Bluetooth Controlled Robot using ARDUINO

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Abstract - Robot is a re-programmable, multi functional device which is primarily designed to do work like human such as pick and place, loading and unloading, surveillance, health care, industrial, aerospace application. Robots can perform dangerous and accurate work to increase the productivity as they can work 24 hours without rest. This paper deals with the design and control of automated vehicle type robot which can move in desired direction and captures pictures and videos of required location. An android application has developed using MIT App inventor and a Bluetooth communication is made with robot which interfaces with microcontroller to control its speed and direction. Aim of this work is to design and control the motion of robot using Bluetooth device of an Android phone.

*Keywords -*HC-05 ,MATLAB ,Arduino UNO, L298N Motor Driver Module

I. INTRODUCTION

The design and develop a Bluetooth Controlled Robot using Arduino, HC-05 Bluetooth Module and L298N Motor Driver Module. On the other end of the Bluetooth Communication, I will be using a Smart Phone and a simple Android App to control the Robotic Car. Robots are always a fancy topic for students, hobbyists and DIYers. If you are beginner, then building a robot (like a car or an arm) is probably one of the important projects to do after learning about the basics.
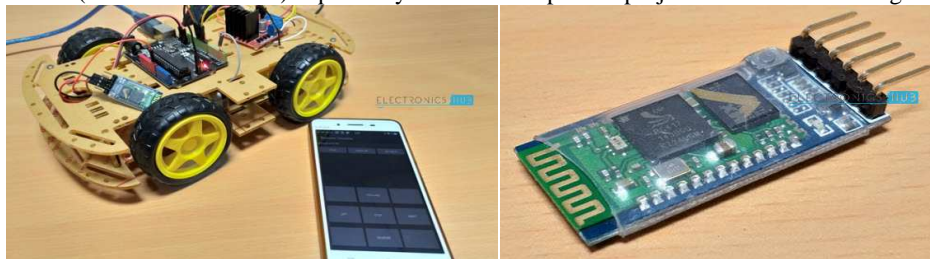
HC-05 Bluetooth Module

Implementing Bluetooth Controlled Robot using Arduino and a few other components and build a simple robotic car that can be controlled using an Android Phone (through an App) over Bluetooth Communication.

Prerequisites for Bluetooth Controller Robot

Apart from Arduino, which is the main controlling module of the project, there are two other important modules that you have to be familiar with in order to implement the Bluetooth Controlled Robot project.

They are the HC-05 Bluetooth Module and the L298N Motor Driver Module.

The HC-05 Bluetooth Module is responsible for enabling Bluetooth Communication between Arduino and Android Phone.

L298N Motor Driver Module

The L298N Motor Driver Module is responsible for providing the necessary drive current to the motors of the robotic car. I have provided information about L298N Module in an earlier project called Arduino DC Motor Control using L298N. So, refer to ARDUINO DC MOTOR CONTROL USING L298N for more information on interfacing L298N with Arduino.

Circuit Diagram of Bluetooth Controlled Robot

The following is the circuit diagram of Bluetooth Controlled Robot using Arduino, L298N and HC-05.
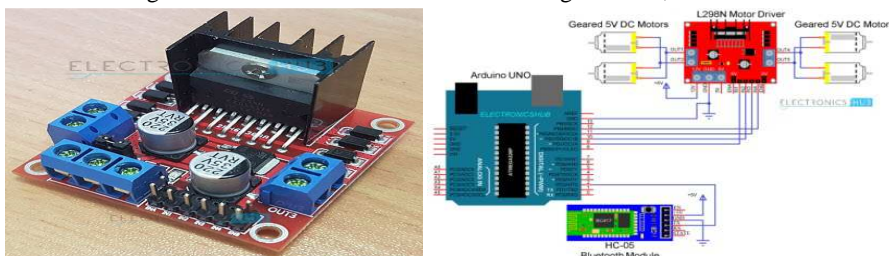
II. COMPONENTS REQUIRED

- Arduino UNO
- L298N Motor Driver Module
- HC-05 Bluetooth Module
- Robot Chassis
- 4 x 5V Geared Motors
- Connecting Wires
- Battery Holder
- Power Supply
- Android Phone
- Bluetooth Controller App

I have used L298N Motor Driver Module to drive the motors of the robot. You can use either this one or L293D Motor Driver Module. If you are using L293D, then check out for the connections.

