Voice Gesture Smart Chair for Physically Challenged

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Abstract— Physically challenged people are those who face many obstacles in life to be dependent on a third person to commute. Many engineers have been working for this solution for a long time. The invention of wheel chair is a great breakthrough that reformed their life but it still restricts their motion independently. In order to reduce their effort to manually push the wheel chair, many developments in wheel chairs came into existing such as electric-powered, gesture based etc. Smart chair powered using Arduino. In this project a voice gesture based wheel chair is discussed.

Key words: Physically Challenged, Obstacles, Wheel Chair, Motorized, Voice Gesture, Arduino

I. INTRODUCTION

The main objective is to design a system which provides resolution for the physically challenged people those who can't commute by themselves, can move using voice command via mobile phone which is connected to the Bluetooth module.

The voice commands are given to the Bluetooth module with the help of mobile phone app and the wheel chair moves according to the given command. The drive of the wheelchair is controlled by the motors and motor drivers connected to the wheels of the chair. The interfacing between Bluetooth module and motors is done by Arduino. This idea was taken in this venture to reduce the human efforts in driving a wheelchair.

II. EXISTING SYSTEM

A motor-powered wheelchair or electric-powered wheelchair is a wheelchair that is driven by means of an electric motor rather than human power. Motor-powered wheelchairs are useful for those unable to drive a manual wheelchair or who may need to use a wheelchair for distances or over terrain which would be fatiguing in a manual wheelchair. They may also be used not just by people with mobility deficiencies, but also by people with cardiovascular and fatigue-based conditions.

III. PROPOSED SYSTEM

The main objective is to design a system which provides solution for the physically challenged people those who can't commute independently, using voice gesture by interfacing the Bluetooth module (HC 05) with Arduino .HC 05 Bluetooth module kit catalogues the commands and sends them to the microcontroller. Microcontroller takes commands from blue tooth kit and passes them to the motor drivers. Motor driver receives the command signal from Arduino and moves the motors according to them. The motors shafts are connected to the wheels of wheelchair.

A. Block Diagram

The main objective is to design a system which provides solution for the physically challenged) people those who can't move independently, using speech commands by interfacing (HC05) with microcontroller and wheel chair. The Mobile phone is placed on the chair from which the input is given to the Bluetooth module. HC05 blue tooth kit registers the commands and forward microcontroller. Microcontroller takes commands from Bluetooth kit and passes them to the motor drivers. Motor driver receives the commands from microcontroller Adruino and moves the motors according to them. The motors are connected to the wheels of wheelchair.

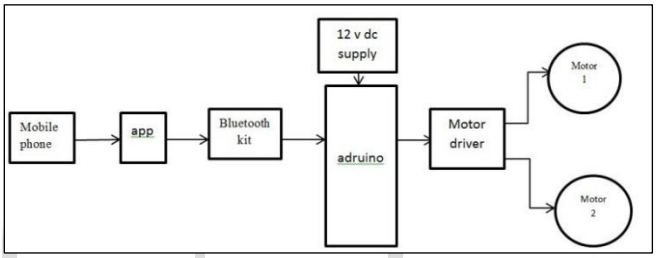

Fig. 1: Block diagram of proposed system

B. Algorithm steps

The working of the project software algorithm can be explained in the following steps:
Step 1: The Arduino is given 12v power supply
Step 2: The Bluetooth module which is connected is to be paired with a mobile at first
Step3: Arduino voice control app needs to downloaded and installed in the mobile
Step 4: If the command is FORWARD the smart chair moves forward.
Step 5: If the command is BACK the wheel chair takes reverse.
Step 6: If the command is RIGHT the wheel chair moves towards right direction.
Step 7: If the command is LEFT the wheel chair moves towards left direction
Step 8: If the command is STOP the wheel chair comes to rest

The programming of the project takes place in three phases. These phases includes

- Bluetooth app development
- Driver interface program
- Arduino interface

These are three key program needed to run the wheel chair. All these program is open source development platform hence user friendly control is obtained by use of library functions.
All codes are of embedded C language.

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to

address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operation.

Fig. 2: Flow chart of smart chair

C. Bluetooth module

There are three main parts to this project. An Android smartphone, a Bluetooth trans receiver, The Android app is designed to send serial data to the Arduino Bluetooth module when a button is pressed on the app. The Arduino Bluetooth module at the other end receives the data and sends it to the Arduino through the TX pin of the Bluetooth module (connected to RX pin of Arduino). The code uploaded to the Arduino checks the received data and compares it. If the received data is 1, the LED turns ON. The LED turns OFF when the received data is 0. You can open the serial monitor and watch the received data while connecting. The block diagram of the Bluetooth is given below.

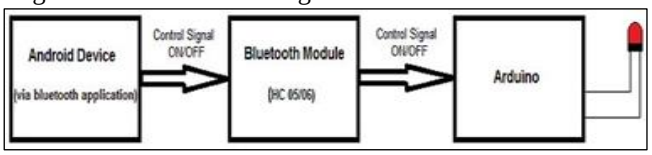

Fig. 3: Module block diagram

D. Micro controller

Arduino is an open source computer hardware. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. Motor

A DC motor is a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

In this we have used DC geared motor .The type of D.C motor used here is in series configuration. This because the chair needs to drive large torque load when applied to the chair, therefore series motor offers high starting torque.

