

## Smart Wheelchair of the Future with Inclined and Declined Surface Adaption

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### ABSTRACT:-

In the current modern era, technology has touched every part of our life's, enabling human beings to work efficiently as well as helping each individual to live a comfortable life. New engineering developments offer opportunities to develop smart wheelchair assistive technology that can improve the lives of many differently abled human beings who use wheelchairs. In our work, we are designing tomorrow's intelligent wheelchairs in which we are developing an accelerometer and bluetooth control intelligent wheelchair. A smart wheelchair precisely adjusts or adapts to the change in the ground surface by adjusting the seat with respect to the inclined or the declined surface.

### INTRODUCTION:-

Traditional manual wheelchairs provide mobility to individuals with physical impairments but are poorly suited for individuals with a combination of physical and cognitive or perceptual impairments. Those individuals who are considered unable to safely and independently operate a manual or powered wheelchair are typically seated in a manual wheelchair and pushed by a caregiver.

In an astonishing report The U.S. Department of Transportation (DOT) fined US Airways \$1.2 million for failing to provide adequate wheelchair assistance to passengers in Philadelphia and Charlotte, N.C. The fine is one of the largest ever assessed by DOT in a disability case. Wheelchair failures are often seen when the wheelchair is moving on an inclined or a declined planes. The patient is observed to fall off from the wheelchairs under these conditions and often suffer injuries sometimes fatal. Thus, several steps are taken and much more is around to make the wheelchairs safe and enrich them with Independent Mobility.

### AIM:-

Our aim is to prevent the patient from falling off the wheelchair during its movement. We are developing an accelerometer and Bluetooth controlled intelligent wheelchair model with effective Surface Adaptation. The idea of this research is to develop an easily operated and safe wheelchair to enable its user to move freely thus preventing any damage to the user.

### FEATURES OF SMART WHEELCHAIR:-

1. Independent Mobility
2. Adaptability to the user
3. Easily Controlled by a Bluetooth enabled Smartphone
4. Accelerometer Sensor Equipment
5. Effective Surface Detection

### ADVANTAGES:-

1. It prevents patients from falling off under inclined or declined positions.
2. Enhances the Effective Mobility of the patient.

3. Since Bluetooth enabled it allows the user to control directional movements of the wheelchair easily through a Bluetooth enabled Smartphone.
4. User Friendly and easy to use provide a wide range of potential users.

**DISADVANTAGES:-**

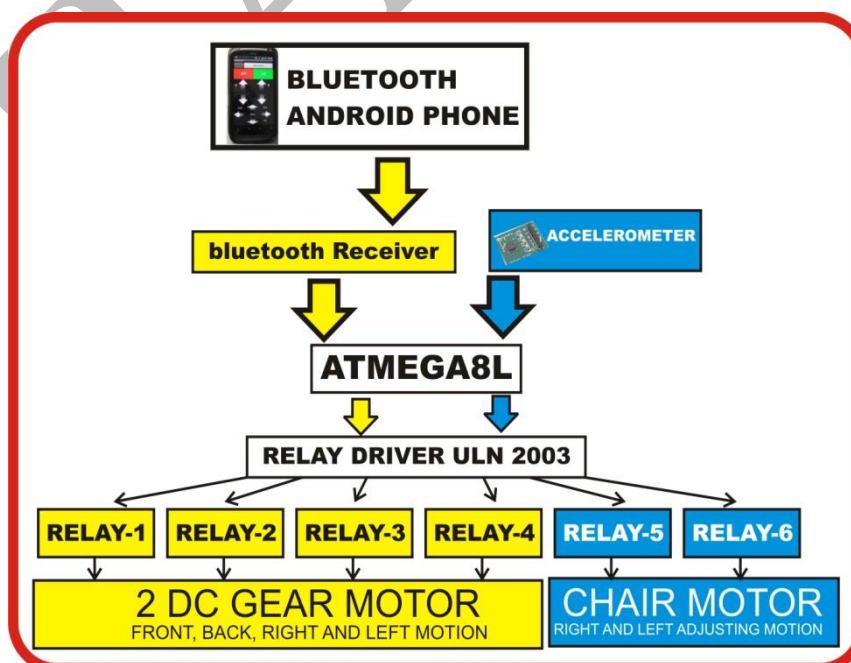
1. The initial cost of the design of a Smart wheelchair is high.
2. There are a variety of disabilities thus it requires a very wide approach on global level.

