I J C T A, 9(5), 2016, pp. 2553-2558

Cursor Based Control Using Eye Ball Movement

S. Adlin Stephi*, R. Mahendran and L. Nagalakshmi*****

ABSTRACT

In present world, disabled people are not able to operate computer because of some illness. The idea of eye control is of great use not only for the natural input but more importantly the handicapped and disabled. This technology is contracted to replace the conventional computer screen pointing device for the use of disabled persons. This method is most useful to operate computers without hands. This is the most useful those can operate the cursor by the movement of eye. The movement of mouse by automatically adjusting the position where of eyesight.Camera is used to capture the image of eye movement. The pupil centre position of eye is first detected and then the different variation on pupil position is identified to get different movement of cursor. The Implemented process for Pupil detection is performed using Raspberrypi.

Keywords: Raspberrypi, Camera, Opencv, Pupil, SDcard, Linux, system-on-chip, retina, monitor

1. INTRODUCTION

Nowadays personal computer systems are carrying a huge part in our everyday lives as they are used in areas such as work, education and enjoyment. What all these applications have in common is that the use of personal computers is mostly based on the input method via keyboard and mouse. While this is not a problem for a healthy individual, this may be an insurmountable bound for people with limited freedom of movement of their limbs. In these cases it would be preferable to use input methods which are based on more abilities of the region such as eye movements. To enable such substitute input methods a system was made which follows a low-price approach to control a mouse cursor on a computer system. The eye tracker is based on images recorded by a mutated webcam to acquire the eye movements. These eye movements are then graphed to a computer screen to position a mouse cursor accordingly. The movement of mouse by automatically adjusting the position where of eyesight.Camera is used to capture the image of eye movement.

2. LITERATURE REVIEW

In this paper[1] author describes the human-computer synergy in universal computing and implementation of human computer interface tracking based system on multiple eye features. For human eye (Iris)detection, batch mode is employed. Iris tracking technique is executed.

If the position of iris is down or up, it does not work. The system not works in real time. It is not expert to handle blinks and close eyes. In this paper [2] author describes the Bio-potential based method which utilizes potential from user's body actions secured by using special instrument. Instrument such as Electrooculograph (EOG), output can be used as sources of computer input for handicapped person, especially those with only eye movement coordination to control a cursor movement and to live more independently. In this paper [3] author describes the camera-based computer interfaces have been developed. This technique is not completely practical

* Associate Professor, Dept. of EEE, S.A. Engineering College, *Email: stefykuttiyai93@gmail.com*

** Assistant Professor, Dept. of EEE, S.A. Engineering College.

*** Post Graduate, Dept. of EEE, S.A. Engineering College.

as some disabled cannot move their hand and it becomes in accurate when someone rotates its head. Electro-oculography is a technology where a electrode around user eye and it is fully covered. The problems with this technique is for using the disabled person needs someone help to put it and also the system is quite expensive.

In this paper [4] author describes the human operator can specify goal destination using visual interface by pointing to features or location on display. This input lets the chair automatically generate a deliberative plan incorporating prior knowledge. At the interpost level, the human operator must use reactive controller to avoid obstacle and features that the sensor detect. At the decrease level, the human operator can directly provide velocity command using joystick. There is the proposed vision-based exploration for an electric wheelchair using ceiling light landmark. In this paper [5] author describes the Simultaneous eye tracking and Eye blinking with interactive particle filters". Eye position is launch using eye recognition algorithm. Then these filters are used for eye tracking and Eye blinking. For describing state transition, auto throwback models are used. A statistical active appearance model is developed to track and detect eyeblinking. In this paper [6]author describes the Voice Based method, which use user's voice as source input. Voice analysis is used to consider user's voice and convert into digital data. The weakness of this system is vulnerable against noise. Other voices which come from enclosing user may affect the system. In this paper [7] author describes the to control the robot using eyeball movement, making it easier to control as there is no requirement of external remote controls and makes it hands free. This makes it a excellent method of design of robotic wheelchair for disabled persons especially for people with paralyzed body. With the help of blink detection, the user can interact with the robotic system through feedback sound. In this paper [8] describes the cap worn by the user is light weighted carrying only a limited camera with LEDs. The user has to only look right or left to move the wheelchair towards the desired direction. The diagonal motion is resolved when user looks right or left for only small duration of time.

