PROJECT REPORT ON

# ANDROID BASED SPY VEHICLE

BY


**ABHIMANYU AMBASTHA**

**MEET HARIA**

**NIKHIL MOHITE**

**PRAMOD BHALERAO**


**UNDER THE GUIDENCE OF**

**PROF. SHILPA VATKAR**


**DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION**

**K.J.SOMAIYA COLLEGE OF ENGINERING,**

**VIDYAVIHAR, MUMBAI-400077.**


**(2013-2014)**

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IN PARTIAL FULFILLMENT OF

**B.E. ELECTRONICS & TELECOMMUNICATION ENGINEERING**

**DEGREE OF UNIVERSITY OF MUMBAI**
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# CERTIFICATE

This is to certify that the following students of Semester VIII

- ABHIMANYU AMBASTHA (1013003)
- MEET HARIA (1013056)
- NIKHIL MOHITE (1013066)
- PRAMOD BHALERAO (1013074)

have successfully completed the project synopsis Titled " ANDROID BASED SPY VEHICLE " towards the partial fulfillment of degree of Bachelor of Engineering in Electronics and Telecommunications of the University of Mumbai during academic year 2013- 2014.

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**PROF. SHILPA VATKAR**
**Internal Guide**

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**External Guide**

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**PROF. S.S. KULKARNI**
**Head of the Department**

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**Dr. SHUBHA PANDIT**
**Principal**

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**INTERNAL EXAMINER**

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**EXTERNAL EXAMINER**

# ABSTRACT

The main focus in building this project is to create a wireless controlled spy vehicle which can be operated through a range of 10 meters using Mobile WiFi Connectivity transmitter and receiver. The mobile phones with android platform is used for interfacing with the vehicle. This vehicle is equipped a wireless camera which will transmit the live pictures and videos remotely.

A PIC-16F877 is a microcontroller that is being used to interface sensors like temperature sensor and gas sensor . An LCD display is also provided to display the temperature and gas values. Power supply with the values of 12V and 5V are provided to different parts of the circuits. A HI-LINK Wi-Fi module is connected at the back panel of the vehicle to receive the information from the mobile phone so as to control the motion of the vehicle and rag picker. The reduction gear dc motors are interfaced with the PIC controller via individual transistors and relays.

The ITEAD Wi-Fi robot panel application that is available free on Google playstore can be downloaded to any android enabled handset. Once the application is setup by configuring the IP addresses and defining the controls, the user can use this application to drive the vehicle anywhere in the range of about 100 metres supported by Wi-Fi.

The wireless transmitter camera over the vehicle will capture the images of surrounding area required for surveillance or monitoring or spying. This data is sent to the wireless receiver camera and is displayed on the Laptop via a TV tuner card.

# ACKNOWLEDGEMENT

It is indeed a matter of great pleasure and proud privilege to be able to present this project on **"ANDROID BASED SPY-VEHICLE".**

The completion of the project work is a millstone in student life and its execution is inevitable in the hands of guide. We are highly indebted the project guide **PROF. SHILPA VATKAR** for her invaluable guidance and appreciation for giving form and substance to this report. It is due to her enduring efforts; patience and enthusiasm, which has given a sense of direction and purposefulness to this project and ultimately made it a success.

We would like to tender our sincere thanks the staff members for their co-operation. We would also like to express our deep regards and gratitude to the **PROF. RUCHIRA JADHAV** for providing valuable contributions and suggestions towards the improvement of our project.

We would wish to thank the non - teaching staff and our friends who have helped us all the time in one way or the other.

Really it is highly impossible to repay the debt of all the people who have directly or indirectly helped us for performing the project.

# PREFACE

We take an opportunity to present this project report on **"ANDROID BASED SPY-VEHICLE"** and put before readers some useful information regarding our project.

We have made sincere attempts and taken every care to present this matter in precise and compact form, the language being as simple as possible.

We are sure that the information contained in this volume would certainly prove useful for better insight in the scope and dimension of this project in its true perspective.

The task of completion of the project though being difficulty was made quite simple, interesting and successful due to deep involvement and complete dedication of our group members.

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## LIST OF FIGURES

# 1. INTRODUCTION

Surveillance, Espionage or spying involves individual obtaining information that is considered secret or confidential without the permission of the holder of the information. Spying area in military ground where enemy stay can be took before taking any action.

This vehicle is a virtual or mechanical artificial agent. In practice, it is usually an electro mechanical system which, by its appearance or movements, conveys a sense that it has intent or agency of its own. Our aim in building this project is to create a wireless controlled spy vehicle which can be operated through a range of 10 meters using Mobile WiFi Connectivity transmitter and receiver. This can also sense the obstacles on its way to maneuvering its path by using Infrared sensors, can also sense the temperature and gas to display their values on LCD and mobile screen. A wireless camera is also equipped with the vehicle which will transmit the live pictures and videos remotely.

This unit is helpful and useful for surveillance of an area in defense grounds for enemy, spying purpose where the human reach is not recommended or avoided. The unit is small handy portable and can reach places easily. Mobile phones today became an essential entity for one and all and so, for any mobile based application there is great reception. Wireless controlled vehicles utilize RF circuits, which had limitations like limited range, limited frequency ranges and controls. But a mobile phone controlled vehicle can hold up these limitations. It has a robust control, unlimited range (coverage area of the service provider), no fear of interfering with other controllers and we can have as much as 12 controls.

## 1.1 WHAT IS THIS SPY VEHICLE?

The SPY VEHICLE is a vehicle that can be controlled from anywhere around the network area. Just by using a WiFi enabled mobile phone, the user can control the vehicle from anywhere in the area, can control the vehicle via android operating system mobile.

## 1.2 MAIN FEATURES OF THE PROJECT

- Effective in implementation
- Low power consumption and compact size.
- Long control range due the usage of RF devices.
- Vehicle monitored from a remote area (no need of 'line-of-sight' arrangement).
- Maneuvering its path avoiding obstacles by own
- Land mine detection

## Why Android, - The world's most popular & fastest Growing mobile platform

Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It's the largest installed base of any mobile platform and growing fast—every day another million users power up their Android devices for the first time and start looking for apps, games, and other digital content. Android gives you a world-class platform for creating apps and games for Android users everywhere, as well as an open marketplace for distributing to them instantly.


Global partnerships and large installed base
Building on the contributions of the open-source Linux community and more than 300 hardware, software, and carrier partners, Android has rapidly become the fastest-growing mobile OS.

Every day more than 1 million new Android devices are activated worldwide.
Android's openness has made it a favorite for consumers and developers alike, driving strong growth in app consumption. Android users download more than 1.5 billion apps and games from Google Play each month.

With its partners, Android is continuously pushing the boundaries of hardware and software forward to bring new capabilities to users and developers. For developers, Android innovation lets you build powerful, differentiated applications that use the latest mobile technologies.

## Powerful development framework

Easily optimize a single binary for phones, tablets, and other devices.
Android gives you everything you need to build best-in-class app experiences. It gives you a single application model that lets you deploy your apps broadly to hundreds of millions of users across a wide range of devices—from phones to tablets and beyond.

Android also gives you tools for creating apps that look great and take advantage of the hardware capabilities available on each device. It automatically adapts your UI to look its best on each device, while giving you as much control as you want over your UI on different device types.

