

Arduino Based Bluetooth Controlled Robot

Subankar Roy^{#1}, Tashi Rapden Wangchuk^{#2}, Rajesh Bhatt^{#3}

^{#1}Diploma Student in Dept. of Electronics & Communication Engineering, CCCT Polytechnic

^{#2}Sr. Lecturer in Dept. of Electrical and Electronics Engineering, CCCT Polytechnic

^{#3}Diploma Student in Dept. of Electronics & Communication Engineering, CCCT Polytechnic
Chisopani, P.O. Nandugaon, South Sikkim, India

Abstract—A robot is usually an electro-mechanical machine that is guided by computer and electronic programming. Many robots have been built for manufacturing purpose and can be found in factories around the world. Designing of the latest inverted ROBOT which can be controlling using an APP for android mobile. And in which we use Bluetooth communication to interface Arduino UNO and android. Arduino can be interfaced to the Bluetooth module though UART protocol. According to commands received from android the robot motion can be controlled. The consistent output of a robotic system along with quality and repeatability are unmatched. This robots can be reprogrammable and can be interchanged to provide multiple applications.

Keywords— Arduino, HC-05(Bluetooth Module), L298 (Dual H-bridge Motor Controller), DC Motor.

I. INTRODUCTION

Nowadays smart phones are becoming more powerful with reinforced processors, larger storage capacities, richer entertainment function and more communication methods. Bluetooth is mainly used for data exchange; add new features to smart phones. Bluetooth technology, created by telecom vendor Ericsson in 1994[1], shows its advantage by integrating with smart phones. It has changed how people use digital device at home or office, and has transferred traditional wired digital devices into wireless devices. A host Bluetooth device is capable of communicating with up to seven Bluetooth modules at same time through one link [2]. Considering its normal working area of within eight meters, it is especially useful in home environment. Thank for Bluetooth technology and other similar techniques, with dramatic increase in Smartphone users, smart phones have gradually turned into an all-purpose portable device and provided people for their daily use [3][4]. In recent years, an open-source platform [5]. Android has been widely used in smart phones. Android has complete software package consisting of an operating system, middleware layer and core applications. Different from other existing platform like iOS (iPhone OS), it comes with software development kit (SDK), which provides essential tools and Application [6]. Using a Smartphone as the “brain” of a robot is already an active research field with several open opportunities

and promising possibilities. In this paper we present a review of current robots controlled by mobile phone and discuss a closed loop control systems using audio channels of mobile devices, such as phones and tablet computers. In our work, move the robot upward, backward, left and right side by the android application such as Bluetooth Terminal.

II. PROPOSED SYSTEM

The purpose of our research is to provide simpler robot’s hardware architecture but with powerful computational platforms so that robot’s designer can focus on their research and tests instead of Bluetooth connection infrastructure. This simple architecture is also useful for educational robotics, because students can build their own robots with low cost and use them as platform for experiments in several courses.

Common control architectures: The following list shows typical robot control architecture:

A. Arduino

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino had used the Atmel Atmega AVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560.

B. HC-05

A HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

III. BLOCK DIAGRAM

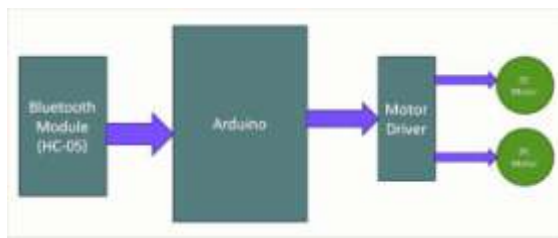


Fig.1 Block Diagram of the Project

C. Android Phone:

In this project we will control the robot using Android Phone by using an application which we will get from Android Play store. By installing the application we can move the robot in four direction i.e., is front, reverse, left and right directions [7].

D. Bluetooth Receiver:

Bluetooth Receiver consists of Bluetooth serial interface module and Bluetooth adapter. Bluetooth serial module is used for converting serial port to Bluetooth. This module has two modes: master and slaver device. The device named after even number is defined to be master or slaver when out of factory and can't change to the other mode. But for the device named after odd number, users can set the work mode (master or slaver) of the device by AT commands [8][9].

E. Arduino UNO:

The Arduino Uno is a 8 bit microcontroller board based on the ATmega328. It has 14 digital pins and 6 analog pins and other power pins such as, GND, VCC, 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 has SRAM 2kb and flash memory 32kb. EEPROM with 1KB. Arduino is open source hardware board with many open source libraries to interface it on board microcontroller with many other external components like LED, motors, IR sensors and many other things one want to interface with Arduino board. Arduino is a complete board which include all things to connect with external peripheral and to program through computer. It contains everything needed to support the microcontroller. We either need to connect it to a computer using a USB cable or power it with an AC-to-DC (7-12v) adapter. The Arduino circuit acts as an interface between the software part and the hardware part of the project [10].

