Eye Monitored Wheel Chair Control for Physically Handicapped

Ms. Humera Mujawar, Ms. Tanaya Patil, Ms. Pooja Patil, Mr. Dinesh O. Shirsath, Mrs. S. S. Sankpal

Abstract— **The aim of the project to make lives of the physically handicapped people simple and simpler which will make them self reliant thereby reinstate their confidence and their happiness. an Eye Monitored System is created which allows movement of the patient's wheelchair depending on the eye movements. A new assembly is presented where a patient sitting on the Wheel Chair assembly looking directly at the camera, is able to move in a direction just by looking in that direction**. **The system is cost effective and thus can be used by patients spread over a large economy range.**

Keywords: **ATMEL 8051 Microcontroller, Eye monitored wheel chair, Eye-Detection and motion tracking, MATLAB 2013A.**

I. INTRODUCTION

The idea is to create an Eye Monitored System which allows movement of the patient's wheelchair depending on the movement of eye. A person who is physically handicapped
can partially move his eyes and tilt his head and hence gives an opportunity for detecting the movements. Hence a new assembly is created called as Eye monitored wheel chair control for physically handicapped people. In this assembly patient sitting on wheel chair looks directly at the camera is able to move in a direction just by looking in that direction. Signals from the camera are monitored by MATLAB script which will help in guiding the motors connected to the ATMEL 8051 Microcontroller over the Serial Interface to move in a particular direction. In this paper the movements of Eye and head are monitored and based on this, movement of wheel chair is decided.

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The camera is wired to the person's laptop which has a MATLAB script running which constantly captures snapshots and processes them. The script based on the processing determines whether the person wants to move in a particular direction, and communicates this information using serial communication to a microcontroller which drives motors of the wheelchair is the desired direction.

II. RELATED WORK

The present existing systems in the market use cheek or tongue monitored systems, where some body part of the person is wired to some electrical circuitry, which creates complications. The novelty of our system lies in the fact that no part of the system physically interacts with the user, making him to feel comfortable when using the chair. The feature of this assembly is that there is no electrical connectivity to the handicapped person, hence it is easy to handle as movement of Wheel chair depends upon on Eye movement. The web camera detects the eye movements which will be further processed to drive the motors. Serial communication is used to communicate between the web camera and the microcontroller. The microcontroller will be placed on the wheel chair which will be connected to the motors, driving the wheel chair in the direction the person sitting on the chair desires to move in.
There are different Eye tacking mechanisms for computing the position of pupil.

Electro-Oculogram (EOG) Method:
 This method obtains the gaze direction by sensing the electro-oculographic potential and this is done by measuring the potential using electrodes placed on face where human eye is an electric dipole with a negative pole at the fundus. The big advantage of this method is the ability to detect eye movements even when they are closed, and positive pole at the cornea. The big advantage of this method is the ability to detect eye movements even when they are closed.

Lens Tracking Systems:
In this method a non slipping contact lens fits over corneal bulge. The tracking of the pupil is recorded by affixing a magnetic coil or mirror to the lens. The integrated mirror in the contact lens allows measuring reflected light; alternatively, the integrated coil in the

contact lens allows detecting the coil's orientation in magnetic field. The big advantage of this method is high accuracy and nearly unlimited resolution in time.

III.PROPOSED EYE MONITORED WHEEL CHAIR CONTROLLED SYSTEM

In the proposed system web camera mounted on a cap, continuously stares at the user's eyes. The webcam which is wired to the patient's laptop is running a MATLAB application designed to monitor and react to eye movements. Based on a series of snapshots taken and thereafter processed, the motion of the user's eyes are detected, and decision to move the Wheel Chair in a particular direction is taken and is communicated serially to ATMEL 8051mirocontroller. MATLAB 2013a has an image processing toolbox which we utilized for the eye detection. Continuous snapshots of are taken and feature points extracted are saved i.e. we capture approximately 1 snapshot every second and process it. 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 of Microcontroller.
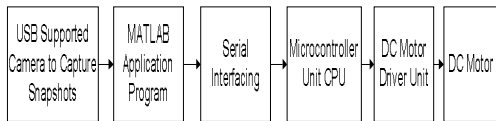
Block diagram

Figure 1:Block diagram of Eye Monitored wheel chair controlled system

Operation:
Operation of this assembly consists of series of steps.