For example, you can create a single app binary that's optimized for both phone and tablet form factors. You declare your UI in lightweight sets of XML resources, one set for parts of the UI that are common to all form factors and other sets for optimizations specific to phones or tablets. At runtime, Android applies the correct resource sets based on its screen size, density, locale, and so on.

To help you develop efficiently, the Android Developer Tools offer a full Java IDE with advanced features for developing, debugging, and packaging Android apps. Using the IDE, you can develop on any available Android device or create virtual devices that emulate any hardware configuration.
1.5 billion Downloads a month and growing. Get your apps in front of millions of users at Google's scale.

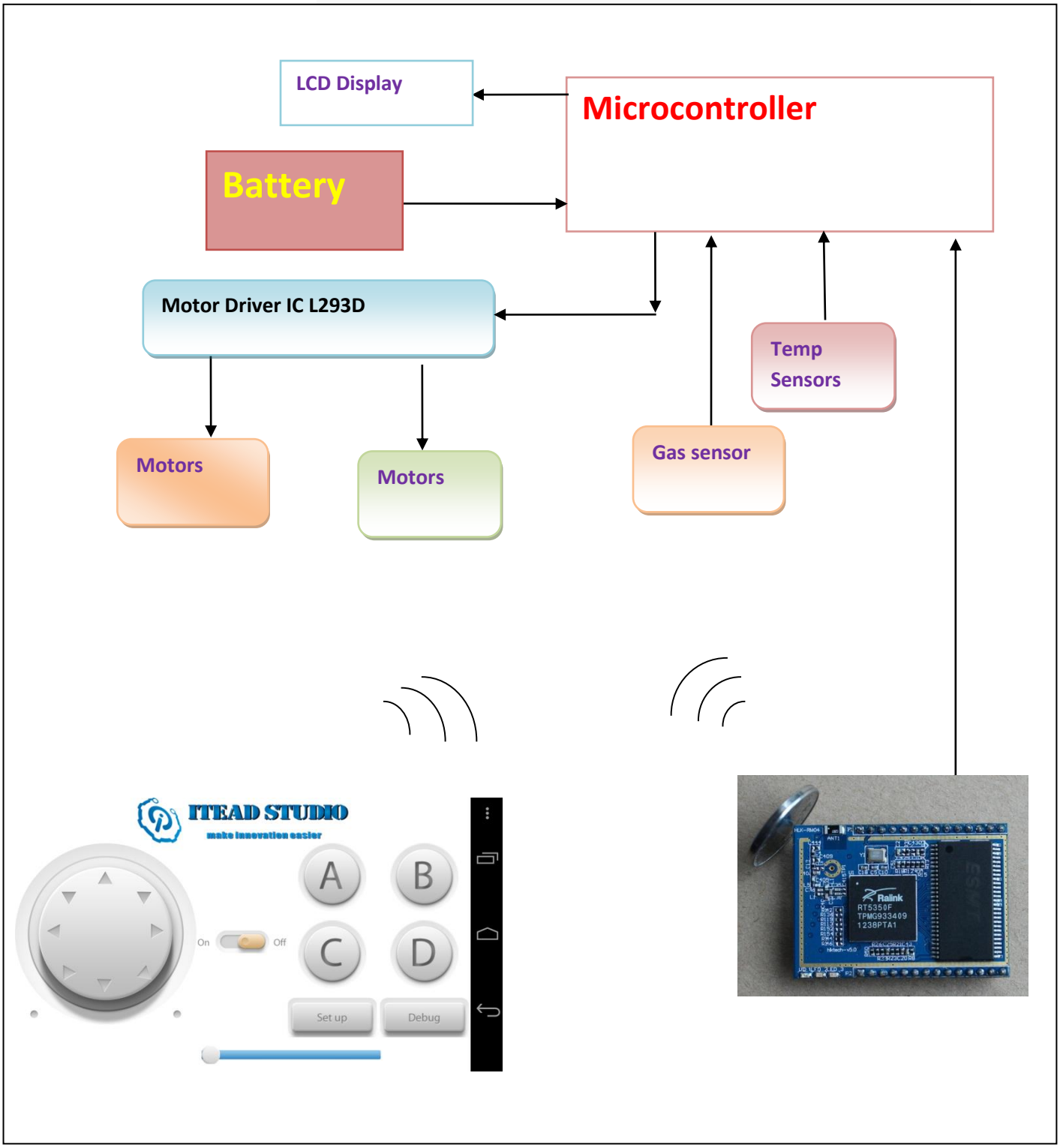
## Open marketplace for distributing your apps

Google Play is the premier marketplace for selling and distributing Android apps. When you publish an app on Google Play, you reach the huge installed base of Android.

As an open marketplace, Google Play puts you in control of how you sell your products. You can publish whenever you want, as often as you want, and to the customers you want. You can distribute broadly to all markets and devices or focus on specific segments, devices, or ranges of hardware capabilities.
You can monetize in the way that works best for your business—priced or free, with in-app products or subscriptions—for highest engagement and revenues. You also have complete control of the pricing for your apps and in-app products and can set or change prices in any supported currency at any time.

Beyond growing your customer base, Google Play helps you build visibility and engagement across your apps and brand. As your apps rise in popularity, Google Play gives them higher placement in weekly "top" charts and rankings, and for the best apps promotional slots in curated collections.
Preinstalled on hundreds of millions of Android devices around the world, Google Play can be a growth engine for your business.

# 2. BLOCK DIAGRAM



# 2.1 BLOCK DIAGRAM DESCRIPTION:

## Android smart Phone

Android smart phone mean a mobile phone which running on android operating system. We are using mobile as wireless remote control. For wireless communication WiFi serial module is being used.

## WiFi Serial Module

WiFi Serial Module is a device that acts as mediator between any embedded system and the WiFi communication medium. It has built-In protocol for serial communication i.e. serial port profile. Thus it provides an ideal solution for developers who want to integrate WiFi wireless technology into their design with limited knowledge of WiFi and RF technologies. This module enables you to wireless transmit & receive serial data. It is a drop in replacement for wired serial connections allowing transparent two way data communication. You can simply use it for serial port replacement to establish connection between MCU or embedded project and PC for data transfer.

## MICROCONTROLLER PIC16F877A

The PIC16F877A is a 20MHz PIC controller with a 14-bit processor and 8KB FLASH program memory, 3 Bytes RAM, 256 Bytes EEPROM. This processor is also equipped with a full set of analog (10-bit) and digital inputs, on-board hardware multiplier, timers, compare/capture/PWM modules, in-system flash programming, and is supported by a wide range of development tools.

## Wireless Camera

A camera is a device that records images, either as a still photograph or as moving images known as videos. This is used in the vehicle to take the video surveillance of the area. And it is transmitted using a carrier signal. On the receiving end it is converted to video signal. It has a range of 50-100Mts with no line of sight.

## DC Motor

A DC motor works by converting electric power into mechanical work. This is accomplished by forcing current through a coil and producing a magnetic field that spins the motor. Gear DC Motor is used to drive the vehicle which is connect to wheel of the vehicle this motor is called as gear motor because this has a specific number of RPM based on the combination of gears connected to the shaft of dc motor.

## Temperature Sensor

A thermistor is a type of resistor with resistance varying according to its temperature. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting over current protectors, and self-regulating heating elements.

