

## AUTOMATED WHEELCHAIR FOR PHYSICALLY DISABLED PERSON

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**Abstract:** *This paper describes the significant design to build a voice-controlled based wheelchair. This project is intended to increase the ease of mobility for disabled/injured people. The design would allow these people to live more independently. Presently, people use blow-tubes or chin-joysticks to control motorized wheelchairs. Speech recognition is a prominent technology which can give an alternative to people to interact with machines or devices especially to those who are quadriplegics. We have resolved the disabled problems by implementing voice control interfacing, over a microphone, can be tracked by using sensor for interfacing to the wheelchair. In this project, the manual wheelchair has been modified so that it can be actuated by two DC motors. The motions of the wheelchair are then controlled by the verbal instructions of the user. The results show that the design is applicable and feasible. The speech processing and signal processing can be done in real-time and is therefore deemed a viable alternative to present methods of motorized wheelchair control. The design and the analysis of the project are presented in this report.*

**Keywords:** *Powered Wheelchair, Voice Recognition System, Restored Memory, DC Motors.*

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### I. INTRODUCTION

"World report on disability" (2011) jointly presented by World Health Organization (WHO) and World Bank says that there are 70 million people are handicapped in the world. Unfortunately due to road accidents as well as disease like paralysis day by day the number of handicapped people is going on increasing. Physically handicapped person is most among all the disabilities percentage. If a person is physically disabled he is depend on other person for his day to day work like travelling, food, interest etc. So a voice controlled wheel chair is developed which will perform operation automatically by taking commands from the physically handicapped user for movement purpose. The use of voice control wheelchair encourages the view of the machine as a partner rather than as a tool. Voice control wheelchair has the potential to provide these people with effectiveness to alleviate the impact of their drawbacks, by compensating for their specific impairments. In particular, robotics wheelchair may help in maneuvering a wheelchairs also planning motion. Emerging field of robotic applications is robots assistant also used recently.

### II. LITERATURE SURVEY

The problem for adults, not dependent mobility is an important aspect of self-esteem and plays a pivotal role in aging in place. For example, if older people find out it increasingly difficult to walk or wheel themselves to the washroom, they may do so less often or they may not drink more liquid so they reduce the urination frequency. If they not able to walk or move themselves to the washroom and help is regularly unavailable in the home when needed, a move to a more enabling environment (e.g., assisted living) may be necessary. The leading cause of the proposed system is limitation of movement. During Survey we come across some practical examples, similar to that of proposed system, based on voice commands. When trying to find appropriate solution we thought of developing a voice operated Wheelchair from a single application by using his wheelchair. To accommodate these people, many researchers give the concept of Voice Operated wheelchairs which have used technologies originally developed for mobile robots. A smart wheelchair typically consists of either a standard power robot to which a computer and a collection of sensors have been

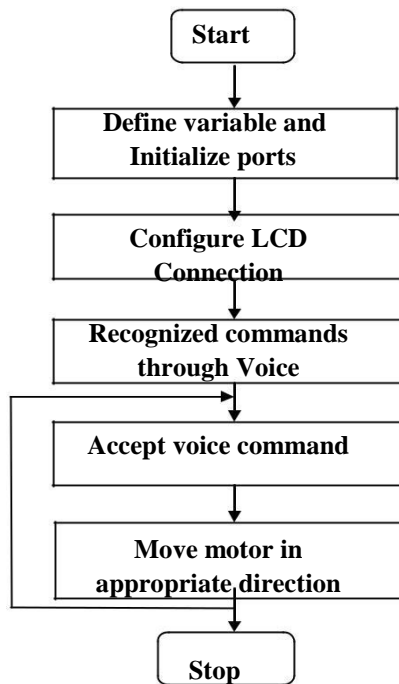
added or a mobile robotbase to which a seat has been joined to it. Elegant wheelchairs have been designed that provide navigation support to the user in a number of unique ways, such as ensuring accident-free travel, assisting the performance of particular tasks (e.g., passing through doorways), and autonomously transporting the user between locations.