F. L298:

The L298 is an integrated monolithic circuit in a 15lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver

designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping 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. An additional supply input is provided so that the logic works at a lower voltage.

G. DC Motor:

Almost every mechanical movement that we see around us is accomplished by an electric motor. Electric machines are means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motor is used to power hundreds of devices we use in everyday life. An example of small motor applications includes motors used in automobiles, robot, hand power tools and food blenders. Micro-machines are electric machines with parts the size of red blood cells and find many applications in medicine.

IV. SOFTWARE DESCRIPTION:

The smart microcontroller unit named as Arduino Uno can be programmed with the Arduino software there in no any requirement for installing other software rather than Arduino. Firstly, Select "Arduino Uno from the Tools , Board menu (according to the microcontroller on your board). The IC used named as ATmega328 on the Arduino Uno comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. Communication is using the original STK500 protocol (reference, C header files). We can also bypass the boot loader and programs the microcontroller through the ICSP (In Circuit Serial Programming) header. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2. On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

The Arduino Uno is one of the latest smart microcontroller unit and has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL at (5V) with serial communication, which is available on digital pins 0 - (RX) for receive the data and pin no.1 (TX) for transmit the data. An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard

USB COM drivers, and no external driver is needed. However, on Windows, an .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus. Arduino programs are written in C or C++ and the program code written for Arduino is called sketch. The Arduino IDE uses the GNU tool chain and AVR Libc to compile programs, and for uploading the programs it uses avrdude. As the Arduino platform uses Atmel microcontrollers, Atmel's development environment, AVR Studio or the newer Atmel Studio, may also be used to develop software for the Arduino.

V. CIRCUIT DIAGRAM

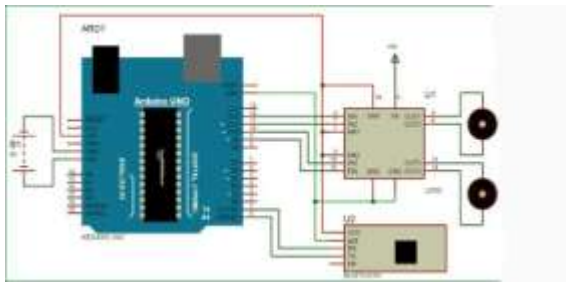


Fig.2 Circuit Diagram of the Project

A. Circuit Description:

Here in this robot we have used a Bluetooth module which controls the robot via 2 DC High Torque motors at 10,000 RPM approx. The robot is control by an android phone application. Microcontroller used here is Arduino UNO R3 from microcontroller family which contributes in a serial communication UART mode and the communication is governed on 9800bps to communicate it with the Bluetooth module.

VI. CONCLUSION

The Wireless control is one of the most important basic needs for all the people all over the world. But unfortunately the technology is not fully utilized due to a huge amount of data and communication overheads. Generally many of the wireless-controlled robots use RF modules. But our project for robotic control makes use of Android mobile phone which is very cheap and easily available. The available control commands are more than RF

modules. For this purpose the android mobile user has to install a designed application on her/his mobile. Then he/she needs to turn on the Bluetooth in their mobile. The wireless communication techniques used to control the robot is nothing than Bluetooth technology. User can use several commands like move reverse, forward, move left, move right using these commands which are given from the Android mobile. Robot has a Bluetooth receiver unit that receives the commands and move left, move right using these commands which are given from the Android mobile and send it to the Arduino circuit to control the motors. The Arduino UNO then transfers the signal to the motor driver IC's to operate the motors.

ACKNOWLEDGMENT

After completing the project we come to know that there are many uses of the Arduino UNO R3. Arduino can easily take the input from the real world and produce the output according to it and it can control almost anything and the knowledge is ever expanding and so are the problems which the mankind strive to solve. In this spirit, it is hoped that the current activity will lead to further enhancements. For example; work on future for military purpose by the robot.

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AUTHORS



Subankar Roy is a final year Diploma student, Dept. Of Electronics and Communication Engineering from Centre for Computer and Communication Technology, Chisopani, South Sikkim. His main areas of interest are satellite communications, microcontroller, microprocessor and Microwave Theory and Techniques.



Tashi Rapden Wangchuk is presently associated with the Department of Electrical and Electronics Engineering at “Centre for Computer and Communication Technology” (CCCT-Govt. Polytechnic), Chisopani, South Sikkim, India; as a Senior Lecturer since 2003 to till date. He has completed his BE in Electrical Engg. From Assam Engineering College (Guwahati) and has also completed his MTech in Electrical Engg. From KSOU. His areas of interest are Electrical Power systems, Control systems. Microprocessors and Digital Signal Processing.



Rajesh Bhatt is a final year Diploma student, Dept. Of Electronics and Communication Engineering from Centre for Computer and Communication Technology, Chisopani, South Sikkim. His main areas of interest are Analog and Digital Circuits, Embedded Systems and Wireless Communication & Networking.