Circuit Design: I wouldn't go into the details of the construction of the robot as your robot chassis might be different from mine and you can easily figure it out how to build the robot from the available parts and possible cable management for making the robot more appealing. Coming to the design of the circuit, first is the HC-05 Bluetooth Module. The +5V and GND pins of the Bluetooth Module are connected to +5V and GND of Arduino. Since I will be only transmitting data related to the Robot's movement from Android Phone to Bluetooth Module and do not intend to receive any data from Arduino, I will connect only the TX pin of the Bluetooth Module to RX Pin of Arduino. This RX pin of Arduino is based on Software Serial library (Pin 2 and Pin 3 are configured as RX and TX on Arduino). The RX pin of the Bluetooth is left open. Now, the L298N Motor Driver Module. Digital I/O Pins 9 through 12 of Arduino are configured as Input pins of the Motor Driver and are connected to IN1 through IN4 of the L298N Motor Driver Module. Both the Enable Pins are connected to 5V through provided jumper. The robot chassis which I am using in this Bluetooth Controlled Robot Car project is supplied with 4 geared motors. Since L298N has slots for only two motors, I have joined the left side motors as one set and the right side motors as other set and connected both these sets to the output of L298N Module.

III. WORKING

Assemble the robot, make the necessary connections and upload the code to Arduino.

If you understood the HC-05 Bluetooth Module tutorial, then understanding the Bluetooth Controlled Robot project is very easy.

First, in the Android App, I have used 5 keys as Forward, Reverse, Left, Right and Stop. The corresponding data associated with each key is as follows:

- Forward – 1
- Reverse – 2
- Left – 3
- Right – 4
- Stop – 5

When a key is pressed, the corresponding data is transmitted to the Bluetooth Module from the Phone over Bluetooth Communication.
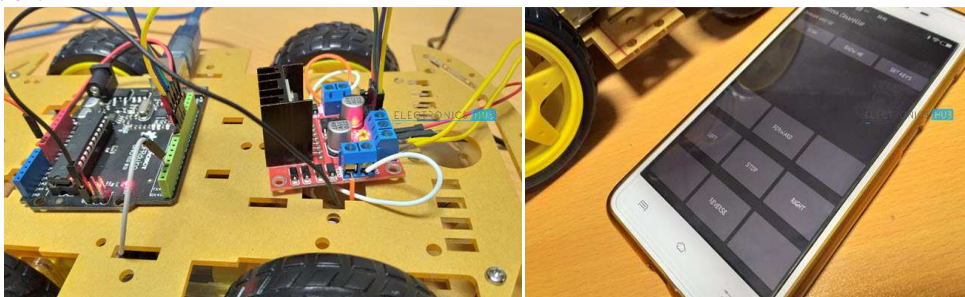
In the Arduino code, the Arduino UNO receives any of this data from the Bluetooth Module (as per the key pressed) and performs a simple switch case operation, where each case associated with appropriate instructions to the Motor Driver Input Pins. For example, if 'Forward' key is pressed in the Android Phone, then '1' is transmitted. Arduino will then make IN1 and IN3 as HIGH and IN2 and IN4 as LOW to achieve a forward motion.

Similarly, other keys correspond to appropriate setting of IN1 – IN4 pins.

IV. LIMITATIONS

- As the range of the Bluetooth Communication is limited (a maximum of 10 meters for class 2 devices for example) the control range of Bluetooth Controlled Robot is also limited.

- Make sure that sufficient power is provided to all the modules especially the Bluetooth Module. If the power is not sufficient, even though the Bluetooth Module powers on, it cannot transmit data or cannot be paired with other Bluetooth devices.

V. APPLICATIONS

- Low range Mobile Surveillance Devices
- Military Applications (no human intervention)
- Assistive devices (like wheelchairs)
- Home automation

VI. CONCLUSION

The OS of smart phone is android which can develop effective remote control program. At the same time, this program uses blue-tooth connection to communicate with robot. It has proven to allow for meaningful two way communication between Android phone and the robot which allows a non-expert to interact with and adjust the functionality of system

REFERENCES

[1] Arpit Sharma1, Reetesh Varma2, Saurabh Gupta3 and Sukhdeep Bhatia4, "Android Phone Controlled Robot Using Bluetooth" IJEEE ISSN 0974-2174, Volume 7, Number 5 (2014, pp. 443-448).

[2] A.V.Sudhakara Reddy, M. Ramasekhara Reddy, M. Vijaya Kumar "Stability Improvement During Damping of Low Frequency Oscillations with Fuzzy Logic Controller", International Journal of Engineering Research and Applications (IJERA), Vol.2, No.5, pp.1560-1565, September 2012.

[3] G.Sathya, Fathima Shameema S, Jyothi MolSebastian, Jemsya K S"Automatic Rescue System for Ambulance and Authoritative Vehicles, Vol.2 - Issue 4 April.