Thermistors can be classified into two types depending on the sign of k. If k is positive, the resistance increases with increasing temperature, and the device is called a positive temperature coefficient (PTC) thermistor, or posistor. If k is negative, the resistance decreases with increasing temperature, and the device is called a negative temperature coefficient (NTC) thermistor. Resistors that are not thermistors are designed to have a k as close to zero as possible, so that their resistance remains nearly constant over a wide temperature range.

# 3. CIRCUIT DIAGRAM

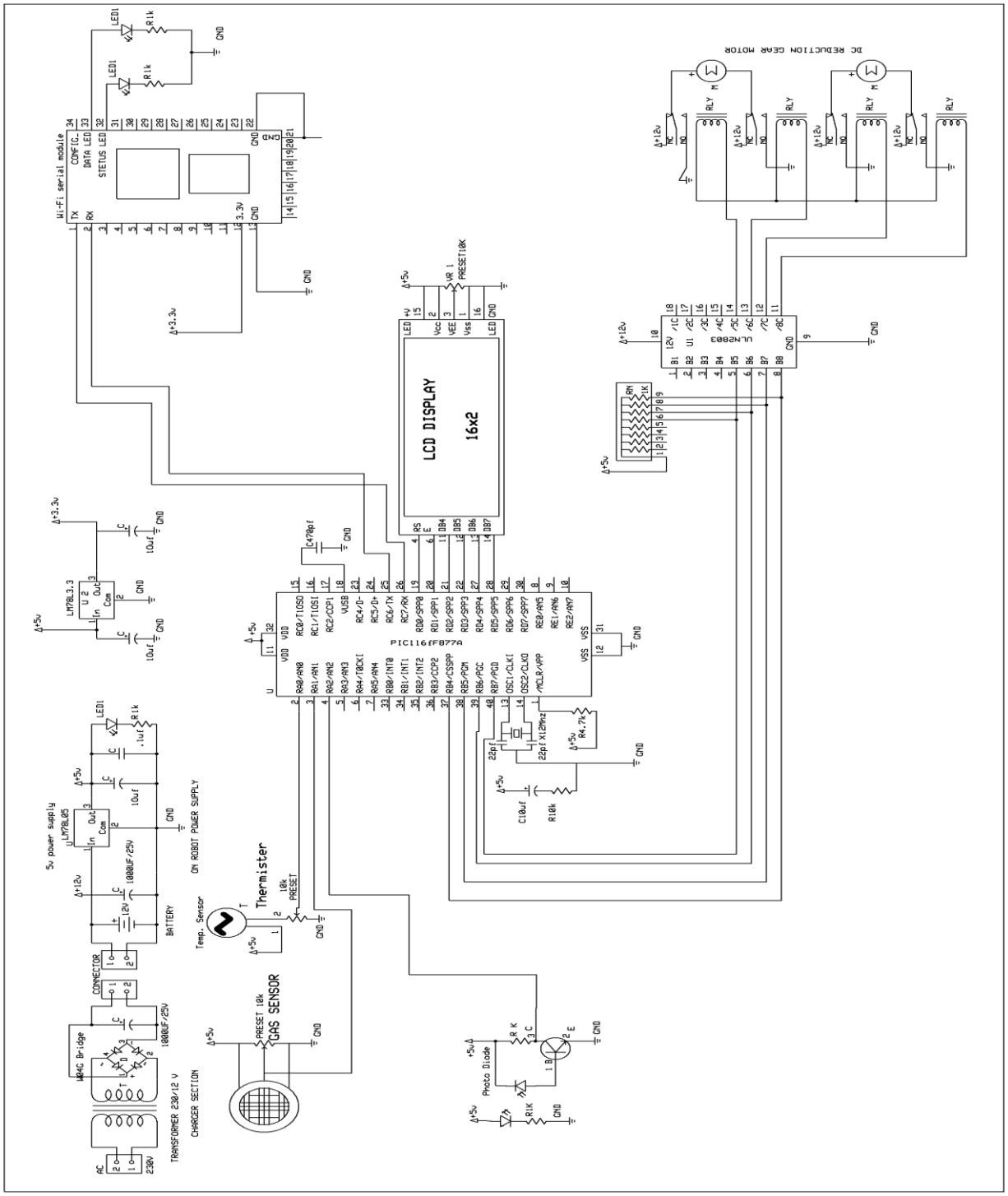



FIG 3.1 CIRCUIT DIAGRAM

## 3.1 Circuit Diagram Explanation

The heart of our project is the PIC16 Micro-controller; which is a five port device, used for interfacing many components.

**WiFi Module**: Port pins C.6 and C.7 are used for serial communication and are interfaced with the module for transmission and reception. The WiFi module is also provided with data and status LED's and is also provided with 9V power supply.

**LCD Display**: Port D of PIC16 is interfaced with LCD 16x2 matrix working in 4-bit mode. It is interfaced with ports providing data/command, R/W and Enable. It is provided with 5V power supply and a contrast control. It displays temperature and gas values.

**Motors & Relays**: Port B of PIC16 is connected with 6 transistors driving 6 relays which itself is connected to 3 motors.

**Sensors**: Port A of PIC16 is interfaced with 2 sensors namely, temperature and gas. These sensors sense the respective value and display temperature and gas values on LCD and mobile screen and also avoids obstacles.

**Power Supply**: An arrangement of AC to DC rectifier, filter and IC's that provide different voltage values of 12V, 9V, 5V and 3.3V are implemented on the circuit. These voltages are provided to the respective parts of the circuit.

**Wireless transceiver camera**: This module is placed on the chassis for providing live videos of area under surveillance.

# 4. ANDROID APPLICATION

The android application used for interfacing the mobile with the WiFi module is ITEAD WiFi Robot Panel that is available freely on the Google play store. The GUI is so designed that it can control the motion of our vehicle along with four more options to move the rag picker up and down, and to start and stop the vehicle.

The set up of the app is done by entering the IP addresses of client and server. The server is the WiFi module attached to the vehicle and the client is the mobile phone.

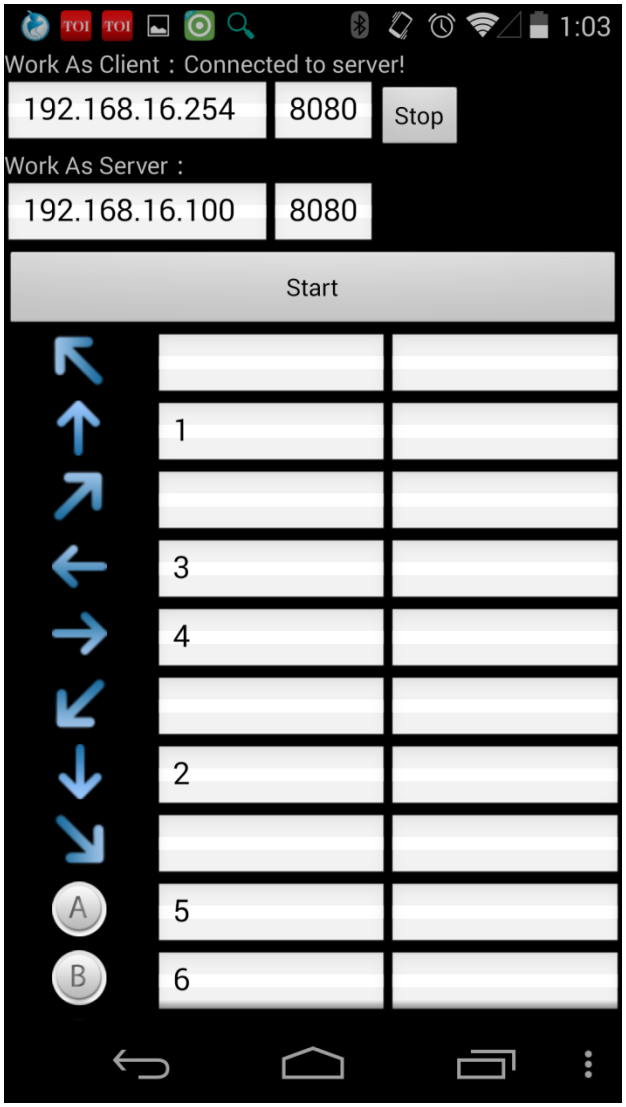
The IP addresses are assigned while configuring the WiFi module, and are as follows:

