Solar Powered Touch Screen Wheelchair

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Abstract:-- **Many wheelchairs are available with various running technologies, but the cost is very high and it is not much effective. Mostly, the idea of building solar wheel chair is to overcome some disadvantages of the existing systems .Solar plays a very important role in our day to day life. In this paper it is discussed that how solar power is utilized for providing the power to the wheelchair, which will reduce the efforts of the handicapped person. The wheelchair is basic need of physically disabled persons. To move the wheelchair there is need of external person or person has to take lot of efforts. Our project is specifically related to the Smart Android phone handling the wheel chair system using android application. The purpose of selecting the android platform is that nowadays android mobile phones are commonly used. The user has to first get connected with the wheelchair with the help of application. This system allows the user to robustly interact with the wheelchair at different levels of the control (left, right, forward, backward and stop) and sensing. The other components that are required in the system are microcontroller, motor and sensors. The main motive is to let the system be more simple and efficient. The proposed system will be efficient in terms of cost and handling purpose. This project uses Arduino kit Microcontroller circuit and DC motors to create the movement of wheel chair and Sensors to detect the hurdles in between wheelchair and the way of direction.**

Index Terms— **AndroidApplication,Solarpanel,Ultrasonic sensor,Bluetooth Module,Aurdino Micro-controller.**

I. INTRODUCTION

1.1 Background of the project

According to census, the disabled population of country is increased by 22.4% between 2001 and 2011. 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 rore are females. The population of disabled person is increasing due to various reasons as road accidents ,natural disasters, earthquake etc. There should be some means of machine that could provide locomotion to this people.

1.2 Help to the disabled peoples

This population needs a support that is provided by wheelchair. The normal wheelchair needs external aid to move. The user has to push chair with their hands, it delops stress on user at the time of travelling. To overcome this problem, the automated wheelchair is designed using technology and human intelligence. An automated wheelchair is based on some input interfacing machine which provides input to the motor. The motor processes the input provided and takes the corresponding action (in terms of movement – move left, front, back, right). With the introduction of android Smartphone in the system, the working becomes less complex. The system becomes quite user-friendly to the user.

1.3 Literature Survey:

In the past few years, many projects related to wheelchair have been designed. in last few years the wheelchair is controlled by using joystick, human voice, gesture, brain mapping etc.

In joystick based wheelchair person with different disabilities may find it difficult to move joystick as it requires considerable amount of force moreover it may affect the reaction time of the wheelchair which may be dangerous. Voice controlled system can provide inaccurate response in noisy environment and it can become difficult for the user to locomote in such environment.

II. OBJECTIVES

The main objective of this project .
• To develop a wheelchair that use renewable energy, environmentally friendly and economical.
• To help the handicapped person for mobility and locomotion.
• To develop an electrical wheelchair that can charge the battery when it is not in used.

III.PROPOSED SYSTEM

A wheelchair is a mobility device designed for shifting patients, moving physically challenged people from one place to another with the help of another person or by means of self pushing.In this project, the movements of the wheelchair are controlled with the help of an Android application.

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This project will provide disability weight innovative solutions to handle the wheel chairs to use of Bluetooth module. This project describes a wheelchair which can be controlled only by using the android application .The main aim of this project is to facilitate the movement of the disabled people and elderly 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 detect the hurdles in between wheelchair and the way of direction. In this project, Bluetooth module is used as controller to control the movement of wheelchair. There are five basic movements of a wheelchair to be applied by the user.
The five operation done by wheelchair.

