Wireless Eye Monitored Wheel Chair Control

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Abstract: **There is a statistical suggestion that there are around 11,000 new cases for quadriplegia every year in United States of America. Great scientist like Stephen Hawking and Max Brito have been suffered from the same. So, our project is an attempt to make the lives of people suffering from this, to reinstate their confidence and happiness. The idea is to create an Eye Monitored System which allows movement of the patient's wheelchair depending on their own eye movements. We know that a person who is suffering from quadriplegia can partially move his/her eyes and tilt his head, thus presenting an opportunity for detecting those movements. Therefore, we have created a device where a patient sitting on the wheel Chair assembly looking directly towards the camera, will be able to move in a direction just by looking in the respective directions. The camera signals are monitored by a MATLAB script software, which will then be guided to the motors wired to the AVR Microcontroller over the Serial Interface to move in its particular direction. The system is very cost effective and hence can be used by the patients who are spread on over a large economy.**

Keywords: Eye Monitored Wheelchair, AVR Microcontroller, Motor Driver Circuit, LCD Display, Arduino, Embedded C, MATLAB 2014.

I. INTRODUCTION :

The person who is paralyzed will be obviously dependent on somebody, due to the loss of their self-mobility within this growing population. The development of the wheelchair for paralyzed users isn't surprisingly recent, but from starting with the conventional, manually powered wheelchairs to advanced electrical wheelchairs. Conventional wheelchair user tends to focus exclusively on the manual use where user assumes it to use it with their hands which excludes them to do so. Diseases or accidents injuring the nervous system results in people losing their ability to move with their voluntarily muscle. Because voluntary muscle will be the main actuator which enables people to move their body, paralysis may not allow the person to move their locomotory organs such as arm, leg and others.

Most paralysis will be constant and however there are other forms also, such as periodic paralysis which is caused by genetic diseases and by various other factors.

Aim: This project presents "The design and implementation of Wireless Monitored Wheel Chair Control through their eyes for the people suffering from Quadriplegia" which is designed using MATLAB's image processing tool, XBEE Wireless Protocol networks and Embedded automation technologies.

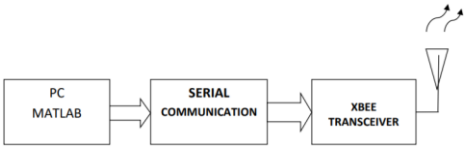
II. METHODOLOGY:

In proposed system we are solving all drawbacks of existing system.

The idea is to create an Eye Monitored System which allows movement of the patient's wheelchair depending on their eye movement. We know that a person suffering from quadriplegia can partially move his eyes and tilt his head, thus gives an opportunity for detecting these movements. We have created a device where the patient who will be sitting on the wheel chair assembly, can just directly look at the camera, will be able to move in that direction just by looking in that particular direction. MATLAB can be used as an image processing toolbox which we utilized for the eye detection. We used 'Cascade Object Detector' which is capable of detecting eye-shaped objects based on their shape and size. Viola Jones Algorithm is used for the same.

The camera signals are monitored by a MATLAB script, which guides the motor that is wired to the AVR Microcontroller over the Serial Interface to move in the particular direction.

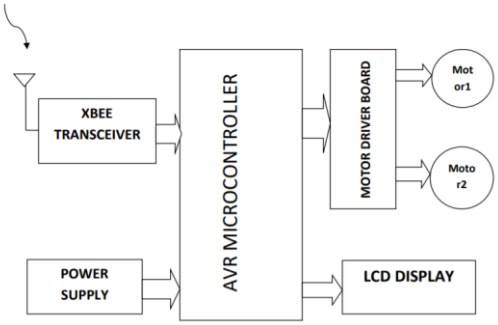
Sensor Side:



This is the basic design flow of the sensor side, shown in the figure. It consists of a personal computer/ laptop which consists of MATLAB image processing tool, serial communication device and an XBEE Transceiver. MATLAB based eye ball sensor is designed here by using MATLAB. Depending on eye movement image processing tool generate

Serial data which is transmitted to wheel chair section through the serial communication device and XBEE wireless protocol device. Serial communication device provide communication between the PC and XBEE transceiver module. XBEE support data communication.

