



BLUETOOTH BASED ROBOT CONTROL USING ARDUINO

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ABSTRACT:

Now-a-days the world is optimizing and is becoming more precise by switching from the world of personal computers to laptops to android phones. Human is moving and is accepting compact technologies so that, the gap between personages and the machines is being reduced to ease the standard of living. The purpose of this project is to design and implement a compound robot. The compound robot will be able to move in four directions (left, right, forward, backward) and will detect the distance of the obstacle from the robot on the android app. The main intent of this project is to design and bring about a robot prototype by using Arduino Uno, Motor Driver L293D, HC05- Bluetooth module and to procure the goal of this project, to gain knowledge about Ultrasonic sensor HCSR-04, reconcilable software and controlled motor circuit need to be determined. The robot will have several characteristics like continuous display of distance from the obstacle on the app, easy handling of a robot with the help of an app rather than any remote controller.

Keywords: Smart phones, Bluetooth, Android OS, Robot, Motor.

Introduction:

1. 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.

2. Present day, android is widely accepted as an open source platform. Android consist of a complete package involving an operating system, middleware layer and core applications. A Smartphone is a cell phone built on a mobile computing platform, which has big number of boosted connectivity and computing ability than what a feature phone has.

3. In this paper, we are overcoming the problem of traditional robots, which are usually handled with any remote controller. Reducing the remote work we are making the robot move by just a click on the cell phone with android operating system.

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:

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.

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).

Motor Driver L293D

L293D is a motor driver IC which allows the motor driver to move in any direction. With the help of motor driver, two DC motor can be attached on a single IC and both of them can be moved in either directions. L293D is a 16 pin IC which can control a set of direct current motors, Dual H-bridge Motor Driver integrated circuit(IC). This driver drives small as well as quite big motors, and it works on the concept of H-bridge circuit which allows the voltage to be flown in any direction. H-bridge is ideal for driving a DC motor as the voltage needs to change the direction of the motor to make it move it in either clockwise or anti-clockwise direction. L293D pin diagram consist 4 input pins, 2, 7 are the left pins and 15, 10 are the right pins these pins regulate the rotation of the motor in either left side or right side. Inputs are given as Logic 0 (low) and Logic 1 (high), for rotating the motor the low and high signals are provided. It has Vcc pin where voltage required for internal operation is specified maximum of 5V supply can be provided. Vss or ground pin is there where we can apply voltage for driving the motor, maximum of 36 V supply can be applied. Maximum of 600mA current per channel can flow in the circuit.

DC Motor

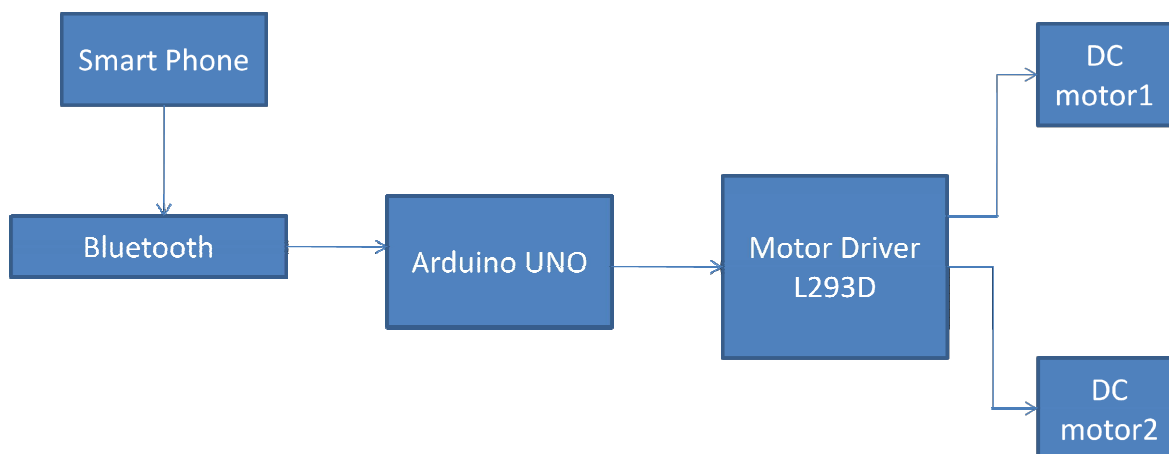
Direct current motor is an electric motor which is capable of handling mechanical movements by converting conventional energy. DC motor takes electrical energy and produces mechanical energy. Dc motors are usually referred to as power devices, which are specifically used in auto mobiles, food blenders and so in robots. It is an electrical machine convertor which converts DC electric power to mechanical power and basically rely on the forces composed by magnetic field. It have either electro mechanical or electronics as internal mechanism to periodically change the direction of the current flow, mostly produces rotatory motion while some produce force directly and motion in the straight line.

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].

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[100]

BLOCK DIAGRAM**IV. DESIGN AND IMPLEMENTATION**

The robot is made up of an Arduino board, motor driver, 2 DC motors, Bluetooth module HC-05 & Ultrasonic sensor. Firstly the data from the android app is sent as an input to the Bluetooth module which further gives it to the Arduino Uno, Uno is a controller which controls the signals and performs the assigned functions it understands which signals have to be forwarded to the motor driver so that it moves in particular order. Like in if the user have tapped the left button on the app the Arduino will send the signal to the motor driver to activate the left pins and accordingly move the motors so that the wheels can follow the direction.

As shown in the block diagram, User give directions through the app to the microcontroller with the help of Bluetooth module, then Arduino handles the motor driver which further supports the dc motors and enable the high signal at specific motor pins. The motor driver has several pins and those pins are for power supply, ground, and each dc motor have its own respective pins which when gets a high signal activates the dc motor, like pins 5,6 for the left motor and 9,10 for the right motor. Now the distance of the obstacle from the robot is calculated by the ultrasonic sensor which in turn gives a serial output on the app screen showing the distance.

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.

REFERENCES:

1. Android Developers Guide. Android Architecture.
2. Heidi Monson (1999) Bluetooth technology and implementations, John Wiley & Sons.
3. Piyare, R. and Tazil, M. (2011) "Bluetooth based home automation system using Android phones". IEEE 15TH International symposium on consumer electronics (ISCE), 14-17 June 2011, Singapore.
4. Potts, J. and Sukittanon, S. (2012) "Exploiting Bluetooth on android mobile devices for home security application", proceedings of southeastcon, 15-18 March 2012, Orlando, Florida, USA.