A. Initialization: Initially we set up the serial communication that will be used later for the interface between MATLAB and the controller, the video capture and the program variables.

B. Image and Video Processing: continuous video frames are taken and sample the input and save it as the screen shots. Each frame is then converted into the black and white frames. For the accurate results, contrast stretching on each frames is performed to make the dark region darker and bright region brighter. This will enable the detection of the eyes better.

C. Estimation: Now, after working on the each frame we try to detect the eyes and this done by estimating the position of left as well as the right eye. Thus, threshold values are set and detect the position of the eyes which can be used for the further processing.

D. Detection: Now, in this step actually the eye movement is detected. The idea is to compare the current position of the eye with the previous position. Thus, the difference in the coordinates will help to predict the motion in the particular eye. But sometimes, it may be possible that only one of the either eye will be

detected. In that case, preference will be given to the eye that is detected currently.

E.Motion: Now after detecting the eye movements, we have to come up with a decision algorithm that will help the controller to drive the motors accordingly

Valid Left: The decision to turn left will be considered as valid if the eye turns left and stays there for a cycle. This action will be detected as a left turn request. After that, the patient w ill turn right to again look forward. Thus, this signal should be considered as void.

Valid Right: Similarly, the decision to turn right will be considered as valid if the eye turns right and stays there for a cycle. This action will be detected as a right turn request. After that, the patient will turn left to again look forward. Thus, this signal should be considered as void.

Valid Straight: The signal to go straight is when a person looks left and right or right and then left. This will be detected as to go straight.
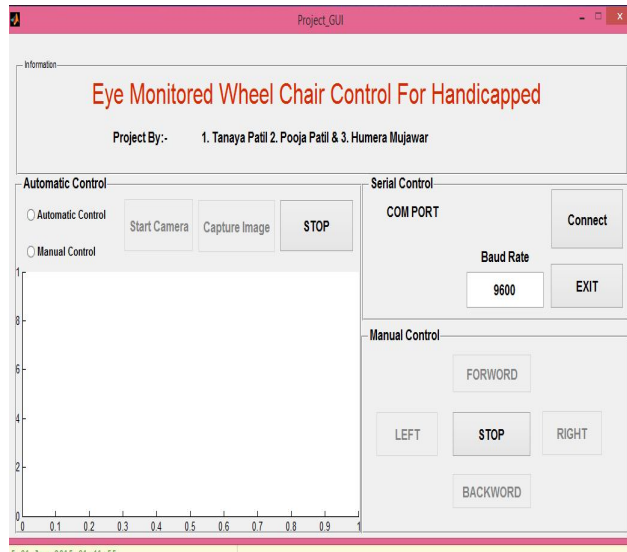
IV.CIRCUIT DIAGRAM:
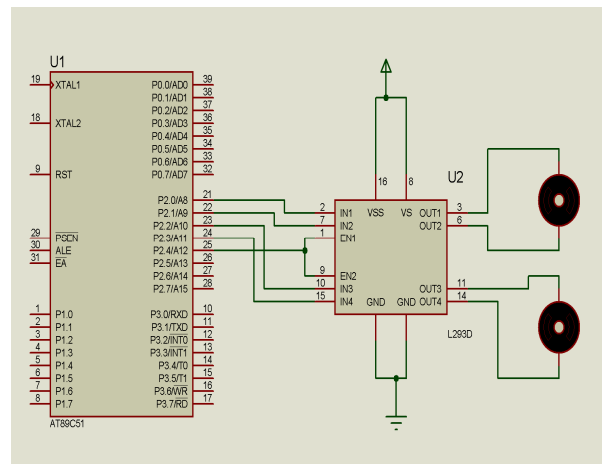
V. SIMULATION:
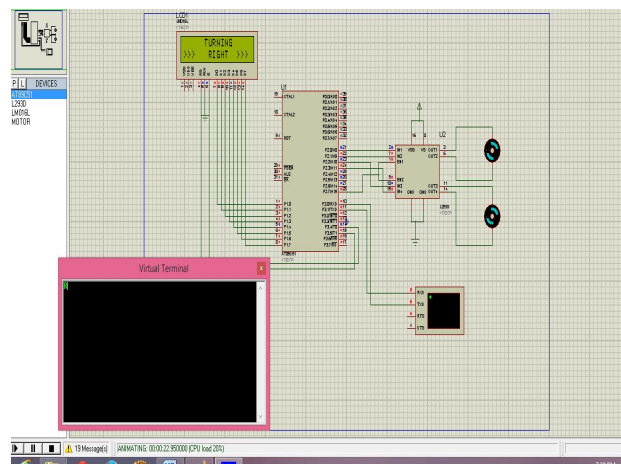
VI.GUI:

