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# Eye Controlled Wheelchair System Along With Hand Talk

**D.Jyothi Rani**
**M.Tech (Embedded Systems)**
**Mallareddy Engineering College For Women,**
**Maisammaguda, Dhulapally, Secunderabad,**
**Telangana State, India.**

**B. Adhithya, M.Tech**
**Assistant Professor**
**Mallareddy Engineering College For Women,**
**Maisammaguda, Dhulapally, Secunderabad,**
**Telangana State, India.**

***Abstract***

***The main aim of this project is to design a wheel chair for physically challenged people to help mainly for the leg amputees. As this project uses the Eye blink technology, for controlling the directions of the wheel chair, and it makes use of gestures of body parts to announce their basic needs like food, water, etc..,. MEMS (Micro Electro-Mechanical Systems) accelerometer sensor is placed on the any movable part of the body of the paralyzed and he need to move that part in different directions to announce different needs.***

***Keywords:*** ***Raspberry pi, USB camera, MEMS, DC motor, voice module, speaker,***

## 1. Introduction

A novel technique is implemented for the eye and hand controlled based independent and cost effective system. The purpose of Eye and hand movement based control electric wheelchair is to eliminate the necessity of the assistance required for the disabled person. And it provides great opportunity of the disabled to feel of independent accessible life. The implemented system will allow the disabled person to control the wheelchair without the assistance from other persons. In this system controlling of wheelchair carried out based on Eye movements. The camera is mounted in front of the user, to capture the image of any one of the Eye (either left or right) and tracks the position of eye pupil with the use of Image processing techniques and The MEMS is mounted to hand of the user, By using hand movement (either left or right) and tracks the position of hand speaker can announce their basic needs. According to the position of the eye wheelchair motor will be directed to move left, right and forward. To make system cost effective for monitoring, a Raspberry pi board allowed accessing the system without displaying unit. To perform this task, Raspberry Pi processor is programmed using embedded 'Linux'.

This project makes use of an onboard computer, which is commonly termed as Raspberry Pi processor. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used. The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage.

## 2. LITERATURE SURVEY

There were many previous works carried out on electric wheelchairs. A few of them helped us get ideas for our current prototype.

In [1], Karthikeyan K C et.al, proposes an optical-type eye tracking system to control powered wheel chair. Users eye movement are translated to screen position using the optical type eye tracking system movement.

In [2], a method is proposed to control the motorized wheelchair using EOG signals. The method allows the user to look around freely while the wheelchair navigates automatically to the desired goal point. Another control method of a robot is by means of an

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electric wheelchair, dedicated to severely disabled persons, equipped with a low-cost web camera, using only eye movements and gaze direction.

In [3], iris recognition is by characterizing key local variations. The basic idea is that local sharp variation points, denoting the appearing or vanishing of an important image structure, are utilized to represent the characteristics of the iris. Using the ideas listed in the survey we developed a wheel chair for paralyzed persons based on eye recognition technology.

## 3. IMPLEMENTATION:

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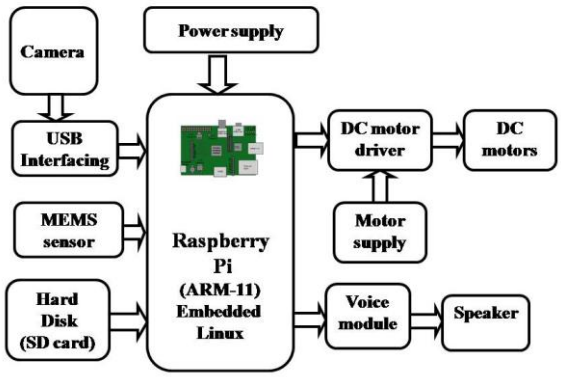
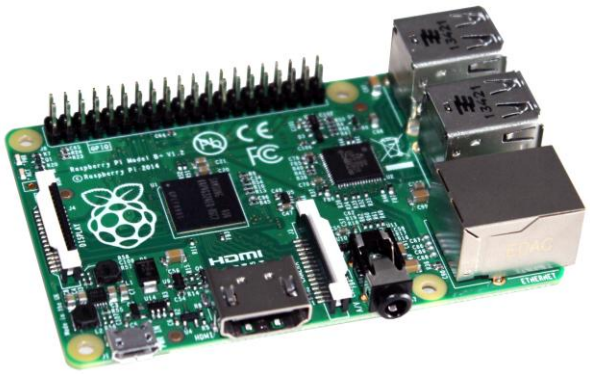



From the above figure, we can see that the device which is able to perform the task is a **Raspberry Pi** processor. This uses the Eye blink technology, for controlling the directions of the wheel chair, and it makes use of gestures of body parts to announce their basic needs like food, water by using MEMS accelerometer sensor. To perform this task, **Raspberry Pi** processor is programmed using embedded 'Linux'.

