ANDROID CONTROLLED ROBOT FOR SURVEILLANCE

[1]Anuradha S. Nigade, [2]Sonali K. Pawar
[1]Assistant Professor, [2]Assistant Professor
[1] Department of Electronics Engineering,
[1]Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune, India

Abstract : Android smart phones are undoubtedly the most popular gadgets these days. You will find various apps on the Internet that exploit inbuilt hardware in these mobile phones, such as Bluetooth and Wi-Fi, to control other devices. Presented here is a phone-controlled robot that can be controlled via an app on your mobile. The control commands are sent via Bluetooth and the robot has such features as:

- It can be controlled from Android smart phones by touch or voice commands.
- The speed of the robot can also be controlled.
- The robot will sense and inform to the phone its distance from the nearest obstacle. It will also send information about the direction in which it is moving.

IndexTerms **- Bluetooth, Wi-Fi, Android, Motor**

I. INTRODUCTION

Smart phones are becoming a basic need in day to day life with massive storage capacities, fortified processors, ample divertissement functions and vast communicating methodologies. Bluetooth is mainly used for exchanging data between different devices be it two smart phones or be it a robot and a smart phone. It mainly performs data transmission and even improves the characteristics of the smart phone, it was developed by telecom vendor Ericsson in 1994, shows its merits by incorporation with smart phones. It has changed the medium of how people use digital devices at home or offices and has brought wireless devices in existence. The basic element of a Bluetooth is piconet, which is a collection of several slave devices operating together with one master. Maximum of seven slaves can share a common master through a same link. Even several piconet can link together and form scatternet. It is useful in-home environments, looking at its range or normal working area be 8 meters. Bluetooth has gradually increased users to prosecute smart phones, which have gingerly turned into a multipurpose portable device and are accessible to people for their quotidian use. Present day, android is widely accepted as an open source platform. Android consists 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. 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. PURPOSE

The purpose behind this research is to design a robot for the monitoring and surveillance purpose by just a tap on the phone, with the help of an android application on one's cell phone. The android app will help the robot to move in different direction and transfer the material intended, in fact it will help the robot to not collide with any paraphernalia, as the distance of the obstacle will continuously get displayed on the screen of the app. By just Bluetooth connectivity an android app can handle the movements of a robot and can move it in left, right, forward and backward directions.

III. WORKING PRINCIPLE

When we start thinking about building a Robot, first thing which will come to mind is the control of that Robot. In those days, we used wired remote controls to control the robot which is bit complicated and there may be meshed in wires which can become the worst part. Nowadays, we are exposed to Android devices which are powerful mobile computers and they become more and more popular smartphones used worldwide. Because the Java programming language is used in the Android, getting started with the Android API is easy and the API is open and allows easy access to the hardware Components. It also provides numerous communication interfaces like USB, Wi-Fi, and Bluetooth, that can be used to connect to our projects.

The communication between the robot and the android application is carried over by the Bluetooth link between the phone's Bluetooth and the Bluetooth device in the Robot. The ASCII commands are sent from the phone to the Robot which in turn checked by the Arduino for the control of the wheels according to the commands to move the robot in the desired direction.

IV. BACKGROUND

A. 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.

B. 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 has 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.

C. ARDUINO MEGA

UNO is a microcontroller based on ATmega2560. It has 14 digital input-output pins; 6 pins are for PWM outputs, 6 pins act as analog input pins. 16 MHz crystal USB connector power jack is attached, consist of LCSP header and reset button. UNO contains everything needed to support any normal microcontroller (µC). In UNO connections can be established by connecting Arduino to personal computer with a USB cable, power with AC to DC adapter can be provided or battery to get started. Arduino is a firm which design hardware, µC based kits for building digital devices and interactive objects that can percept and control physical devices. It establishes a serial communication interface for loading programs from PC through USB.