3. PROPOSED SYSTEM

The proposed system is designed to control the mouse by eyeball movement implemented using Raspberry pi. The Raspberry Pi is a credit card sized SoCor single computer uses ARM1176JZF-S core. SoC, or System on a Chip, is a method of placing all necessary electronics for executing a computer on a single chip.The main advantage is the handicapped peoples can operate the computers. This technology is intended to replace the conventional computer screen pointing device for the use of disabled persons. This method is most useful to operate computers without hands this is the most useful those can operate the cursor by the movement of eye. The movement of mouse by automatically adjusting the position where of eye sight.Camera is used to capture the image of eye movement. The pupil centre position of eye is first detected and then the different variation on pupil position is identified to get different movement of cursor.

4. SYSTEM MODEL

Raspberry Piboard is a reduced marvel, packing considerable computing power into a footprint no larger than a credit card. It's capable of some stunning things, but there are a few things you're going to need to know before you plunge head-first into the bramble patch. Supports GPIO, I2C, SPI and serial I/O buses suitable for connecting to various electronic gadgets and devices and USB, HDMI, Ethernet connectivity on board. Bringing computers back to electronics enthusiasts. Allow people to prototype and frame hardware applications (or rather appliances/gadgets) that can be programmed and composed using Linux or similar environments. Software is getting saturated, redundant, complicated and largely boring. There are attractive things you can do with hardware if you love electronics.

3.1. Block diagram

In this block diagram first the USB camera will capture the eye image. **.**Camerais used to capture the image of eye movement. The pupil centre position of eye is first detected and then the different variation on pupil position is identified to get different movement of cursor.

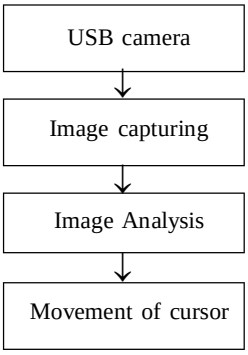

Figure 1: Block diagram representation

The Implemented process for Pupil detection is performed using Raspberry pi. The pupil reference has the coordinates of (*x*, *y*). Raspberrypi will be combine with USB Camera.Raspberry pi will be use SD card, then the install raspbian OS and open cv on rassberry pi. First image will be capture by USB Camera. Focus on eye in image and detect the center position of pupil by opencv code.

3.2. Raspberry pi representation

The Raspberry Pi, is designed to run an operating system called GNU/Linux—hereafter referred to simply as Linux. Unlike OSX or Windows, Linux is open source. It is possible to download the source code for the entire operating system and make whatever changes you passion. Nothing is hidden, and all changes are

