EYE MOVEMENT CONTROLLED WHEEL CHAIR

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Abstract: There are different reasons for which people need an artificial of locomotion such as a wheelchair. The number of people, who need to move around with the help of some article means, because of an illness. Moreover implementing a controlling system in it enables them to move without the help of another person is very helpful. The idea of eye controls of great use to not only the future of natural input but more importantly the handicapped and disabled. Camera is capturing the image of eye movement. First detect pupil center position of eye. Then the different variation on pupil position get different command set for wheelchair. The signals pass the motor driver to interface with the wheelchair itself. The motor driver will control both speed and direction to enable the wheelchair to move forward, left, right and stop.
Index Terms—disabled People, USB camera, Raspberry pi module, Raspbian platform, wheelchair.

I. INTRODUCTION

Eye movement controlled wheelchair is to enable complexly paralyzed patient to make their life more accessible and to provide them opportunity of independence and movement. However, to steer own wheelchair through a conventional joystick is difficult for people experience total paralysis in all four limbs ,such as muscular dystrophy , spinal cord injury , amyotrophic lateral sclerosis, etc. The idea of eye control is of great use to not only the future of natural input but more importantly the handicapped and disabled. People who are unable to walk and are using wheel chairs exert great amounts of enery using physical strength to turn a steer the wheels. With eyesight Bering their guide, the disabled would save being their guide, the disabled would save energy and could use their hands and arms for other activities. To design a system that detects the image input. To design or create a browser which is used for mainly visibly impaired people. The signals pass the motor driver to interface with the wheelchair itself. The motor driver will control both speed and direction to enable the wheelchair to move forward, left and right. Camera captures the image. Focus on eye in image by opencv code. Pupil detection will be done by opencv code .Raspberry pi board use in this research. Raspbian OS install the opencv and USB camera configuration.
The position of pupil. Then the different position will be use the different motion for wheelchair. Like motion of wheelchair left, right, and forward. Result of digital image will be send to GPIO pins. And that pins are connected to motor by NPN transistor to control the motion of wheel of motors.

II. SYSTEM ALGORITHM

The principle behind this prototype is based on eye movement technology. The need to design this application is specifically for physically paralysis people. This system designed by Linux operating system. In Linux environment any application is able to run at a quite faster rate. Linux based raspberry pi module will be very efficient to overcome the requirement. There are many Linux based OS is sufficient for my research work and has some advantage to use this. Linux is user-friendly. For a beginner it is an absolute test.
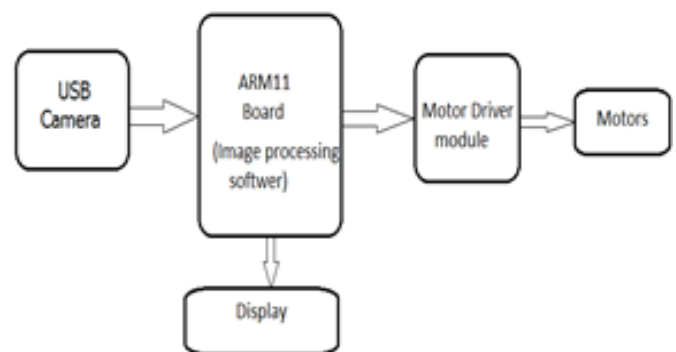

Fig.1: Block Diagram representation

Here, in this block diagram the whole system is controlled by Arm11 processor and this processor is implemented on Raspberry Pi Board so this board is connected with many components as shown in figure. The block diagram explains the functionality of the system in below.

III. IMPLEMENTATION

The Implementation process for Pupil detection using Raspberry pi and on the terminal of Raspbian image installed on raspberry pi. The Raspberry Pi is an ultra-low-cost, deck-of-cards sized Linux computer. It is controlled by a modified version of Debian Linux optimized for the ARM architecture. It has two models model A and model B. The Model B has 512 MB RAM, BCM2385 ARM11, 700 MHz System on chip processor. It has 2 USB ports and HDMI out.

