



## **A Review Paper on Solar Power Motorized Wheelchair**

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### **ABSTRACT**

As per the census 2011 (2016 updated) disabled population of India particularly physically disabled the count is 54,36,826 Which is huge and continuously increasing other than medical treatment these people are dependent on the wheelchair for their movement. But the old generation manual wheelchair is dragged by the other person not by the disabled person. With the help of an automatic wheelchair the disabled person can move the wheelchair without the help of others. However, car chairs require energy, fossil fuel use continues to decline, and demand remains high, so alternatives need to be found from renewable resources. People are transforming renewable energy sources to suit their needs. Since solar energy is one of the free and abundant sources of energy, using solar energy to automate wheelchairs can reduce the total cost and eco-friendly nature of fuel and set limits to the world of automation. Increase. This article "Solar Electric Wheelchair" details its structure, working principles and components used, and all project work is carried out in Nagpur. In today's world, there are many people with disabilities who find it difficult to move or perform daily activities. This type of person relies primarily on the help of others. However, you can be independent and carry out your daily activities independently with the help of assistive devices. The most common assistive device is a wheelchair. A wheelchair is basically a chair with wheels that helps people who cannot walk due to illness, disability, or injury. However, there are many disabled people with weak limbs and joints who cannot move their wheelchairs. Therefore, smart wheelchairs can bring many benefits to them and everyone in society. A smart wheelchair is a motorized wheelchair with many additional components such as computers and sensors that help wheelchair users and staffs operates the wheelchair easily and efficiently. Recent developments in artificial intelligence, sensor technology and robotics have contributed to the growth of wheelchairs with new features. This paper aims to review the latest technology in smart wheelchairs and discuss future research in this area..

**Key words:** smart wheelchair, geared motor, solar PV panel, arduino uno, lead acid battery, voltage regulator, motor controller

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### **INTRODUCTION**

Disability is one of the disorders that takes a long time to heal. Perhaps months, years, and sometimes the disability is permanent. Therefore, there are big doubts about the movement of these disabled people. This is because a person's daily work needs to be moved from one place to another due to lack of skills. Wheelchair help is needed to unknowingly move these disabled people, but manual wheelchairs are designed to be pulled by people with disabilities, so they are manually wheelchairs for people with disabilities. You need to take advantage of the movement of. This disadvantage can be ended with the introduction of car chairs. As horizontal technology increases day by day, the whole world is moving towards

automation. A wide range of wheelchairs that support motion control, gesture control, Bluetooth control, etc. are continuously on the market. Most wheelchairs require either AC power or fossil fuels (for wheelchairs for internal combustion engines) to charge the battery. This shortcoming can also be eliminated by using renewable energy sources, or solar energy, to power the electricity supply. Solar energy is one of the most important sources of energy and is abundant and free. Our project “Solar Powered Wheelchair” is based on the Automatic wheelchair which is driven by the DC motors and it gets the power generated by the Solar Panel. The Automation involves the movement of the wheelchair forward, backward, right, and left with the help of Joystick which is connected to the PCB circuit board. The whole wheelchair works on the 12 volt DC supply to the motors through the relay circuit. This paper gives an idea about the construction, working and component used in the Automatic Wheelchair and supplying energy to this Wheelchair through solar energy (solar panel) which ultimately reduces fuel cost and creates the whole wheelchair ecofriendly. A motorized wheelchair or electric powered wheelchair is a wheelchair that is propelled by means of an electric motor. Motorized wheelchairs are useful for those who are not able to impel a manual wheelchair or who may need to employ a wheelchair for distances or over terrain which would be strenuous in a manual wheelchair. They may also be used not just by people with conventional mobility, but also by people with cardiovascular and fatigue-based conditions. Electric wheelchairs have enhanced the quality of life for many people with physical disabilities through the mobility they afford. The most fundamental job of the chair is to take input from the user, usually in the form of a small joystick, and decipher that motion into power to the wheels to move the person in the preferred direction.

### PROPOSED MODEL

In below block diagram, we can see that the system consists of following major components

1. Solar panel
2. Rectified AC power supply
3. Battery
4. Charging controller
5. Direction control
6. Motor

In this system, power is supplied from the battery through the solar panel and through the charging controller, which limits the overcharging of the battery. It is also possible to charge the battery from a rectified AC power source. Then power flows from the battery to the directional controller. Directional controllers include diodes, rectifiers, capacitors, microcontrollers, and relays that direct the movement of the wheelchair. Finally, there is the placement of the DC motor with the gearbox assembly or the smooth motion the front motor is for LEFT and RIGHT direction and the rear motor is for FORWARD and BACKWARD direction.

