

# Eye Tracking based Robotic Vehicle

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**Abstract**— People who are unable to walk and are using wheel chairs exert great amounts of energy using physical strength to turn and steer the wheels. Hence we will be designing an automatic wheelchair for the handicapped/ disabled people based on eye tracking using sensor system. The purpose of this project is to develop a wheelchair that will be controlled by the eyes of the person seated in the wheelchair. It will allow people without full use of their limbs the freedom to move about and provide a level of autonomy. The most challenging aspects lied in finding a good way to calibrate the specks to a person's eyes without obscuring their vision, determining the eye's movement, and controlling the wheelchair's wheels for proper movement.

**Key words:** Eye Tracking, Robotic Vehicle

## I. INTRODUCTION

The aim of this project is to introduce automation in transportation for the paralytic people and Handicapped people. This project proposes advanced model of existing system .This existing system can operate using joysticks in hand or using head movement detection sensor. But this proposed system operates in eyeball movement detection. Inside house paralytic people reaching a desired destination is little bit difficult. This Wireless intelligent robot is designed to help the handicapped person who moves on a wheel chair, instead of the handicapped person moves the wheel chair by his hand, the chair will automatically move to a particular direction as the patient moves his eyes towards a direction, with the help of Eye ball movement detection sensor. The chair will also sense the obstacles in front of it and gives a beep sound.

Even though, the eye control offers a more natural mode to guide the robot, it is omitted because users are normally not allowed to look around during motion.

So people can't move freely inside their house they depend on others for their motion. Here with the help of eyeball movement detection system, the new idea of providing a cost effective, less hardware complex embedded system that helps the parlay move freely inside their house.

## II. BLOCK DIAGRAM

### A. Eye Ball Detection using Infrared Sensor:

The flow of our proposed system starts with the detection of the eyeball position. In order to detect the position of the eyeball we use the eyeball IR sensor. The values generated by the sensor depending on the position of the eyeball are routed to the kit. The sensor consists of IR transmitter and receiver circuitry (LDR). The IR transmitter will transmit the light. The iris of the eye which is in black colour will absorb all the light and it won't reflect whereas the white part will reflect the light.

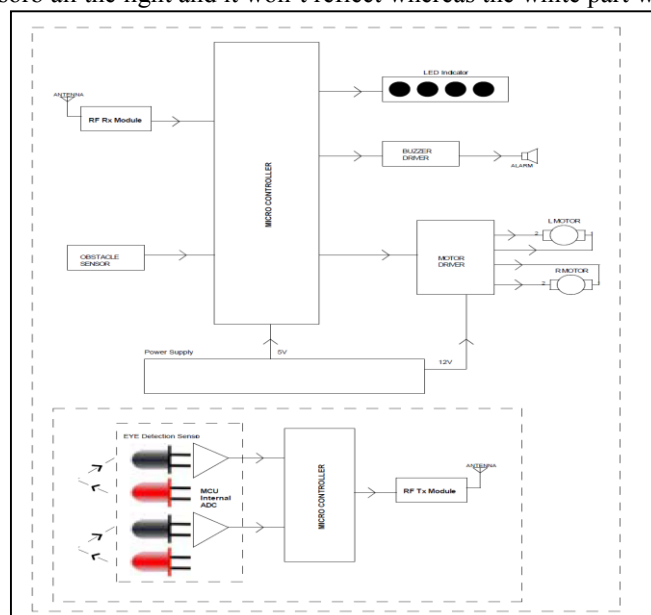


Fig. 1: Block Diagram

### B. Digital Signal Processing [ADC]:

The Infrared sensor senses the eye movement and converts it into an electrical signal, which is applied to the micro controller. The analogue signal is converted into digital format (8 or 10 bit number) by the inbuilt analogue-to digital converter (ADC) of the micro controller. The sensed values of the eye movement used to Control robot.

### C. Track Movement using Micro Controller Algorithm:

The signals from the eyeball sensor are sent to the micro-controller. Based on the signals received by the micro-controller, it sends the control signal to enable the motor circuitry. The motor circuitry supplies power to the motor, thus the motor start to rotate and the robot is locomoted.

### D. Motor Circuitry:

H-bridge is so named because it has four switching elements at the "corners" of the H and the motor forms the cross bar. The basic bridge is shown in the figure. The key fact to note is that there are, in theory, four switching elements within the bridge. These four elements are often called, high side left, high side right, low side right, and low side left (when traversing in clockwise order).

### E. Movement Detection

#### 1) Check Movement:

Depending on input of micro controller it checks whether the movement is valid movement or invalid movement.

#### 2) Valid Movement:

If the movement is valid then the robot will move left, right or straight.

#### 3) Left Movement:

If the values generated by the sensor matches with the values of left in the coding, then the micro controller will automate the motor circuitry to left. Depending on H-Bridge table wheels will turn in left direction. As a result the robot will turn left.

#### 4) Right Movement:

If the values generated by the sensor matches with the values of right in the coding, then the Micro controller will automate the motor circuitry to the right. Depending on H-Bridge table wheels will turn in right direction. As a result the robot will turn right.

#### 5) Straight Movement:

If the values generated by the sensor matches with the values of straight in the coding, then the Micro controller will automate the motor circuitry to the straight. Depending on H-Bridge table wheels will move in free direction. As a result the robot will go straight.

#### 6) Invalid Movement:

Invalid movement include such as blinking of eyes.