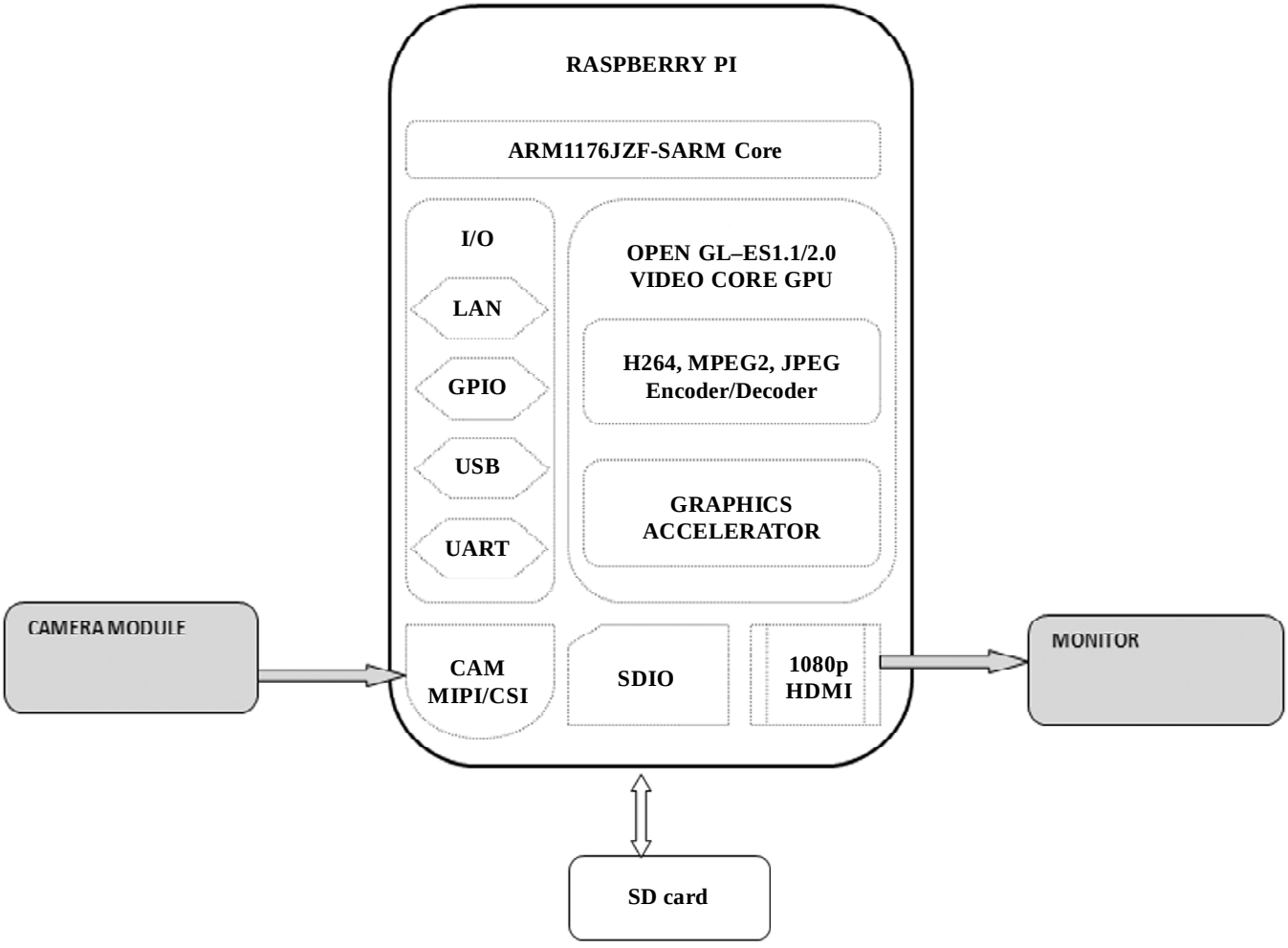

Figure 2: Raspberry pi diagram

made in full view of the public. This open source development has allowed Linux to be quickly altered to run on the Raspberry Pi, a process known as porting. At the time of this writing, certain versions of Linux—known as distributions—have been ported to the Raspberry Pi's BCM2835 chip, including Arch Linux and Debian Fedora Remix.

The processor at the compassion of the Raspberry Pi system is a Broadcom BCM2835 system-on-chip (SoC) multimedia processor. This means that the vast bulk of the system components including its central and graphics processing units along with the communications hardware and audio, are created into that single component hidden beneath the 256 MB memory chip at the midpoint of the board. It's not just this design that makes the BCM2835 different to the processor found in your laptop or desktop.

3.3. Pupil anatomy

The pupil is hole located in the centre of the iris of the eye that allows light to enter the retina.It appears black because light rays entering the pupil are either consumed by the tissues inside the eye directly, or absorbed after diffuse reflections within the eye that mostly exiting the narrow pupil.

The main advantage of pupil capture is that as the border of the pupil is more sharper than the limbus, a higher resolution is achievable. The disadvantage is that the difference in contrast is small between the pupil and iris than between the iris and sclera-thus making the bound detection more difficult. Pupil is signed as one black circle in the acquired eye image. In the first stage pupil is detected with a flexible threshold method when the pupil is clearly appears in the secured eye image.By using this we can conclude the centre pupil location as reference.