Wheelchair Side:

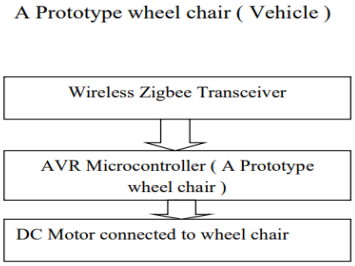


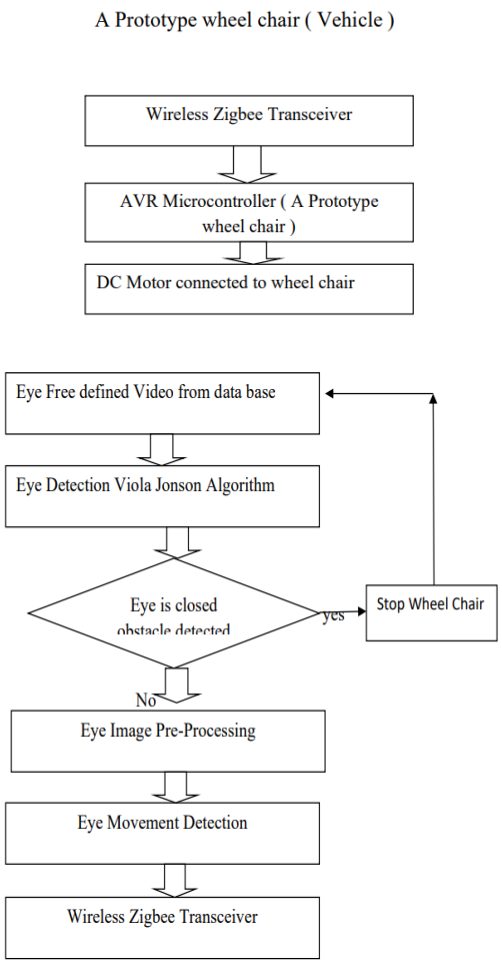
This is the basic design flow of wheel chair section, shown in the figure. It consists of XBEE transceiver, AVR microcontroller, LCD display, Motor driver board, motors and power supply. XBEE transceiver receives the data from sensor section. Received data is given to AVR Microcontroller section. AVR Microcontroller is programmed to control the wheel chair through motor driver board. LCD display is for display purpose.

Eye-Detection and Motion Tracking:

MATLAB consists of an image processing toolbox which can be utilized for the eye detection process. We can use the 'Cascade Object Detector' which is capable of detecting eye-shaped objects based on their shape and size. It uses the Viola Jones Algorithm for the same and also the description of the Algorithm is given in the software section of the report. Continuous snapshots of every 25th frames are taken and featured points are extracted and saved i.e., it captures at-least 1 snapshot approximately every second and process it. AVR microcontroller XBEE transceiver motor driver board mot or1 power supply LCD display Moto R2Based on the position of the feature which points the previous snapshot and current snapshot also, a movement is detected and it is communicated to the wheelchair assembly via the serial port.

III. ALGORITHM FOR THE PROPOSED SYSTEM:





IV. HARDWARE SPECIFICATIONS:

AVR Microcontroller: AVR Microcontroller serves as the heart of the project, Embedded C language is also used for the programming. The AVR is modified through the Harvard architecture with 8-bit RISC single chip microcontroller which was developed in 1996 by Atmel. The AVR is one of the first microcontroller ancestry which used on-chip flash memory for program storage, but it was opposed by one-time programmable ROM, EPROM, or EEPROM which was used by other microcontrollers at the time.

Series name	Pins	Flash Memory	Special Feature
Tiny AVR	6-32	0.5-8 KB	Small in size
Mega AVR	28-100	4-256KB	Extended peripheral
X-mega AVR	44-100	16-384KB	DMA, Event System included

What's special about AVR?

They are fast: AVR microcontroller carries out most of the instructions in the single execution cycle. AVRs are almost about 4 times faster than PICs, hence they ingest less power and that can be operated in different power saving

modes. Let's do the comparison between the three most regularly used families of microcontroller.

	8051	PIC	AVR
Speed	Slow	Moderate	Fast
Memory	Small	Large	Large
Architecture	CISC	RISC	RISC
ADC	Not Present	Inbuilt	Inbuilt
Timer	Inbuilt	Inbuilt	Inbuilt
PWM Channels	Not Present	Inbuilt	Inbuilt

Motor Driver Circuit: Motor driver circuit is used to drive the motor, whereas switching circuit is used provides logical switching and also relay driver board is used to drive the motor, 12v relay is used. We know that a relay acts as an electrically operated switch. Many relays use an electromagnet which operates as a switch mechanically, but other operating principles are also used, such as solid-state relays. Relays are used whenever it is necessary to control a circuit by low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled with one signal.

LCD Display: A liquid crystal display (commonly contracted LCD) is a flat and thin display device which is made up of number of colors or monochrome pixels arrayed in front of a light source or a reflector. It is often utilized in battery-powered electronic devices because it uses a very little amount of electric power.

Serial Communication Device: Serial communication is the common method of transferring the data between a computer and a peripheral device such as programmable instrument or even any other computer. Serial communications pass-on data is one bit at a time which is sequentially over a single communication line to the receiver. Serial communication is also the most admired communication protocol which is used by many devices for instrumentation and also numerous GPIB-compatible devices also came up with the RS232 based port. This method is only used when data transfer rates are very low or when data must be transferred over long distance.

