

BLUETOOTH - BASED CONTROLLED CAR USING ARDUINO

Zin Mar Lay*

Abstract

In this research, the designed and constructed controlled car with automation system using Bluetooth is discussed. The control unit is the Arduino board. The HC-06 Bluetooth module activates wireless communication with android phone. It is ready to transmit and accept the data. The Bluetooth module operates data exchange from android phone to Arduino. An android operates using android application software. The Arduino activates using Arduino programming language and it receives the data from Bluetooth. The Arduino commands the motors of controlled car via motor driver circuit. The Arduino controls the car to activate backward, forward, left side and right side directions according to the receiving data from android phone. This research is a combination method of embedded system and technology of android.

Keywords: Arduino, bluetooth, motor driver, motor, android system

Introduction

A Bluetooth technology is a high speed low powered wireless technology link that is designed to connect phones or other portable equipment together. It is a specification for the use of low power radio communication to link phone, computers and other network devices over short distances without wires. Wireless signals transmitted with Bluetooth cover short distances, typically up to 30 feet (10 meters).

It is achieved by embedded low cost transceiver into the devices. It supports on the frequency band of 2.45GHz and can support up to 721KBps along with three voice channels.

Scope of Work

In this research, the Bluetooth controlled car is developed using L298 motor driver circuit, HC-06 Bluetooth module and Arduino. The smart phone and the application are used to control the car with Bluetooth communication system. The L298 motor driver circuit is implemented to provide the necessary current for driving the motor. The block diagram of constructed system is shown in Figure (1).

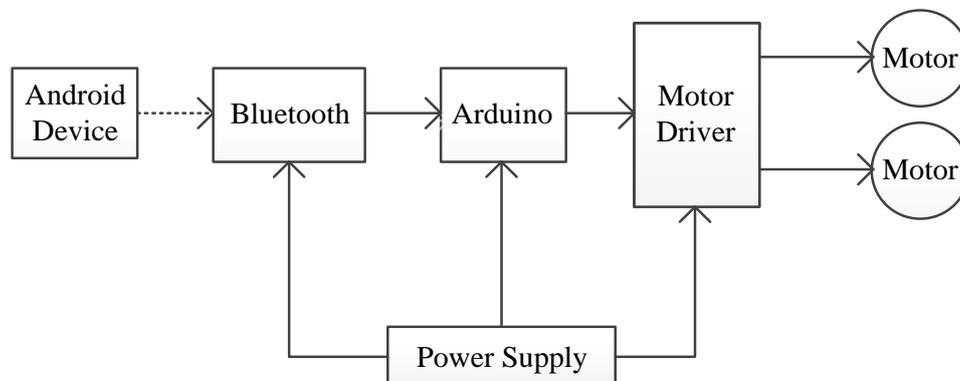


Figure 1 Block diagram of the constructed system

* Dr, Lecturer, Department of Physics, University of Mandalay

Electronic Devices Used in This Work

Arduino Uno Board

The Arduino Uno is a microcontroller board based on the ATmega 328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to computer with a USB cable or power it with a AC- to- DC adapter or battery to get started.



Figure 2 The photograph of Arduino Uno Board

Bluetooth Module HC-06

The HC-06 is a class 2 slave Bluetooth module designed for transparent wireless serial communication. Once it is paired to a master bluetooth device such as PC, smart phones and tablet, its operation becomes transparent to the user. All data received through the serial input is immediately transmitted over the air. When the module receives wireless data, it is sent out through the serial interface exactly as it is received.

