

# Smart Wheel Chair

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**Abstract:** The propose wheelchair project have safety features. The system utilizes microcontroller along with Blynk server, and motorized circuit in order to achieve this system. Our proposed system consists of a controller circuit and a wheelchair circuit. The controller circuit allows the user to provide direction commands to the wheelchair through a directional push button. The wheelchair circuit consists of a micro controller push button used to receive these commands and then operate the wheelchair motors in order to achieve desired movement. This allows the disabled person the operate the wheelchair easily as well as another person can operate the wheelchair. Also the system consists of emergency help features for the disabled. If the person is in trouble or needs help the person just needs to press a button and his GPS coordinates are sent to his/her loved ones through blynk message. Also if the person falls from wheelchair or is unable to press the button, the system automatically sends the GPS coordinates through blynk message to persons loved ones.

**Keywords:** Blynk server, GPS, Microcontroller.

## 1. Introduction

It is inevitable for any country to have people with disabilities or have trouble with standing up, especially arthritis patients. The most common used devices for disabled people are wheelchairs. What's more, the life quality of disabled people and patients has caught attention by society. Modernized wheelchair has become a popular engineering challenge for decades. We aimed to design a new mechanical system in wheelchair to help people stand up, this mechanism should be safer, simpler in structure, less power consuming and more economic. The standing wheelchair design may help people with disability to surge self-esteem; reach objects placed high, deliver speech on podium. By the way, it's boring for a person to sit for long time. And also it helps to monitor the health, to track the location, to control the state of wheelchair and to monitor the speed of the wheel chair. With the development of Swedish society, many people and organizations pay more attention to life quality of people with disabilities. Wheelchairs play irreplaceable role in aiding people for few decades. Therefore, the upgrade and refreshment of wheelchair function and mechanical structure will be a priority for community and welfare institution. Wheelchair has a variety range of styles in current market. Aluminium, steel and lightweight solid are the common materials in manufacturing. It can also be classified by functions: manually operable wheelchairs and Electrical

controlling wheelchairs. Nowadays, standing wheelchair is developed as a new kind of wheelchair. If the patient wants to reach a higher position or move from chair to bed, even deliver a speech at podium, he or she will be willing to form a standing up process. At this time, standing wheelchair will help him or her to accomplish this goal.

## 2. Literature survey

*Smart wheelchair control system using cloud-based mobile device*

Sanghyun Park (2013), Suggested that as the world feature phone moved to smart mobile features, a big change took place in the IT industry. A variety of products and services in conjunction with the smart mobile with new products and services are changing rapidly. Among these is a handicapped assistive wheelchair product in conjunction with smart mobile and other studies have been conducted. A lot of research including but not limited to voice recognition, gesture, iris recognition and wheel chair movement has been done. The wheelchair as an assistive device is not used by two but one person and so many technologies are constantly being researched with smart mobile to prevent the sudden accident and respond appropriately to it. In this paper, a wheelchair is developed to maintain equilibrium of a seat in conjunction with smart mobile device. Using smart mobile devices to control the wheelchair seat using the seat control system was to prevent the bedsores. In addition, studies in other smart mobile devices that use the same personalized service like cloud were applied on the research

A customized wheelchair control system to drive a structured system. Smart mobile devices are by default included with a Bluetooth module is commonly used, use Bluetooth. Smart mobile devices and controllers are connected by Bluetooth communication. Smart mobile devices use a touch screen, wheelchair automatic seat control settings and seat manual controls, and automatic control of the wheelchair seat and set the system time, the prevention of rape with the window, making it easier to move the wheelchair control can be applied. In addition, using the wheelchair state in real time, you can monitor the remaining battery charge. With the use of the android-based smart mobile device regardless of the screen size of mobile device anyone can control the system using Bluetooth

communication. Depending on the preference of different people, they can choose the size and type of smart mobile device.