MATLAB Component:

(i) Image Capturing and Eye Detection.
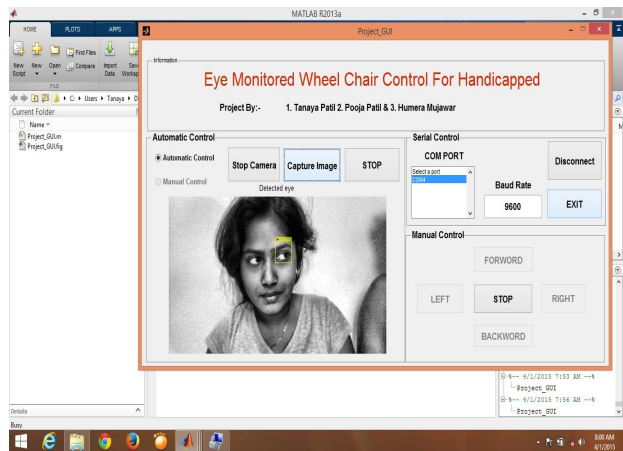(ii) Image Processing.
(iii) Movement Detection.

Figure 2:Image captured during movement of eye

VII. CONCLUSION:

Eye monitored wheel chair control will be very much beneficial to the physically handicapped people with its ease of operation,as with eye movement the the wheel chair will be moving in that particular direction only.

REFERENCES:

1. Sandesh Pai, Sagar Ayare, Romil Kapadia " Eye Controlled Wheelchair ".
2. Gunda Gautam, Gunda Sumanth, Karthikeyan K C, Shyam Sundar, D.Venkataraman" Eye Movement Based Electronic Wheel Chair For Physically Challenged Persons
3. Eye Monitored Wheel Chair Control for people suffering from Quadriplegia.
4. Michael F. Land "Eye movements and the control of actions in everyday life"
5. S. Tameemsultana and N. Kali Saranya, "Implementation of Head and Finger Movement Based Automatic Wheel Chair", Bonfring International Journal of Power Systems and Integrated Circuits, vol. 1, Special Issue, pp 48-51, December 2011
6. Manuel Mazo, Francisco J. Rodriguez, Jose L, Lazaro, Jesus Urena, Juan C. Garcia, Enrique Santiso, Pedro Revenga and J. Jesus Garcia, "Wheelchair for Physically Disabled People with Voice, Ultrasonic and Infrared Sensor Control ", Autonomous Robots, vol.2, no. 3, pp. 203-224 ,Sep 1995.
7. Tabasum Shaikh, Naseem Farheen Sayyed, Shaheen Pathan, "Review of Multilevel Controlled Wheelchair", 4th National Conference on Electronic Technologies, pp. 275-279, April 2013.

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