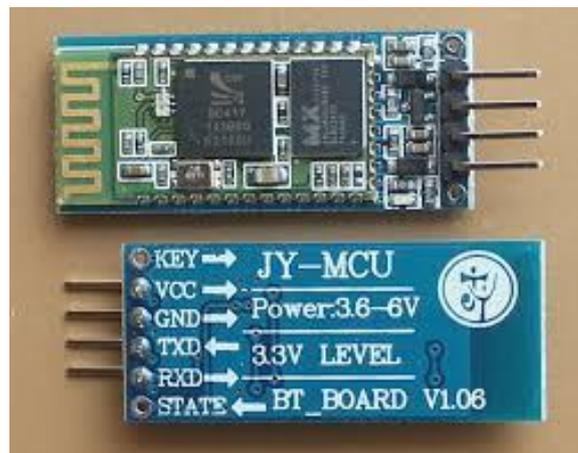


Figure 3 The photograph of Bluetooth module

L298 IC

L298 is a high power version of L298 motor driver IC. It is a high voltage, high current, dual full-bridge driver designed to accept standard TTL logic levels (Control Logic) and drive inductive loads such as relays, solenoids, DC and Stepper motors. Two enable inputs are provided to Enable or disable the device independently of the input signals. The emitters of the

lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor.

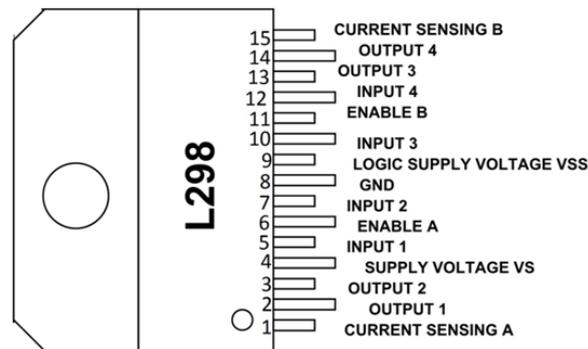


Figure 4 Pin configuration of the L298 IC

DC Motor

A DC motor is any of 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.



Figure 5 The photograph of the DC motor

Design and Construction of the System

Construction of Bluetooth with Arduino

The HC-06 module communicates with Arduino Bluetooth module through serial communication. TX pin of Bluetooth module needs to connect with RX pin (receive pin) of Arduino. RX pin of Bluetooth connected with TX pin (transmit pin) of Arduino Uno board. The Arduino triggers the output four states according receives data through the Bluetooth module from an android device. The +5V and GND pins of Bluetooth module are connected to +5V and GND of Arduino.

Construction of Complete Circuit for the Whole System

The constructed system is developed to control the car by smart phone Bluetooth communication. The two motors from controlled car are driven using L298N dual H-Bridge motor drive. Using the L298N motor driver IC, eight diodes, two resistors are implemented for driver circuit. Arduino Uno board is the control unit. The HC-06 bluetooth transceiver module has higher speeds to performance and its TX and RX pins are connected to the RX and TX pins of Arduino. After pairing the smart phone and Bluetooth device, sent the commands to operate the motor. If button is pressed, the Bluetooth transmit the data to Arduino. The Arduino receives the data and generates the outputs to operate the motor driver.