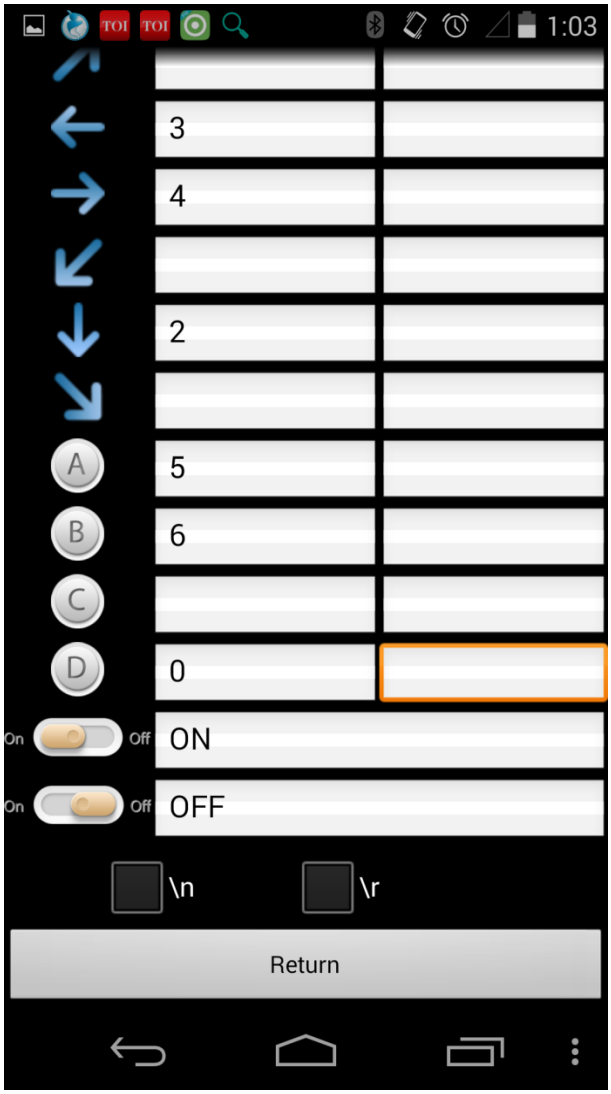
Client- 192.168.16.254:8080
Server- 192.168.16.100:8080

How to connect?

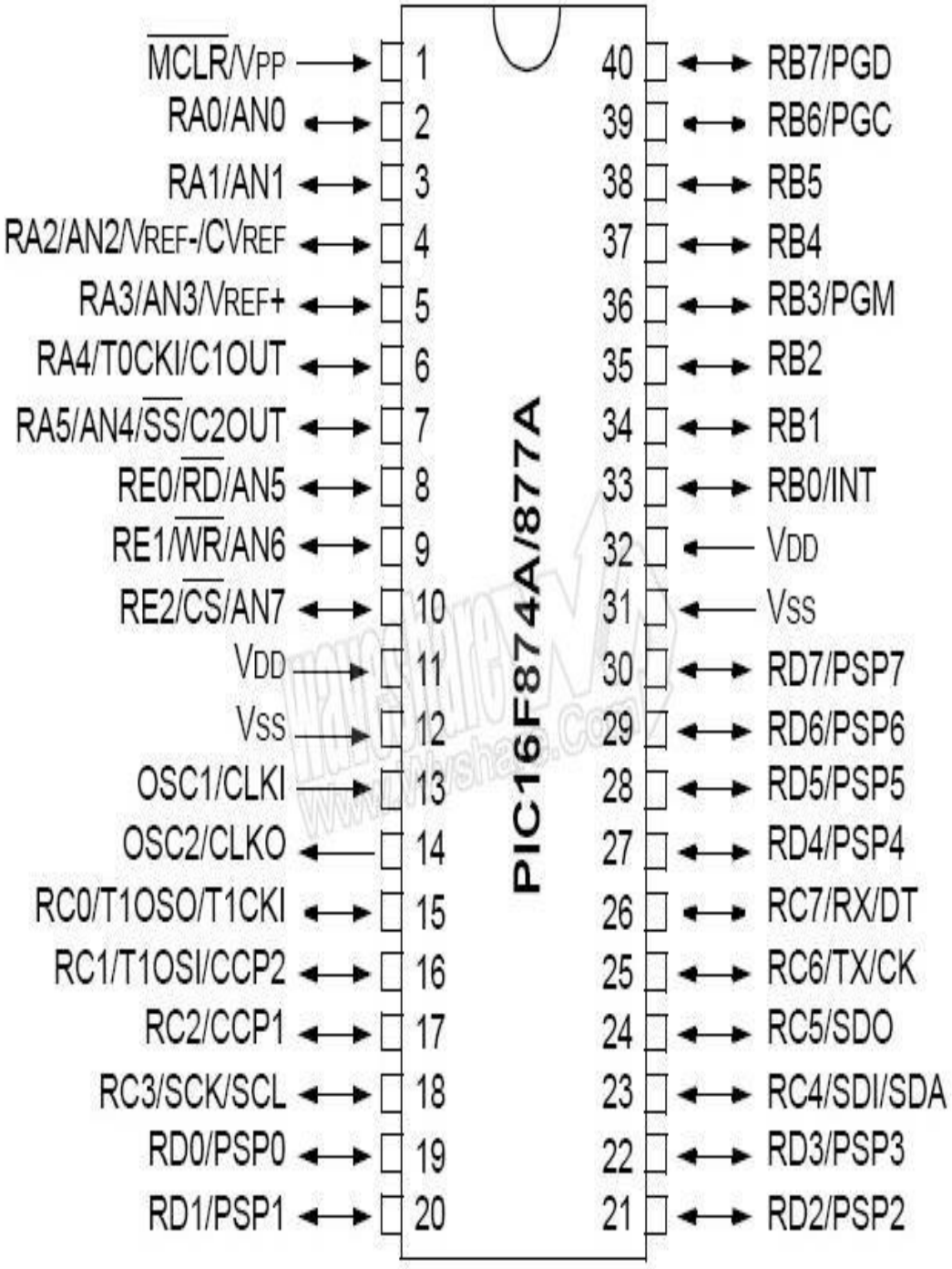
1. The WiFi module first needs to be connected with a mobile phone.
2. The IP addresses are then entered in the android application.
3. The numbers to be transmitted to the PIC16 to control the vehicle is entered in the setup window.
4. After tapping the connect button, the status is shown as ‘connected to server’, if successful.
5. The vehicle is now ready to be controlled through this app.

