AUTOMATIC WHEELCHAIR USING EYEBALL SENSOR

Rajavenkatesan.T[1], Nagalakshmi.S[2], Ram Prasath.K.P[3], Venkataramanan.S[4]

[1]*Assistant Professor.Dept., of EIE, K.S.Rangasamy College of Technology, Tiruchengode, (India).*

[2,3,4] *UG Students, Dept., of EIE, K.S.Rangasamy College of Technology, Tiruchengode, (India)*

ABSTRACT

An automatic wheel chair is a mobility-aided device for persons affected by moderate, severe physical disabilities, and chronic diseases as well as elderly. Many people with disabilities do not have the ability to control the powered wheel chair using joystick and hand movements as it is tougher for the person to move and it is software oriented. The proposed method consists of hardware which eliminates the individual's work using eyeball sensor. The proposed model uses an eye ball movement tracking system to control electronic wheel chair. Once the movement has been processed and it is given to the microcontroller. The microcontroller process depends upon the feed coding and the output is gives in to the driver circuit. Also, the obstacle detection sensors will be connected to give necessary feedback for proper operation of the wheelchair system. All four wheel will be connected to driving circuit that will move to wheelchair based on eye ball movement.

Keywords: DC motor, Eyeball sensor, IR sensor, Micro controller.

I. INTRODUCTION

There are patients who have lost control of both arms and legs, as a result of higher level spinal cord injury or brain and nervous system disorder. These kinds of patients can't use the standard wheelchair which depends on the arms muscular force to move the wheelchair. At the same time, they can't use the electrically powered wheelchair which is controlled by joystick. So these types of patients still want the help of another person to move their wheelchair from one place to another. Many researchers have proposed different methods to control the wheelchair. One of the possible solutions for them is to use their eye ball movement to control the wheelchair. The control of the wheelchair is depends upon the eye ball sensor, which will do the functions like right, left, forward and reverse operations.

The wheel chair is designed in such a way that it can move freely without external support or dependency. Through this feature the patients can enable movements of their wheelchair as per their desire.

II. LITERATURE SURVEY

There were many pervious works carried out on electronic Wheelchairs. These are a few of them which helped us to get ideas for our current prototype.

In [1] "touch screen based wheelchair system," This method is very much user free and requires very less muscle movement form the user. Touch screen is used as input device and LCD displays the user's gesture

correctly when recognized. An IR obstacle detection unit can be used which is fixed to the wheelchair to avoid possible accident A resistive touch screen will be best suited for this application as it is low cost and has greater lifespan compared to other types of touch screens available. From the screen, user can either select a predefined path or can create their path in real-time. The drawback of this method is that, it is less accurate in the turning of wheelchair

In [2] voice and Gesture Based Electric-Automatized Wheelchair Using ARM", this method is very greatly user free and comfortable for elders with limbs impairments. The benefit of this method is to people who are unable to perform simple movements with their hands. This technique is used language and hence can be considered universal. A voice recognition IC is interfaced with a microcontroller. This IC accepts the input from the user as voice commands which are then converted to digital signals that a microcontroller can process. It will produce the desired output which controls the wheelchair

In [3] "automatic Wheelchair Controlled using Hand gesture", an EMG Sensor, and guide Signal Separation' can be used in this method. A system is designed which uses an IR sensitive camera to identify the gesture shown by the user. The capture images of the gesture are given to the microprocessor which does further processing. The drawback of this method is that it cannot be used by the persons who are suffering from nerve disorder and stoke etc.

III. HARDWARE IMPLEMENTATION

3.1 Eyeball sensor

The basic principle of this direction sensing is the color of the eyes. There are two main color sin the human eyes. i.e., black and white. The infrared light rays passed to the eye and measure the white portions.

The Infrared sensors are placed on either side of the sensor. The eye ball sensor is connected to the microcontroller. It will perform the analysis, processing and amplification of the signals from the sensor's eye-ball movements. The eye ball movement is an analog signal which can be converting into a digital signal. Depending upon the movement of the eye ball and controller provides the output. It can be passed through driver circuit to their direction of right, left, forward, reverse directions.

The sensor output is based on the eye ball. If the eye ball is large then the accuracy is more. If the eye ball is small then the accuracy is low.

