International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163
Issue 03, Volume 6 (March 2019) - Special Issue www.ijirae.com
SPECIAL ISSUE - 5th Inter National Level Conference - "MEEMIC – 2019"

REAL TIME ELECTRONIC WHEELCHAIR CONTROLLED BY EYEBALL MOVEMENT WITH BIOMETRIC AUTHENTICATION

Kabilan.M, Manikandan.V, Mohamed Samsudeen.S, Naveen Kumar.G*
Guided by
Dr.R.Satish Kumar , Principal
Department of Medical Electronics,
Sengunthar College of Engineering, Tiruchengode, Tamilnadu.
scewsadik@gmail.com, j.ranadivelrajput08@gmail.com,msamsudeen17@gmail.com,
navin2998@gmail.com,ronaldovickeymk7@gmail.com

Manuscript History
Number: **IJIRAE/RS/Vol.06/Issue03/Special Issue/SI.MRAE10100**
Received: 20, February 2019
Final Correction: 05, March 2019
Final Accepted: 20, March 2019
Published: **March 2019**
Editor: Dr.A.Arul L.S, Chief Editor, IJIRAE, AM Publications, India

Abstract: A powered wheel chair is a mobility-aided device for persons with moderate/severe physical disabilities or chronic diseases as well as theelderly. In order to take care for different disabilities, various kinds of interfaces have been developed for powered wheelchair control; such as joystick control, head control and sip-puff control. Many people with disabilities do not have the ability to control powered wheel chair using the above mentioned interfaces. The proposed model is a possible alternative. In this paper, we use the optical-type eye tracking system to control powered wheel chair. User's eye movement are translated to screen position using the optical type eye tracking system. When user looks at appropriate angle, then computer input system will send command to the software based on the angle of rotation of pupil i.e., when user moves his eyes balls up (move forward), left (move left), right (move right) in all other cases wheel chair will stop. Once the image has been processed it moves onto the second part, our microprocessor. The microprocessor will take a USB output from the laptop and convert the signal into signals that will be sent to the wheelchair wheels for movement. Also, the pressure and object detection sensors will be connected to our microprocessor to provide necessary feedback for proper operation of the wheelchair system. The final part of the project is the wheelchair itself. The rearwheels will provide forward. The front two wheels will be used for steering left and right. All four wheels will be connected to our microprocessor that will send signals to control the wheels and thus the overall movement.

Key Words: Electronic wheel chair, Eye movement based wheel chair, Electronic wheel chair using Image analysis method or technique.

I.INTRODUCTION

The ability to move freely is highly valued by all people. However, it is sometimes difficult for a person with a physical disability. Nowadays, an electric wheelchair is commercially available for disabled people. It generally requires considerable skill to operate. Moreover, some disabled people cannot drive an electric wheelchair manually, even with a joystick, because they lack the physical ability to control the movement.

To enable a disabled person to drive a wheelchair safely and easily so that they can enjoy a higher quality of life, researchers have proposed several electric wheelchair systems. The use of voice commands to control an electric wheelchair is one research result. A small number of command words and high-performance voice recognition are employed in this system. An electric wheelchair control with electro-oculography (EOG) techniques has also been proposed. In this case, the different commands for the wheelchair are derived from the electro-oculography (EOG) potential signals of eye movements. A system for electric wheelchair control using the eyes was proposed in 2007. A commercially available web camera on a head-mounted display (HMD) which the user wears is used to capture moving pictures of the user's face. A computer mounted on the electric chair processes the captured image data, detecting and tracking movements of the user's eyes, estimating the line-of-sight vector, and actuating the electric wheelchair in the desired direction indicated by the user's eyes. One of the key essentials of the proposed system is detecting and tracking the eye movements. This article will be an eye movement based controlled wheelchair system. A spectacle mounted camera will track eye movement and control a wheelchair to go forward, stop, left or right. The most challenging aspects will lie in finding a good way to differentiate iris and pupil locations, determining the eye's movement, and controlling the wheelchair's wheels in proper movement.

II. PROBLEM STATEMENTS

To develop an eye movement controlled wheel chair for physically challenged persons to move in any desirable direction.

