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Automatic Wheelchair Using Eye Blink Sensor

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Abstract – The market for a wheelchair is very wide as more than 600 million people who are suffering from some kind of disability or elderly people are in need of a wheelchair. Many from these people who are suffering from a disability have restricted body movements due to which they cannot use the traditional wheelchair. For people with moderate physical disabilities or long-term diseases as well as the elderly an alternative to a traditional wheelchair is a powered wheelchair, a mobility-aided device. In order to tackle different disabilities, there are many different ideas that have been developed for powered wheelchair control like head control, joystick control and sip-puff control. Still there are many remaining who cannot use the above mention methods for controlling a powered wheelchair. A possible alternative to this issue is the planned model. This model is an attempt is to make the lives of the disabled people more efficient and simpler, the motive is to make them self-sufficient which will build their confidence and boost their happiness. The planned model is an Eye Monitored System which allows the person to control the wheelchair's movements by eye blinks. This model can be spread over a large economy range as it is cost effective.

Keywords: Automatic Wheelchair, Eye Monitoring System.

1. INTRODUCTION

People suffering from disabilities are separated and do not get the same opportunities as the others from their own communities when their needs are not met due to their disability. There is a vast opportunity, by providing the wheelchairs for the purpose of their mobility it also helps them with a new perspective towards life and open up to a whole new world and opportunities. To follow on this the new steps to be taken are- the development of the

national policies, expand training opportunities in the design field, production and supply of wheelchairs.

Every single person to move freely is highly valued. So, to tackle this issue a suitable wheelchair which completely focuses on manual use and complete comfort of the user's choice. Due to any accident or disease which affects the nervous system often results in the loss of the ability to move their voluntary muscle. Locomotor organs like arms and legs, their movements can be risked if the suffer from paralysis, as the voluntary muscle is the main controller that enables to move the body. Electric wheelchairs are available for the use if any such incident occurs, they are controlled via a joystick but still there are many who can't use it due to their restricted hand movements.

Designing a electric wheelchair which can function and be controlled by the movement (blinking) of eyes. Infrared sensor mounted on transparent glasses which is used to monitor the eye blinking so the person can control the movements of the wheelchair according his will. The aim of the project is to design this electric wheelchair to make live simpler. A computer mounted on the electric chair will receive the data from IR-sensor and then processes captured data, of detecting and tracking movements (blink) of the user's eye and then it will send a command to DC motors accordingly and turning the electric wheelchair in the desired direction which was indicated by the user's eye.

In India out of the 1381.57 million population, 26.8 million persons are 'disabled which is 1.58% of the total population. 18.7 million people in rural areas and 8.1 million in urban areas. In the case of total population also, 69% are from rural areas while the remaining 31% lives in urban areas.



Fig.1 Hindrance of Wheelchair users during work

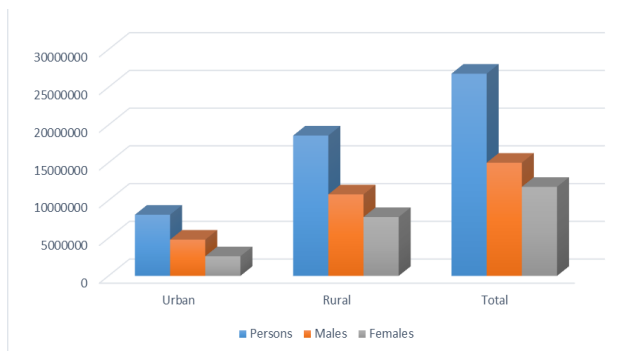


Fig.2 Percentage of disabled people in India (2016)

2. PROPOSED MODEL

Automatic Wheelchair system is basically based on mechanical and the electronic system. Nowadays, there are so many ways to make automatic wheelchair. The proposed system is based on Eye blinking process. In this project we are using IR Sensors to monitor eye blinking of user. There is sonar sensor also available in front part of wheelchair for obstacle detection. There is buzzer is also available for alerting user and people nearby wheelchair. We are using two 12v DC motors for locomotion of wheelchair using 24v power supply. All this process of controlling Wheelchair is done using Microcontroller AT Mega 328. There is LCD attached to the system which will show the name of project once while starting the system. We are using standard wheelchair which are commercially available as the main objective of this project is to provide a budget friendly Automated Wheelchair so everyone can take advantage of present technologies.

3. WORKING

The working process of the system as follow:

Initially user has to wear the eye glasses having 2 IR Sensor mounted on each side Then the power supply of 24v is given to the circuit using 2 batteries of 12v. The installation process will start as it will take 6 sec. There will be no movement for 6 seconds but after that wheelchair will start moving forward as we gave system a timer delay so the user can get in confront. The project name will be displayed on LCD screen attached to the circuit and starts moving forward. As the system starts first process will be obstacle detection using ultrasonic sensor. If there is any obstacle available in range of 100cm of the Wheelchair, it will immediately send the signal to microcontroller to activate the buzzer and the Wheelchair will not move anywhere. If there is no obstacle, no signals will be received by the microcontroller and it will go for next step. Simultaneously IR Sensors will start working The IR Sensor's transmitter will transmit the infrared rays into the user eyes. The receiver will pick up the reflected rays which are in straight line to transmitter. Depending on the output of the receiver, we get the info of whether the eye is closed or open. If the eye is closed the output is high and this output activated the corresponding pin in microcontroller which give signal to DC Motor on particular side to stop and move in anti-clock wise direction. If user wants to take a left turn, he/she have to close their left eye for 2 seconds and then left rear wheel will start moving into reversed direction and Wheelchair will turn left and vice-versa. By giving time delay of 2 sec. it is made sure that the normal blinking (12-15 times in a minute) of the user's eye won't affect the controlling and programming process. (Average blink time is 0.3 to 0.4seconds). It can rotate up to 360° on one wheel which makes it easier for user to take turn without any problem. If user wants to stop the wheelchair he/she have to remain their both eyes closed for 6 seconds.