D. ARDUINO IDE

IDE is an integrated development environment based on programming language named as Processing, it also supports C and C++. It basically is a cross-platform application written in JAVA. IDE is basically for software programming of any hardware board or IC. This code editor has following features: Syntax highlighting, brace matching, automatic indentation, one-click mechanism for loading and compiling of the programs on the Arduino board. In IDE program written is known as Sketch. C/C++ sketch consist of two functions which are compiled and amalgamate with a program stubmain():

[1] setup (): this function runs at the beginning or start of the program and even initialize the settings.

[2] Loop (): this function is called repeatedly until the board power is cut-off.

E. HC-05 BLUETOOTH MODULE

This is used for establishing Bluetooth connectivity, it is easy to use Bluetooth SPP (special pot protocol) module. It setup a transparent wireless serial connection. HC-05 is a fully qualified Bluetooth supporting V2.0+EDR (enhanced data rate), 3Mbps modulation, 2.4 GHz baseband and use CSR Bluecore 04- External single chip Bluetooth system. Its footprint is very small limiting up to 12.7 mm X27 mm, its default baud rate is 38400. It underpins master and slave concept, and if the master and slave are paired then red and blue LEDs on the module blinks at 1 time per 2 seconds in interval and if disconnected blue LED blinks for 2 times per second. Its auto pairing pin code is "0000" as default and it automatically reconnect in 30 min when disconnected because of exciding the range of connection.

F. ANDROID PLATFORM

Android is a mobile operating system developed by Google based on Linus Kernel and is mostly wield with touch screen smart phones. Android platform is reliable for building an android application, android is a common choice of people while they buy any cell phone. Android provides easy accessibility and understandability of different aspects for daily use. They are widely known as mobile computers and are expanding the sale of smartphones worldwide. They are widely accepted as they provide open architecture, platform independent and enormous capabilities. It is built from JAVA programming language and as android uses JAVA; android API provide easy access for hardware components. Android may use USB, Wi-Fi and Bluetooth for connecting with the robot.

V. DESIGN & 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.

The Android app developers generally use JAVA language, but this Android app can also build without knowing the Java language. This app was developed in the online Development Environment which is developed by MIT called "App Inventor". This app inventor is specially designed for Nonprogrammers those who don't know the JAVA language. The app shown below has buttons and all the buttons give different bytes in the output that has to be sent to the Arduino using Bluetooth for processing. For e.g. if we press forward button, the Bluetooth Module will give 1 byte at its output, which is received by the Arduino to process the byte and take necessary action. The app consists of the option to use the accelerometer of the Android phone or to use the buttons to control the Robot. You can find tutorials related to the App inventor in its website.

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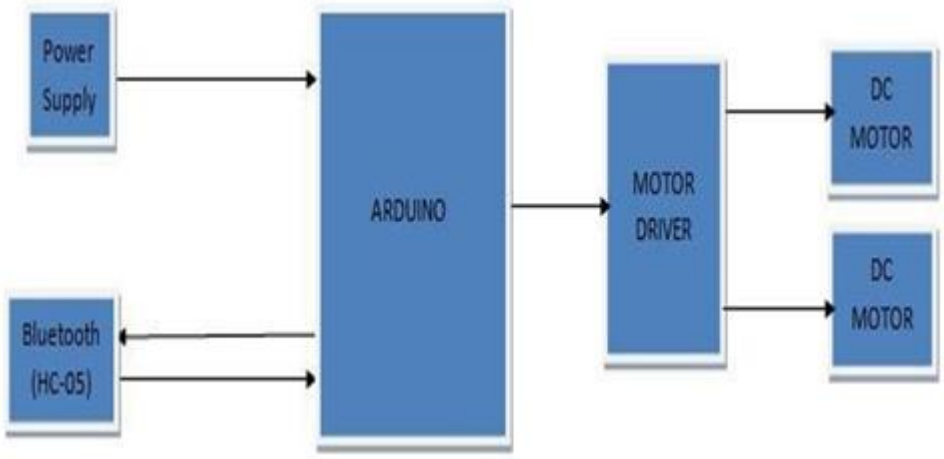

