SMART WHEEL CHAIR USING ARDUINO UNO

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ABSTRACT

For physically handicapped person we developed voice and gesture controlled wheelchair. The person who is handicapped or elderly can use this technology. This system is using voice and gesture. In voice system we use commands such as FORWARD, BACKWARD, LEFT, RIGHT, STOP. We recognized speech and getting a successful recognition rate 99.03% to 98.3% with this we are also using gesture controlling movement of wheelchair for this we use accelerometer sensor. The accelerometer is directly connected to the microcontroller which is connected to the encoder IC (HT12E) this IC is connected to the RF Transmitter module this transmits the data wirelessly. The motor gets the signal and then it will operate accordingly. The purpose of this system is to implement the direction control wheelchair with voice and gesture.

KEYWORDS: *Microcontroller, RF Module, Accelerometer Sensor, Bluetooth Module.*

I.   INTRODUCTION

The physically handicapped person who uses traditional wheelchair is facing many problems. They need a permanent assistant while they are moving from one place to another for their day to day work. In market joystick wheelchairs exists but what if person is handicapped also with hand then what should happen!! So, we developed a voice and gesture controlled wheelchair to navigate from one place to another without any need of assistance.

The system of hand gesture recognition need only one hand. In this system the accelerometer is present which gives the orientation in x, y and z direction according to that the microcontroller gives command to the motor driver IC which rotates the motor.

In voice system we use recognition commands from mobile phone and at the receiver side the Bluetooth Module (HC05) receives the signal. These signals are fed to the microcontroller which operates the motor accordingly.

The old system of wheelchair is not worthy for old age people as well as handicapped people. So, voice and gesture plays a vital role regarding this problem and our system is more preferable and cost effective regarding the situation of the elderly and handicapped people.

II.   LITERATURE SURVEY

During the survey we find that there is the need of smart wheelchair which is controlled by both voice and gesture. While we are studying or analyzing the other project based on wheelchair we found some problems. Some of them wheelchairs prototypes are:

Automated Wheelchair: In this wheelchair ultrasonic sensor, infrared sensor is used for controlling of wheelchair. Also, in this wheelchair voice commands are used and for obstacles they are using infrared sensors. If any obstacle come then the infrared sensors which are connected with microcontroller, gives command and according to that motor will function.

Wheelchair only using Gesture: This wheelchair is used for physically disabled people. They use their hand movements for the motion of the wheelchair. The accelerometer is used for the controlling the wheelchair.

The above projects have some problems. So, after observing all these pros and cons we developed the

smart wheelchair which is controlled by both voice recognition and hand gesture.

III. WORKING

The physically handicapped or elderly person faced many problems with traditional wheelchair. In our project we are using the voice and gesture recognition for controlling the wheelchair.

In voice recognition, we send the commands with the help of mobile app. Bluetooth receiver receives the command. The data which comes from the bluetooth device is compared with the predefined data to get the result. According to this we give commands to the motor driver IC (L293D) which drives the motor.

In gesture recognition, 3-axis accelerometer and gyroscope sensor (MPU6050) which gives the orientation in x, y and z direction and gives command to the Arduino. This parallel data is converted into serial data with the help of 12 - bit encoder IC (HT12E). This data is fed into RF Transmitter Module which transmits the data wirelessly and at the receiver side RF Receiver receives the signal and then the data is converted into the 12-bit data with the help of 12-bit decoder IC (HT12D). Then according to this the motors are controlled with the help of motor driver IC (L293D).
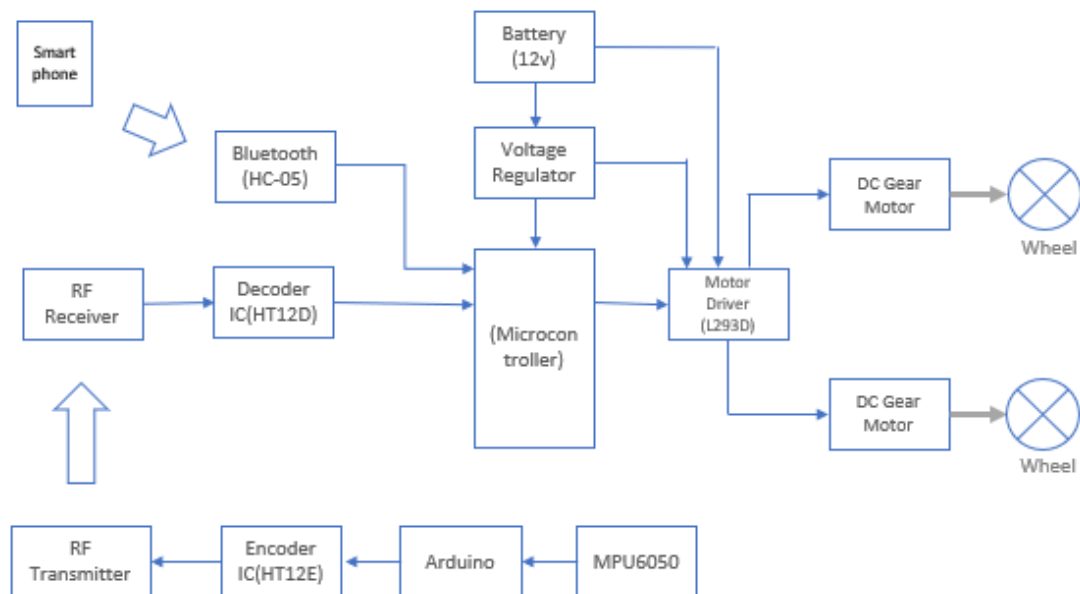
IV. PROPOSED ARCHITECTURE

Fig-1: Block Diagram of proposed architecture

Above diagram shows the block diagram of the proposed work "Smart Wheelchair". In this we are using Arduino Uno microcontroller. This microcontroller is connected with different modules. Here, all modules have their specific function.

