

Smart Solar Wheelchair Controlled Using Android App And Joystick

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Abstract: The proposed project is designed to provide support for physically handicapped persons and patients who use wheelchairs, to navigate in an aerial map without any external support. Traditionally, the wheel chairs were equipped with pedals where the patient had to navigate using peddling. There was a wheel chair model where the patient used their hands to move the wheel mechanically. In our proposed model, the locomotion of the wheel chair is achieved electrically. The logic of the electric wheelchair can be controlled by a wired panel as well as through an android app with wifi module ESP8266. The system also has the feature to alert the caretaker and their families during emergencies. The patient has to press the emergency button to intimate the emergency to their family. The system also has an auto collision detection system, using ultrasonic signals. It saves the patient from collision, due to system fault. The battery is charged through solar panels. The solar panels are connected to the battery, which gets charged due to solar power.

Keywords: Arduino, WIFI module (ESP8266), Android application, solar panels, ultrasonic sensors.

1. Introduction

Present technology has a main role in bringing the healthy change in wheelchairs and its new modified types. A wheelchair is a chair with wheels to help people move around. It is used by individuals who have impairments that limit their ability to walk. It typically consists of a seat supported on two large wheels attached towards the back of the seat and one small wheel in front near the feet, a noticeable braking system with led lightings in front and rear part of the wheelchair. The main motive of the wheelchair is to make the physically disabled person independent for locomotion. As we are using the solar panels to power the wheelchair with lead-acid battery to operate the wheelchair. Our main motive is to use renewable energy resources to charge the wheelchair rather than depending on electrically charging it. In rural areas there are regular power cuts as the disabled person who cannot run the wheels manually has to depend on electricity to charge may face difficulty to charge, as the solar powered wheelchair helps in this situation. In our project we are using a mobile application to control the wheelchair using the wifi module. We are using the ESP8266 wifi module to connect the wheelchair to mobile application to control the movement of the wheelchair. In the wheelchair prototype and mobile application we have an emergency button to alert the guardian of disabled/handicapped person that he/she is in trouble or needs the guardian's help immediately. The wheelchair has a horn button that can be used to alert people standing or obstructing the path of disabled person. Our wheelchair prototype has an ultrasonic sensor which is used to detect the obstacle that is present on the path, it helps visually impaired persons who cannot see the path and may lead to an accident. In this situation the SR04 sensor detects and sends the signal as well as stops the wheelchair. This wheelchair runs on a 12v battery and rechargeable battery can also be used to power the wheel chair with solar energy. We make use of L293D as a motor drive to run the wheels through a DC motor. This wheelchair can serve the people who are disabled and reduce their dependence on their guardians for locomotion and be self reliant.

2. Related works

Mr.K.Vijayakumar et al., (2021) [1] The main ideology to construct this solar wheelchair is for the physically disabled persons the main motive is to run the wheelchair through renewable energy. Here they make use of the joystick to control the movement of the wheelchair. The main feature is it can be used in both indoors and outdoors and through both solar powered and ac power supply. The joystick is programmed using the arduino.

Mayur Waghe et al., (2020) [2] In his work the wheelchair is designed in such a way that it makes use of solar energy with the help of a battery to run the wheel chair.. In this it is mentioned that the wheelchair can achieve 26% more distance as compared to only battery driven wheelchair. The wheelchair can also be used as a stretcher which will be used for physically

JM. Pita et al., (2020) [3] the main intention is to make wheelchair work more efficient with solar energy than electrically charging . It is mainly helpful in rural areas where they face regular power cuts due to which the wheelchair cannot be charged , so the disabled person with no option needs to use the manual wheels for locomotion.

Mayank Shadwani et al., (2016) [4] the primitive goal is to make a variant of a wheelchair that can reduce the human effort of handicapped or disabled persons , so here we use the hand gesture or actions to give motion to the wheelchair . It makes it easier to control the movement of the wheelchair .

Varsha Pathak et al., (2019) [5] the android application is used to control the wheelchair through the bluetooth module. The handicapped or physically disabled person without manual work can control through their smartphone . If there is a problem in the joystick or connection problem this comes into great use .

3. Design of smart solar wheelchair

Our main aim is to design and develop a smart solar wheelchair which is operated via an android application and the joystick that has been attached with an ultrasonic sensor . The wheelchair consists of ESP8266 which acts as the main of the system; wireless data transmission is carried out through the WIFI module. Here the ultrasonic sensor detects the obstacle and signals the disabled person and stops the wheelchair . This wheelchair is mainly run on solar power .

