

Android Phone Based Assistant System for Handicapped/Disabled/Aged People

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Abstract

This paper Intelligent Assistant System is a system which provides functionality for disabled people to live independently in today's world. This project increases the ease of mobility for disabled/injured people. We have resolved the disabled problems by implementing voice control, and accelerometer based interfacing with the wheelchair. In this project, the wheelchair has been modified so the motions of the wheelchair are controlled by the instructions of the user. It also provides an opportunity for visually or physically disabled persons to move from one place to another. Intelligent assistant system serves as a boon for those who have lost their mobility. The development of Intelligent Assistant System for the basic purpose of safety, mobility of user, human interface with wheelchair. The necessities of numerous people with incapacities can be happy with wheelchairs; a few individuals from the impaired group discover it is troublesome or difficult to work a wheelchair. This project could be a piece of an assistive innovation. It is for more free, profitable and agreeable living for disabled, injured persons. Many disabled people require help in order to overcome physical challenges. Thus this project will provide an alternative to the disabled in controlling the motion of the wheelchair using their voices and Accelerometer.

Keywords: Wheelchair, Autonomous System, Accelerometer, Voice Command, Ultrasonic, Robotics

I. INTRODUCTION

Mobility has become very important for a good quality of life. Loss of mobility due to an injury is usually accompanied by a loss of self-confidence. Designing a system with independent mobility for such disabled people is our aim in this project. Statistics show us that 43 million are disabled, about 17% of 250 million; almost 1 out of 5 persons are disabled. 52% of spinal cord injured individuals are considered paraplegic and 47% quadriplegic. [1]

The thought behind this project is to outline for a Handicapped individual who is experiencing Quadriplegics, the individuals who couldn't move their hands and legs. Quadriplegics are restricted in their movement and need some gadget to speak with their wheel seat for portability without others help [2]. Different types of smart wheelchair have been developed in the past but the new generations of wheelchairs are being developed and used which features the use of artificial intelligence and hence leaves a little to think about to the user who uses the wheel chair. The mechanism is aimed the following challenges:

- 1) This aims to solving the mobility problem for old and physically challenged people.
- 2) Unlike the other this wheelchair controlled manually, our design can be controlled by the voice commands and accelerometer which solves their problem of dependency on others.
- 3) Speech processing can be done in real time and has long been considered as a natural to assist powered wheelchair user.

Many disabled people exist in today's world and require help in order to overcome physical challenges.

Thus this project will provide an alternative to the disabled in controlling the motion of the wheelchair using their voice and Accelerometer. The efficiency of using assistive technology wheelchair can be identified.

People may have all the expertise in the world but without any motivation, it is unlikely that they will achieve their true potential.

As inspired by Stephen Hawking wheelchair, we develop a prototype of wheelchair that is controlled by the user voice commands and also controlled by the user smart phone's built-in accelerometer sensor via android app.

II. MATERIALS REQUIRED

A. Arduino Uno

The Uno is a microcontroller board in view of the ATmega328P. It has 14 advanced information/yield pins (of which 6 can be utilized as PWM yields), 6 simple data sources, a 16 MHz quartz precious stone, a USB association, a power jack, an ICSP header and a reset catch. It contains everything expected to bolster the microcontroller; essentially associate it to a PC with a USB link or power it with an AC-to-DC connector or battery to begin.. You can tinker with your UNO without stressing a lot over accomplishing something incorrectly, most dire outcome imaginable you can substitute the chip for a couple of dollars and begin once again once more.

"Uno" implies one in Italian and was denoted the arrival of Arduino Software (IDE) 1.0. The Uno board and form 1.0 of Arduino Software (IDE) were the reference renditions of Arduino, now advanced to more up to date discharges. The Uno board is the first in a progression of USB Arduino sheets, and the reference demonstrate for the Arduino stage; for a broad rundown of present, past or obsolete sheets see the Arduino file of board.

