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Iris Controlled Wheel Chair in Real Time

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Abstract: In today's world, it is very difficult to survive for all those who are handicapped. Some suffering people can not afford the technology or some people does not have the knowledge to use such technologies. Keeping the need of poor and the knowledge of general people ICWCRT (Iris Controlled Wheel Chair Control in Real Time) is proposed. This wheel chair is controlled by human iris. Therefore, this electric chair can be used by the disabled people, so that, they don't depend on anyone. The inputs of computer with human iris are only considered in some specific condition. Most importantly it works in real time. ICWCRT is robust against the different human races but it is not flexible with various user's movement. The proposed ICWCRT is flexible against aforementioned influencing factors. Moreover, it is affirmed that the proposed ICWCRT can be controlled by human eyes just precisely and securely.

Key words: PC contribution by human eyes just, look estimation, electric wheel chair control, survive, handicapped, India

INTRODUCTION

Individual's sense of dignity and confidence was affected by ability to exercise freedom of mobility. The Census 2001 says that in India 2.1% of population is disabled and 0.6% population is suffering from mobility in ability. Studies states that every year there are almost 40 million cases of quadriplegia. Stephen Hawking is also the patient of this problem. Therefore, there are so many people who are suffering from movement disability due lack of money (Jain *et al*., 2015).

The moto of the project is to make people's life simpler, so that, can move around easily and are not a burden on anyone (Plesnick *et al*., 2014). There are numbers of techniques available for wheelchair but there drawback is that there are very costly and not affordable by poor. Therefore, keeping these problems in mind an electric wheel chair is proposed which can be controlled by the human iris and also works in real time.

The iris controlled wheel chair was created which enabled the patient's wheel chair movement based on the iris. A patient of quadriplegia can easily move his/her eyes and also can move the head around, thus, it gives patient the opportunity to use the chair (Tefft *et al*., 1999). The system was created which included automated chair mounted camera which can be easily moved by the person by making his/her iris movement. The camera signals which act as an input are sent to PC and managed by MATLAB which will go through circuit of Arduino and then to the serial interface which controls motors and also, allow it to move in a preferred direction. The system overcomes the problem of technology and finance. Hence, it can be used by patients which are spread throughout the large economy. This chair will help patient carry out their work more conveniently.

Literature review: This is the study of various papers and the technologies acquired by them. So, in previous studies, we studied that they have used a number of technologies, presently, we have successful working chairs but none of the chair works in the real time. Here, we have proposed a electric wheel chair which is controlled by iris and it works in real time.

MATERIALS AND METHODS

The problem with current wheel chair is that they don't work in real time, there system is not robust against human faces, illuminations conditions, user's movements and EWC vibrations and some chair have very high criticality.

An iris controlled wheel chair is proposed which works in real time and it is robust against different human races. In the wheelchair the web camera is used to detect the eye movements which will be further processed to drive the motors. For the simplicity and to make a prototype, a design a small, motorized, wooden platform is proposed and the web camera will be attached on the chair. The wireless communication is used to communicate between the camera and the Arduino microcontroller by Bluetooth. The Arduino microcontroller will be placed on the wheel chair which will be connected to the motors, driving the wheelchair in

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Table 1: Comparitive study

Research name	Published years	Methodology	Limitations
Eyeball motion controlled wheelchair using IR sensors (Jain *et al*., 2015)		In this system three different Infrared are placed on the eye frame to judge the movement of iris, so that, it cane give command to the wheelchair	It does not work in real time
Smart wheelchair based of eye tracking (Wanluk *et al*., 2016)	2016	The picture preparing module contains a webcam introduced on the eyeglass and C++ code picture handling programming	It does not work in real time
Eye movement high based electric wheel chair (Abhishek *et al*., 2016)	2016	Camera is mounted on the head gear. Open CV application is used to monitore the camera signals which then guides the motor wired with the micro-controller	Criticality of the chair is very
Eye controlled electric wheelchair (Mani *et al*., 2015)	2015	Head mounted camera is used to take the commands. Then the images are forwarded to the PC and the images are processed by Python Software. The signals are sent to motor driving circuit which controls the motor	It does not work in real time
Eye based electric wheelchair system (Arai and Mardiyanto, 2011)	2011	It uses IR camera which mounted on the head glasses of the user	This system is not robust against different human races