# SCREEN SHOTS OF ANDROID APP SETUP



## PIC16F877A Pin Diagram



# PIC CODING

```
Define CONF_WORD = 0x3f72
Define LCD_BITS = 4  'allowed values are 4 and 8 - the number of data interface lines
Define LCD_DREG = PORTD
Define LCD_DBIT = 4  '0 or 4 for 4-bit interface, ignored for 8-bit interface
Define LCD_RSREG = PORTD
Define LCD_RSBIT = 0
Define LCD_EREG = PORTD
Define LCD_EBIT = 2
Define LCD_RWREG = PORTD  'set to 0 if not used, 0 is default
Define LCD_RWBIT = 1  'set to 0 if not used, 0 is default
Dim an0 As Word
Dim an1 As Word
Dim i As Byte  'declare a variable
Hseropen 9600  'open hardware uart port for baud rate 9600
TRISA = 0xff  'set all PORTA pins as inputs
TRISB = 0
RB = 0
ADCON1 = 0  'set all PORTA pins as analog inputs

Lcdinit 0
Lcdcmdout LcdClear  'clear LCD display
Lcdout " Android Based "
Lcdcmdout LcdLine2Home
Lcdout " Spy Vehicle  "
WaitMs 2000
Lcdcmdout LcdClear  'clear LCD display
Lcdout " K.J.S.C.E "
Lcdcmdout LcdLine2Home
Lcdout " "
WaitMs 2000
Lcdcmdout LcdClear  'clear LCD display
Lcdout "Guided By:Prof:"
Lcdcmdout LcdLine2Home
Lcdout "Shilpa Vatkar "
WaitMs 2000


loop:
Hserget i  'wait to receive a byte on serial port
If i = "1" Then
PORTB.0 = 1
PORTB.1 = 0
```

```
PORTB.2 = 1
PORTB.3 = 0
Endif
If i = "2" Then
PORTB.0 = 0
PORTB.1 = 1
PORTB.2 = 0
PORTB.3 = 1
Endif

If i = "3" Then
PORTB.0 = 1
PORTB.1 = 0
PORTB.2 = 0
PORTB.3 = 1
Endif
If i = "4" Then
PORTB.0 = 0
PORTB.1 = 1
PORTB.2 = 1
PORTB.3 = 0
Endif
If i = "5" Then
PORTB.4 = 1
WaitMs 250
PORTB.4 = 0
Endif

If i = "6" Then
PORTB.5 = 1
WaitMs 250
PORTB.5 = 0
Endif
If i = "0" Then
PORTB.0 = 0
PORTB.1 = 0
PORTB.2 = 0
PORTB.3 = 0
Endif


Adcin 0, an0  't
Adcin 1, an1  'g

an0 = an0 / 4
```

```
Lcdcmdout LcdClear  'clear LCD display
Lcdout "Temperature:", #an0, "'C    "
Lcdcmdout LcdLine2Home
Lcdout "Gas:", #an1, " PPM"  'formatted text for line 2

'Hserout "T", #an0, CrLf
'Hserout "G", #an1, CrLf  'send formatted output to serial port

WaitMs 50

Goto loop  'loop forever
End
```

# 5. SENSORS

## 5.1 TEMPERATURE SENSOR

A **thermistor** is a type of resistor whose resistance varies significantly with temperature, more so than in standard resistors. The word is aportmanteau of *thermal* and *resistor*. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements.

Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range, typically −90 °C to 130 °C.

The NTC thermistor is connected to Connected to port A.0.

### Specifications:

- 2.2 to 100K Ohms Resistance @25ºC
- Proven Stability and Reliability
- 30AWG Solid Tin Plated Copper Leads
- Thermally Conductive Epoxy Coating
- Temperature Range -40ºC to +125ºC
- Available in Custom Tolerances
- RoHS Compliant

## 5.2 GAS SENSOR

A **gas sensor** is a device which detects the presence of various gases within an area, usually as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can also sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave the area. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

Gas sensors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in a variety of locations such as on oil rigs, to monitor manufacture processes and emerging technologies such as photovoltaic. They may also be used in firefighting.

Connected to port A.1

### Specifications:

- Power supply needs: 5V
- Interface type: Analog
- Pin Definition: 1-Output 2-GND 3-VCC
- High sensitivity to LPG, iso-butane, propane
- Small sensitivity to alcohol, smoke
- Stable and long life
- Size: 40x20mm

# 6. WiFi SERIAL MODULE - HILINK – RM04

| | |
|---|---|
| Network standard | wireless：IEEE 802.11n、IEEE 802.11g、IEEE 802.11b<br>wired：IEEE 802.3、IEEE 802.3u |
| Wireless transmission rate | 11n: maximum up to 150Mbps<br>11g: maximum up to 54Mbps<br>11b: maximum up to 11Mbps |
| Tracks number | 1-14 |
| Frequency range | 2.4-2.4835G |
| Emission power | 12-15DBM |
| Interface | 1个10/100Mbps LAN/WAN multiplex interface、interface |
| **Antenna** | |
| Antenna type | Onboard antenna / External Antenna |
| **Functional Parameters** | |
| WIFI work mode | Client/AP/Router |
| WDS Function | Support WDS wireless bridge connection |
| Wireless security | Wireless MAC address filtering<br>Wireless security function switch<br>64/128/152 bit WEP encryption<br>WPA-PSK/WPA2-PSK、WPA/WPA2 security mechanism |
| Network management | Remote Web management<br>Configuration file import and export<br>WEB software upgrade |
| **Serial to Network** | |
| Maximum transmission rate | 230400bps |
| TCP connection | Max connection number>20 |
| UDP connection | Max connection number>20 |
| Serial baud rate | 50~230400bps |
| **Other Parameters** | |
| Status indicator | Status indicator |
| Environmental standard | Operating temperature：-20-70℃<br>Operating humidity：10%-90%RH<br>Storage temperature：-40-80℃<br>Storage humidity：5%-90%RH |
| Additional properties | Frequency bandwidth optional：20MHz、40MHz ,Auto |

# 7. WIRELESS CAMERA-JMK WS-309AS

Wireless security cameras are closed-circuit television (CCTV) cameras that transmit a video and audio signal to a wireless receiver through a radio band. Many wireless security cameras require at least one cable or wire for power; "wireless" refers to the transmission of video/audio. However, some wireless security cameras are battery-powered, making the cameras truly wireless from top to bottom.

Wireless cameras are proving very popular among modern security consumers due to their low installation costs (there is no need to run expensive video extension cables) and flexible mounting options; wireless cameras can be mounted/installed in locations previously unavailable to standard wired cameras. In addition to the ease of use and convenience of access, wireless security camera allows users to leverage broadband wireless internet to provide seamless video streaming over-internet.

