# Hand Gesture Controlled Wheelchair

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***ABSTRACT-*** ***This paper is to develop a wheel chair control which is useful to the physically disabled person with his hand movement or his hand gesture recognition using Arduino technology,today's world becomes fast, everyone is very busy & there are few peoples to take care of these peoples properly. The aim of our proposed work is to prepare a Hand Gesture Controlled Wheelchair for the physically challenged people who faces many difficulty in moving from one place to another in daily life. The goal of this project is to create a wheelchair control that makes use of MEMS (micro-electromechanical system). technology to recognise hand gestures or movements for the benefit of those who are physically impaired. One of the most important milestones towards the inclusion of people with severe physical disabilities is the adoption of powered wheelchairs with advanced navigational capabilities. People with arm or hand disabilities find it challenging to operate a wheelchair in residential settings. The wheel chair was created to solve the aforementioned issue, allowing end users to simply move safely and complete several crucial everyday duties.***

***In order to help people with physical disabilities, this project aims to develop a wheelchair control that uses MEMS technology to recognise hand gestures or movements***

## 1.Introduction

Human life is changing rapidly in the 21st century. Consequently, everyone is behind the innovation of technology. Normal people can easily fall behind technology in this mode of life, but what about the most physically and mentally disabled members of our society? Because everyone in the world is busy doing his or her job, mobility of disabled and older people is dependent on others. Consequently, there are not many people who take good care of these people. We are considering designing automatic wheelchairs to meet their needs and increase their mobility to provide them within dependence. Almost 650 million people worldwide, or 10% of the world's population, currently have some form of physical disability. We made a hand-controlled wheelchair to help them relax by responding to their hand gestures. Wireless wheelchairs have a range of 200 yards. This means that wheelchair users can control vehicles from 200 yards away. No matter the weather, he can call his chair from the seat he is sitting in. Moving from room to room is always difficult for people with disabilities, and even then, they need help from someone else to push the wheelchair and move from one place to another. A person with a disability is now independent and does not need anyone's help to move his wheelchair because he is able to use a hand gesture control wheelchair. Persons with disabilities depend on themselves because they can only move their hands from one place to another without the help of others. The automation is not the only luxury feature of the wheelchair. It must be beneficial to all ordinary people. Consequently, the key goal is how we can reduce the physical strength that ageing consumes individuals and people with disabilities in operating a wheelchair. Many of these people have their own wheelchairs, but they cannot afford to automate. Currently available automatic wheelchairs are more expensive than our designed wheelchairs.

## 2. Literature Survey

When an unfortunate event affects the motor capacity of a person, it's necessary to use bias like wheelchairs that offer a means of relegation for cases with motor problems in the lower branches. Tremendous hops have been made in the field of wheelchair technology. still, indeed these significant advances have ‟ t been

suitable to help quadriplegics navigate wheelchairs unassisted. Some cases that can not manipulate the wheelchair with their arms due to a lack of force or psychomotor problems in the superior members, request electric wheelchairs, constantly manipulated with joysticks; still joystick manipulation is indeed not practical and constantly must be handled with the mouth. The present composition presents the partial results of the development of a wheelchair controlled by an intuitive interface, where the instructions are given by hand gesture instructions. The advances are presented in the consummation of the control software using a Webcam and some distance and presence detectors controlled by a snap microcontroller that establishes the communication with a program developed in Lab view. This paper is inspired by an IEEE Research Paper named "A Wearable Head-Mounted Sensor Based Apparatus for Eye Tracking Applications " that was presented at the IEEE International Conference on Virtual surroundings, mortal- Computer Interfaces, and Measurement Systems Istanbul, Turkey, dated 14- 16 July 2008. The below paper's approach was dealing with wheelchair control using eyeball movement with slight variations to it. Our paper deals with the control of wheelchair stir by hand gestures.

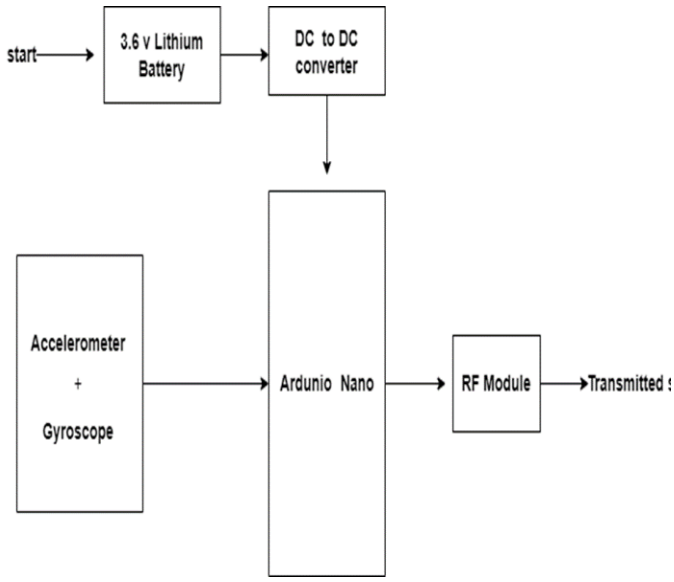


Figure. Flow Chart of Hand controlled wheelchair

This project was developed with the intention of making it possible for people with physical disabilities to navigate and move about their homes without assistance. The project's current structure calls for using hand gestures as orders to control the wheelchair. The RF receiver transmitter module can be used to implement the approach wirelessly, as we have done in this module. At the moment, a microprocessor controls the wheelchair's movement (Arduino Open SourcePrototyping Platform). The handgesture method is used to operate the complete system, as shown in the block diagram.