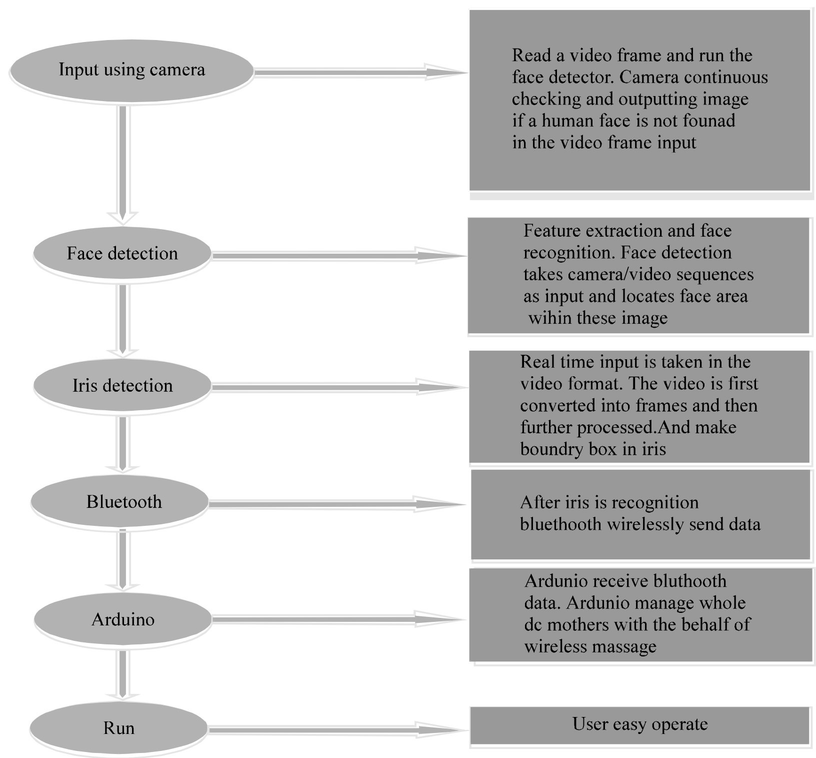

Fig. 1: Description flow chart

the direction the person sitting on the chair desires to move in. The major components from the system design standpoint eye-detection and motion tracking. Arduino controlled wheelchair Bluetooth (HC-05) DC motor (Fig. 1 and Table 1).

Step 1: Our first step is to input the image using camera in this step the face detector is ran and it checks until it finds the image of a face of a human.

Step 2: The second step is about feature extraction and face recognition in this step all the features of the face like nose, eyes lips are differentiated.

Step 3: In third step the iris detection is done, this is one of the main step of the system. In this step real time input is taken from the video and iris detection is done.

Step 4: The fourth step includes Bluetooth. Once, the iris detection is done the Bluetooth dens the data wirelessly to the chair.

Step 5: In the fifth step, Arduino receives the instructions from the Bluetooth and the DC motor starts working, the chair starts moving in the desired direction by the user.

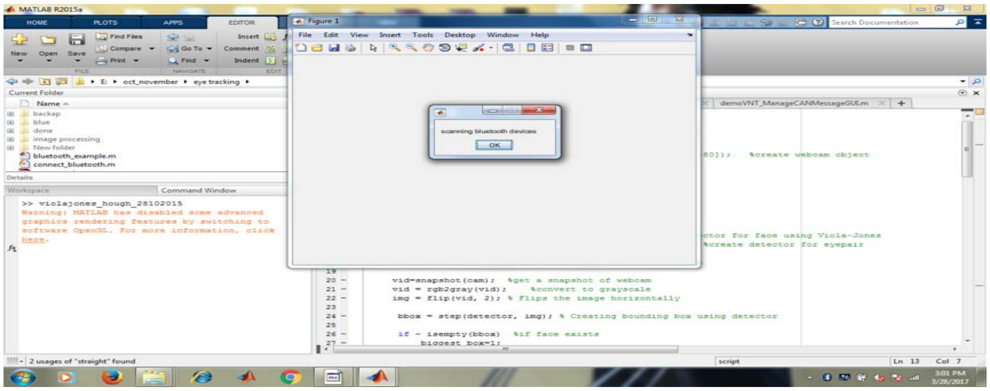

Fig. 2: Searching for Bluetooth connection

RESULTS AND DISCUSSION

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

Image and video processing: We, then take continuous video frames 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, we perform contrast stretching on each frames to make the dark region darker and bright region brighter. This will enable the detection of the eyes better.

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

Detection: Now, in this step we actually detect the eye movements. The idea is to compare the current position of the eye with the previous position. Thus, the difference in the coordinates will help us 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, we will give preference to the eye that is detected currently.

Error handling: To avoid detection errors, we incorporated an error handling mechanism which specifies a threshold for the height and width of a valid eye by calibrating it for the user. If the detection results give a height and width value lesser or greater than the threshold, the value is voided and not considered for the decision making.