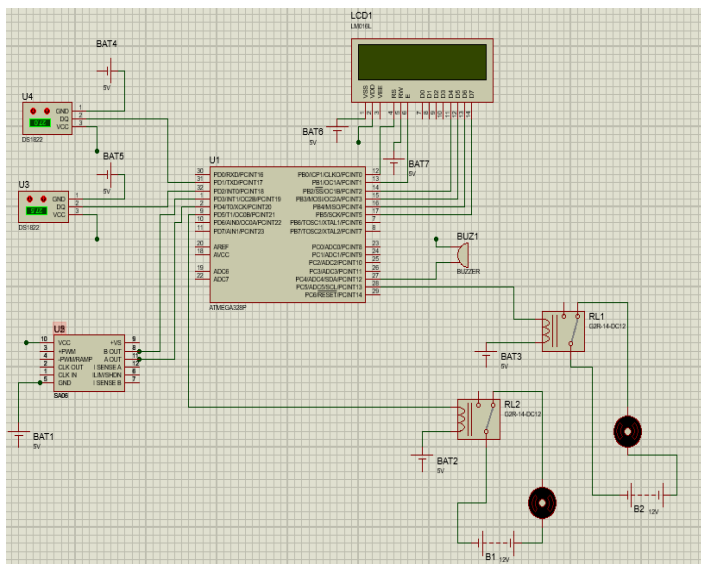


Fig. 3. CIRCUIT AND PIN DIAGRAM

4. SOFTWARE REQUIREMENT

1) PROGRAMMING LANGUAGES

: Embedded C

2) COMPILERS: Arduino IDE

3) Proteus software is used to simulate and test circuit.

4) Express PCB software is used to design PCB

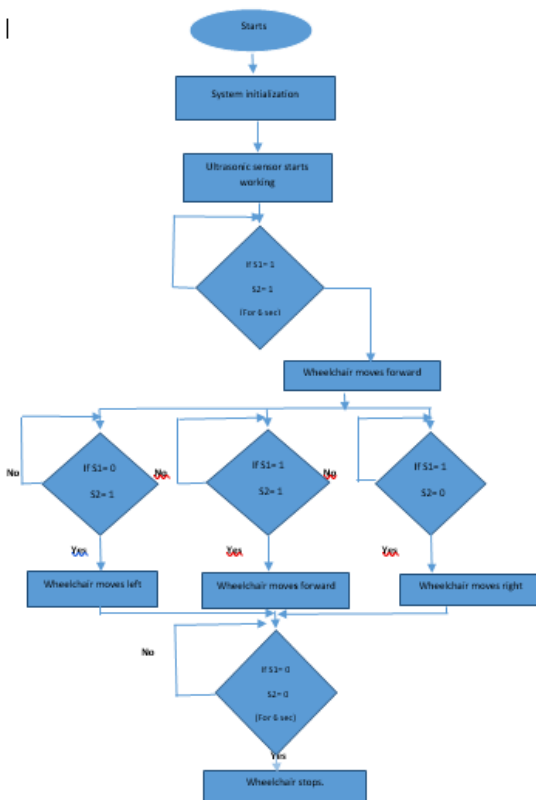


Fig.4 Flow Chart

S. No	Total no. of trails	Total no. of proper centre trails	Total no. of proper left trails	Total no. of proper right trails	Total no. of proper trails	Accuracy	Error
P1	30	10/10	9/10	9/10	18	93.3%	6.7%
P2	30	10/10	8/10	9/10	17	90%	10%
P3	30	10/10	9/10	10/10	19	96.6%	3.4%
P4	30	10/10	9/10	9/10	18	93.3%	6.7%

Fig.5 Trails and Error Data

5. APPLICATION

- Ability to mount himself/herself on this powered wheel chair.
- Height and the level of the seat can be maintained by the person himself.
- Maintain the speed of this powered wheel chair in accordance to the needs.
- Low cost, easy to operate and no need of extra power.

6. RESULT & DISSUSSSION

The proposed wheelchair model is designed, manufactured and tested and ready to use. This wheelchair is tested on outdoor (public road, footpaths) and built specifically for indoor use. DC motors are performing well while bearing up to 70 kgs limit. Batteries used in this project are sufficient to provide enough power supply to the motors and electric circuit. The eye tracking (blinking) device made using transparent glasses and IR sensors is performing well under testing procedure. If user follows the proper instructions, can have good experience using this wheelchair. The resulted accuracy of the tracking device is 90-95%. Is has been tested using 4 different persons.

7. CONCLUSION

Research on automatic Wheelchairs has done referring some research papers, newspaper, websites etc. The Standard Wheelchair is also studied to know its importance and new ways to use and express them in daily life. Development of this project can be example to make more budget friendly. Automatic Wheelchair in future. Some other features also can be added to perform multiple controlling tasks. Like a joystick can added and it will have two type of controlling procedure. This wheelchair is made using commercially available standard wheelchair. It comes with low price as compared to other Automatic controlled Wheelchair available in market.

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