4. SIMULATION RESULTS

Raspberrypi will clubber with USB Camera. Raspberry pi will be use SD card, then the install raspbian OS and open cv on rassberry pi. First image will be capture by USB Camera. Focus on eye in image and detect the center position of pupil by opencv code. Take the exact position value of pupil as reference, and then the next the different value of X, Y coordinates will be set for accurate command. rasberry pi signals pass by

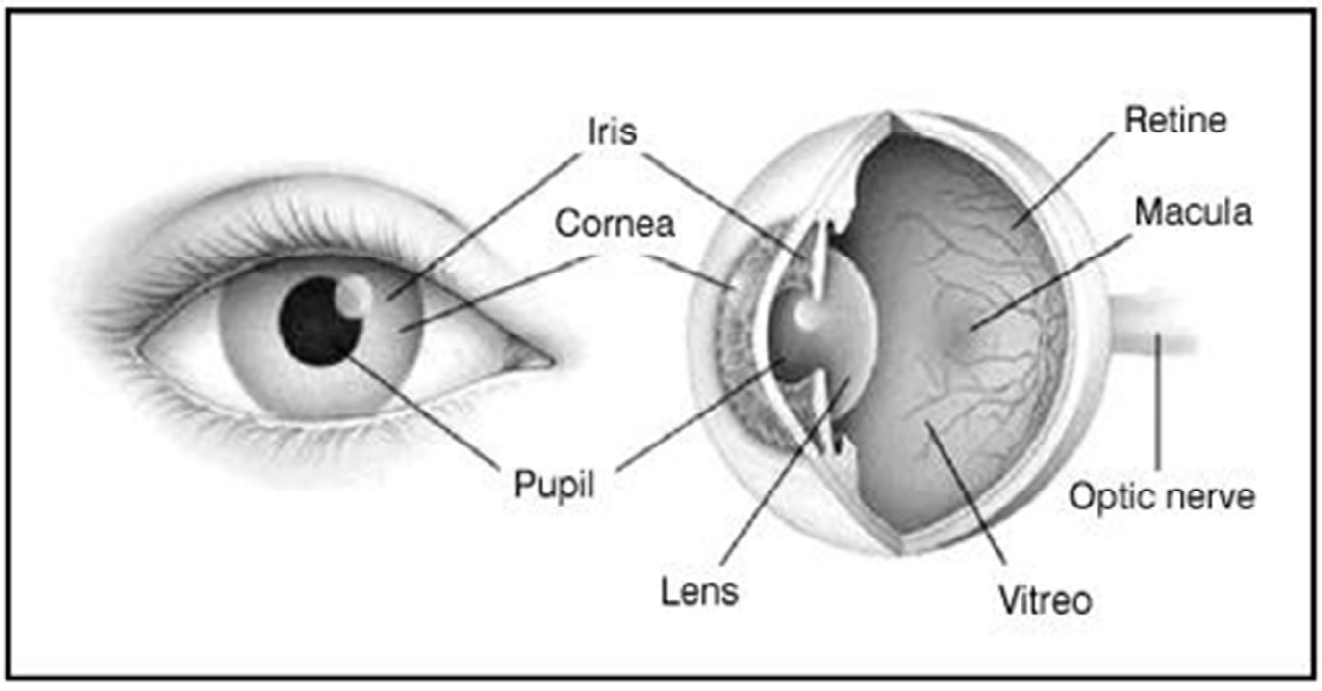

Figure 3: Pupil anatomy

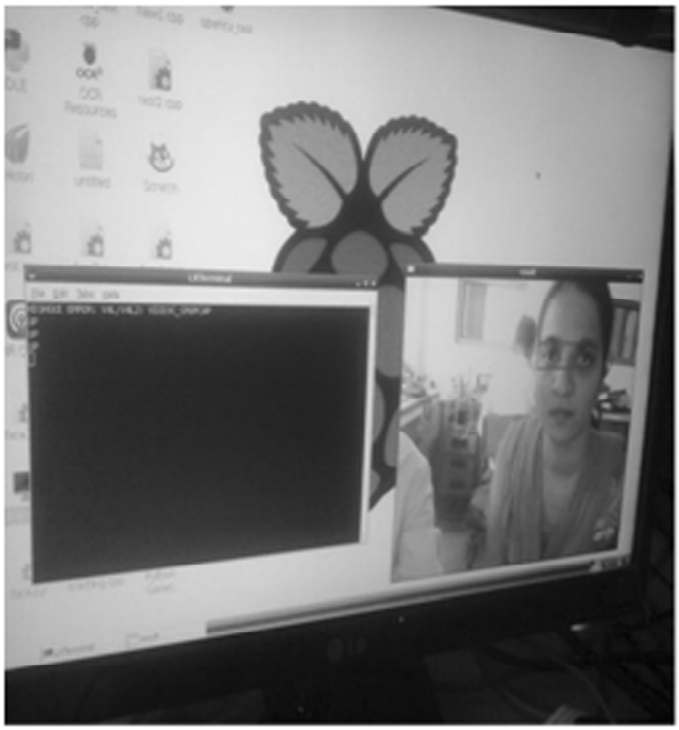

Figure 4: Simulation results

GPIO to transistor circuit. One of the main aim for Eye Movement controlled wheelchair is to enable completely paralyzed patients to make their life more feasible and to provide them opportunity of independence. In order to use the pupil to control the mouse pointer (cursor) on the screen, the central coordinate of the screen is set as a start point. This position is used as the base for tracing, and the first position of the mouse pointer is set as the center of the screen. The moving position of the cursor takes the initial position as the base. As the pupil move to one of the direction, the coordinate of the mouse pointer on screen change according to the action of the pupil. When the pupils return to the original position, the cursor stops moving.

The starting and stopping of the cursor is also controlled by movement of the eyes. When the user moves his eyes for a second, then the cursor starts or stops moving. That is, if the cursor is in moving condition, then after a eye movement, it stops and vice versa. The eye direction arrows are used for testing purpose at the time of demonstration. Beside these arrows, a circle is seen in the green color. When some obstacle is detected in front of the eyes, this circle becomes red, a buzzer beeps and the cursor stops. Note that this circle doesn't appear red for natural stopping of cursor by eye movement.The eye movement and its circuitry required two 1.5 V batteries and three 9 V batteries. The camera used, is a USB camera which can be straightly plugged in and used. The camera drivers should be loaded in the system before use.

5. CONCLUSION