### III. PROPOSED SYSTEM

To develop a system of improved facilities in the main aim of proposed system. The proposed system can overcome all the limitations of existing system. The proposed system will ensure that there is no need of any other human operator or care taker. The proposed system helps wheelchair to communicate with each other. This Communication is used to task know whether the task assigned to wheelchair is complete or not

### IV. WORKING

Here input is taken from voice recognition circuit with HM2007 voice recognition chip. This chip can recognized 20 words from a vocabulary which is 2-second long words. The vocabulary was stored on an external 8K SRAM. These recognized words are transfer to the Microcontroller 89s52 which controls the movement and direction of wheelchair. Microcontroller 89s52 decides the operation of the two DC motors depending on the recognized words received. L293D is a dual H-bridge driver IC which is used for driving purpose of DC motors. These recognized words are transferred to the wheelchair using electrical signals which are used the drive the left or right motor of the wheelchair. Four wheels are used in the wheelchair for perfect balancing. The movement of wheels is monitored by DC motors which are attached to the wheelchair. Two wheels placed on left side of the wheelchair are controlled by one motor and likewise the wheels on the right side are controlled by the second motor. The other circuitry built into the wheelchair includes the transmitter and receiver circuits and the obstacle detection circuit and Flowchart is as shown in Fig.1.



**Fig.1. Basic Flowchart.**

Two Proximity sensors are used for obstacle detection, one sensor use to detect obstacle that appears in front of wheelchair and second is used to detect down stair obstacle which means if downstairs appear in path of chair sensor will detect the it as obstacle. It involves two IR signal emitters which emit IR signals

continuously when some obstacle appears in front of the wheelchair, these IR signals are obstructed, and returned back. These returned signals are then noticed by the IR sensor present just at the side of the emitters. As the IR signals are noticed, a circuit is attached to the buzzer, and the buzzer beeps. At that time, signal is send back to the voice recognition system so as to stop the wheelchair. The wheelchair directions and movement possible are as given below.

**Left:** Left motor stopped and right motor is activated and move in forward direction.

**Right:** Right motor stopped and left motor is activated and move in forward direction.

**Stop:** Both motors are stopped.

### V. OBJECTIVE

With the discussion in the preceding sections we are now well versed with the problems faced by the physically impaired, and the illiterate while commuting using the existing wheelchair. The project aims to find potential solution to the above discussed problems. The proposed solution involves the development of a device which allows the

physically impaired to move independently. On completion of this project, the physically impaired will be able to use our wheelchair with the same ease, convenience and safety. Such a system would directly influence their quality of

life by providing the freedom to travel independently. All in all, this project would be of great benefit to users of all categories. The project can be similarly implemented in other places like hospitals, airport, organizations, railway station, metro etc. with provision being made such that whenever any obstacle will be sensed wheel chair will stop at its own so that accidents can be avoided.

## VI. WHEELCHAIR SYSTEM DESIGN AND HARDWARE IMPLEMENTATION

### A. System Architecture

Implementation of this proposed system mainly involves steps. They are voice recognition controlling direction of wheelchair using microcontroller based on the received voice commands by making use of motors. These DC motors will be driven by microcontroller the user gives voice commands as input in order to drive the wheelchair to the required position. Mic(Condensed Mic) which converts the voice signal to the electric signal and the signal is given to the voice recognition module. The voice recognition module converts the analog signal into digital signal and the signal is transferred to the microcontroller. The microcontroller will take the decision to move forward or backward or left or right with help of relay switching unit. The block diagram of the system is shown above fig.2.

