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Mobile Gesture Controlled Car

Varun Girish[1]

Student, Department of ECE, BMS College of Engineering, Bangalore, India[1]

Abstract: Mobile is an electronic device which almost every person in the society possesses. The evolution of mobile phones has not only changed the way we communicate but now it also includes a wide range of sophisticated sensors such as Gyroscopes, Accelerometers, Proximity sensors etc. The smartphone acts as a gateway and provides a lot of features such as Bluetooth and WiFi. Such smartphones can help make the world around us smarter. One such example is discussed in this paper for a mobile gesture controlled car. The smartphone can act as remotes to the car and is capable of controlling the car by means of a gyroscope present inside the phones. This paper demonstrates the simple use of a mobile device to control a toy car using Bluetooth and an app for controlling the motion of the car. The mode of communication is Bluetooth communication.

Keywords: Bluetooth, Gesture control, Mobile communication

I. INTRODUCTION

The emerging smartphones have a variety of sensors in them which can be used for a number of purposes. For instance the gyroscope present in the phones can give an accurate pointing angle. This is used for rotation of the screen when the mobile is turned around. Such sophisticated sensors can be used for a lot of applications in our daily lives. One such example is using the accelerometer in the smartphone to control the motion of a car. The toy car is controlled by an app on a mobile device. The movement of the mobile in a particular direction prompts the car to move in the same direction. This is possible due to the accelerometer present inside the mobile phone.

II. OPERATION

The project has two components:

1) Mobile application
2) The Arduino setup on the car

The accelerometer is an electronic device that is used to measure the non-gravitational acceleration along a particular direction. The accelerometers work on the principle of piezoelectric effect. The microscopic crystal structures get stressed by the accelerative forces, which cause a voltage to be generated. Using an ADC and by knowing the sensitivity of the accelerometer it is possible to determine the acceleration along each axis. This data is in turn sent to the Arduino Uno via the Bluetooth module (HC-05). In the arduino code the incoming data from the mobile accelerometer is analysed and decided where the car must move. Subsequently the Arduino sends a message to the motor driver(L293d) which moves the motors in the required direction.

III. THEORY

It is important to understand the components used in the system. Following is the brief summary of the operation of each of the main component.

A. ARDUINO UNO:

It is a microcontroller based on the ATmega328P. It has 14 input/output pins of which 6 are analog pins. It supports both UART and SPI protocols for communication. It is capable of performing complex mathematical computations

B. L293D

The L293D is a motor driver IC which allows DC motor to rotate in either directions. The L293D is a 16 pin IC which can control two DC motors simultaneously *(See Fig.2)*. Motor driver is basically a current amplifier which takes a low current from the microcontroller and gives a higher current to drive a motor. But, to enable the operation of motor in both the directions we need to use H-bridge. Reversing the voltage across the motor results in rotation of the motor in the opposite direction. When S1 and S3 is switched on, the potential difference between the motor terminals is positive and thus it rotates in clockwise direction. But when S1 and S4 are switched on the potential difference between the motor terminals become negative and thus the motor rotates in the anti-clockwise direction. This is the concept of operation of the H-bridge (See Fig.1).

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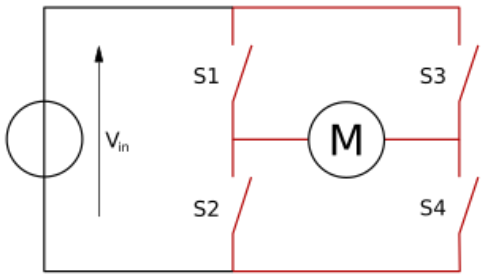

Fig.1 H-bridge

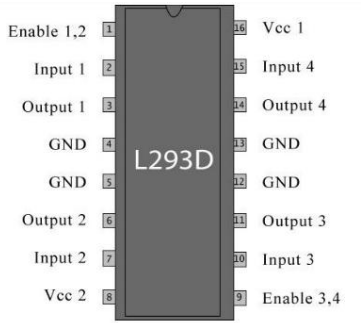

Fig.2 Pinout of L293D

C. BLUETOOTH MODULE HC-05

The Bluetooth module HC-05 is an easy to use SPP(Serial Port protocol) module designed for wireless communication. It can either be used in a master or slave configuration. It uses UART protocol for interfacing with the Arduino Pro mini. It supports 3 Mbps speed with a 2.4 GHz radio transceiver.

