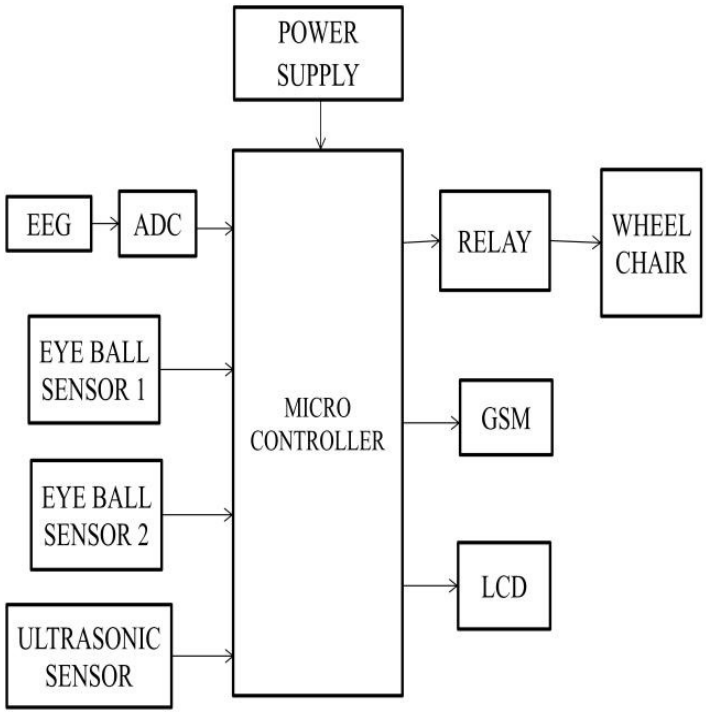
It is originally from (Group Special Mobile) is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 80% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs from its predecessors in that both signaling and speech channel's are digital, and thus is considered a *second generation* (2G) mobile phone system. This has also meant that data communication was easy to build into the system. GSM EDGE is a 3G version of the protocol.

**Module Name: Q2303A**


**Microcontroller (AT89S52)**

It is a low power, the device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. It provides 256 bytes of RAM,8k bytes of flash,, watchdog timer, there 16-bit timer/counters. High-performance cmos-8bit microcontroller with 8k bytes of in system flash programmable and erasable read only memory.

## 7. BLOCK DIAGRAM




Block Diagram of eye tracking and brain wave

## 8. ULTRASONIC SENSOR

Ultrasonic sensor transmits ultrasonic waves into the air and detects reflected waves from an object. There are many applications for ultrasonic sensors, such as in intrusion alarm systems, automatic door openers and backup sensors for automobiles. Velocity of wave propagation is expressed by multiplication of frequency and wavelength. Because of higher resolution, it is possible to get higher measurement made large accuracy.

In order to detect the presence of an object, ulatrasonic waves are reflected on objects. Metal, wood, concrete, glass, rubber and paper, etc., reflect approximately 100% of ultrasonic waves, these objects can be easily detected.

## 9. RESULT ANALYSIS

AT89S52 has been successfully used to design and test the eyeball motion and brain wave controlled wheelchair using IR sensor and EEG wave generated by the neurons. The outcomes of the variously conducted trials on different person have been observed and logged to be used in case of future studies. The proposed design is complete and successfully tested.

## 10. CONCLUSIONS

The EEG signals are acquired from the electrodes placed on the scalp of the head and the IR sensors are sensed the movement of eye ball for different cases of motion like Right, Left, and Forward and Stop commands are given to microcontroller and it converts as a digital signals and send to the DC motor which is placed on the wheelchair. The obstacle is detected by the ultrasonic sensors and when the obstacle detect automatically wheelchair goes to OFF state and message will send to the relation via GSM. Character recognition and generating control codes are done efficiently by the microcontroller.

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