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.

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 will 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.

Safety considerations: Given the application of the system, we incorporated a safety mechanism wherein based on the blink detection the wheel chair halts. If the user wants to halt the wheel chair in case of an emergency, he can blink thrice, causing the wheel chair to halt.

Serial communication: Now, according to the detected command, the MATLAB application will transmit 0, 1 or 2 for left, right and straight, respectively to the controller which will drive the motors.

This is the first step of the working of the system, it first searches for Bluetooth devices nearby and then, it selects the Bluetooth HC-05 which is used in this system. Figure 2 shows the system is searching for the Bluetooth devices nearby. Figure 3 shows the system has read the iris of the user and now it will seek for the command from

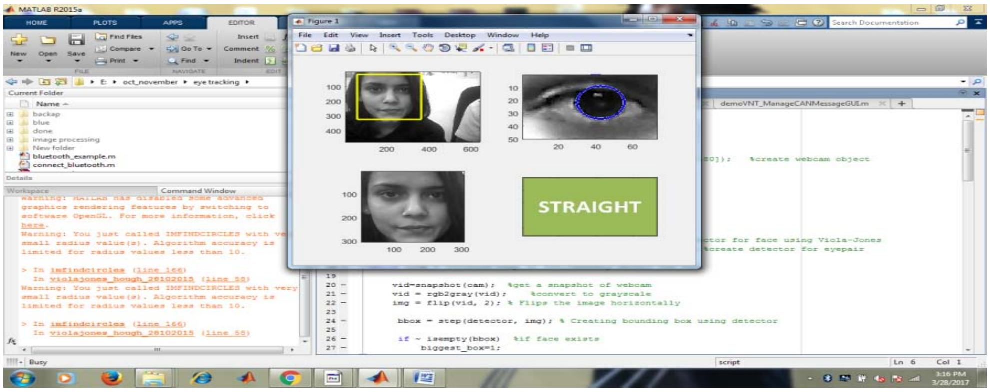

Fig. 3: Chair moves forward as iris directed straight

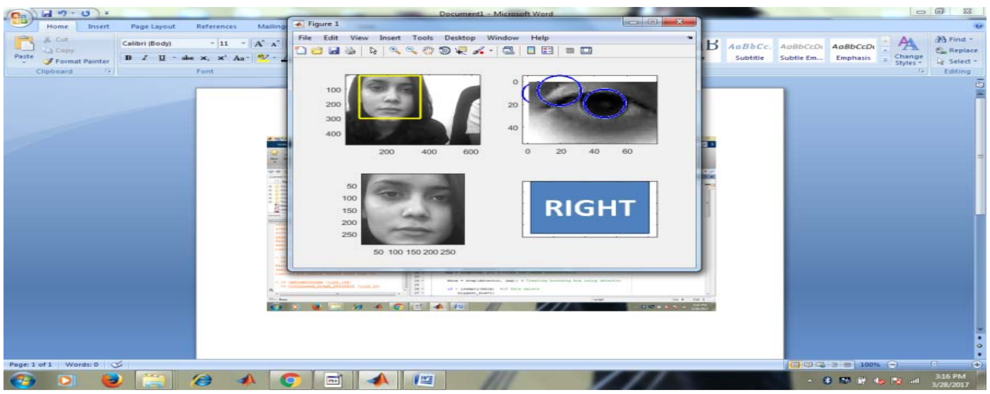

Fig. 4: Chair moves in right direction as iris directed right

the movement of the iris. So, in this image it has read the command to move straight as the iris is looking at the straight direction. Figure 4 shows the iris's direction is towards right, so, system read the direction right now it will command the chair to move towards right direction.

CONCLUSION

The recognition of iris is safest as well as precise method. It is adopted because of its characteristics, i.e., very easy to use, high reliability, highly accurate, security, safety. There are numbers of techniques available for wheelchair but there drawback is that there are very costly and not affordable by poor. Therefore, keeping these problems in mind an electric wheel chair is proposed which can be controlled by the human Iris and this chair also works in real time.

SUGGESTIONS

Savvy wheelchairs will remain productive ground for mechanical research for quite a while to come. Savvy wheelchairs are extraordinary demonstrating reason for sensor investigate, particularly machine vision. Savvy wheelchairs moreover, allow to study human-robot coordinated effort, flexible or shared control and novel data procedures for instance, voice control, "EOG" and eye-taking after. Additionally, wise wheelchairs will continue filling in as demonstrating justification for robot control structures.

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