Figure 1: The Eyeball Sensor on goggles

3.2 Motors

The Geared type dc motor with 12Vpower supply and 45rpm motor is used to move the wheelchair. DC motors are available from15W through 6,0kW. These motors are high torque, continuous S1 or S3 periodic-duty products suitable for a wide variety of applications ranging from pumps to propulsion. The motors operate on battery power or generated "pure" DC power. The motor will take input from the driver circuit, depending upon input the motor move in the directions of right, left, forward, reverse.

Motor 1		Motor 2		Direction
Input 1	Input 2	Input 1	Input 2	
0	1	0	1	Forward
1	0	1	0	Reverse
0	1	0	1	Right
1	0	0	1	Left

Table1: Truth Table Representing the Working of the Motor

The two motor is connected to the driver circuit and it will move the wheelchair based on the input signal from the circuit, the truth table becomes as shown in table2

Input One	Input Two	Output
0	1	Forward
1	0	Backward
1	1	Stop
0	0	Stop

Table2: Truth Table for Controlling Two Wheels Simultaneously

3.3 Motor Driver

L293D is a dual H-Bridge motor driver with one IC interface two DC motors which can be controlled in both clockwise and anti-clockwise direction. L293D has output current of 600mA and it can be amplifies the input signal form controller. This device is suitable for use in switching application at frequencies up to 5 kHz. The output supply (VCC2) has a wide range from 4.5V to 12V, which is suitable for low speed operation.

3.4 Microcontroller

The ATmega8 contains 8K bytes On-chip In-System Reprogrammable Flash memory for program storage. It is mainly used for a small speed application.

It has 3 ports such as port B, port C, and port D. The port B is connected to the eye ball sensor. As inputs, Port B pins that are outwardly pulled low will source current if the pull-up resistors are started. The Port B pins are tri-stated when a reset condition is on, even if the clock is not running. Depending on the clock pulse, PB6 can be used as input to the inverting amplifier and input to the internal clock operating circuit. Depending on the clock selection pulse, PB7 can be used as output from the inverting amplifier.The port C is connected to the driver circuit for motor input.Port C is a 7-bit bi-directional I/O port with internal tell off resistors (selected for each bit).

Block Diagram

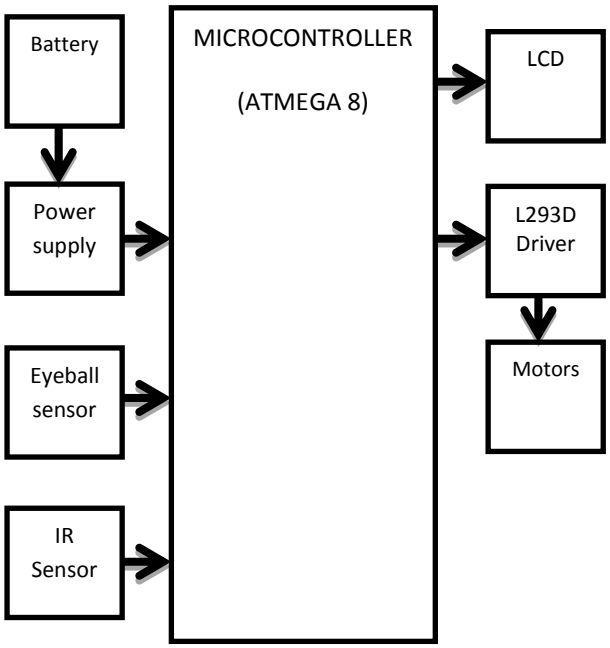

Figure 3. Block diagram of the project

The Port C output buffers have balanced drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are started. The Port C pins are tri-stated when a reset condition is on, even if the clock is not running. The port D is connected to the driver circuit for motor output. The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.The controller is processed depending upon the coding.

3.5 Obstacle Sensor

The obstacle sensor is placed at the front of the wheelchair. It is used to provide information on the objects in the direction of the wheelchair. It is consists of transmitting and receiving section. The IR signal is passed through in the direction and it can be received. If any obstacle in the direction of wheelchair, it will sends 5V supply to controller, then wheelchair is stopped. Otherwise 0V supply is given to the controller.

