



Wireless Video Surveillance Robot Controlled using Simple Bluetooth Android Application

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Abstract: Controlling a robot by remote is quite common for now-a-days, if we claim for controlling a robot by wireless medium which is your android phone, sounds impressive, and if we says that the controlling can be done without tracking a robot by eyes; we are providing a idea of video streaming to controls a robot.

This prototype of our proposed system uses a wireless-networking standard technology called Bluetooth. An Android application designed to control the robot actions via Bluetooth connection is another step forward and includes video streaming by wireless cameras to track the robots.

For possible communication between two systems one is a smart device which runs on Android OS, while another is a robot build on Arduino Uno board. The both systems are interconnected with each other by Bluetooth module attached to robot. The android application is able to send data over Bluetooth module according to the the application features, sensors, and touch screen. Android device are uses Bluetooth service on Serial Port Profile (SPP) connection to control the robot.

Keywords: Arduino board, streaming, wireless, Bluetooth, Serial Port Profile (SPP), Surveillance, Remote, Wi-Fi

I. INTRODUCTION

In this paper we mainly focus on the android App which remotely controls the robot by inputting the video by directional commands of move and the commands are serially transmits to robot via Bluetooth module attached with the robot build on Arduino board.

On the robot side, you have to add a Bluetooth module connected to the robot controller. The Bluetooth module is a small device designed to transmit data between peripheral devices. In other words, this small device is able to synchronize the I/O data between the robot and the Android device. [1]

In this paper we are going to go over building a Arduino robot that can be controlled via Bluetooth with an Android phone/tablet. The following is the list of components we are going to use:

- Chassis

- L293D motor driver
- Arduino Mega
- Bluetooth module
- Android phone or tablet

Apart from the list of parts for the robot you are going to need these basic things to build and program your robot

1. Computer with the Arduino IDE and Eclipse Luna
2. Soldering iron
3. Some solder and wires

Also, the second and important part of our proposed system is wireless video streaming. In streaming, the video content sent in compressed form over the wireless transmission medium and displayed by the viewer in real time on the android application.

With streaming video, a user does not have to wait to download a file to play it. Instead, the media is transferred in a

continuous stream of data and is played as it arrives on the android application. [2]

II. ASSEMBLY

After the assembly of your robot chassis and soldered your motor driver and Bluetooth module, the next step is to wire up your Arduino board to the motor drivers and chassis.

If you already have a robot platform and you have plans to control wirelessly the robot, you can use HC-05 Serial Bluetooth Module.

HC-05 Serial Bluetooth Module – It has a signal range 30 feet; this wireless module is cheap and easy to use. [3]

III. ANDROID APPLICATIONS DEVELOPMENT TOOLS

A large community of Android developers applies their programming skills on several software development tools with support for fast debugging. Using these tools, it is the shortest way to build easily and in minutes any Android application able to control remotely a robot. In the following, we explore several development tools that can be easily used to develop Android application.

Android SDK – the first and the best development platform is and will be the Android development kit. [4]

IV. BUILDING THE APPLICATION

Bluetooth – before starting to build any application, it is good to know the Android Bluetooth APIs.

The Android platform includes support for the Bluetooth network stack, which allows a device to exchange data with other Bluetooth devices wirelessly. This application framework provides access to the Bluetooth functionality through the Android Bluetooth APIs. These APIs let applications connect to other Bluetooth devices wirelessly, enabling point-to-point and multipoint wireless features. [5]

Using the Bluetooth APIs, an Android application can perform the following tasks:

- Scan for available Bluetooth devices
- It asks the local Bluetooth adapter for paired Bluetooth devices
- Establish the RFCOMM channels
- It connects to other devices through the service discovery mode
- Transfer data to and from devices via Bluetooth
- Manage multiple Bluetooth connections

V. ARDUINO

The Arduino sketch makes use of the SoftwareSerial library to communicate via two digital pins to the bluetooth device.

You will need to make sure that the SoftwareSerial baud rate is set to match the baud rate of your bluetooth device. [6]

VI. ARDUINO SKETCH

Given below is the arduino sketch used on the arduino board.

```
#include<SoftwareSerial.h>
SoftwareSerial blue(8, 9);

//Initialization part

void setup()
{
  blue.begin(9600);
  Serial.begin(9600);
  //Declaring the output pins
}
void loop()
{
  //Code for the driving the motors
}
```

We use the Android Bluetooth APIs to accomplish the four major tasks necessary to communicate using Bluetooth: setting up Bluetooth, finding devices that are either paired or available in the local area, connecting devices, and transferring data between devices.