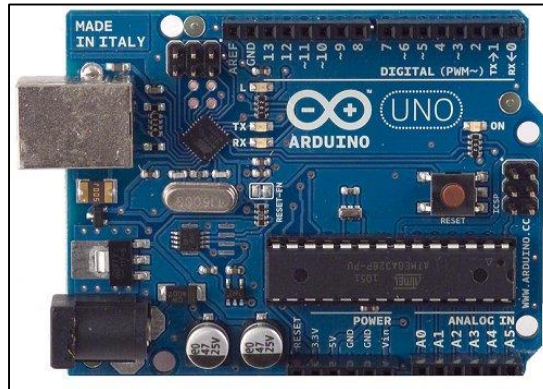


Fig. 1: Arduino Uno

B. Bluetooth Module HC-05:

HC-05 module is a simple to utilize Bluetooth SPP (Serial Port Protocol) module, intended for straightforward remote serial association setup. The HC-05 Bluetooth Module can be utilized as a part of a Master or Slave arrangement, making it an extraordinary answer for remote correspondence. This serial port Bluetooth module is completely qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with finishes 2.4GHz radio handset and baseband. It utilizes CSR Blue center 04-External single chip Bluetooth framework with CMOS innovation and with AFH (Adaptive Frequency Hopping Feature).

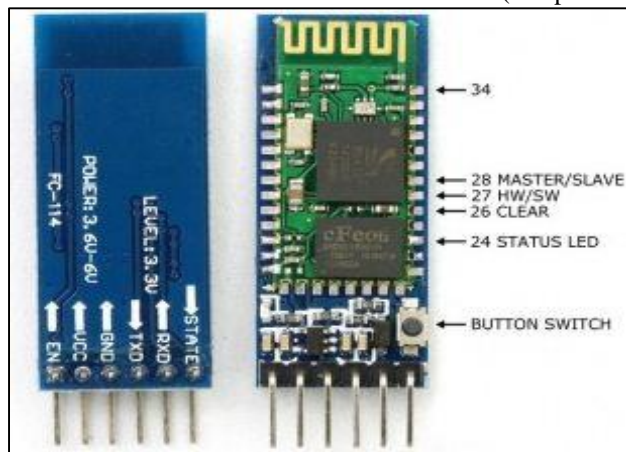


Fig. 2: HC-05 (Bluetooth Module)

C. Ultrasonic Sensor HC-SR04:

The distance sensor works by sending out a pulse of ultrasonic sound and measuring the amount of time it takes for the sound to come back, known HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit.



Fig. 3: HC-SR04 (Ultrasonic Sensor Module)

III. SYSTEM DESIGN

This framework there is compulsory to give the power supply to individual parts and standard power supply ought to be utilized for Arduino uno, Driver circuit, sensor, Motors and switch. The figure demonstrates the usefulness of the framework. In proposed framework segment like Bluetooth module HC-05,

Ultrasonic sensor, control circuit and ADXL345 specifically associated through the Arduino Uno board and Arduino Uno board is associated with the driver circuit of Motor, if there should arise an occurrence of crisis controlling of wheelchair is finished by ultrasonic sensor.

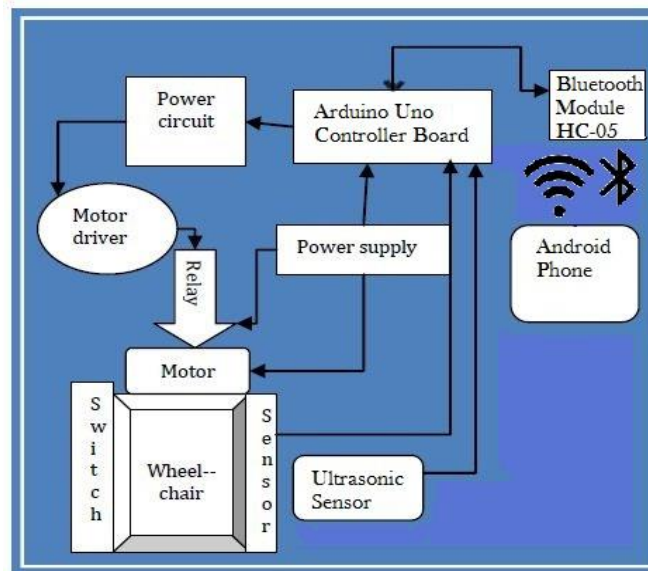


Fig. 4: System Block Diagram

After receiving the commands, the controller then operates the motors when the user will give commands to move in four directions. The communication between the android device and receiving is sent as serial communication data.