## Technical Parameters of Transmitting Unit

- Video Camera Parts: 1/3" 1/4" Image Sensors
- System: PAL/CCIR NTSC/EIA
- Effective Pixel: PAL: 628X582 NTSC: 510X492
- Image Area:PAL: 5.78X4.19mmNTSC: 4.69X3.45mm
- Horizontal Definition: 380 TV Lines
- Scanning Frequency: PAL/CCIR: 50HZNTSC/EIA: 60HZ
- Minimum Illumination: 3LUX
- Sensitivity: 18DB-AGL ON-OFF
- Output Electrical Level: 50MW
- Output Frequency: 1.2G/2.4G
- Transmission Signal: Video, Audio
- Linear Transmission Distance: 50-100M
- Voltage: DC 9V
- Current: 300mA
- Power Dissipation:<=640MW

## Technical Parameters of Receiving Unit

- Receiving Method:Electronic
- Frequency Modulation
- Reception Sensitivity: 18DB
- Receiving Frequency: 1.2G/2.4G
- Receiving Signal: Video, Audio
- Voltage: DC 12V
- Current: 500mA

# 8. TV Tuner

A TV tuner card is a kind of television tuner that allows television signals to be received by a computer. The output of wireless transceiver camera is audio-video which can be directly connected to TV sets directly but cannot be connected to Laptops. TV tuner card converts the audio-video signal to a signal which is acceptable to laptops.

## Specifications

- Model ID: IT-TV 150 FM(USB Stick)
- Device type: External (TV Tuner Stick) for PC, Laptop
- Remote Control: Yes Supported
- TV Recording: Yes, TV Recording in MPEG-2, MPEG-4 (H.264) formats
- S-Video In: Yes
- USB: USB 2.0
- Additional features: Reach 30 frames per minute with the resolution 720x480(NTSC DVD),reach 25 frames per minute with the resolution 720x576(PAL DVD).

# 9. POWER SUPPLY SECTION

- Two 6volts battery connected in series=12volts.
- Power Supply on-off switch.
- Capacitor filter.
- 7805 voltage regulator.
- Capacitor filter.
- Spike suppreser.
- Power supply indication LED.
- Current limiting resistor.

## 6V BATTERY SPECIFICATIONS

- BM part #; SLA-6V 4.5
- Voltage 6V
- Capacity 4.5 Ah
- Type : sealed lead acid battery
- Warranty 1 year
- Shipping weight 2 pounds
- Length : 2.76”
- Width : 1.86”
- Height : 3.98”

# 10. MOTOR AND RELAY SPECIFICATIONS

- The output of port B of PIC16 is weak and hence is pulled up by 10kohm resistor.
- This output is given to transistors BC547 that amplifies the signal magnetizing relay coils.
- Relays are 12 volts SPDT (SINGLE POLE DOUBLE THROW) .
- Motor movement is controlled by port B output through Relays.
- Four motors driving wheels are 12volts DC REDUCTION GEAR MOTOR.(60 rpm)
- Two of these motors are connected in parallel.
- ARM movement is controlled by a 12 volt DC REDUCTION GEAR MOTOR of 5 RPM.

# 11. LCD

Liquid Crystal Display (LCD) displays temperature of measured element, which is calculated by the microcontroller. CMOS technology makes the device ideal for application in hand held, portable and other battery instruction with low power consumption.

GENERAL SPECIFICATIONS :

- Drive method: 1/16 duty cycle
- Display size: 16 character * 2 lines
- Character structure: 5*8 dots
- Display data RAM: 80 characters (80*8 bits)
- Character generate ROM: 192 characters
- Character generate RAM: 8 characters (64*8 bits)
- Both display data and character generator RAMs can be read from MPU
- Internal automatic reset circuit at power ON
- Built in oscillator circuit

PIN Configuration

| JP1/JP14 Pins 1-8 | Description | JP1/JP14 Pins 9-16 | Description |
|---|---|---|---|
| Pin 1 | Ground | Pin 9 | D2 (not used) |
| Pin 2 | VCC(+5) | Pin 10 | D3 (not used) |
| Pin 3 | Contrast | Pin 11 | D4 |
| Pin 4 | Data/Command(R/S) | Pin 12 | D5 |
| Pin 5 | Read/Write(W) | Pin 13 | D6 |
| Pin 6 | Enable(E1) | Pin 14 | D7 |
| Pin 7 | D0 (not used) | Pin 15 | VCC (LEDSV+) |
| Pin 8 | D1 (not used) | Pin 16 | Ground |

LCD Control Codes

| Description | ASCII / Decimal value |
|---|---|
| Display custom character | 0-7 |
| Backspace | 8 |
| Horizontal Tab | 9 |
| New Line | 10 |
| Vertical Tab | 11 |
| Form Feed (Clear Screen) | 12 |
| Carriage Return | 13 |
| Reset Controller | 14 |
| Set Geometry | 15 |
| Set Tab Size | 16 |
| Set Cursor Position | 17 |

| | |
|---|---|
| *Not used | ** |
| Set Contrast | 19 |
| Set Backlight | 20 |
| Command Escape | 21 |
| Data Escape | 22 |
| Raw Data Escape | 23 |
| *Not used | ** |
| Display an ASCII character | 22-255 |

# 12. PCB fabrication

The layout of circuits on printed circuited boards for 'THE ANDROID BASED SPY VEHICLE' is made using EXPRESS-PCB Software. Given below is a brief description about the software and the snapshots of the schematics and PCB layout of the circuit components being used for making android based spy vehicle. ExpressPCB is an easy-to-use PCB software for beginners.

**What's Special?** This electronics design software consists of two applications, one for drawing schematics and the other for PCB layout. ExpressPCB circuit board layout program allows you to complete your layout in a few simple steps.