**APPLICATIONS:-**

1. Hospitals and Health Care Centres.
2. Old age Homes.
3. Para Sports For differently Enabled individuals
4. Physically handicapped Individuals.

**DESIGN EQUIPMENTS:-**

- ATMEGA 8L MICROCONTROLLER
- RELAYS
- ULN 2003 RELAY DRIVERS
- DOTTED PCB
- ACCELEROMETER GY-61
- DC MOTORS
- REGULATOR 7805
- BLUETOOTH MODULE
- WHEELCHAIR BODY FRAME
- 12V DC SUPPLY

**(C)ARCHITECHTURE OF SMART WHEELCHAIR:-****Fig 2.0 Block Diagram of Smart Wheelchair**

The working of Smart Wheelchair is divided in two sections:-

1. Bluetooth control wheel chair

In this section patient or helper can control wheel chair movement from a Bluetooth module. It is control by accelerometer and Bluetooth operated Android phone. Patient or helper can use a smartphone to control the directional movements of the wheelchair.

2. Accelerometer control wheel chair

This is an important feature of our project, in which when patient is in climbing or incline surface area, accelerometer control circuit adjust wheel chair seat according to climbing or incline surface area surface. Due to this mechanism patient's falling from chair incident chance are reducing. This mechanism works in both upward and downward action.

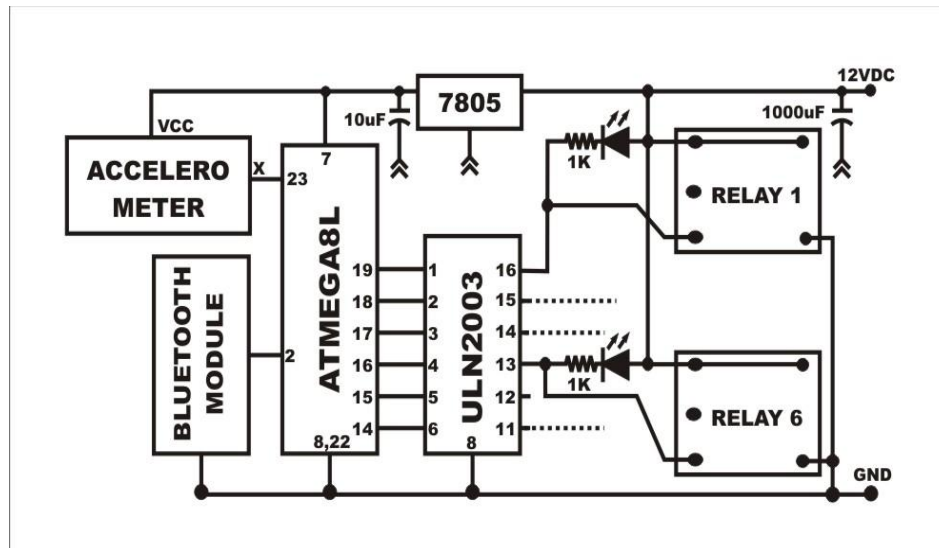


Fig 3.0 Circuit Diagram of Smart Wheelchair

**WORKING:-**

At first, a Bluetooth module is used which comprises of a Bluetooth enabled smartphone linked with a Bluetooth receiver. This is used to send the basic commands of forward, backward, left and right for the movement of the wheelchair.

Secondly, an Accelerometer GY-61 3-Axis  $\pm 3$  g Accelerometer is used which is used for the adjustment or the alignment of the seat of the wheelchair under inclined or declined surface area contacts. It uses a sensor ADXL335 which is used to detect the inclined or the declined surface and thus adjusts the position of the seat accordingly. Thirdly, High-performance, Low-power AVR 8-bit Microcontroller ATMEGA8L is used to provide the basic control functions in the circuit. It basically interfaces the Bluetooth functions to the Chair and the direction motors and hence controls the overall functioning of the wheelchair circuit. Fourthly, ULN2003 ideally suited for interfacing between low-level logic circuitry and multiple peripheral power loads, the Series ULN20xxA/L high-voltage, high-current Darlington arrays feature continuous load current ratings to 500 mA for each of the seven drivers. The ULN2003 has become my primary choice to controlling external components - its cheap, effective, and requires no operating voltages other than the common ground. A 7805 regulator is used in the circuit to control the amount of current flowing in the circuit. After this, few relays are used which are used to drive the current to the motors and to control the directional movement of the wheelchair as well as the motor rotation in clockwise and anticlockwise direction for the adjustment of seat. DC motors are used for the movement of the tyres of the wheelchair as well a Worm gear Motor is used to work both in clockwise and anticlockwise direction to facilitate the seat adjustment. Few LED's are used to indicate the proper functioning of the circuitry. Finally, a 12V or 16V DC Power supply is used to provide power to the circuit.