All of the Bluetooth APIs are available in the android.bluetooth package. [5]

```
//The most important API included is:
import android.bluetooth.BluetoothAdapter;
//various methods used are:
public void onResume() {
  super.onResume();
  //first of all, we check if there is bluetooth on the phone
  mBluetoothAdapter =
  BluetoothAdapter.getDefaultAdapter();
  if (mBluetoothAdapter == null) {
    // Device does not support Bluetooth
    Log.v(TAG, "Device does not support Bluetooth");
  }
  else{
    //Device supports BT
    if (!mBluetoothAdapter.isEnabled()){
      //if Bluetooth not activated, then request it
      Intent enableBtIntent = new
      Intent(BluetoothAdapter.ACTION_REQUEST_ENABLE);
      startActivityForResult(enableBtIntent,
      REQUEST_ENABLE_BT);
    }
    else{
      //BT activated, then initiate the BtInterface object to
      handle all BT communication
```

```

        bt = new BtInterface(handlerStatus,
handler);
    }
}

//called only if the BT is not already activated, in order to
activate it
protected void onActivityResult(int requestCode, int
resultCode, Intent mData){
    if (requestCode == REQUEST_ENABLE_BT){
        if (resultCode == Activity.RESULT_OK){
            //BT activated, then initiate the
BtInterface object to handle all BT communication
            bt = new
BtInterface(handlerStatus, handler);
        }
        else if (resultCode ==
Activity.RESULT_CANCELED)
            Log.v(TAG, "BT not activated");
        else
            Log.v(TAG, "result code not
known");
    }
    else{
        Log.v(TAG, "request code not known");
    }
}

//handles the clicks on various parts of the screen
//all buttons launch a function from the BtInterface
object
@Override
public void onClick(View v) {
    //Code for sending the characters to the Bluetooth
module on the arduino
}
    
```

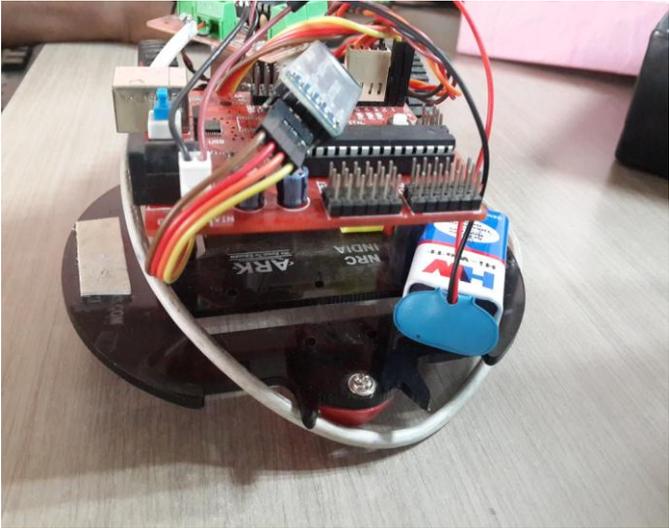


Figure1: Proposed Robot Prototype

Once connection is successfully established, the user can send controlling commands through the GUI of the android application. The command sent via the mobile application is received by the Bluetooth module which transmits it through serial communication to the Arduino board.

The Arduino board processes the commands and provides the appropriate output to the motor driver shield L293 D. The motor driver shield provides the required power to the motors according to the given commands. [7]

The android application simultaneously provides the live video streaming using the network camera or android mobile devices mounted on the robot. [2]

VII. WORKING OF PROPOSED PROTOTYPE:

Arduino board is used for the robot. Bluetooth module named 'HC-05' is connected to the Arduino board. The android application establishes a connection with the Bluetooth module on the Arduino board.

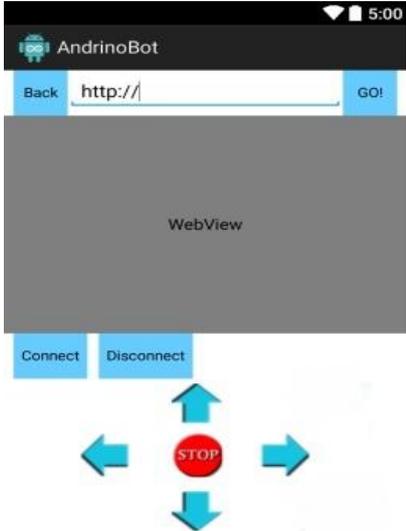


Figure2: Screenshot of the android application

VIII. APPLICATIONS

The existing wireless surveillance systems are stationary and can't be used for many critical applications. The controlling of such surveillance systems are very tedious, out dated and time consuming.

- It can be used as a Surveillance System which can be controlled wirelessly
- It can be remotely controlled from far
- It requires less Man Power.
- It can be used for critical situations like flood, disposal of bombs, Fire Fighting, Terrorist attack, Earth quake, Spying.

IX. CONCLUSION

We have successfully implemented the working of the wireless video surveillance robot controlled using a simple android mobile device. The robot is successfully controlled using the android application through Bluetooth. The real time video feed is successfully achieved using the Wi-Fi technology on our designed android application.

X. REFERENCES

- [1] Surveillance Robot Using Arduino Microcontroller, Android APIs and the Internet, First International Conference on Systems Informatics, Modelling and Simulation, 2014.
- [2] IP Webcam, Google Play Store [Web]: <https://play.google.com/store/apps/details?id=com.pas.webcam&hl=en>, February 2012. Indoor Surveillance Security Robot with a Self-Propelled Patrolling Vehicle, Volume 2011, Article ID 197105.
- [3] HC – 05 Datasheet [Web] : http://www.tec.reutlingen-university.de/uploads/media/DatenblattHC-05_BT-Modul.pdf
- [4] Android Developers Site API Guides [Web]: <http://developer.android.com/guide/topics/connectivity/bluetooth.html>
- [5] Android Developers Site API Guides [Web]: <http://developer.android.com/guide/components/index.html>, October 2012
- [6] The Arduino Website [Web]. Available: <http://arduino.cc/en/Main/arduinoBoardUno>, September 2012
- [7] L293D Datasheet- Texas Instruments – Quadruple Half-H Driver [Web] Available: <http://www.alldatasheet.com/datasheetpdf/pdf/27189/TI/L293D.html>, October 2012