**Distributor.** The designing software is free and can be downloaded from website.

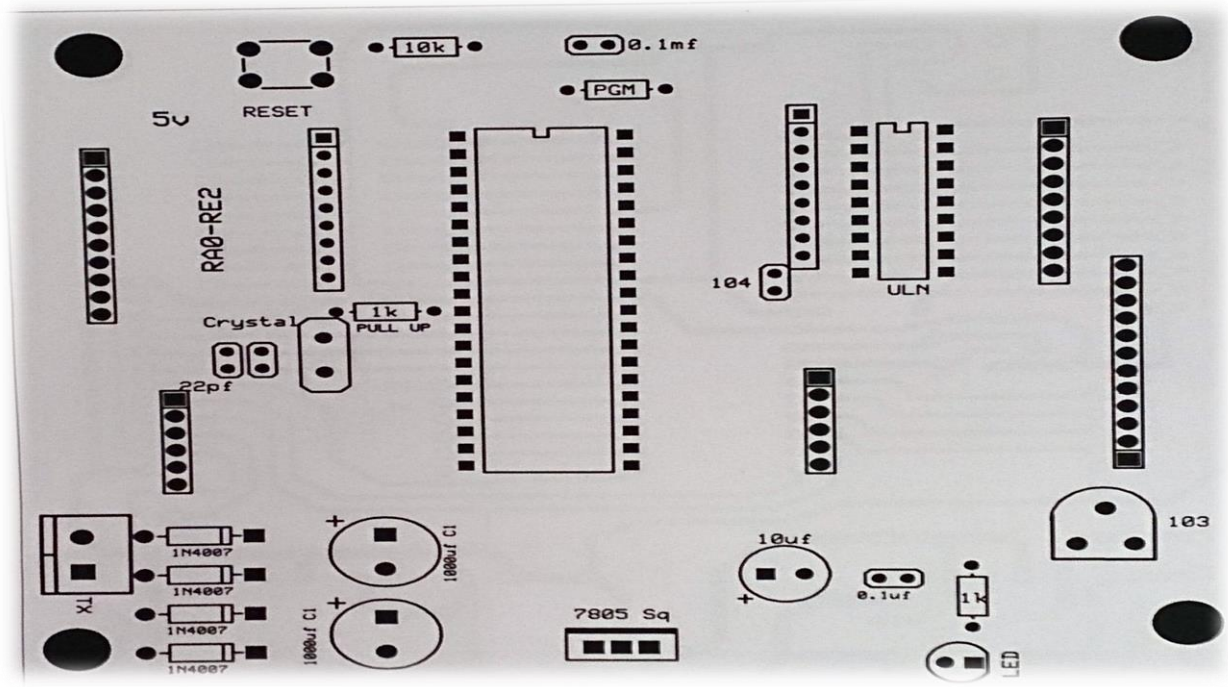



**FIG 5.1 SCHEMATIC FOR PIC 18, POWER SUPPLY AND INTERFACES**

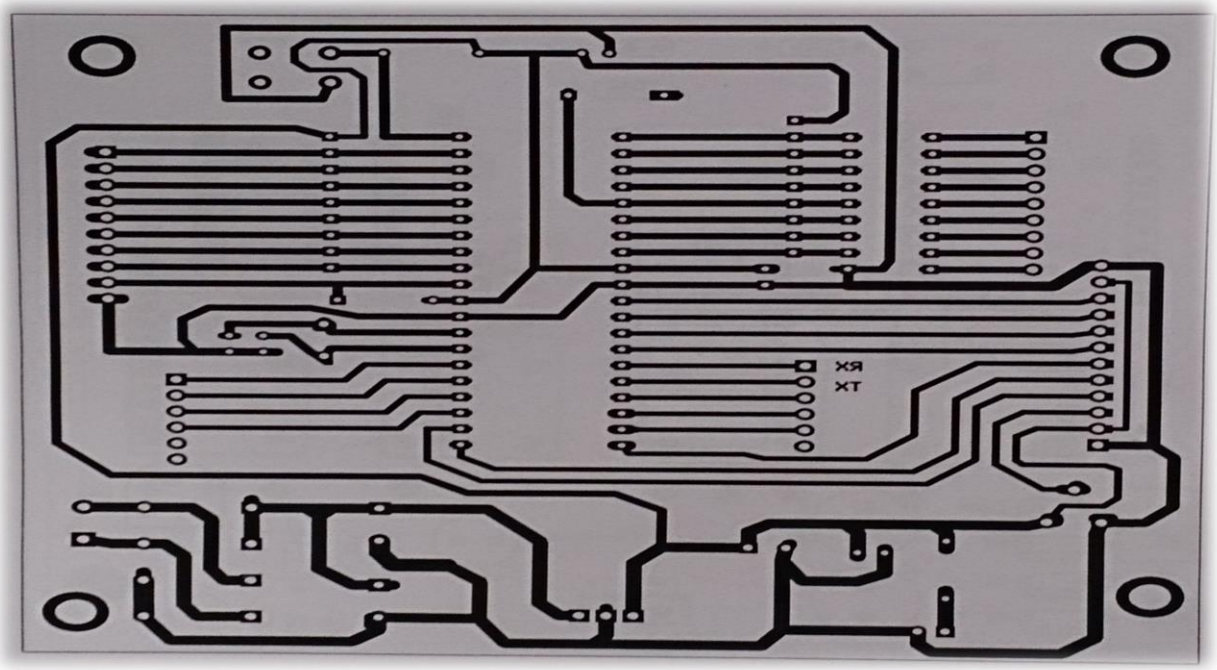



**FIG 5.2 PCB LAYOUT FOR PIC 18, POWER SUPPLY AND INTERFACES**

The above two are the snapshots of schematic and PCB-layout of the main body of our project .The PIC16 microcontroller is placed along with the tracks that provides I/O connections to LCD pins, sensors, relay motors, WiFi module. A power supply arrangement is made at the bottom which involves tracks for rectifiers, filters and dc to dc voltage converter IC'S. The arrangement of crystal oscillator as a clock input to microcontroller, reset arrangement and providing contrast to LCD is also made on the board.