1. Moving Forward
2. Moving Backward
3. Turning Left
4. Turning Right
5. Stop

The basic block diagram for proposed system is as shown in fig1. For ontrolling the moement of wheelhair the touh sreen based android mobile used. An android application is to be developed for this purpose. The signal from android mobile is gien to the miroontroller through Bluetooth module,which takes actions as a form of output. If the user selects the front direction, than both the motors are made to move in the same direction and with same speed. Similarly is for the reverse direction. If the user wants to move in the left/right direction than polarity of both the motors are reversed correspondingly.
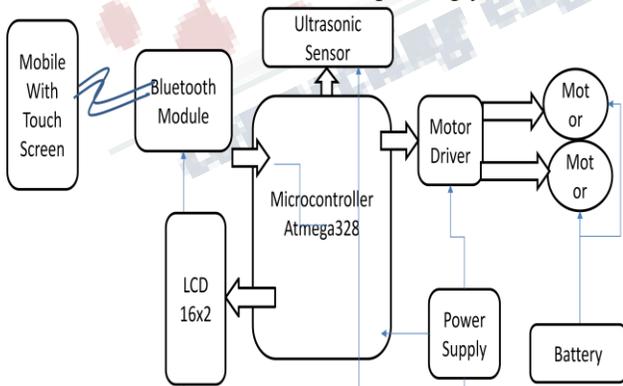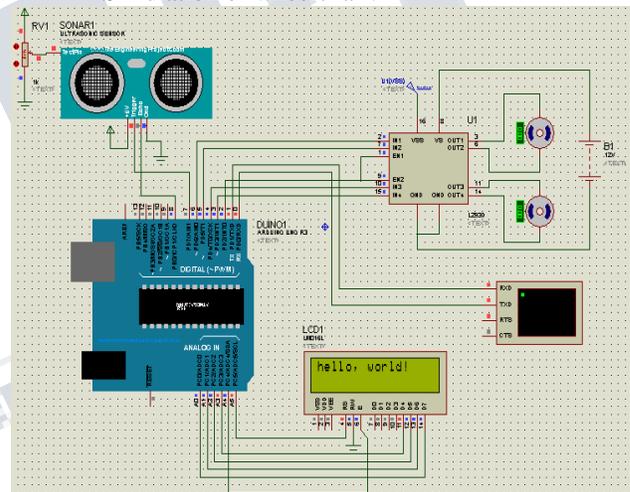

Fig1. Basic block diagram of proposed system

IV. IMPLEMENTATION

- Hardware Requirement(refer fig 3)
i. Arduino UNO
ii. Bluetooth Module
iii. Motor driver
iv. Battery 12volts
v. 2 DC Motors
vi. Android phone
vii. Solar panel
viii. Charge controller

- Software Requirement
i. Android Studio
ii. Arduino programming

- Simulation of wheelchair:

Fig2.simulation of wheel chair

- ***Hardware design of wheelchair***

i)Solar panel

Solar panels are used to collect energy required for wheelchair. the solar panel is exposed to 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.

ii.DC Motor:

The prime mover to be used in this solar operated wheelchair is a permanent magnet D.C. motor. The main reason for using this motor is that it is highly efficient and the flux density does not decrease with time. It's performance characteristics suite very well to the requirement of our solar operated wheelchair. A motor controller converts DC to AC. Advantages of PMDC motors include long life span, little or no maintenance, and high efficiency.

iii.Battery:

To charge a battery, the charging voltage must be higher than the battery voltage or at least equal. As per the motor power requirement, a 12 V- 80 A-hr. lead acid battery is very much feasible for the solar three-wheeler. "Trickle charging" (charg-ing in low amps, 2 to 10 amps) is always better for any battery charging; it increases battery life and decreases electricity pil-ferage. Here, the charge controller will charge the battery 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.

Fig 3 hardware Design

V WORKING

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. However, the general points of consideration during the designing of the solar operated wheelchair are: simplicity, strength, stability, safety, corrosion and wear, weight, size, flexibility, ease of control, 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 help of a charge controller. the charge controller coverts 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.

VI. CALCULATIONS

♦ *Dimensions of chair*

Height of chair = 26 inches = 66cm
Length of chair = 24 inches = 60cm
Width of chair = 12 inches = 30 cm
Drive wheel diameter = 4 inches = 10cm

a) Total weight of wheelchair = 20 kg
actual torque:
= 20 * 9.81
= 196.2 N
The total weight on wheels is 50% of the total weight of the wheelchair.
Therefore,
Total weight on wheels = 98.1 N
This weight is divided into two because of two wheels for driving as = 98.1/2 = 49.05 N
Net Force acting on each drive wheel, F1 =49.05N
Torque required for driving T = F1 * R
= 49.05 * (10/2)
= 245.25 N-cm

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= 1.225 N-cm

b) Total torque required:

We have two drive wheels in this chair so two motors are required separately for each wheel.
Total Torque, T = T1 + T2
= 2.45 N-cm

c) Power required for each drive wheel:

P = (2π*N*T)/60
P = (2π*100*1.225)/60
= 12.82 W
Therefore, a 15 kg-cm torque, 100 rpm motor

V.FUTURE SCOPE

- The system can be adapted to make it for the external environment by adapting the GPS location and the user can make selection to go through it.
- The other way is that the path will be stored as the video and the wheelchair can travel automatically by recognizing various past patterns

VI. CONCLUSION

This project elaborates the software simulation of Solar Powered Touch Screen Wheelchair with the help of Bluetooth Module. The circuit works properly to move as the command given by the user. The detection of any obstacle is successfully controlled by the microcontroller. This proposed system contributes to the self-dependency of differently abled 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.

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