The controller program is design to move the motor through a motor driver IC as per the commands by the android device and the android device send the respective commands to control the motor like forward, reverse, right, left, stop.

The prototype that we made is too small for spying; also it can be used for reconnaissance or for surveillance purpose. With few addition and modification in this robot, it can be used in the borders for detecting and disposing the hidden land mines [6].

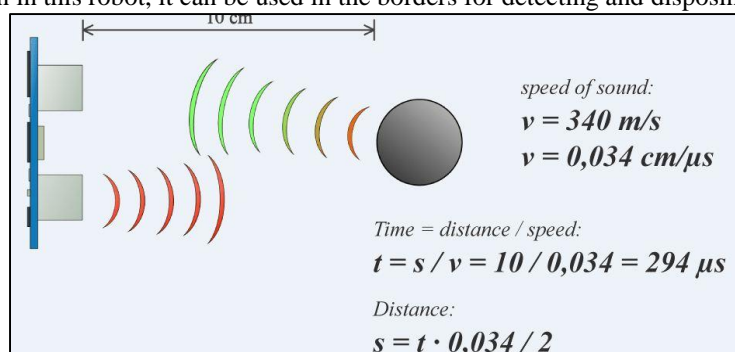


Fig. 6: Block Diagram of the proposed method

A. Voice Command Algorithm:

The application is initialized and the Bluetooth link is established. If the link is not established properly, then again re-establish the connection. Now voice command is awaited. Once when the voice command is detected it is converted into signals and the respective control command based on the algorithm is delivered to the wheelchair system.

The correct voice command has to be performed. Once a wrong command is given, an error is sent and waits for the correct voice command. This shall be mapped to the control algorithm.

B. Accelerometer Algorithm:

The application is initialized and the Bluetooth link is established. If the link is not established properly, then again re-establish the connection. Now hand motion is awaited. Once when the motion is detected it is converted into signals and the respective robot control command based on the algorithm is delivered to the robot.

The correct hand motion has to be performed. Once a wrong hand motion is given, an error is sent and waits for the correct hand motion. This shall be mapped to the robot control algorithm.

IV. IMPLEMENTATION

The design and implementation of the proposed algorithm are implemented with four wheeled wheelchair. Initially the process of establishing wireless connection with through Bluetooth was configured and then the test run was conducted. The testing of the four natural tilts of accelerometer was started first. Based on the tilting of the smart android phone in the two axis corresponding electrical signals were obtained and the vehicle responded to the programmed algorithm. The movement of wheelchair in forward, backward, left turn and right turn was done successfully. The next level was that the testing of the wheelchair's motion with an obstacle in between its path movement was done and the wheelchair resulted in a halt. During this stage only the reversing of the vehicle was possible and all the other direction responses were disabled.



Fig. 7: Implementation the work on prototype

- This prototype of wheelchair helps to control robot through voice commands as well as accelerometer tilt received via android application.
- The integration of control unit with Bluetooth device is done to capture and the read the voice & Accelerometer action.
- Then it operates as per the command received via android application.
- For this arduino controller is integrated in the system which make it possible to operate the robot via android application.

V. RESULTS



Fig. 8: The photographs of working model

VI. CONCLUSION & FUTURE WORK

This project presents a wireless robot designed using an Arduino controller, motor driver, ultrasonic sensor, Bluetooth module and it's controlled by using android mobile. Android mobile consists of Sensors and Bluetooth. It can be used to control the movement of the robot. The movement of the robot car is being controlled by the accelerometers in mobile with x, y values and these values are sent to the development board with robot car using Bluetooth.

In this system we can control the robot car direction by simply tilting the mobile in x, y directions and also can be used to pick an object by using the android mobile. Here, for picking the object a motor is fixed in the robot car so that it is useful for lifting an object.

The Ultrasonic sensor is used while the robot is in for detecting any obstacles in the way. Here we are using the Bluetooth technology to interface robotic car to mobile wirelessly. This system is mainly used for physically disabled people and also useful to do jobs in areas and in situations that are hazardous for human.

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