IV. PROPOSED SYSTEM

The proposed architecture is as shown in the Fig.3. The smartphone communicates with the Arduino by means of HC05 and send the accelerometer values to the Arduino. In the Arduino the values received are analysed. After the analysis the Arduino gives the command to the L293D to run the motors in the appropriate direction.

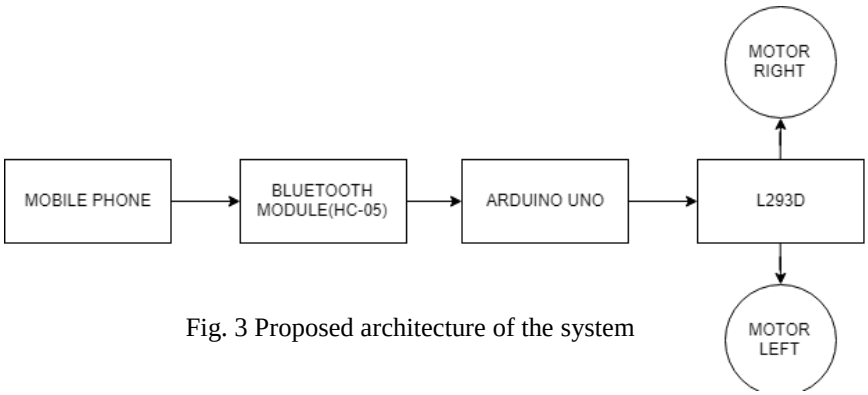

Fig. 3 Proposed architecture of the system

The circuit diagram is as shown in the Fig.4. The L293D connections are completed using the pinout as shown in the Fig.2.The connection of HC-05 to the Arduino is as follows:
Txd of HC-05 → Rxd of Arduino
Rxd of HC-05 → Txd of Arduino
The circuit diagram for the set up is shown in Fig.4.

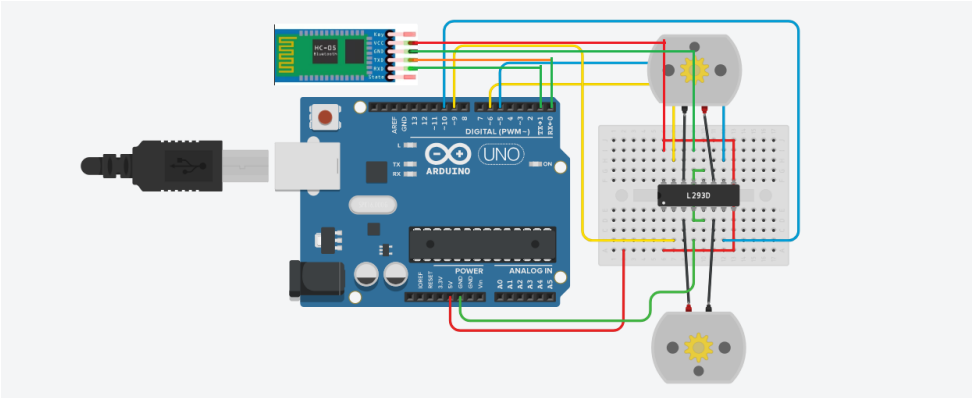

Fig.4. The circuit diagram for the entire setup

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V. MOBILE APP FOR CONTROLLING THE CAR

The car can be controlled by creating an android application using the MIT App Inventor 2 tool. The app gathers the data from the smartphone's accelerometer and sends it serially to the HC-05 module present on the car. The tool is relatively easy to use and gives the accelerometer reading very accurately. A screenshot of the app is shown in Fig.5.

Fig.5 Screenshot of the app

VI. POSSIBLE APPLICATIONS AND FUTURE SCOPE

Although the usage of Bluetooth has its own drawbacks like limited range of operation, it also has its own advantages like low power consumption. If the limited range of operation is overcome then this can be used in the defence sector for surveillance and also this technology can be nurtured to upscale for its usage in the virtual reality domain. With a little tweaks this can be used to diffuse bombs and prevent the loss of human life.

VII. OBSERVATION

It was found that the car responded to the Smartphone's movement quite instantaneously and the result was successful. The car followed the path according to the motion of the smart phone. Smartphone's which are very common nowadays have a range of sensors available and it is easily accessible to all the people. These sensors can be put to good use by incorporating them in projects such as these, for the development of smart devices.

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