**Forward:** Both motors are in forward direction.

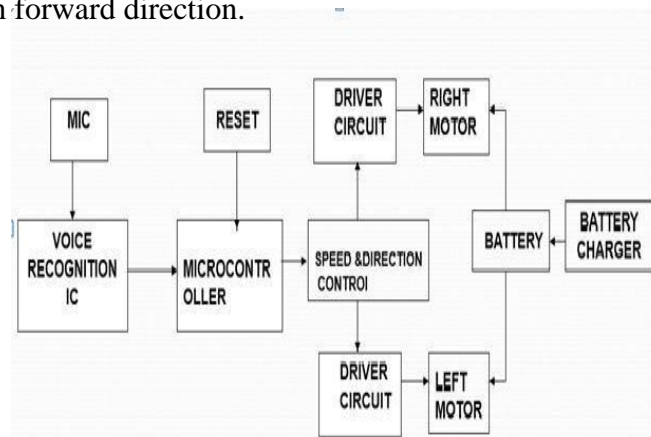
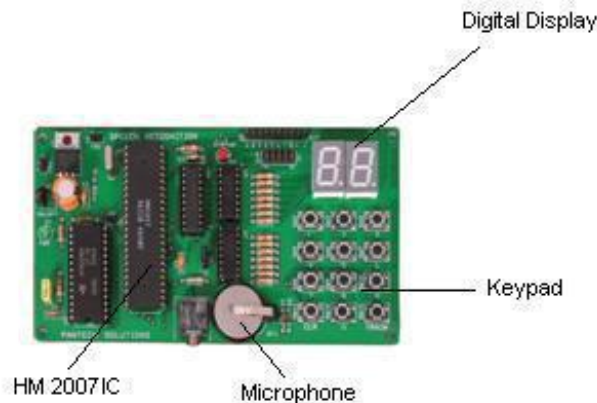


FIG.2. SYSTEM ARCHITECTURE.

**B. HM2007 (Vice Recognition Kit)****Fig.3. HM2007 (Voice Recognition Kit).****C. Infrared Proximity Sensor**

program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer.

The AT89S52 provides the following standard features: 8K Bytes of In-System Programmable (ISP) Flash Memory, 256x8-bit reflections are monitored. When sensor senses reflections it means that near by there's an object.

**D. DC Motor**

Two DC motors are used to move the wheelchair in different direction such as Forward, Reverse, Left, and Right. Microcontroller is used to control these motors. L293D is a dual bridge driver IC is used for driving the DC motors.

**E. L293D (Driver IC)**

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which is used to control a set of two DC motors concurrently in any direction. It means that with a single L293D IC you can control two DC motor. L293D is dual H-bridge Motor Driver integrated circuit (IC). The L293D can drive small and quiet big motors as well, check the Voltage. It Hm2007 is a single chip CMOS voice recognition circuit works on the concept of H-bridge. H-bridge is a circuit which with the analog front end is on-chip, analysis of voice, permits the voltage to be flown in either direction. To rotate recognition process and system control functions as shown in the motor in clockwise or anticlockwise direction voltage Fig.3. Up to 20 word vocabulary of duration two second each. need to change its direction. Therefore H-bridge IC are Voice recognition system can be consists of exterior perfect for driving DC motor. In a single L293D chip there microphone, keyboard, 64K SRAM memory integrate with the two H-Bridge circuit inside the IC which can rotate two dc micro-processor. The speech recognition system is a totally motor independently. assembled system and it is easy to use programmable speech

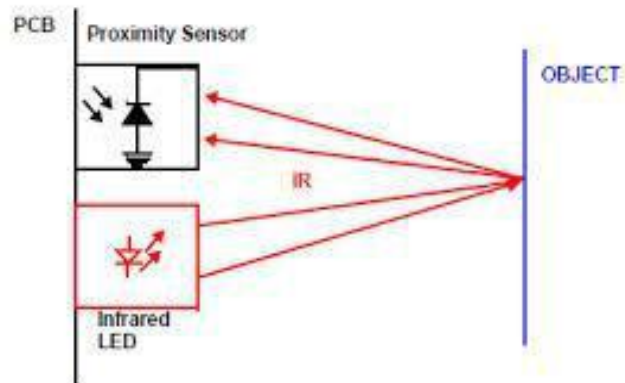
**F. Microcontroller 89s52**

recognition circuit. Programmable, means that you train the words (or vocal utterances) you wish the circuit to recognize. The AT89S52 is a low-power, high-performance CMOS This board permits you to

experiment with many side of 8-bit microcontroller with 8K bytes of in-system speech recognition technology. It contain 8 bit data out which programmable Flash memory. The device is produce using can be interfaced with the microcontroller for monitor the Atmel's high-density non-erasable memory technology and is motor direction. well matched with the industry-standard 80C51 instruction set and pin out. The on-chip Flash memory permit the Internal RAM, 32 I/O lines, Fast Programming Time, two data pointers, three timer/counters of 16-bit, a Full Duplex UART Serial Channel, on-chip oscillator, and its speed should be high.