## 3.Working principal

- An ADXL335 accelerometer is utilised as a sensor in this hand gesture controlled wheelchair. It will produce an analogue signal when moved in the X, Y, and Z axes, respectively. The analogue signal is compared to the digital signal using an operational amplifier. The signal is wirelessly sent using a 434 Mhz radio frequency transmitter. To prevent interference from other devices, the data is encoded with an encoder IC HT12E before being sent. Fig. 1: Image of word taken from IAM Dataset.
- The wheelchair is made up of two major components: a transmitter that is attached to the user's hand and a receiver that is positioned within the chair.Both of them are wireless modules. Each unit consists of a pair of RF modules that are used to transmit and receive signals, respectively. As soon as the person modifies their wrist motion, the chair will move.
- For powering the circuit in this design, a 3.6V rechargeable lithium battery was employed. In the circuit, a DC to DC Converter is used. The variable power supply is converted by the. battery to an Arduino Nano powered by a steady 5V supply.The RF Module then delivers the signal to its pair that is wired into the receiver circuit after receiving the signal from the Arduino Nano. The emitted signal from the transmitter circuit's RF module is received by its pair in the receiver circuit, as shown in Fig. The Arduino Uno receives the signal and is sent by it.

- The circuit includes a 12V power supply. The rechargeable battery is utilised for that. Ultimately, the relays linked to the circuit by the Arduino Uno transfer the signals obtained from the RF Module & Ultrasonic Sensor, and the chair operates as a result. On the circuit, there are 4 relays in use. There are two relays utilised for each motor. Our wheelchair moves left, right, forward, and backward in accordance with this. battery to an Arduino Nano powered by a steady 5V supply.The user can control the wheelchair from anywhere within the range of the transmitter, which has a range of up to 50 metres. When a person is accompanied by a companion and is unable to control the wheelchair on his own, the companion can do so by imitating the person's gesture.

## 4.FUNCTIONALITY OF THE PROJECT

The essence of this corporate effort is that the sensor is able to recognize tilt and use the accelerometer to alter the trajectory of the wheelchair based on the tilt. When tilting to correct right side, the wheelchair moves to the right or when tilting to the other side, the wheelchair moves to the left. The development of the wheelchair can be controlled in the forward, backward, left and right directions as in the table.

| Hand Gesture | Input From Arduino | | | | Direction |
|---|---|---|---|---|---|
| | D1 | D2 | D3 | D4 | |
| Stable $0^0$ | 0 | 0 | 0 | 0 | No Movement |
| Bend To Right $45^0$ | 0 | 0 | 0 | 1 | Right Movement |
| Bend To Left $45^0$ | 0 | 0 | 1 | 0 | Left Movement |
| Bend To Backward $45^0$ | 1 | 0 | 0 | 0 | Reverse Movement |
| Bend To Forward $45^0$ | 0 | 1 | 0 | 0 | Forward Movement |

Table 1. Algorithm setting for wheelchair direction

In order for the wheelchair to stop at that location using its built-in braking system and to emit a beeping sound using its buzzer, the proximity sensor must detect any obstructions or other undesirable objects that abruptly move in front of the wheelchair. The chair will allow all other motions, but won't let that one until the object is free from that position.

The buzzer's other function is to alert the user that the circuit is on by beeping when it is switched on.

Near the user's hand, a switch is provided in the wheelchair so that they can turn the circuit on or off as needed. Also, the wheelchair comes with a toolbox where the disabled person's personal items can be stored, such as first aid supplies, gloves, and medications.

## Review and Discussions

After integration, all the parts provide us the wheelchair's functional skeletal model. According to the hand movements, the wheelchair model operates flawlessly. The following table lists the reaction times of the various modules as observed after many test runs. The following formula is used to calculate the readings: Success Rate is calculated as (Total Trials * 100 * Successful Trials)

| SI.NO. | Parameter | Success Rate |
|---|---|---|
| 1 | Gesture changes | 97% |
| 2 | Distress Alert | 100% |
| 3 | Edge Detection & Avoiding | 100% |
| 4 | Obstracle Deteraction | 97% |

Table 2: success rate comparision of the various features of the wheelchair

Together with that, we also see that the wireless module's indoor communication spans a distance of several metres. The developed approach works completely without any wires or limits, as opposed to the constrained requirement of the person to be on the wheelchair the entire time to control it [1] [2] [6] [7]. The distance from the wheelchair that can be cleared of obstructions is restricted to a maximum of 15 cm. If a wheelchair is seen, it will

turn away from the obstruction, but it will still be back in the lead. It has been shown that proximity sensors last for a maximum of 200–250 degrees.

**Conclusion**

We suggest a wheelchair control system based on hand gestures to assist wheelchair users who engage in hand-eye coordination tasks, such as driving the wheelchair simultaneously. An original prototype that used four motion commands determined by the position of the hand and was operated by one hand's deliberate motions was used to test the viability of the suggested method.
With the help of various preliminary studies, the gesture recognition system's effectiveness.
performance evaluations. We gained fresh practical knowledge and design concepts from the experiments.
We plan to use a variety of experimental scenarios to further investigate the system's applicability. This project's long-term objective is to develop a new system based on the detection of movement in both arms as well as to offer specific features for further applications.

**Future Scope**

Instead of using acceleration motion, we can move an automated wheel chair by using a wireless remote.We can also use voice command ICs to interface our voice signal with a micro-controller.This system can be extended by including GSM, which sends an SMS during an emergency.Research is currently being done on the development of handicap wheel chairs using the human nervous system.

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