[4] B Bhargava Reddy, D Sivakrishna and A V Sudhakara Reddy "Modelling and Analysis of Wind Power Generation Using PID Controller", International Journal For Scientific Research & Development (IJSRD), Vol.1, No.9, pp.2045-2049, November 2013.

[5] A. V. Sudhakara Reddy, M. Damodar Reddy andY. V. Krishna Reddy "Feeder Reconfiguration of Distribution Systems for Loss Reduction and Emissions Reduction using MVO Algorithm", Majlesi Journal of Electrical Engineering,Vol.12, No.2, pp.1-8, June 2018.

[6] A. V. Sudhakara Reddy, Dr. M. Damodar Reddy, M. Satish Kumar Reddy "Network Reconfiguration of Distribution Systems for Loss Reduction using GWO algorithm", InternationalJournal of Electrical and Computer Engineering (IJECE), Vol.7, No.6, pp.3226-3234, December 2017.

[7] S.Bharathi, A.V.Sudhakara Reddy, Dr.M.Damodar Reddy, "Optimal Placement of UPFC and SVC using Moth-Flame Optimization Algorithm",International Journal of Soft Computing and Artificial Intelligence, ISSN: 2321-4046, Vol.5, No.1, pp.41-45, May2017.

[8] A. V. Sudhakara Reddy, Prof. M. Damodar Reddy, "Optimization of Distribution Network Reconfiguration Using Dragonfly Algorithm", Journal of Electrical Engineering, Vol.16, No.4, No.30, pp.273-282, ISSN:1582-1594, March 2017.

[9] Arvind Kumar Saini1,GarimaSharma2, Kamal KishorChoure3, "BluBO: Bluetooth Controlled Robot," International Journal of Science and Research (IJSR) National Conference on Knowledge, Innovation in Technology and Engineering (NCKITE), 10-11 April 2015, pp. 325-328S.

[10] Kalyani S, A. V. Sudhakara Reddy and N. Vara Prasad "Optimal Placement of Capacitors in Distribution Systems for Emission Reduction Using Ant Lion Optimization Algorithm", International Journal of Current Advanced Research, Vol.7, No.11, pp.16339-16343, 2018.

[11] A. V. Sudhakara Reddy and Dr. M. Damodar Reddy "Application of Whale Optimization Algorithm for Distribution feeder reconfiguration", i-manager's Journal on Electrical Engineering, Vol.11, No.3, pp.17-24, Jan-Mar 2018.

[12] Y V Krishna Reddy, M. Damodar Reddy and A. V. Sudhakara Reddy "Flower Pollination Algorithm for Solving Economic Dispatch with Prohibited Operating Zones and Ramp Rate Limit Constraints", Journal of Emerging Technologies and Innovative Research (JETIR), Vol.5, Iss.10, pp.498-505, 2018.

[13] A. V. Sudhakara Reddy, N.Rajeswaran and D. Raja Reddy "Application of modified ALO to economic load dispatch for coal fired stations", International Journal of Recent Technology and Engineering (IJRTE), Vol.8, No.2, pp.2147-2152, 2019.

[14] Y V Krishna Reddy, M. Damodar Reddy and A. V. Sudhakara Reddy "Flower Pollination Algorithm to Solve Dynamic Economic Loading of Units with Practical Constraints", International Journal of Recent Technology and Engineering (IJRTE), Vol.8, No.3, pp.535-542, 2019.

[15] Sabarinath.G, T.Gowri Manohar and A. V. Sudhakara Reddy "Voltage Control and Power Loss Reduction in Distribution Networks using Distributed Generation", International Journal of Innovative Technology and Exploring Engineering (IJITEE), Vol.8, No.12, pp.2863-2867, 2019.

[16] Y. Praveen Kumar Reddy, N. Vara Prasad and A. V. Sudhakara Reddy "A Power Sensor Tag with Interference Reduction for Electricity Monitoring of Two-Wire Household Appliances", Journal of Research in Science, Technology, Engineering and Management, Vol.6, No.1, pp.31-35, 2020.

[17] B. Bhargava Reddy, P. Nagarjuna and A. V. Sudhakara Reddy "Traffic Signal Control Using Lab View", Journal of Research in Science, Technology, Engineering and Management, Vol.6, No.1, pp.1-4, 2020.

[18] A. V. Sudhakara Reddy, Balla Shiva Kumar and Ch. Narendra Kumar "A Hybrid Diesel Wind PV Based Energy Generation System", International Journal of Recent Technology and Engineering (IJRTE), Vol.8, No.4, pp.12157-12162, Nov 2019.

[19] R. W. Lucky, "Automatic equalization for digital communication," Bell Syst. Tech. J., vol. 44, no. 4, pp. 547-588, Apr. 1965