Smart phone unit sends the command to the bluetooth module (HC05) wirelessly. The bluetooth unit give that command to microcontroller.

The 3 axis accelerometer and gyroscope sensor (MPU6050) gives the orientation in x, y and z axis. The 12-bit encoder IC (HT12E) converts the data into the serial stream. This converted data is transmitted to the RF Receiver module with the help of RF Transmitter module. The 12-bit Decoder IC (HT12D) converts this data into the original form. The Motor Driver IC (L293D) is connected with the microcontroller and gives command to the motor to rotate.

V. SIMULATION DIAGRAM

In this system Arduino UNO is used as a controller for controlling the modules and sensor. We used Arduino UNO because it have more no. of pins than Arduino Nano. A battery of 12v is used for power supply and to drive motors.
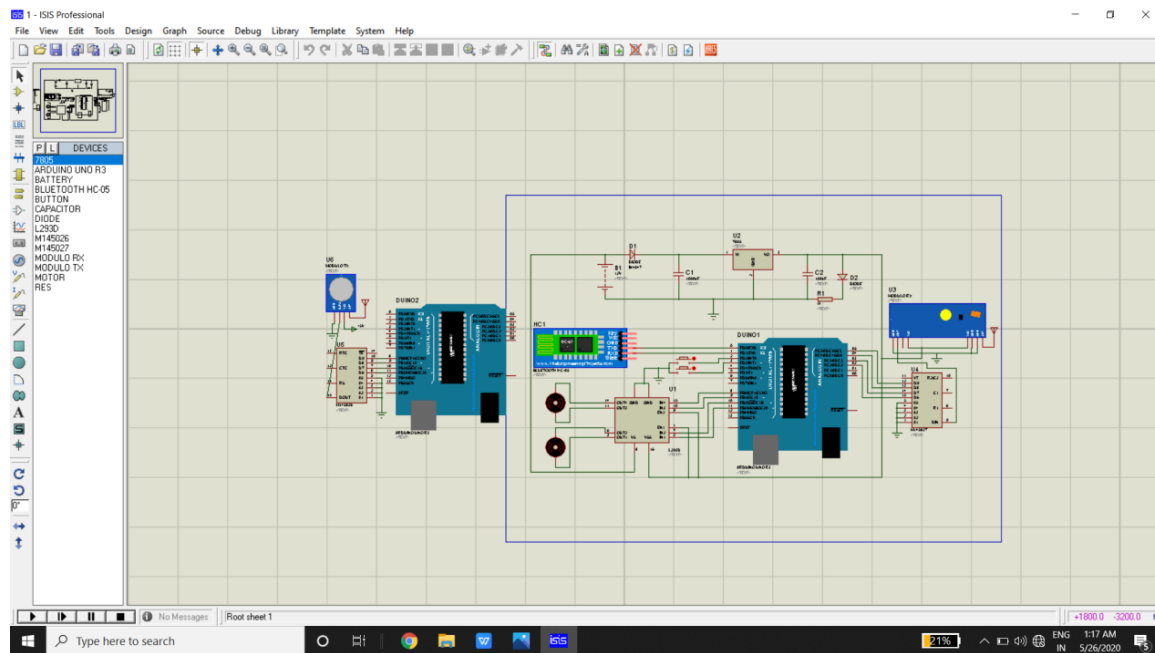
Fig-2: Circuit Diagram

A 3 axis accelerometer and gyroscope sensor (MPU6050) recognizes the hand gesture and rotates the wheel according to that. The signals which are coming from the MPU6050 are encoded into the serial stream with help of Encoder IC (HT12E). This encoder IC is in synchronization with decoder IC with the help of address bits. The address bits in both the IC's are having same pattern otherwise they are not synchronized and it will not work. This encoded data is transmitted wirelessly to the RF Receiver module at the receiver side by the RF Receiver module. This encoded data is decoded with the help of Decoder IC which is in synchronization with encoder IC. After that the 4-bit data is applied to the microcontroller and according to this the commands are given to the Motor Driver IC (L293D) which helps to rotate the wheels in a particular direction.

When the module is on another operating mode then it receives signal by the android mobile app with the help of Bluetooth. In this the commands are given on android mobile app which are transmitted wirelessly to the Bluetooth Module (HC05) at the receiver side. The commands are in the string format which are compared by predefined commands with the help of microcontroller. Then according to those commands the motor driver IC rotates the wheel in the desired direction.

VI.   RESULT

The aim of the project is to help handicapped and elderly people. To attain this we use voice and gesture recognition techniques. The voice recognition and gesture methods work very quickly whenever user use these features the sensors reacts fast and follow the commands immediately. So, we can say that the system we make is a life changer for handicapped and elderly people.

VII.   CONCLUSION

The project which we proposed can be successfully developed in industry. We also implemented the voice and gesture controlled wheelchair in real world. Those who are old and handicapped for them this project is very helpful. The results of our project is very much satisfied and if this project is industrialized then it will surely change the perspective of handicapped person. This project has low cost as well as it will give high happiness to the handicapped.

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