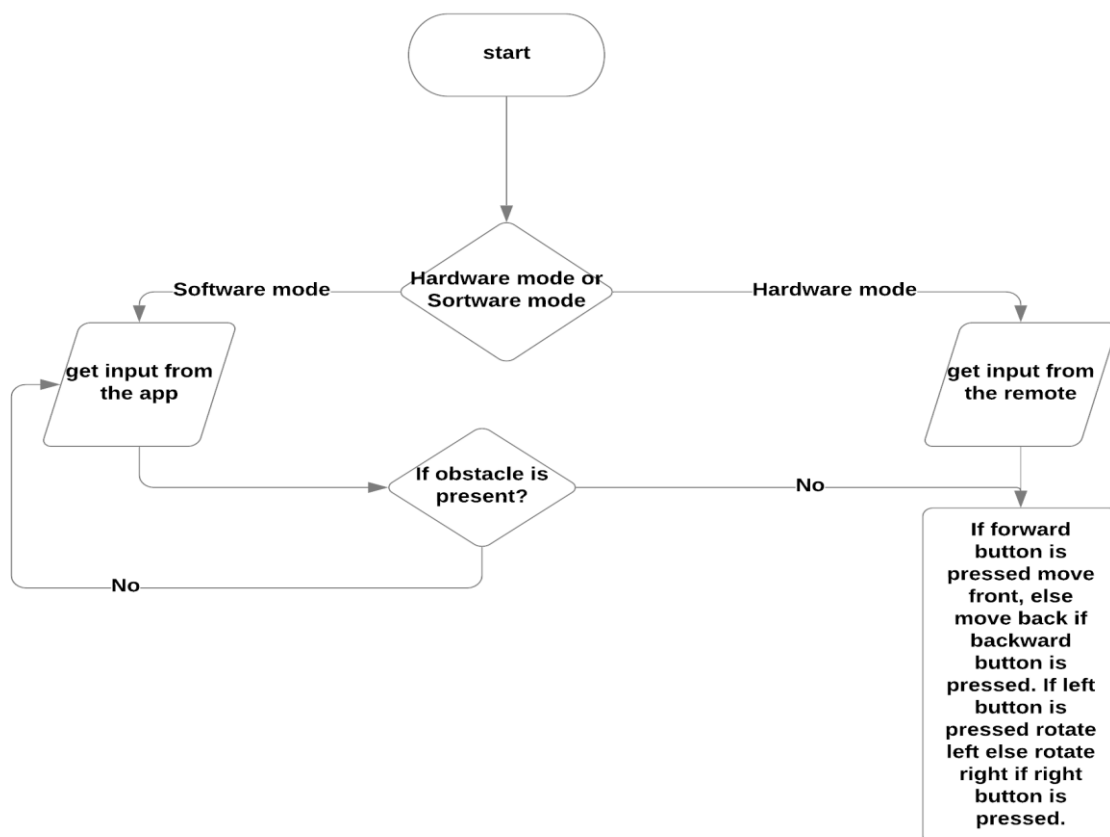


Figure 1: Block diagram of the smart solar wheel chair

From figure 1 it gives the complete idea of the design of the Solar wheelchair using the ESP8266 wifi module and Ultrasonic sensor

Power Supply Unit: Power Supply acts as the main building block of any electronic devices. It is used to provide the required amount of power for their specific operation. Here we make use of a +9V hw rechargeable Power Supply for rotating the wheels through dc motor.

Ultrasonic Sensor: Ultrasonic sensors are used to detect the obstacles or objects in the given direction. The ultrasonic sensor produces and detects the ultrasonic waves. We are using an SR04 ultrasonic sensor to detect the obstacle in the path of the wheelchair. .When the transmitted ultrasonic waves reflect back it alerts the person that the obstacle is ahead.



WIFI module (ESP8266): It is also called Nodemcu. It can be configured as a server mode and as well as client mode. It has a capability of boosting an existing weak wifi network signal. It is developed by Espressif. It has a single analog pin and 10 digital pins which we can use for development of the application.



Motor drive: For motor drive here we use the L293D .The L293D permits the DC motor to rotate in both forward and backward direction..Here basically we make use of H-Bridge circuit theory for changing the rotating direction of the DC motor , as the voltage needed to be changed for rotating the DC motor in forward or backward direction.

4. Implementation of smart solar wheelchair

The smart solar wheelchair is operated and controlled using a ESP8266 WIFI module .It consists of an emergency alert system when the user is in trouble he/she can press the emergency button present in a wheelchair or in a mobile application as it alerts the guardian of disabled person.. This solar wheelchair also consists of obstacle detection and led lighting , the ultrasonic sensor alerts and stops the wheelchair for the visually impaired persons.