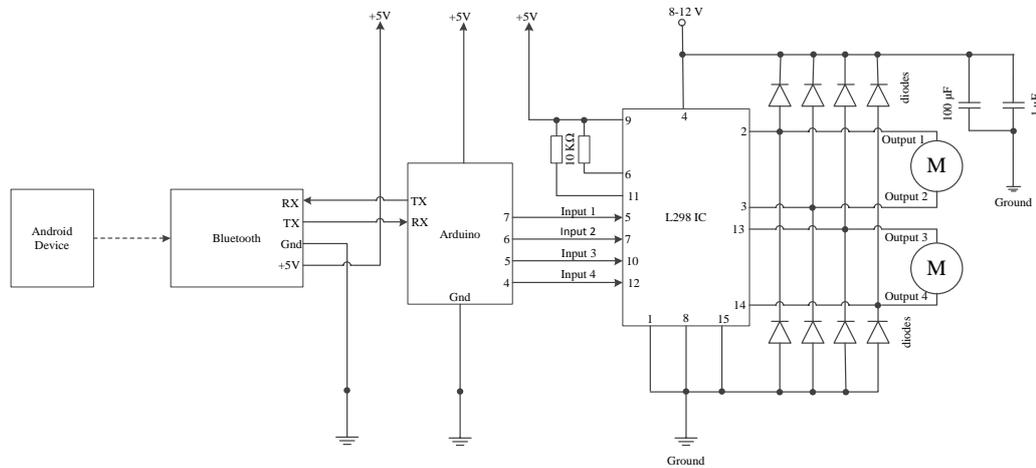


Figure 8 The complete circuit for the constructed system

The Flowchart for the Main Program

At the beginning of the program, define the functions and initialize serial baud rate 9600 bits/sec and assign pin 7, 6, 5 and 4 of Arduino are as output pins. And then read the receiving data from Bluetooth. If the data is equal to 'a', the Arduino gives the data (1, 0, 1, 0) to drive the motor to forward direction. If the data is not 'a', it tests the data is 'e' or not. If the data is 'e', the Arduino generates the data to operate the backward direction. Also left, right and stop directions are controlled by Arduino according to the receiving data from Bluetooth serial communication.

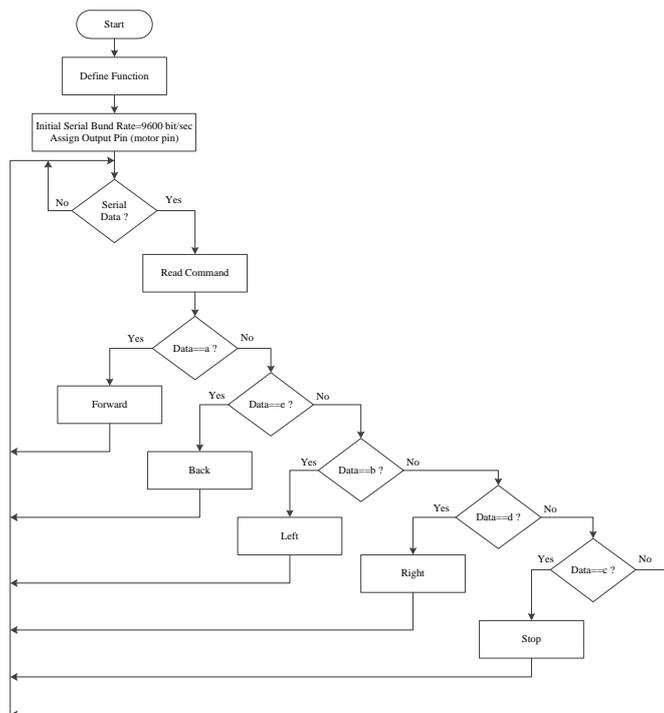


Figure 9 Flowchart of the main program

Arduino Control Signal to Motor

Table 1 Arduino Control signal to motor

Pin	Forward	Backward	Left	Right	Stop
4	1	0	1	0	0
5	0	1	0	1	0
6	1	0	0	1	0
7	0	1	1	0	0

Results, Discussion and Conclusion

Results and Discussion

The research is developed by using Arduino, L298 motor driver and Bluetooth module. The android phone and android application control the car. The Arduino and android phone are responsible for enabling via Bluetooth module. The constructed L298 motor driver circuit which provides the necessary current to drive the motors. The left side motor is joined to two output pins of motor driver and the right side motor is also joined to the other two output pins. The Bluetooth and application are paired to easy to control the car. The five buttons in application control the movement of the car in various directions according to the receiving commands over Bluetooth.

If one key is pressed, the Arduino receives the data via Bluetooth and it performs with appropriate instructions and sends the data to input pins of motor driver. The operating range of Bluetooth is about 10 meters. Figure (11) is the photograph of circuit connections of the system. Figure (12) is the photograph of front view of the constructed system. Figure (12) is the photograph of smart phone and controlled car via Bluetooth communication.