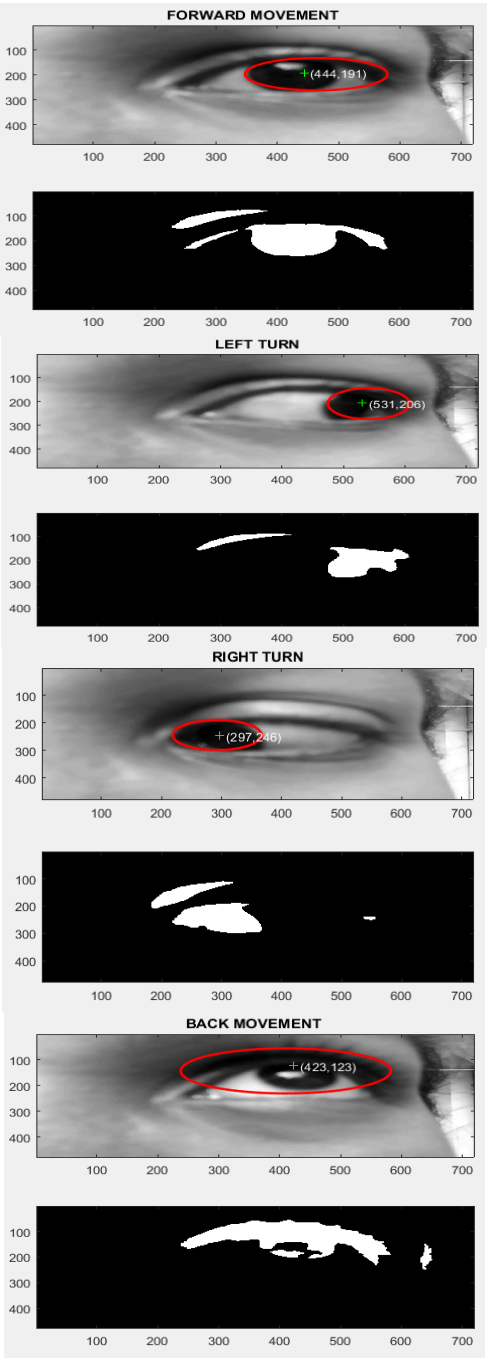
V. SOFTWARE SPECIFICATION

MATLAB: This software is the highest-performing language for the practical computing. It also incorporates its computation, visualization and also programming to be as easy-to-use in the applicable environment, where problems and solutions are expressed in mathematical notations which will be familiar.

Arduino software: It is the tool used for assembling computers that can sense and control more of the physical world than our desktop computers. It's an open-source corporeal computing platform which is based on a simple microcontroller board, and a development environment for writing software for the board. It can be used to develop interactive objects, which takes the input from variety of switches and sensors to run variety of lights, motors and other physical outputs.

Embedded C: It is the set of language extensions for the C programming language by the C standards committee to address congruity issues that exists between the C extensions for different embedded systems. This Embedded C language allows various range of programming styles starting from high-level application codes which downs to direct low-level bluff of hardware registers. As a result, C language becomes the most popular programming language for embedded systems today.

VI. RESULT



VI. CONCLUSION

The system functions with the precision rate of 70-90 %. The aim of this project is to contribute to the society in our small
way by deposing an idea for a system which could actually better the lives of millions of people across the globe. Direction in which pupil looks is manifest by fixing range to the particular direction as user looks. Perception of pupil is done even on illumination, unless the illumination is covering whole eye. This happens when the light hits the pupil and the flash spreads on the pupil covering whole pupil and ignores those pixels. So, we treat the illumination spots which leaves maximum change edges behind that cannot be set on and the operator will consider another position to be the iris location. This process works even if image captured in little dark environments.

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REFERENCES

[1] K. T. V. Grattan, A. W. Palmer, and S. R. Sorrell (October1986), Communication by Eye Closure- 'A Microcomputer Based System for the Disabled', IEEE Transactions on Biomedical Engineering, Vol. BME-33, No. 10.

[2] Q.X. Nguyen and S. Jo (21st June 2012.) Electric- wheelchair control using head pose free eye-gaze tracker, Electronics Letters, Vol. 48 No. 13.

[3] Rory A. Cooper (July 1999) Intelligent Control of Power Wheelchairs', IEEE Engineering in medicine and Biology,0739-51 75/95,

[4] Djoko Purwanto, Ronny Mardiyanto, Kohei Arai (2009) Electric wheelchair control with gaze direction and eye blinking', Artif Life Robotics, 14:397–400, May 18.

[5] Rinard et al. (Mar. 20, 1979) 'Method and Apparatus for monitoring the position of the eye', United States Patent, 4,145,122

[6] J.G.Daugman (2004)How iris recognition works, IEEE Trans.Circuits and Syst. for video Tech. 14(1), 21-30