A. USB Camera interface with the Raspberry Pi

USB Cameras are imaging cameras that use USB 2.0 to transfer image data. USB Cameras are designed to easily interface with dedicated computer systems by using the same USB technology that is found on most computers. It is on raspberry pi on also. The accessibility of USB technology in computer systems as well as the 480 Mb/s transfer rate of

USB 2.0 makes USB Cameras ideal for many imaging applications. Resolution Of 640x480 Or Even 320x240 pixels. The distance between camera and eye is 12 to15 cm. In this project use INTEX IT-306WC PC webcam as a USB camera. There is a lot of recent motivation to do image processing and computer vision tasks on the Rasberry Pi. Then opencv is installed on raspberry Pi. Install properly USB camera with the raspberry pi then, also USB camera will use the driver to work properly on raspberry pi board.UV4L driver will be used for raspberry pi. If everything works, then I used scrot to take the screenshot for testing. sudo apt-get install scrot.
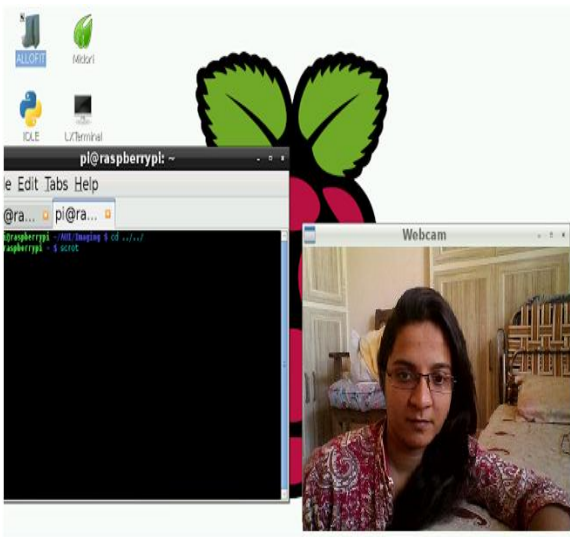

Fig .2. Camera interface with raspberry Pi

B. Pupil detection algorithm

The pupil is a hole located in the center of the iris of the eye that allows light to enter the retina. It appears black because light rays entering the pupil are either absorbed by the tissues inside the eye directly, or absorbed after diffuse reflections within the eye that mostly miss exiting the narrow pupil. Pupil - the opening in the center of the iris- it changes size as the amount of light changes (the more light, the smaller the hole).
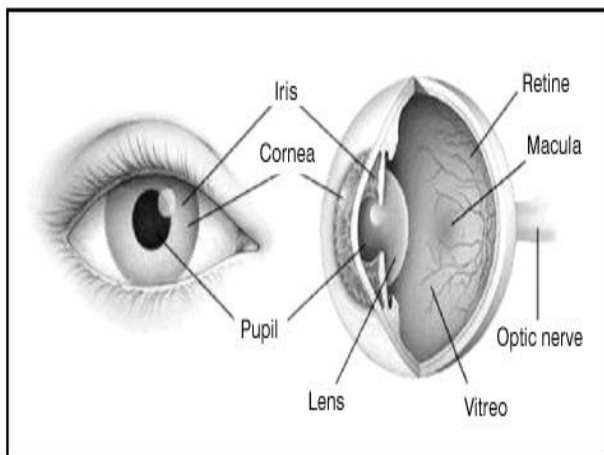

Fig. 3.Eye anatomy

C. Pupil detection algorithm

The eye tracking techniques develop in two directions, electro-oculography (EOG) and digital image analysis. In this Research work, use camera operating in the software analyzing digital images. The Advantage of methods using visible light is their versatility.In this case pixel intensities are projected on vertical and horizontal axes. Are connected with rapid change of the given projection function *PF* (horizontal Or vertical):
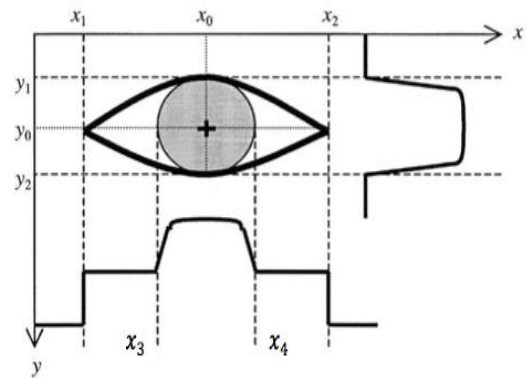

Fig. 4. Projection Functions and their relation to pupil position

Pupil position(x0,y0) is determined as following:

$$x_0 = \frac{x_3 + x_4}{2}, \; y_0 = \frac{y_1 + y_2}{2}$$

The Aim of this project is to describe selected algorithms for eye pupil detection, compare their effectiveness using digital images, and implement in an application for eye movement controlled wheelchair. The exact position of the pupil is detected. Fist the pupil center position will be finding and store as a reference. Then the change value of X,Y coordinates like, $X_0 > X_p$ Than Right command, $X_0 < X_p$ than left command, $Y_0 < Y_p$ then forward command, $Y_0 > Y_p$ then stop command. These signals pass the motor and motors operate with this command. Then motors move on forward, left, and rightand stop.
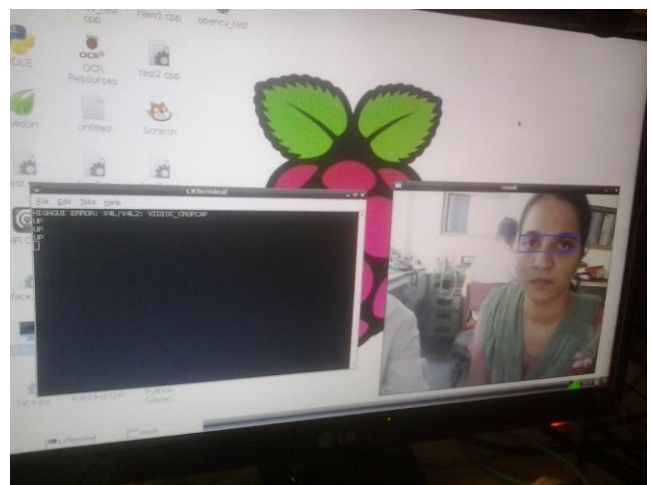
D. Output of pupil focus:

Fig.5.Output screen of eye focus algorithm

This fig shown that the eye and pupil of eye will be detected by the camera by the opencv code. USB Camera will be interface to the Rasberry Pi. This result shown in raspbian OS. The blue bracket will be show the eyes detect porcine. And then red dots will be present the position of pupil. Then the different value will be use the different motion for wheelchair. Different value of X, Y coordinates will be select proper value for the particular position or motion for the wheelchair. Like potion of eye left, right, up and down. Like motion of wheelchair left, right, and forward.

E. Algorithm of execution on Raspberry pi
USB Camera will be interface with raspberry pi. Rassberry pi will be use SD card, then the install raspbian OS and opencv on rassberry pi. Fist image will be capture by USB Camera. Focus on eye in image and detect the center position of pupil by opencv code. Take the center position value of pupil as reference, and then the next the different value of X, Y coordinates will be set for particular command. rasberry pi will be signals pass by GPIO to transistor circuit. Transistor will be work as a motor driver, and then control the speed and direction of motor. Transistor circuit connects to the four DC motors. Different value of X, Y coordinates will be select proper value for the particular position or motion for the wheelchair. Like potion of eye left, right, up and down. Like motion of wheelchair left, right, and forward.
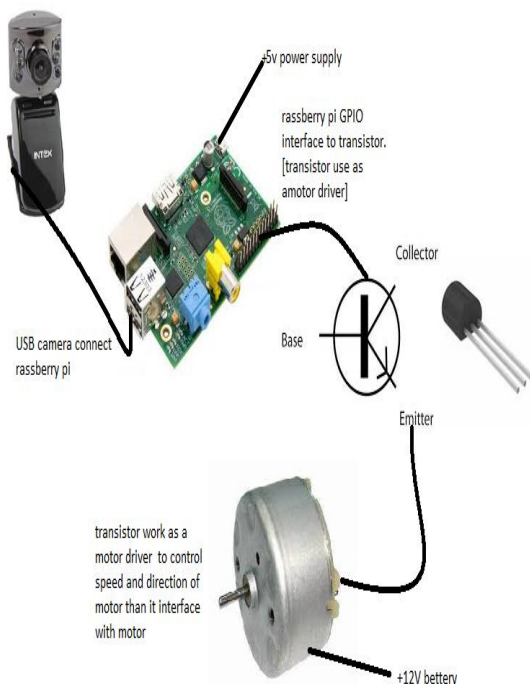

Fig. 6. Algorithm of execution on Raspberry Pi

IV. RESULT
This thesis aim is wheelchair controlled by eye movement .then the camera capture the image and focus on eye in image .the center position of pupil will collect then the different value of X,Y coordinates will be set for different commend, like Right, Left ,Forward and stop. Then signals pass to the motor driver. It controls speed and direction of DC motor. DC motor move Right, Left, Forward and stop. One of the main goals for Eye Movement controlled wheelchair is to enable completely paralyzed patients to make their life more accessible and to provide them opportunity of independence and movement.

V. CONCLUSION
The idea of eye controls of great use to not only the future of natural input but more importantly the handicapped and disabled. One of the main goals for Eye Movement controlled wheelchair is to enable completely paralyzed patients to make their life more accessible and to provide them opportunity of independence and movement. This system embedded on Raspberry pi. This thesis aim is wheelchair controlled by eye movement .then the camera capture the image and focus on eye in image .the center position of pupil will collect then the different value of X,Y coordinates will be set for different commend, like Right, Left ,Forward and stop. Then signals pass to the motor driver. It controls speed and direction of DC motor. DC motor move Right, Left, Forward and stop.

VI. ACKNOWLEDGEMENT

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