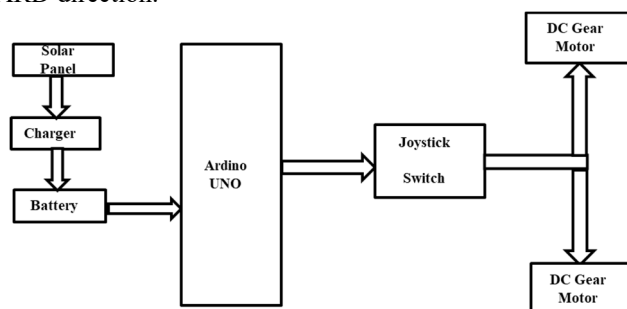


Fig. 1 Block Diagram

### CONSTRUCTION & WORKING

The “Solar Powered Wheelchair” has a metallic chair fabricated on the metal frame. The frame has two part the front part is moveable and the rear part is fixed. This frame has wheels aligned to it, together forming a wheelchair. There are total 4 wheels two in the front side and two in the rear side of the wheelchair. There is a placement of two DC Motors, one is aligned with the two front wheels for the purpose of direction control mainly LEFT and RIGHT. Once the command is given to the microcontroller ATmega16 through joystick control the front motor operates for approx. 5 sec and the

moveable part of the frame turns to an angle and then the motor stop, turning the wheelchair in either direction. The Other motor with gear system is placed on the right wheel of the rear side of the frame. The left wheel is aligned with the right wheel with the shaft connected to it. This motor is for the movement of the whole wheelchair in the FORWARD and BACKWARD directions. These motors are attached to a Printed Circuit Board which have 4 relays, Opto-couplers, transistors, diodes, resistors, microcontroller ATmega16, LED screen, IC 7805, Pot, capacitor bank placed in it. This board is placed between the lead acid battery and the motor. There is a 20 watt / 12v solar panel on the wheelchair. The above solar panels are built on a sloping metal frame to absorb maximum sunlight, and the frame is mounted on the lower frame of the wheelchair, which provides the roof of the wheelchair. Solar-powered wheelchairs operate on the power generated by 20 watts / 12V solar panels. This is about 500mA, and you can get the same power by charging a 12V \ 2.5amp lead-acid battery per hour. We knew that solar power wasn't always available, so we first had to store it in order to have a constant supply of DC motors. The charging controller is located in front of the battery to limit overcharging of the battery. It also aims to charge the battery via AC power rectified via a charging controller in extreme weather conditions where sunlight is not sufficient to generate electricity. Between the battery and the solar panel, there is a control circuit used for directional control, known as the directional control circuit (PCB circuit). The directional control circuit is divided into two parts. Using a opto-coupler, the section where the operating voltage is 5V and the section where the operating voltage is 12V. The reason for splitting the circuit in two is to protect the ATmega16 microprocessor. If the relay fails, the high current surge causes the relay's electromagnetic coil to become high voltage, altering the logic of the ATmega16 microcontroller and possibly damaging the battery. The components in the first section are the IC 7805, LCD screen, ATmega16 microcontroller, capacitor bank, resistors and transistors. The microcontroller's A port is connected to the output, the B port remains open, the C port is connected to the input, and the D port is connected to the LCD screen. The LCD screen displays the program code supplied to the microcontroller for directional control operations. The 7805 IC is used to step down the voltage from 12V to 5V for the operation of Section 1 components. Capacitors are used to store electrical energy and, if necessary, return the stored energy to the circuit. Capacitors are charged throughout the battery and discharged in the same circuit. On the other hand, there are components such as relays, resistors, diodes and transistors. There are four DC relays, two for one DC motor and two for another DC motor. 7A, 12V \ 250V relays work with NO and NC contactor targets. Each relay has a current leak of approximately 2mA. Resistors are used to control the flow of current to other components when a high current spike occurs in the circuit during an abnormal condition in the PCB. The function of the diode in this circuit is to allow current to flow in one direction and close in the opposite direction. After the directional control circuit, power is sent to the DC motor fitted with the gear assembly for smooth movement. The specifications of the DC motor are DC12V, the generated torque is about 10kg / n, and the rotation speed is 60RPM. The front motor is for left and right movements, and the rear motor is for forward and reverse movements

#### **ADVANTAGES**

- Electric Powered
- Quick and Easy Movement
- Useful for Children
- Provide better support
- Utilization of clean energy source reduces pollution and save energy wasted.
- Offer reliable and abundant energy source to charge the wheelchair almost anywhere exposed to sunlight
- Improve the energy reserve capacity

#### **FUTURE APPLICATIONS**

- Can be used in remote locations with no electric plug source.
- Transport patients from remote inaccessible areas, which can be further upgraded with remote controls.
- Can be used by elderly or handicapped individuals in urban areas
- The Intelligent Vehicle for Physically and Mentally Disabled Persons designed in this project has a lot of advantages, but can also be improved on. Here the vehicle is controlled by joystick. Controlling by EEG signals is a better option for the patients who cannot adopt methods.

### CONCLUSION

Our solar electric wheelchair project has been successfully developed and successfully achieved its purpose and purpose. Renewable energy sources, which are solar energy, can be used to control the movement of wheelchairs for the disabled. Improvements can be made by driving a wheelchair directly with solar power without using a battery. The design and development of this automated "solar-powered wheelchair" is based on the ATmega16 microcontroller and relay set for directional control, and has been successfully implemented on a commercial scale for the disabled and the elderly. Electric wheelchairs help people with severe disabilities live an easy life. The low cost of assembling this car chair really benefits the general public.

- For further development, the project can be developed as follows Addition of wireless system.
- Sensors can also be attached to different sections on the left, right and rear.
- There is also the execution of intelligent home navigation that allows people with disabilities and the elderly to traverse the entire home and get help from a technical interface.

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