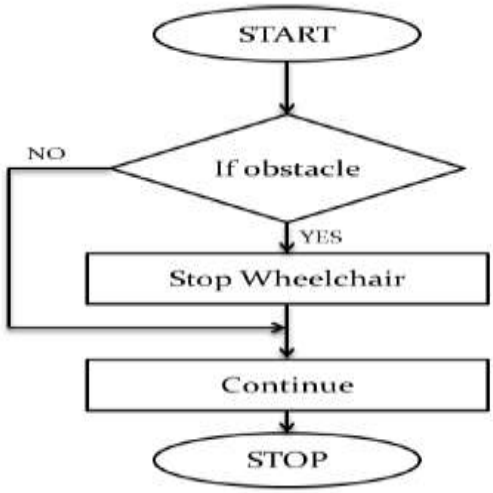

Figure 4. Flow chart of obstacle sensor

IV. KEIL C COMPILER AND FLASH MAGIC BURNER

We are using the Keil C Complier software to program the microcontroller in Embedded C codes.[7] The Keil C51 C Compiler for the ATmega8microcontroller. It provides more features than any other 801151 C compiler available nowadays. The C51 Compiler allows you to write 8051 microcontroller application sin C that, once compiled, have the efficiency and speed of gathering language. Language extensions in the C51 Compiler give you full access to all capital of the 8051.Flash Magic Burner is an application for programming microcontrollers. The program will routinely verify the chip after the Hex file is loaded to it.

WORKING

The eye ball sensor sensing the position of the eye and given to the microcontroller. It will convert input to digital signal and send to the driver circuit. The output of the controller is digital signal. It has L293D IC which converts digital to 12V analog signal. The obstacle sensor is also connected to the controller. The motor will move depending upon eye ball movements.

V.CONCLUSION

The system is designed in such a way that it is simple, cost effective and easy to operate so that it aids the physically challenged people. However, the efficiency of the system mostly depends on the controller program, as the human eye move more to sudden changes in the system, rather than a normal change. Hence system should be designed in such a way fast to measure eye ball movement and more efficient to process. Obstacle sensor is used to detect object in the undesired condition such as dark areas, glass wall or stones, smoke area, and etc

VI.FUTURE WORK

This system can also extended for the blind people that instead of eyeball sensor, Google maps can be used to move the wheelchair.

REFERENCE

[1] K. Sudheer, 'Voice and Gesture Based Electric-Automaticed Wheelchair Using ARM' ,International Journal of Research in Computer and Communication technology, IJRCCT, ISSN 2278-5841, Vol 1, Issue 6, November 2012.

[2] Luis A. Rivera, Guilherme N. DeSouza, et al, and Senior member, 'A Automatic Wheelchair Controlled using Hand Gestures, IEEE, University of Missouri on April 2010.

[3] Ituratte, J. Antelis, J. Minguez, 'Synchronous EEG brain-actuated wheelchair with automated navigation,' Kobe, Japan, May 2009.

[4] Bong-Gun Shin, Taesoo Kim, Sungho Jo, et al, 'Noninvasive brain signal interface for a wheelchair navigation', International Conference on Control, Automation and Systems, Gyeonggi-do, Korea, October 2010.

[5] Ana C. Lopes, Gabriel Priez,Lu´ısVaz, UrbanoNunes, et al, 'Wheelchair navigation assisted by human - machine shared - control and a P300 - based brain compute interface', International Conference on Intelligent Robots and Systems, an Francisco, CA, USA, September 2011.

[6] M. Palankar, K.J. De Laurent's, R. Alqasemi, E. Veras, R. Dubey, Y. Arbel, and E. Donchin, et al, Control of a 9-DoF wheelchair-mounted robotic arm system using a P300 brain computer interface: Initial experiments. In Robotics and Biomimetics, 2008. ROBIO 2008. IEEE International Conference on, pages 348–353. IEEE, 2008.

[7] FahadWallam, Muhammad Asif, et al, 'Dynamic finger movement tracking and voice commands based smart wheelchair', International Journal of Computer and Electrical Engineering, August 2011.

[8] Kohai Arai, Ronny Mardiyanto, et al, 'Electric wheelchair controlled by human eye only with obstacle avoidance', International Journal of Research and Computer Science, December 2011.

[9] Vasundhara G Posugade, Komal K Shedge, Chaithali S Tikhe, et al 'Touch screen based wheelchair system', International Journal of Engineering Research and Application, March – April 2012.

[10] Ito, Nara, 'Eye movement measurement by picture taking in and processing via video capture card, an Institute of Electronics', Information and Communication Engineers Technical Report, ISSN 31-36, April 2002.