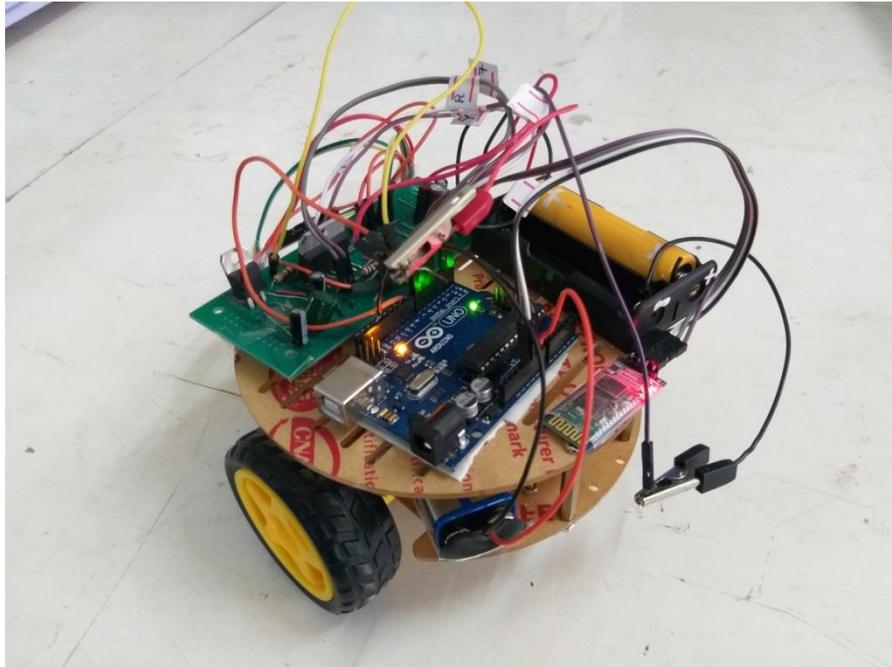


Figure 10 The photograph of circuit connections of the system

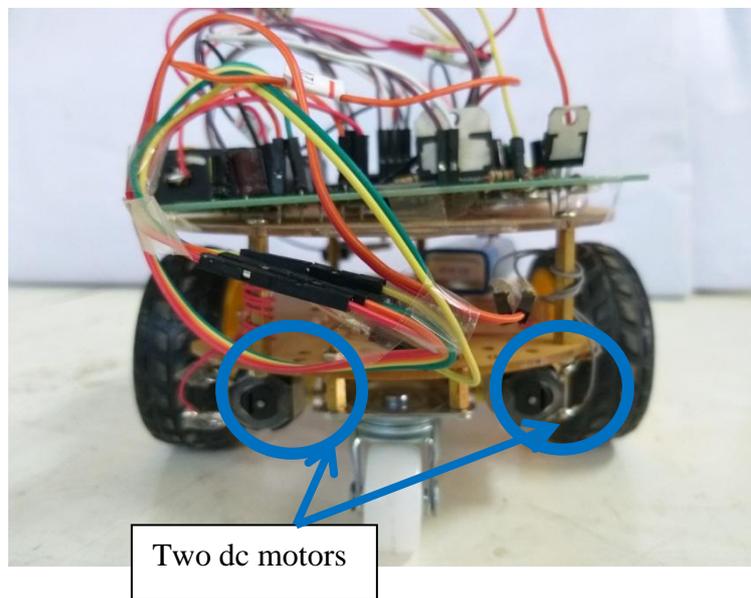


Figure 11 The photograph of front view of the constructed system



Figure 12 The photograph of smart phone and controlled car via Bluetooth communication

Conclusion

In this research, the Bluetooth communication system is used to drive the controlled car to various directions. Further research can be done other wireless ways to communicate with controller using wifi serial transceiver module, Zigbee, GSM/GPS communication, Radio RF transceiver.

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