Because the custom smart mobile device uses a cloud system, a variety of devices can use the custom system. Cloud system consists of the Hadoop-based. Smart mobile devices cloud systems 3G, LTE, WIFI receives data using. Data is stored in a cloud server anytime, anywhere there is an Internet connection if you can use a custom wheelchair control system. HDFS data by allowing users to save a lot of server problems or if you do not use the pre-born can be prevented Smart mobile devices when users log in, cloud server control related information from the seat, pressure ulcer prevention hours, emergency contact information brings. By using the cloud system or other equipment used to reinstall the app if you do not happen to reset.

The figure on the left of Figure 4 wheelchair seat X, Y - axis is in the direction of tilt. Under pressure ulcer prevention has been designed to set the time. The figure on the right in Figure 4 buttons to control wheelchair movement consists of under the direction buttons to adjust the speed of the wheelchair can be moved easily. The left side of the interface, the current wheelchair by allowing real-time monitoring of information in the event of a problem helps respond quickly. The remaining battery indication of a smart wheelchair through a mobile device is easy to see, do not use the battery is discharged allows one to prevent. In addition, using GPS in real time, check the current moving speed of the wheelchair can be. Interface support multi-point.

If the elderly or the disabled exactly one button is pressed, the control system does not work occasionally occur. This paper interfaces of smart mobile devices because it supports multi-point, and at the same time touch the problem was not recognized. Smart mobile devices use the specified protocol to control the wheelchair. Quick recognition and Hex format to the correct operation of the data was used. In this study, cloud-based mobile device uses a customized wheelchair control system. This system is not only Android based mobile devices, but developed to enable other devices any ready-to-use device. The smart mobile device used during the test is a 5-inch and 10.1-inch. Usually the elderly and persons with disabilities use a 5-inch smart device without a problem, but because people with severe disabilities develop discomfort by using the hand to click the buttons 10.1-inch device was used. As the device screen becomes bigger, the buttons also become wider thereby providing easy usage of the system. By applying the Klaus system, the elderly and disabilities app reinstalled or reset the device there was no problem. Also the same customized system has an advantage that it can be applied to other systems, and users are able to use it comfortably. Currently, the username and password through a customized wheelchair control system is provided, but in the future through biometrics we will be able to deliver the service that suits customized users. In addition, not only Android systems but a variety of mobile devices will be applied.

*Android phone controlled voice, gesture and touch screen operated smart wheelchair*

Shraddha Uddhav khadilkar (2015), made a research observing that "World report on disability" jointly presented by World Health Organization (WHO) and World Bank says that there are 70 million people are handicapped in the world. Unfortunately, day by day the number of handicapped people is going on increasing due to road accidents as well as disease like paralysis. Among all the disabilities percentage of physically handicapped person is most. If a person is handicapped he is dependent on other person for his day to day work like transport, food, orientation etc.

We know that at every second the population of World as well as India is increasing very rapidly. In India 120 million people are disabled out of which 41.32% are physically disable. The aim of the project is to use wheelchair automatically and operate by using voice and gesture control for moving forward, backward, left and right by smart phone. Quadriplegics and Multiple sclerosis patients have severe disabilities and cannot drive joystick operated traditional wheelchairs. Traditionally wheelchair have some limitations in content to flexibility, bulkiness and limited function A wheelchair is fitted with an obstacle sensor, temperature sensor, Gas sensor, smoke sensor, motor and smart phone to help driver to achieve some independent mobility.

By just tilting smart phone which is with the wheelchair user wheelchair can be moved in 4 directions. The obstacle sensor can help the rider control the wheelchair by talking over some of the responsibility for steering and avoiding objects until the user is able to handle the job. The approach allows the user to use human voice, gesture movement smart phone and synchronize the with the movement of wheelchair so that they can use it with comfort. The complexity is reduced by making use of smart phone so that size of the system is very compact. The wheelchair integrated with voice, gesture movements and smart phone. So handicapped person who cannot walk, can drive chair by gesture movements using smart phone. Taking advantage of technological evolution in order to increase the quality of life for handicap people and facilitate their integration into the working worlds.

In order to guide a wheelchair various situations can be distinguished. If the user is capable of controlling by voice the ideal solution is use of voice recognition through android phone otherwise by using gesture recognition through android phone. The next part is by using temperature smoke, gas, sensors the parameter value is detected. There is facility of panic button in case of any emergency with the wheelchair user so he / she may call /SMS to the police, relative, hospitals by using the panic button as well as the buzzer will blow. Another facility is by using Android phone the blind user can read SMS, e-mail.

