

Advance Eye Controlled Wheelchair for Disabled Person

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Abstract-- The project includes electronic eye movement controlled wheelchair which is implemented for the disabled person. Statistics suggests that there are around 40 cases per million of quadriplegia (Paralysis of four limbs) every year. Person suffering from quadriplegia cannot operate the typical wheelchair available for disabled person. As an attempt to make lives of the people suffering from this phenomenon simple, the project aims at using eye pupil movement to control wheelchair. The web camera attached to the laptop placed on the wheelchair of the user will capture the image of the eyes. These eye movements are processed using MATLAB software and serial commands are sent to Arduino circuit which then controls the motor attached to the Wheelchair. Ultrasonic sensor is used to detect obstacle in the path of wheelchair. An additional eye blink controlled camera is attached to the wheelchair used for capturing spontaneous images while wandering. This project hence makes the life of the disabled person simpler and eliminates the need of assistance required for them.

Keywords---- Paralysis; Wheelchair; Webcam

I. INTRODUCTION

Advanced Wheelchair for Disabled Person is a fully automated wheelchair specially designed for people suffering from paralysis or for physically challenged souls. Paralysis can attack people in many different ways and one of the most dangerous type is Quadriplegia [4]. Quadriplegia is such a condition of body where the person cannot move any of his limbs. Thus Paralysis of all four limbs is known as Quadriplegia. Thus technically it is impossible for people with this problem to operate the typical wheelchair available in the market as to operate these wheelchairs available in market, the person has to exert a great amount of physical strength to move the wheels of the wheelchair. Lives of such people has become really difficult and hence as a small attempt to

make their life easier, this system is introduced where the patient can use his eyes to control the wheelchair.

The purpose of this project is to develop a wheelchair that will be controlled by the eyes of the person seated in the wheelchair. Eye movement controlled wheelchair is to enable completely paralyzed patient as well as elderly to make their life more attainable. Person who are unable to walk and are using wheelchair, exert great amount of energy using physical strength to move the wheels. [1]With use of this wheelchair disabled would save energy and could use their hand and arm for other activities. Currently there are different eye based method used for controlling wheelchair, such as EOG, ECG, EEG based eyeball sensing method, Face detection and eye detection. Several algorithms are used to find exact pupil location direction. Haar cascade like feature detection algorithm can also be used.

The main components used in this system are web camera, Matlab and Arduino. The system captures the images using a webcam that will be attached to the laptop placed on the wheelchair of the user[2]. These captured images will be sent to the Matlab where it will compare the images with the pre input images and give the required output to the Arduino. Arduino is then connected to the motor of the wheelchair. Thus with these serial commands given to the motor by the Arduino through Matlab will decide direction of the wheelchair. The commands given to the Matlab can include commands like Left, Right, Stop, Forward, Reverse etc.

To make this system more advanced and more accessible, an ultrasonic sensor is attached on the front side of the wheelchair. With the help of this sensor, the wheelchair will stop automatically whenever any obstacle

is placed in front of the wheelchair, thus making this system more safe and valuable to life. The existing system includes voice based method and Infrared reflection based method. Voice based method works properly when user speaks the command clearly. But due to background noise and anatomy of vocal tract, voice based system is not effective [3].

Infrared reflection based eye pupil detection system provide explicit detection of eye pupil centre location. But the infrared radiation affects the eye of the disabled person and he/she may loss the eye visibility. The uniqueness of this

system is that, no part of the system physically interacts with the user, making disabled person feel comfortable. The aim of this system is to the society in our small way by setting out an idea for a system which could actually better the lives of millions of people across the globe. This system is cost effective and can be used globally and easily by every disabled [1].

II. LITERATURE SURVEY

There were previous works carried out on electronic wheelchairs. A few of them helped us get ideas for our project.

Dulari Sahu proposed an eye control wheelchair for disabled person. This eliminates the personal assistant required for those persons. The whole system is controlled by Raspberry PI [1].

Reona Cerejo issued proposed on Arduino circuit. The whole system is controlled by the arduino. Arduino is a simple microcontroller board and open source development environment that allows to make functional and creative projects by using arduino microcontroller and software. And make the system affordable. And this paper also more concentrate on find the direction in which eye look using MATLAB frame. Depending upon the location of pupil in these blocks action is performed [2].