## 4. RELATED WORK:

This system consists of ARM-11 micro processer which is the main controlling part of the system. The USB camera capture the image of eye according to that wheelchair will move like forward, backward, right and left and also it uses the MEMS sensor and voice module to announce the basic needs of paralyzed person. The brief introduction of different modules used in this project is discussed below:

### Raspberry pi processer (ARM-11):



The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor (The firmware includes a number of "Turbo" modes so that the user can attempt over clocking, up to 1 GHz, without affecting the warranty), VideoCore IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage

### Web Camera:

A **webcam** is a video camera that feeds its image in real time to a computer or computer network. Unlike an IP camera (which uses a direct connection using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, FireWire cable, or similar cable. Their most popular use is the establishment of video links, permitting computers to act as videophones or videoconference stations. The common use as a video

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camera for the World Wide Web gave the webcam its name. Other popular uses include security surveillance, computer vision, video broadcasting, and for recording social videos.

### MEMS sensor:


The schematic for the 3-axis accelerometer is shown below. The device can be powered directly through the Vcc/3.3 V pin using a supply that is within the MMA7260QT's acceptable power supply range of 2.2 V to 3.6 V. Alternatively, the board can be powered by higher voltages, up to 16 V, using the VIN pin, which connects to a low-dropout 3.3 V regulator. In this configuration, the Vcc/3.3 V pin can serve as an output to be used as a reference voltage or power source for other low-power devices (up to around 50 mA, depending on the input voltage).

The sensitivity selection pins GS1 and GS2 are pulled up to the Vcc line, making the default sensitivity 6g; these pins can be pulled low by a microcontroller or through jumpers. For 5 V microcontroller applications, the lines should not be driven high. Instead, the microcontroller I/O pin can emulate an open-drain or open-collector output by alternating between low output and high-impedance (input) states. Put another way, if you are using a 5 V microcontroller, you should make your sensitivity selection I/O lines inputs and rely upon the internal pull-ups on the GS1 and GS2 lines if you want them to be high. It is always safe for you to drive these lines low.

Each of the three outputs is an RC-filtered analog voltage that ranges from 0 to Vcc. For 5 V applications, the outputs will range from 0 to 3.3 V. The 3.3 V output can be used as a reference for analog-to-digital converters to gain full resolution samples. Otherwise, your conversions will be limited to 66% of the full range (e.g. an 8-bit ADC will yield numbers from 0 to 168).

### WIFI MODULE:

Wi-Fi or WLAN as it is commonly known is fast becoming the preferred mode of connecting to the internet. Many people are not aware of the descriptions and explanations related to it. Wi-Fi gets its name from a certification called Wireless Fidelity given to networks operating under 802.11 standards. Wi-Fi allows computers, PDAs and other devices to connect to a broadband connection in a wireless mode. The 802.11 standard defines the wireless communication operating via electromagnetic waves. While reading the descriptions and explanations related to Wi-Fi, one should remember there are different modes for wireless networks like Infrastructure mode and Ad-Hoc mode that can be used for different criteria.

### DC motor:

A motor is an electrical machine which converts electrical energy into mechanical energy. The principle

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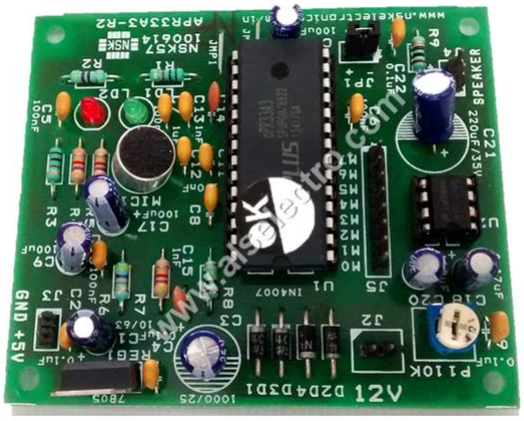
of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force". The direction of this force is given by Fleming's left hand rule and it's magnitude is given by F = BIL. Where, B = magnetic flux density, I = current and L = length of the conductor within the magnetic field.

**Fleming's left hand rule:** If we stretch the first finger, second finger and thumb of our left hand to be perpendicular to each other AND direction of magnetic field is represented by the first finger, direction of the current is represented by second finger then the thumb represents the direction of the force experienced by the current carrying conductor.

When armature windings are connected to a DC supply, current sets up in the winding. Magnetic field may be provided by field winding (electromagnetism) or by using permanent magnets. In this case, current carrying armature conductors experience force due to the magnetic field, according to the principle stated above.

Commutator is made segmented to achieve unidirectional torque. Otherwise, the direction of force would have reversed every time when the direction of movement of conductor is reversed the magnetic field.

**Voice module:**



The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality.

The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate converter.

The aPR33A series C1.0 is specially designed for simple CPU interface, user can record or playback up to 1024 voices by 5 I/O s only. This mode built in one complete memory-management system.

## 4. ACKNOWLEDGEMENT

We would like to thank all the authors of different research papers referred during writing this paper. It was very knowledge gaining and helpful for the further research to be done in future.

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