In this project AVR microcontroller and Bluetooth module are communicating over UART 9600bps. The module comes in SMD package and works on 3.3V power supply. In this profile the data send and receive to module directly comes on the RX

pin of microcontroller. It becomes really easy to make your device Bluetooth compatible. HC-05 has only 4 pins: 5V, GND, TX and RX. The 5V pin and the GND pin are used for power and the TX and RX pin implement a serial interface. The TX pin is used by the module to send information and the RX pin is used to receive information. To test the module, I first connected it to my Laptop. This makes it easier to see whether the module is receiving characters or not. By simply using a terminal program like Hyper terminal to visualize what the module is sending from its serial interface.

#### *Solar powered touch screen wheelchair*

According to census, between 2001 and 2011 the disabled population of country is increased by 22.4%. In 2011, the count of disabled people is 2.68 crore and in 2001 it was 2.19 crore. There is 1.5 crore are males and 1.18 crore are females. The population of disabled person is increasing due to various reasons as road accidents, natural disasters, earthquake etc. There should be some machine that could provide locomotion to this people.

A wheelchair is a mobility device designed for shifting patients, moving physically challenged people from one place to another with the aid of another person or by means of self-driving. In this project, the movements of the wheelchair are controlled with the aid of an Android application. This project describes a wheelchair which can be controlled only by using the android application. The main purpose of this project is to smooth the progress of the movement of the disabled people and aged people who cannot move properly, so with this we can enable them to lead better lives without any problem. This project includes two parts which is software and hardware. Ultrasonic sensor is used to sense the hurdles in the path. In this project, Bluetooth module is used as controller to command over the movement of wheelchair. The five operation performed by wheelchair for the movement.

The five operations done by wheelchair Moving Forward, Moving Backward, Turning Left, Turning Right, Stop. An android application is to be developed for this purpose. The signal from android mobile is given to the microcontroller through Bluetooth module, which takes actions as a form of output. If the user selects the front direction, then both the motors are made to move in the same track and with same speed. Similarly, is for the reverse direction. If the driver wants to move in the left/right direction, then polarity of both the motors are reversed correspondingly.

#### *1) Solar panel*

Solar panels are used to collect energy required for wheelchair. The solar panel is charged through the sunlight which produces solar electricity which is stored in a battery and used by motor as per the requirement. The solar panel consists of solar cells. The amount of power output of a solar cell depends on solar cell efficiency and solar cell area.

#### *2) DC motor*

The prime mover to be used in this solar operated wheelchair is a permanent magnet D.C. motor. The main motto for using

that motor is highly efficient and the flux density does not decrease with time. Its performance characteristics suite very well to the requirement of our solar operated wheelchair. A motor controller converts DC to AC. Advantages of PMDC motors have long life span, little or no maintenance, and high efficiency.

#### *3) Battery*

The charging voltage must be higher than the battery voltage or at least equal for charging the battery. As per the motor power requirement, a 12 V- 80 A-hr. Lead acid battery is very much feasible for the solar wheelchair. "Trickle better for any battery charging; it increases battery life and decreases electricity pilferage. The battery is charged by using charge controller at around 16.2 volts and 6 amps. A full day of sunlight (6 hours) will charge it fully if it's not fully discharged when hooked up. The working of the project takes place in the following manner. On body we fixed seat, battery support and panel supporting rods. For solar panel, battery and seat support we used angular rods. Total weight of the loaded solar operated wheelchair is 15 kg. The factors to be considered for design of wheelchair safety, stability, reliability, control, comforts etc.