III.LITERATURE SURVEY

The existing computer input devices such as keyboard, mouse, and the other input devices have been used to interact with digital instruments. These computer input devices cannot be operated by handicap persons. In this paper, a computer input device by human eyes only is proposed for handicap person and also for wearable computing. The existing computer input devices can be divided into five categories:

- Bio-potential based method which utilizes potential from user's body actions acquired by using special instrument. Instrument such as Electrooculography (EOG) [1], Electromyography (EMG), and Electroencephalograph (EEG) [2], Search coil can be used for measuring bio-potential. The search coil output can be used as sources of computer input for handicap person. EOG method [3] uses voltage differences between fore and aft surface of eyes.
- Voice Based method [4], which use user's voice as source input. Voice analysis is used to analyze user's voice and convert into digital data. The weakness of this system is vulnerable against noise. Other voices which come from surrounding user may affect the system.

IV.PROPOSED METHODOLOGY

- Motion based method [5], utilizes other normal movement organs to operate computer input. Head, foot, and etc. can be used to control computer input.
- Image Analysis method [10]-[15], utilizes camera to analyze user's desire and convert into digital data. Several image processing methods are used to analyze user's desire. The user's desire itself can be done by Gaze based [6], [7], [9] analyze user's desire from users gaze, Face based analyze user's desire from face expression, and the others.
- Search coil method [8] uses induced voltage with coil including in contact lenses attached to user's eyes.

METHOD	ADVANTAGES
Bio-potential based method.[1]	Potential Difference can be calculated easily in both light and dark Environments.
Voice Based Methods[2]	Increases Productivity Can help people who have trouble using their hands Can help people who have cognitive disabilities
	A motion based wheelchair can have the

Motion Based Methods[3]	option to allow for more physical support, including adjustable seating such as tilt and recline. Motion based wheelchair users can also adjust the height of the chair to see their environment more clearly
Search Coil[4]	Coil signals provide a better signal Stability . Therefore, coil signals are better suited for the analysis of fine details of eye movements.

METHOD	DRAWBACKS
Bio-potential Based method.[1]	Poor gaze direction accuracy compared to video tracker, relatively costly
Voice Based Methods[2]	Less accurate on: Background Noise Channel variability Speaker variability Speaking style Sex of the speaker Anatomy of vocal tract Speed of the speech

Consists of three main parts:

(1) Spectacle mounted camera and laptop system that will track the camera wearer's eye.

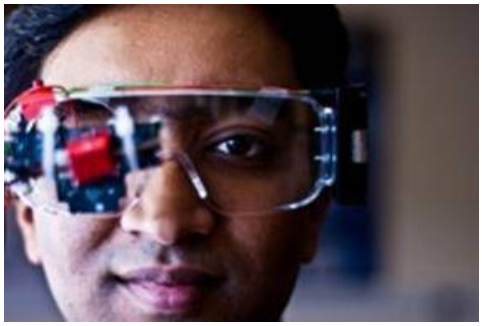

Fig. 4.1 Proposed Camera Position

The microprocessor will take a USB output from the laptop and convert the digital output to electric signals that will be sent to the wheelchair wheels for movement.

Fig. 4.2 Microprocessor

(3) A signal triggered Wheel Chair.

Fig. 4.3 Electronic Wheel Chair

V.FINGERPRINT MODULE SPECIFICATION

General View

The ARA-EM01 is high performance fingerprint module developed by Aratek Biometrics Technology Co, Ltd .it has many features : easy restructure, powerful functions, compatible with Pc and multiple-functions in one module: Fingerprint enrollment, image process, characters acquisition, fingerprint template creation, fingerprint template storage, fingerprint compare (1: 1, 1: N), fingerprint delete. This module can work with different devices based on UAWRT such as PC, SCM and so on. Only easy circuits and fingerprint module can enhance your product into fingerprint authentication power. It is widely used by electronics business, information security, access control, identity authentication and other security industry.

Fig. 5.1 Fingerprint sensor

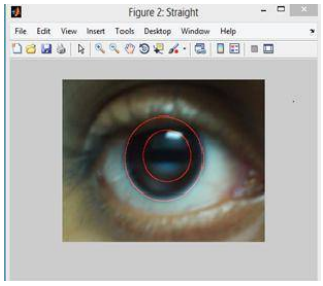

Fig. 6.2 Output obtained as straight looking eye

Application Solution

When ARA-EM01 is embedded into your system, the other functions will be controlled by MCU Controller, so developer can realize his own function logic, user interface and communication port through hard ware and software development, such as fingerprint time and attendance and so on.

VI.EXPERIMENTAL RESULTS

1. The input and its corresponding images shown below are produced after using Daughman's algorithm on input image for processing in the position of iris and pupil detected will be highlighted with the help of a circle as show below. And the position of the image is detected and the decision for the given below input image will be produced as Straight.