The paper is aim for the cursor control using eye ball movement.Without using the hands we can operate the computers.This technology is contracted to replace the conventional computer screen pointing device for the use of disabled persons. The movement of mouse by automatically adjusting the position where of eyesight. It is mostly used for the disabled and paralysis people.Without the help of other person they can use the computers. This work can be extended to implement to produce efficient movements to perform the click events and also cover the total mouse function of the system and to cover the total human-computer interface system using eye blink. Technology also extended to the eyeball movement and eye blinking to get the efficient and accurate movement.

REFERENCES

[1] Bushra Sikander, Sidra Naveed, and Malik Sikander Hayat Khiyal "Eye Tracking System with Blink Detection", IEEE, Volume 2, Issue 8, 2015.

[2] Craig Hennessey, Jacob Fiset, "Long Range Eye Tracking: Bringing Eye Tracking into the Living Room", IEEE, Volume 5, Issue 9, 2012.

[3] Bacivarov, Ionita M., Corcoran, P, "Statistical models of appearance for eye tracking and eye-blink detection and measurement", IEEE Transactions, August 2010.

[4] Ioana Bacivarov, Mircea Ionita, Peter Corcoran, "Statistical models of appearance for eye tracking and eye blink detection and measurement", IEEE transactions on consumer electronics, Vol. 54, No. 3, pp. 1312 1320 August 2012.

[5] Mohan M. Trivedi**,** "Simultaneous eye tracking and blink detection with interactive particle filters" ACM,, vol 2, Issue5, January 2013.

[6] Grauman, K.; Betke, M.; Gips, J.; Bradski, G.R., "Communication via eye blinks Detection and duration analysis in real-time", IEEE conference publications, vol 3, Issue 9, 2013.

[7] Toshiyuki Masui, Koji Tsukada, and ItiroSiio, "MouseField: A Simple and Versatile Input Device for Ubiquitous Computing", Vol. 3205, Springer (2011), pp. 319-328.

[8] Eye Controlled Wheel Chair Using EOG, Alex Dev, Horizon C Chacko and Roshan Varghese, International Conference on Computing and Control Engineering (ICCCE 2012), 12 & 13 April, 2012.

[9] Eyeball and Blink Controlled Robot with Fuzzy Logic Based Obstacle Avoidance System for Disabled K.S. Sabarish, A.M. Suman, (ICEEE'2012) June 16-17, 2012, Bangkok.

[10] Suresh A, ASN Gateway Relocation for fast Hand off in Mobile Wi max Network,"International journal of AppliedResearc"h, Volume 10, no.,17, 2015, pg 1 to 984.