Figure 2: Model of the wheelchair with ultrasonic sensor

Figure 1 illustrates the model of the smart solar wheel chair with an ultrasonic sensor attached which is used

for obstacle detection and stops when an obstacle is found .

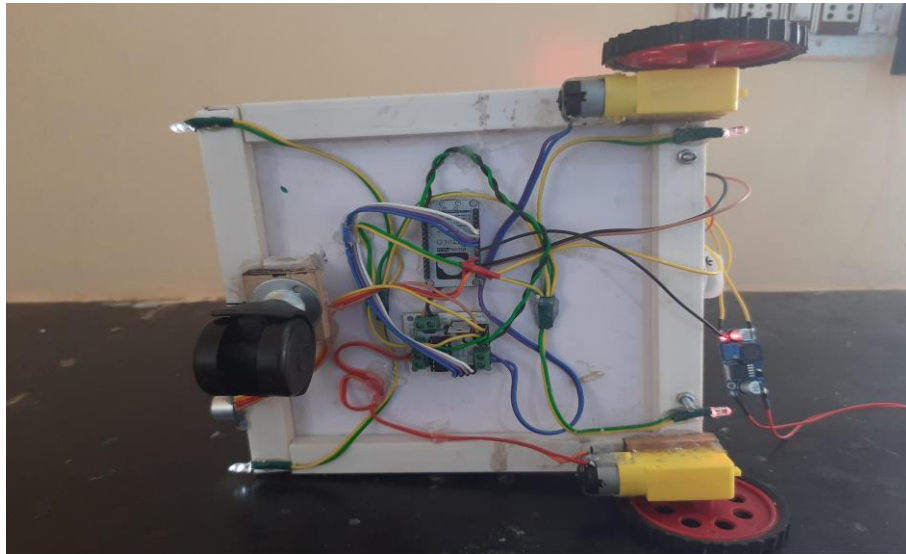


Figure 3 : Model of the surveillance robot

Figure 2 shows the wheelchair prototype with WIFI module ESP8266 and L293D motor drive attached to the base of wheelchair and connected to the DC motor .

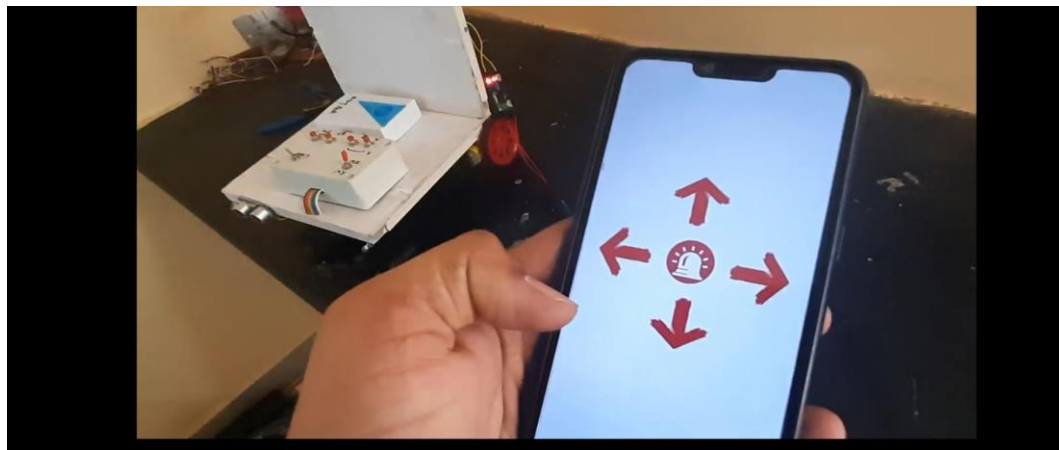


Figure : controlling wheelchair with the android application

Figure 3 The image shows controlling the movement of a wheelchair using an android mobile application , which has 4 navigation buttons and at the centre it has the emergency alert button .

5. Conclusion

The wheelchair prototype which we are introducing by doing this project will be helpful for many of the people who are disabled mentally as well as physically and can make use of this vehicle and can be self dependent and need not to trouble their guardian every time to take care of them .. This paper consists of an ultrasonic sensor which is interfaced to the control unit that produces a buzzer sound to the user when an obstacle is close to it. This article successfully detects the obstacles and alerts the person who takes responsibility for that physically challenged person. The design is carried out using parts that are low cost and this design is easy to control. The analysis demonstrates that the system is economically practical.

6. Future enhancements

This version of the prototype is cheapest and gives the idea to locomote the wheelchair through the android application . Here we are using the wifi module to connect to the wheelchair. Further improvements can be done to improve by using firebase which can increase the connectivity . We can add voice recognition to control the wheelchair . We can add hand gesture control to move the wheel chair .

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