## G. Power Supply

Most digital IC's including memory IC's operate on a 5v power supply is required. The 5v supply voltages are obtained from 9V transformer. To converts the sinusoidal input into the full wave rectified output the output of the secondary is applied to the bridge. rectifier is changed to the peak value of the rectified output Proximity switches open or close an electrical circuit voltage. Since the diodes are not forward biased during the entire positive and negative half-cycle of the input waveform, when they make contact with or come within acertain distance of an object as shown in Fig.4. Proximity sensor is a the pulsating dc is a voltage across the filter capacitor. So the pulsating DC is a combination of DC and voltage. From the device which detects objects nearby without any physical pulsating dc voltage, a regulated dc voltage is obtained by a contact up to nominal range or sensor's area. In detail we can regulator IC. also say that Sensors which translates information on the movement or presence of an object into an electrical signal are called proximity sensors.



**Fig.4. Infrared Proximity Sensor**

## VII. RESULT AND DISCUSSION

In this there's one more term After the design and development of the wheel chair with you need to learn and that is sensing object – the object being respective interfacing circuits, the technology was examined sensed is defined as sensing object. When anything comes in for the movement of the wheelchair using trained voice. This the range of Proximity sensor it flash out infrared beam and design is experimented found on two important aspects firstly, on the correctness of the system and secondly, wheelchair velocity control by means of on & off control of commands. This proposed design was implemented with the facilities help of normal people. This would be implemented for such that by using voice commands speed



can be varied. The handicapped people after having the smoothly enhance design much of the wheel chair. Only advancement in this wheel chair are possible by decreasing the power requirements of the wheel chair or finding a way to automatically charge the battery with the help of motion the wheel chair or solar panel.. Also we will provide system under consideration provides a cheaper and not more reliable alternative to the existing wheelchair in India but across the world.

After the design and development of the wheel chair with respective interfacing circuits, the technology was examined for the movement of the wheelchair using trained voice. This design is experimented found on two important aspects, firstly, on the correctness of the system and secondly, wheelchair velocity control by means of on & off control commands. This proposed design was implemented with the help of normal people. This would be implemented for handicapped people after having the smoothly enhance design of the wheel chair.

### A. Accuracy Of Wheelchair

Chair This experiment was conducted in a room which is in silent condition to observe the result of the experiment. The goal of the experiment is to find the correctness of the wheel chair in response to the speech (voice) in various situations.

**TABLE I: Accuracy Of Wheelchair In Noisy And Silent Area**

Voice command	(a) Result in silent area					(b) Result in noisy area						
	Experiment Trials					Total Response	Experiment Trials					Total Response
	1	2	3	4	5		1	2	3	4	5	
Reverse	1	1	1	1	1	5	1	1	1	1	0	4
Forward	1	0	1	1	1	4	1	1	1	0	0	3
Right	1	1	0	1	1	4	1	1	0	0	0	2
Left	1	1	1	1	1	5	1	1	0	1	0	3
Stop	1	0	1	1	1	4	0	1	1	0	1	3

This experiment was conducted in a room which is in silent condition to observe the result of the experiment. The use of the experiment is to find out the accuracy of the wheel chair in response to the speech (voice) in different conditions.

**Condition 1:** silent place Five trials of experiments were done with the new design based on the commands listed in table there are 4 over 5 commands were recognized by the speech recognition circuit to move the wheel chair. The percentage of the correctness of the wheel chair in silent condition is 80% (Accuracy = 4/5 X100%= 80%).

**Condition 2:** noisy area the testing is done outside the silent room where it is considered as natural environment. From this experiment, the output is obtained as per the Table 1. From the table, there are 3 over 5 commands recognized by the trained speech recognition circuit. The percentage of the accuracy of speech Recognition circuit in noisy area is 60%. This is calculated as, Accuracy = 3/5 X100 = 60%.

### VIII. CONCLUSION

Speech can be one of the desirable interface means for wheelchairs. When this project used by handicapped person, he will be more comfortable, and independent in his life. There is possibility to run the chair at different speeds and choose between joystick and voice control methods. With the implementation of low cost and flexibility in design, this project can reduce the mechanical force required by physically impaired. This project demonstrates how voice recognition along with joystick can make their life simpler without causing any ill effect or affecting other devices. There are many of such examples showing how embedded system makes our life simpler and tension free.

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