## III. ALGORITHM

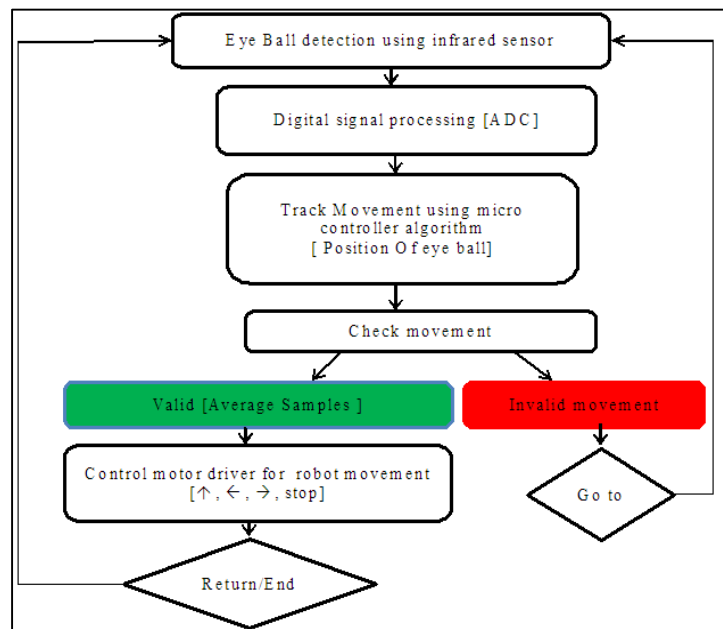


Fig. 2: Flow Chart

## IV. HARDWARE REQUIREMENT

### A. PIC16F873 Microcontroller

- High performance RISC CPU
- Operating speed: DC - 20 MHz clock inputDC - 200 ns instruction cycle

- Up to 8K x 14 words of FLASH Program Memory,  
Up to 368 x 8 bytes of Data Memory (RAM)  
Up to 256 x 8 bytes of EEPROM Data Memory
- Interrupt capability (up to 14 sources)
- Selectable oscillator options
- Low power, high speed CMOS FLASH/EEPROM technology
- Single 5V In-Circuit Serial Programming capability memory
- Wide operating voltage range: 2.0V to 5.5V

#### B. RF Transmitter

- The ST-TX01-ASK is an ASK Hybrid transmitter module.
- Frequency Range: 315 / 433.92 MHZ.
- Supply Voltage: 3~12V.
- Output Power : 4~16dBm

#### C. RF Receiver

- Low power consumption.
- Integrated IF and data filters.
- Operation voltage: 5 Volts.
- Available frequency at : 315/434 MHz

#### D. DC Motor

A DC Motor is connected to port RB4 ~ RB7 of the micro controller through a H-bridge motor driver IC (U2). The DC Motor requires 12 volts at a current of around 600 ma, which cannot be provided by the micro controller. So the driver IC is added

#### E. H-bridge IC

The L293 has 2 H-Bridges (actually 4 Half H-Bridges), can provide about 1 amp to each and occasional peak loads to 2 amps.

#### F. LM7805 Voltage Regulator

This is used to make the stable voltage of +5V for circuits. The LM7805 is three terminal positive regulators available in the TO-220 - package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current.

#### G. Photodiode (Q1)

A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operation

#### H. Infrared light-emitting (IR LED – IRD1)

An infrared light-emitting diode (LED) is a type of electronic device that emits infrared light not visible to the naked eye. An infrared LED operates like a regular LED, but may use different materials to produce infrared light. This infrared light may be used for a remote control, to transfer data between devices, to provide illumination for night vision equipment, or for a variety of other purposes

#### I. Crystal oscillator

A crystal oscillator is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters/receivers.

## V. SOFTWARE REQUIREMENT

#### A. Embedded C:

Embedded C is language for programming microcontroller for embedded applications. There is large and growing international demand for programmers with 'embedded' skills, and many desktop developers.

#### B. Keil u-Vision 8.0:

Keil is basically compiler to compile embedded C programs which creates hex file from the compiled C program. The keil 8051 development tools are designed to solve the complex problems facing embedded software developers.

#### C. Express PCB:

PCB helps designing circuit boards simpler for the beginner and efficient for the professional.

## **VI. ADVANTAGES**

- The main disadvantage of using image processing techniques is it will not work in night. But our system uses only eyeball sensor which tracks the position of the eye by using a simple component IR LED.
- Another advantage of the system is using ultrasonic sensor and accelerometer which make the wheelchair safer for the patient.
- The safety features incorporated in the system were :
  - Controlled speed of detection and wheel chair drive.
  - Eye height and width threshold.
  - Controlled movement in either direction for limited time period.
  - Less jerk by incorporating delay in the wheel chair drive. We do not want the person to get a jerk whenever he wants to move.

## **VII. DISADVANTAGES**

Poor gaze direction accuracy compared to video tracker.

## **VIII. CONCLUSION**

The user has to only look left or right to move the robot towards the desired direction. The diagonal motion is achieved when user looks left or right for only small duration of time.

It is cost efficient system that is very easy to handle, a single person can handle all the work with movement of eyes and hence eye movement based robotic vehicle.

## **IX. FUTURE SCOPE OF THE PROJECT**

- Eye detection can be used in video games replacing joy stick.
- To make a sophisticated product that can be implemented in fighter jets. In this pilot just has to point he target with eyes and press the trigger when target comes under the range.
- In medical field, doctors can study the patients eye movement by using this technique.
- Disabled person can make use of computer without any help of mouse.

## **REFERENCES**

- [1] International journal for research in emerging science and technology, volume-2, issue-2, february-2015
- [2] (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 2, No. 12, 2011
- [3] Colleen Nelson et al Int. Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 4, Issue 5( Version 7), May 2014, pp.129-134
- [4] International journal of engineering sciences & research technology [988-991]
- [5] www.electronicforyou.com