Gunda Gautam proposed on image capturing module and image analysis module.

Image Capture Module:- Image Capturing is to capture a sequence of iris images from the subject using a camera. In iris recognition image capturing is a very necessary step. Since iris is small in size and dark in color, it is challenging to achieve good image. The image is then changed from RGB to gray level for further processing. It is to capture a sequence of iris images from the subject using a camera.

Image Analysis Module:- Image analysis is done by segmentation. Segmentation is to remove non useful information namely the pupil segment and part outside the iris. Segmentation is done by daugman algorithm. Daugman algorithm proposes an integrodifferential operator to find both the pupil and iris contour. This process works even if image taken in little dark environment [3].

Ankur Thakur proposed on Matab component and script. Matlab component includes the topics are as follows

1. Initialization of variables and setting communication.
2. Image capture and eye detection.
3. Image processing.
4. Movement detection.

Using the idea listed in survey we developed a wheelchair for paralysed person [4].

III. SYSTEM OVERVIEW

System overview contains block diagram, flowchart and working of the system.

A .Block Diagram

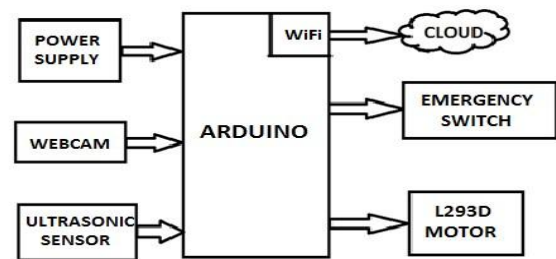


Fig 1. Block diagram of system

This system is designed using WebCamera, Ultrasonic sensor, Arduino and Motor driver IC as shown in Fig 1. Eye pupil of patient is detected by Webcam and then processed using MATLAB software. Image acquisition toolbox is used for eye pupil detection. As per the movement of eye pupil, command to the Motor driver IC L293D is given through Arduino using serial interface. Wheelchair is moved forward, backward, left or right according to the signal given by Arduino to the motor. If any obstacle comes on the path of wheelchair, it can be detected by ultrasonic sensor and wheelchair can be stopped immediately.

B. Working

For eye pupil detection, MATLAB program is designed such that, it monitors and reacts to eye movements. Based on a series of snapshots taken and thereafter processed, the motion of the patient's eyes are detected and decision to move the wheelchair in a particular direction is taken and communicated serially to Arduino Uno. Arduino receives the data, analyse it and send the control signal to motor driving circuit, based on the location of eye pupil. This will decide motor to move either in forward, backward, left or right. Approximately one snapshot is taken every second and processed and based on the position of the feature points in previous snapshot and current snapshot, a movement is detected and this is communicated to the wheelchair assembly via the serial port. Ultrasonic sensor is used to detect obstacle in the path of the wheelchair. If any obstacle detected by ultrasonic sensor, it immediately stops the wheelchair. An additional camera is used which captures an image at the time of any kind of problem and sends that image to the responsible person using IOT.

C. Flowchart

Flow chart of the system is as given in Fig 2.

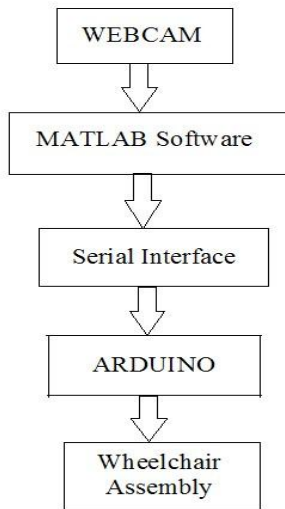


Fig 2.Flow chart

IV. EXPECTED RESULT

The position of iris and pupil will be detected and are produced using Daughman's algorithm. After that they are processed using MATLAB. Then decision will be taken by Arduino for the given input image. As per the pupil movement motor will be moved either in LEFT, RIGHT, FORWARD and BACKWARD direction.

V. CONCLUSION

This hardware along with the software can prove to be an effective system to make the life of the paralytic patients independent. The critical part of the system is image processing at real time which can be addressed by using better high end image processing software. The most effective thing about project is, it eliminates the need of assistant for the patient. The aim of this system is to contribute to the society in a small way by setting out an idea for a system which could actually better the lives of millions of people across the globe.

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