Conversely, the general consideration for design of the solar operated wheelchair are: simplicity, strength, stability, safety, corrosion and wear, size, weight, flexibility, ease of run, modularity, efficient extraction of solar energy, effective use of solar energy and energy storage. The solar panel is placed on the top of the wheelchair, which converts the solar energy to electrical energy, is connected to the battery in order to charge it with the aid of a charge controller. The charge controller converts the pulsating flow of electric charge into constant flow of electric charge which can be supplied to the battery to charge it. The battery supplies the required amount of power to the DC motor. This project elaborates the software simulation of solar power-driven Touch Screen Wheelchair by means of Bluetooth Module. The circuit works properly to move as the command given by the user. The detection of some obstacle is successfully controlled by the ultrasonic sensor. This proposed system contributes to the self-dependency of differently disabled and older people. This paper discusses the Bluetooth technology, power electronics and design facilitated in the making of an easily operated, light weighted and relatively cheap vehicle with reduced manual effort and travel time. Our project would benefit 2.1 million handicapped all across the country.

#### *Wireless head gesture controlled wheel chair*

Old citizens or disabled persons become dependent on other members of the family to navigate through their habitat or within residence. A smart wheel chair can be a useful assistant for them. Recent development in the field of robotics, automation, embedded system, artificial intelligence etc. can be combinedly utilized to design such a wheel chair. It can be controlled wirelessly adopting proper communication system. The chair can be controlled by head gesture as well as hand gesture method with directions as needed. The previous

development of this kind of wheel chair is using a laptop or PC on the wheel chair [1]. By this development the recent wheel chairs are gesture controlled or voice controlled [2]. But the limitations of this kind of technologies is that the wheel chair is getting too bulky and it is to be controlled only by sitting on it. That's why these types of wheel chairs are not giving satisfactory feedback from the users. The proposed model makes the wheel chair a lot easier to assemble and simple in the use, in addition the cost of manufacturing also gets reduced. This developed structure of wheelchair is so designed that a physically unable person can do their habitat and move around their house without any help of others. Our proposed wheelchair is so designed that it can be easily controlled by the head gesture command. The most attractive feature of this wheelchair is that it can be wirelessly controlled as we have done in this module using the RF receiver transmitter module. The controlling technique of this device is performed by microcontroller (Arduino Open Source Prototyping Platform). Layout reveals actual working of all components. Basically, this layout shapes the idea of overall working system. The layout shows that by shaking the head in a required direction accelerometer gets a specific value which is sent to the microcontroller. Then the microcontroller processes the data and send an information through RF-TX. This information is received by the RF-RX and then send to the microcontroller. Then the microcontroller processes the data and as preprogrammed it changes the directions of the wheel by changing the direction of motor. Here the transmitter block diagram represents the working procedure of the transmitter circuit. First an information is got for different head movement which is the data of the accelerometer. This data is sent to the microcontroller to take a decision as preprogrammed. Then the required instruction is sent as a data by the RF transmitter.

Here the transmitter represents the working procedure of the transmitter circuit. First an information is got for different head movement which is the data of the accelerometer. This data is sent to the microcontroller to take a decision as preprogrammed. Then the required instruction is sent as a data by the RF transmitter. The data which is sent by the transmitter section is received by the RF receiver and send to the microcontroller. The microcontroller then takes the decision as it is preprogrammed to control the motor as well as the direction of the wheelchair. Motor 1 and Motor 2 are introduced to clarify the direction changing strategy. The transmitter and the receiver circuit I is fabricated in the lab. All the required components are available in the local market. Printed circuit boards are fabricated and all the collected components are mounted on the board. The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK). Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through

larger distances making it suitable for long range applications. The proposed head gesture based smart wheel chair is tested in the laboratory and shows satisfactory results. All the parts and required electronic components including sensors, trans-receiver, microcontroller etc., are collected from the local market at considerable low price, which makes the device cost effective, compared to the cost of similar imported wheel chair. Wireless connection between the transmitter, fitted on the head (cap) and the receiver makes its use very simple and comfortable. Commercial production of the presented wheel chair could be a good replacement of imported one and could be a great help to the disabled patients in our country.

### 3. Conclusion

This paper presents the smart wheel chair that can be overcome the disabilities of the people having disability to shift from standing position to sitting position or from sitting position to standing position. That can improve the health and the advantages are given and the health of the person using the wheel chair can also be monitor and the location of the wheel chair can be get if the wheel chair fall down.

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