SNAPSHOTS:-

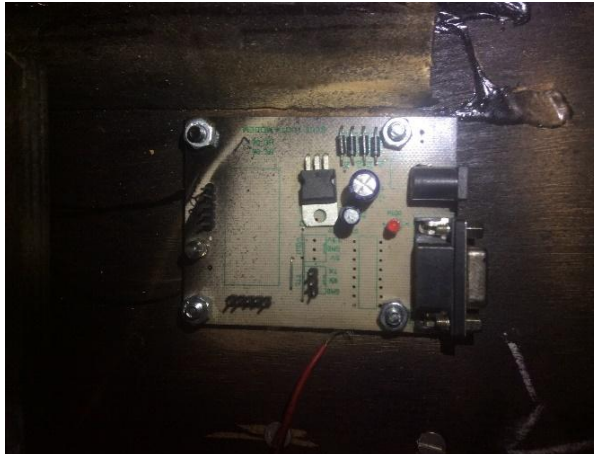


Fig 4.0 Bluetooth Module



Fig 5.0 Microcontroller Circuit



Fig 6.0 Accelerometer Module

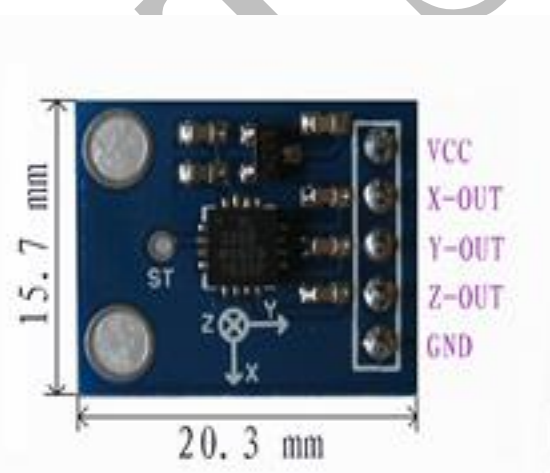


Fig 7.0 Smart Wheelchair Model

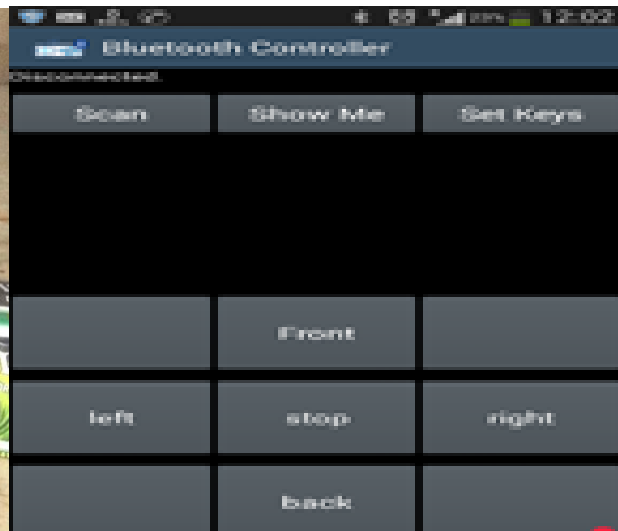


Fig 8.0 Virtual Joystick from Bluetooth Application

**CONCLUSION:-**

The Smart wheelchair is a great boon from the technologists which can enhance the life's of millions of differently enabled people all around the world. They can provide a considerable amount of help to adults as well as children and help them to carry out their general works efficiently. However the high cost of a Smart Wheelchair still comes out to be a basic problem as not everyone can afford it and thus efforts are being made and further researches should provide Cost Effective Smart Wheelchairs to set the moto TECHNOLOGY FOR ALL. Also, the Functionality of the Smart Wheelchair possess another problem as A particular Smart wheelchair can provide a specific help for a different ability. Thus, more and more Smart Wheelchairs should be made keeping in mind the large amount of different abilities prevailing in the world. However, its advantages like Independent Mobility, Effective Surface Adaptation, User Friendly Interface, etc. provide a rather comprehensive and wide area of Research for Scholars to enhance human life.

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