E. Motor Driver

L298N 2A Based Motor Driver is a high power motor driver perfect for driving DC Motors and Stepper Motor. It uses the popular L298 motor driver IC and has an onboard 5V regulator which it can supply to an external circuit. It can control up to 4 DC motors, or 2 DC motors with directional and speed control.

D.C geared motor with 150 rpm producing high torque is used in this project. The motor driver can employ two motors, here for balancing and for high torque production two motors are used. The geared dc motor has a side shaft in which wheel is connected. The gear shaft is connected the shaft of the DC motor .This gives minimum rpm with maximum torque.

IV. CIRCUIT DIAGRAM

Bluetooth module RX and TRX are connected to TRX and RX of Arduino respectively. The ports for motor input are defined. The motor driver has 2 enables four inputs and 4 outputs for the 2 motors respectively. The motor ports are connected to motor driver. The supply for motor driver is given from the Arduino. Now the motor ports are connected via driver circuit to the motor. The power supply for Bluetooth module, driver etc are given through a bread board connection with common ground for +5V and +12 V.

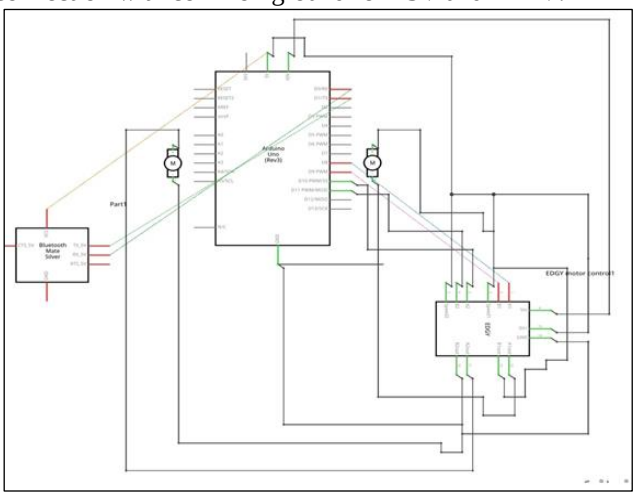

Fig. 4: Circuit diagram

V. IMPLEMENTATION OF HARDWARE

The hardware which is discussed in the section [II] practically implemented in the real time operation.

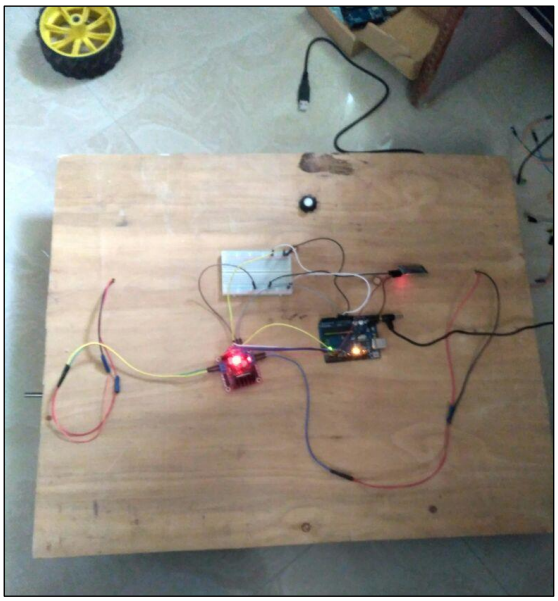

Fig. 5: Base of the prototype

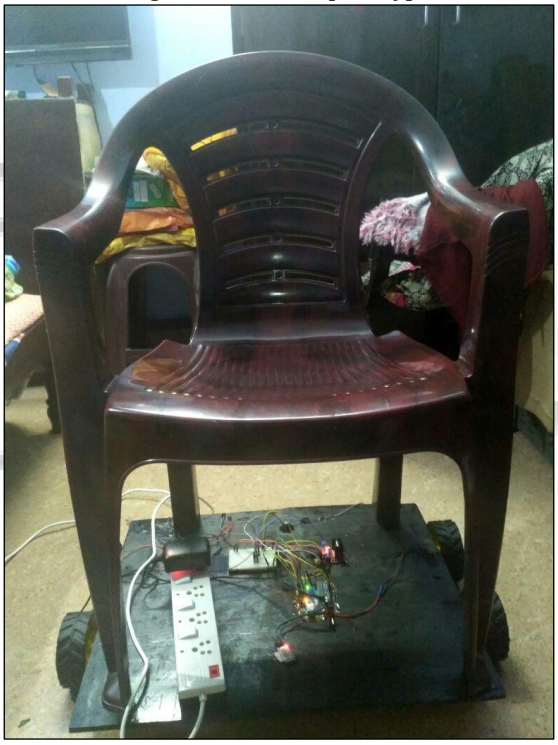

Fig. 6: Complete prototype

VI. CONCLUSION

The paper has been successfully designed and tested. The main goal of the paper is to reduce human effort in driving a wheelchair. Many existing systems has discussed about the wheelchairs and has proposed many methods for reducing their efforts. However all these methods to drive wheel chair need other dependence. So, in order to avoid that constrain, instead of controlling the wheelchair electrically or by remote, our project succeeded in moving the wheelchair using voice gesture. When the voice gesture are given by the physically challenged person sitting on the wheelchair, using HC 05 blue tooth kit the commands are received, and according to those commands the motors will move which in turn moves the wheel chair.

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