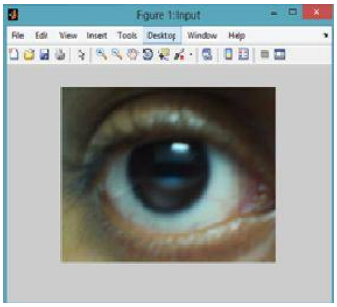

Fig. 6.3 Input for the straight looking eye

2. The input and its corresponding images shown below are produced after using Daughman's algorithm on input image for processing in mat lab. The position of iris and pupil detected will be highlighted with the help of a circle as show below. And the position of the image is detected and the decision for the given below input image will be produced as Right.

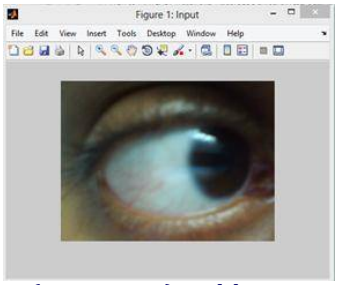

Fig. 6.1 Input for Right looking eye (as per user) andthe image looks Left (as per computer)

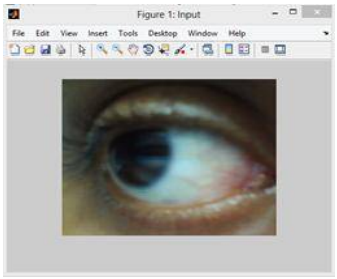

Fig. 6.4 Output obtained as Right looking eye (as peruser) and the image looks Left (as per computer)

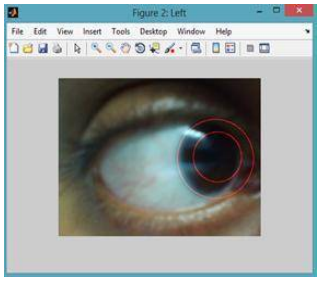

Fig. 6.5 Output obtained as Left looking eye (as per user)and the image looks Right (as per computer)

VII. CONCLUSION

This paper has presented a wheelchair system using eye movements, in which pupil detection that is segmentation is done using Daughman's algorithm and deduction of direction in which pupil looks is decided by fixing range to the particular direction as user looks. Detection of pupil is done even on illumination unless the illumination is covering whole eye, this is because when the light hits the pupil and illumination spreads on the pupil covering whole pupil which ignores those pixels so as we treat the illumination spots it will leave behind a maximum

change edges that cannot be determined and the operator will consider another position to be a iris location. This process works even if image taken in little dark environment.

ACKNOWLEDGEMENT

We are thankful to the management of Sengunthar College of engineering, Tiruchengode, Tamilnadu for providing all the amenities to complete this work successfully.

REFERENCES

1. K. T. V. Grattan, A. W. Palmer, and S. R. Sorrell,Communication by Eye Closure-A Microcomputer Based System for the Disabled', IEEE Transactions on Biomedical Engineering, Vol. BME-33, No. 10, October 1986.
2. Q.X. Nguyen and S. Jo, _Electric wheelchair control using head pose free eye-gaze tracker', ElectronicsLetters, Vol. 48 No. 13, 21st June 2012.
3. Rory A. Cooper, _Intelligent Control of Power Wheelchairs', IEEE Engineering in medicine and Biology, 0739-51 75/95, July 1995.
4. DjokoPurwanto, Ronny Mardiyanto, Kohei Arai,Electric wheelchair control with gaze direction and eye blinking', Artif Life Robotics, 14:397–400, May 18, 2009.
5. Rinard et al., _Method and Apparatus for monitoring the position of the eye', United States Patent, 4,145,122, Mar. 20, 1979.
6. Er. Vijay Dhir&Dr.(Ms) MaitryeeDutta., New Method of IRIS RECOGNITION Based on J.Daugman'sPinciple', Second InternationalConference on Emerging Trends in Engineering and Technology, ICETET-09.
7. J.G.Daugman, —How iris recognition works||, IEEE Trans. Circuits and Syst. for video Tech. 14, (2004)
8. Barea R, Boquete L, Mazo M, López E —Wheelchair guidance strategies using eog||. Journal ofIntelligent and Robotic Systems 34: 279–299, May 2002.
9. Iáñez E, Úbeda A, Azorín JM, Perez-Vidal C —Assistive robot application based on an rfidcontrol architecture and a wireless eog interface||. Robotics and Autonomous, May 2012.
10. Sibert LE, Jacob RJK —Evaluation of eye gaze interaction. In: Proceedings of the SIGCHI conference on Human Factors in ComputingSystems. New York, NY, USA: ACM, CHI '00, 281.