Figure 1: Architecture of Robot

Figure 2: Code Implementation

Figure 2: Android App

VI. APPLICATIONS & RELATED WORK

- Surveillance Device
- Home Automation
- Wheelchairs
- Military applications
- Hostage Rescue Operations

This project can be further developed by integrating it with the internet to monitor your robot while sitting in a remote area. By doing this, one can keep an eye on his or her robot through an internet connected to the user's mobile phone or PC or laptop. This will not only improve the security of your robot in this modern-day world.
Following are the more scopes for this project:

- A robot mounted with camera.
- A headset, with full colour display.
- A mission control centre.

VII. FUTURE ENHANCEMENTS

Range of connectivity can be increased by using Wi-Fi. As of now we are using Bluetooth module which can be replaced by Wi-Fi module. And can extend range by installing routers on short distances. Additional features can be added like to handle robot by voice commands, this is achieved by adding speech recognition module. Movements and features of robot can be increased, by rotating it, and providing it diagonal movements. Camera can be attached and robot can be utilized in order to be used like a spy. More type of information and data can be transferred, head count in a room can be established, face recognition can be made, and by removing user id and password, login can be performed by checking finger prints.

VII. RESULTS AND DISCUSSION

The Android controlled robot has been experimentally proven to work satisfactorily by connecting sample robot to it and the robot was successfully controlled from a wireless mobile device. The Bluetooth client was successfully tested on a multitude of different mobile phones from different manufacturers, thus proving its portability and wide compatibility.

Hence, we concluded following major points after completing our project. They are stated as:

- It deals with multiple issues.
- We have analyzed our project.
- Deployment will help Army and people with disabilities.

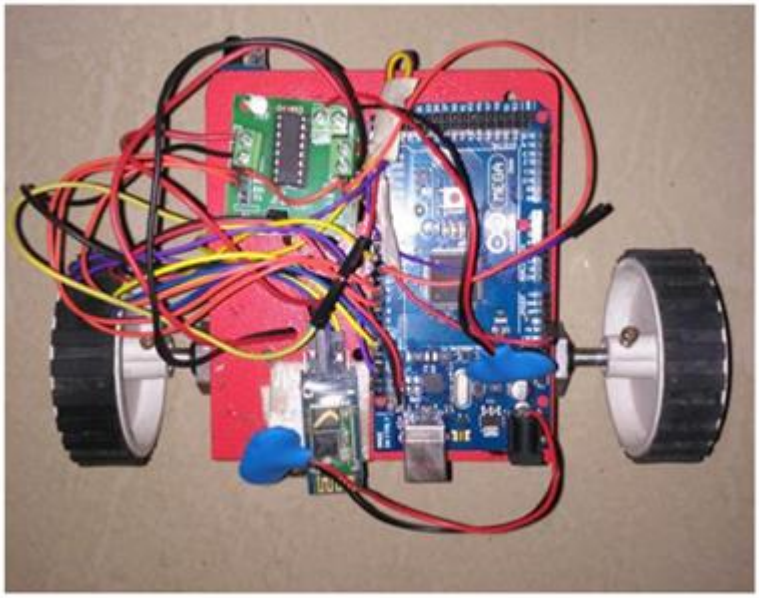

Figure 3: Final Robot

Robot takes input via Bluetooth from android device It takes around 1ms to process the command from button and around 1.3 second for voice command. Bluetooth communication works within the range of 10 meter.

REFERENCES

[1] International Journal of Scientific Engineering and Research (IJSER) ISSN (Online): 2347 - 3878 Volume 2 Issue 7, July 2014

[2] Smart phones android operated robot, http://www.sooxmatechnologies.com

[3] Piyare, R. and Tazel, M. (2011) "Bluetooth based home automation system using Android phones". IEEE 15TH International symposium on consumer electronics (ISCE), 14-17 June 2011, Singapore