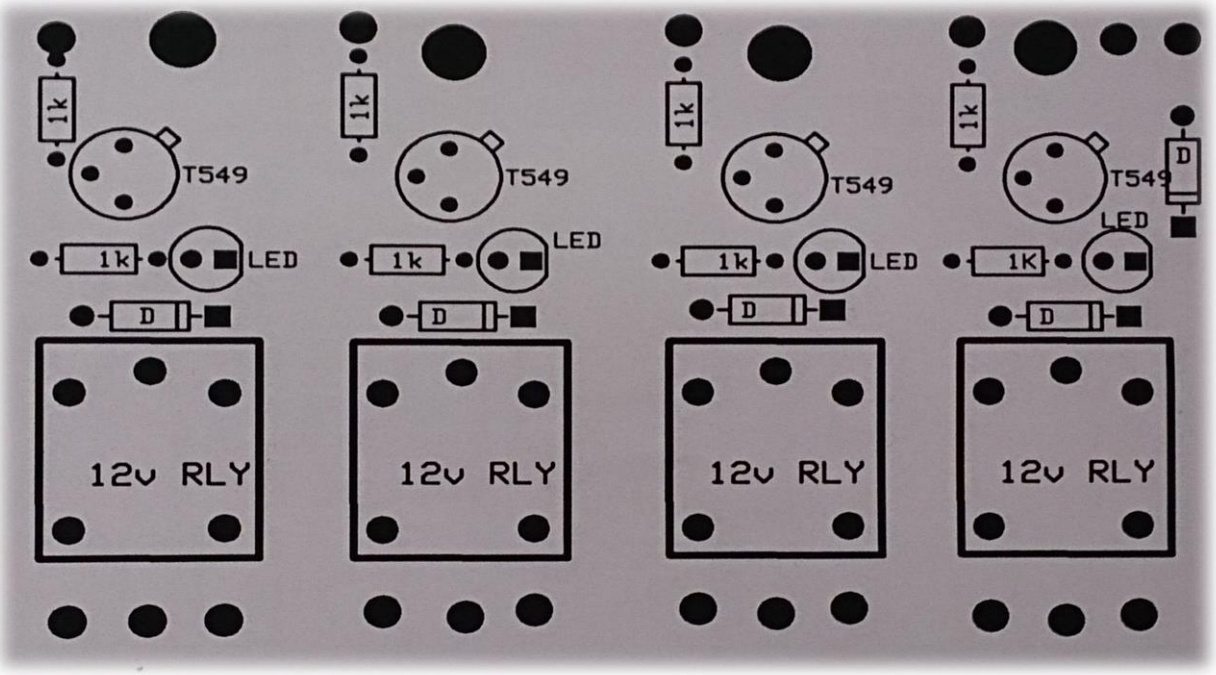


**FIG 5.3 PCB SCHEMATIC FOR RELAYS AND MOTORS**

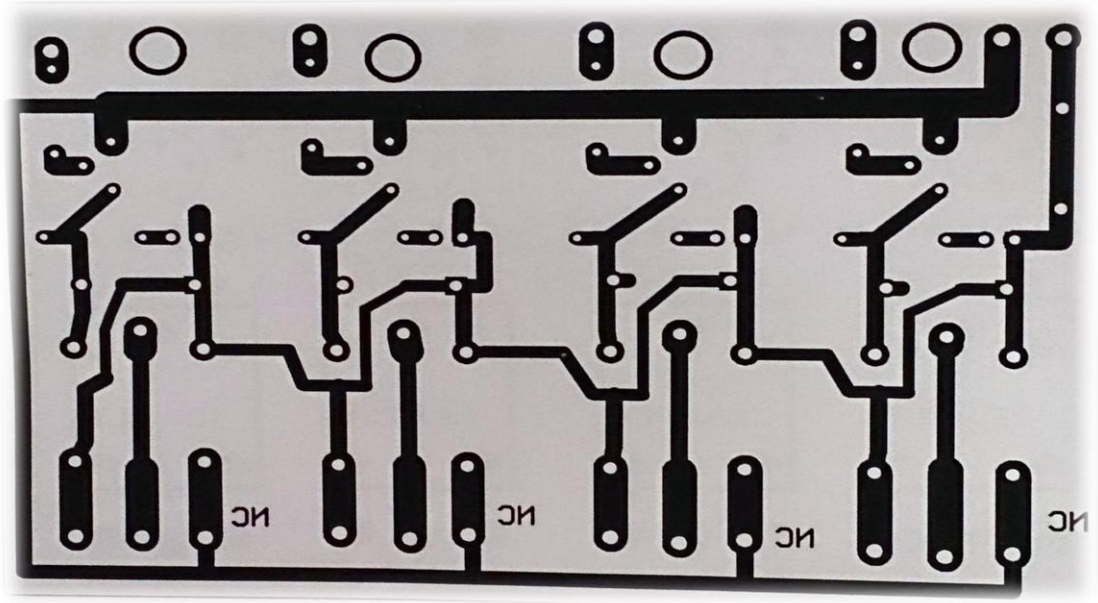


**FIG 5.4 PCB LAYOUT FOR RELAYS AND MOTORS**

The above two snapshots are the schematic and PCB layout for the arrangement of relays and motors. Instead of relay driver IC's, individual transistors (BC549) are used to provide amplified current to motors through relays. A 12V relay arrangement along with indication LED's is also provided on the board. Tracks from relays that connect to motors is also provided.

# 13. Components List

| Sr. No | ITEM | Quantity | Total price |
|---|---|---|---|
| 1. | 7805 - 5V voltage regulator | 1 | Rs 15 |
| 2. | 16x2 LCD with green Backlight | 1 | Rs 250 |
| 3. | Crystal (11Mhz) | 1 | Rs 50 |
| 4. | 40 Pin IC Base | 1 | Rs 22 |
| 5. | Transistor npn BC549 | 6 | Rs 48 |
| 6. | Wifi serial module ( HiLinK-RMO4) | 1 | Rs 3300 |
| 7. | PIC-16F877A | 1 | Rs 180 |
| 8. | Wireless camera (Jmk Ws-309as) | 1 | Rs 2249 |
| 9. | 12v SPDT Relay | 6 | Rs 120 |
| 10. | Gas sensor MQ6 | 1 | Rs 365 |
| 11. | Temp sensor 10K | 1 | Rs 25 |
| | | | |
| 12. | 230v/12v Transformer | 1 | Rs 150 |
| 13. | 2 inch Bore Wheel thick | 4 | Rs 240 |
| 14. | 12V DC Red. Motor 60rpm | 4 | Rs 2600 |
| 15. | Battery 6V | 2 | Rs 1600 |
| 16. | TV Tuner | 1 | Rs 1080 |
| **TOTAL:** | | | **Rs 12,674** |

## Product Specifications

- WiFi protocol v2.0
- Range 10 meters
- Frequency: 2.4 GHz ISM
- Modulation: GFSK
- Transmit power: 4dBm
- Sensitivity: 84dBm
- Rate: 2.1Mbps (Max) /160kbps (A-sync); 1Mbps (Sync)
- Authentication & Encryption
- Power Supply: +3.3 VDC 50mA
- Operating Temperate: -20C to +55 C

# 14. Applications

- Military reconnaissance mission
- Wireless security and surveillance in hot spots.
- Search and rescue operation
- Maneuvering in hazardous environment.
- Any Android phone can download and install the application, connect with the WiFi and can run the vehicle.
- Wireless Telemetry
- Remote Data Logging
- Sensor Monitoring
- Remote Programming

# 15. Conclusion

The android based spy-vehicle is thus useful for monitoring and surveillance of a particular area, to inspect any activity, to spy an area, search and rescue operation etc. This vehicle, controlled using a mobile phone, makes controlling the vehicle simpler, cheaper, at any place, any time. All that needs to be done is to download and install the Android application, connect with the WiFi module and run the vehicle. This indeed eliminates the need of remote controls and their batteries to control the vehicle and hence the vehicle can easily be done with the android enabled handset. Even the temperature and gas values also gets displayed on the screen that is useful when human reach to certain areas is infeasible. Thus, the Android based spy-vehicle is a multi-functional vehicle that can easily be controlled by mobiles, monitor an area by cameras and display the temperature and gas values of the surrounding.

# FUTURE SCOPE

The spy-vehicle is controlled through the mobile phones via the Wi-Fi link which provides a range of about 100 meters. But if suppose the vehicle is needed to be controlled anywhere around the globe without the limit of specific distance, then the GPS (Global Positioning System) technology can be utilized to control the vehicle anywhere around the world by just tracking the position of the vehicle via satellites and monitoring it over the Laptops.

The vehicle can also be controlled anywhere around the globe through GSM technology where a mobile phone can be kept over a vehicle and can automatically pick up the call and move in desired direction as per the DTMF tone frequency sent by the sender.

# 16. DATASHEETS

## 16.1LM 7805 IC (12V to 5V converter)

### Electrical Characteristics (MC7805/LM7805)

(Refer to test circuit ,0°C < $T_J$ < 125°C, $I_O$ = 500mA, $V_I$ = 10V, $C_I$= 0.33µF, $C_O$= 0.1µF, unless otherwise specified)

| Parameter | Symbol | Conditions | | MC7805/LM7805 | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Output Voltage | $V_O$ | $T_J$ =+25 °C | | 4.8 | 5.0 | 5.2 | V |
| | | 5.0mA ≤ $I_O$ ≤ 1.0A, $P_O$ ≤ 15W<br>$V_I$ = 7V to 20V | | 4.75 | 5.0 | 5.25 | |
| Line Regulation (Note1) | Regline | $T_J$=+25 °C | $V_O$ = 7V to 25V | - | 4.0 | 100 | mV |
| | | | $V_I$ = 8V to 12V | - | 1.6 | 50 | |
| Load Regulation (Note1) | Regload | $T_J$=+25 °C | $I_O$ = 5.0mA to1.5A | - | 9 | 100 | mV |
| | | | $I_O$ =250mA to 750mA | - | 4 | 50 | |
| Quiescent Current | $I_Q$ | $T_J$ =+25 °C | | - | 5.0 | 8.0 | mA |
| Quiescent Current Change | $\Delta I_Q$ | $I_O$ = 5mA to 1.0A | | - | 0.03 | 0.5 | mA |
| | | $V_I$= 7V to 25V | | - | 0.3 | 1.3 | |
| Output Voltage Drift | $\Delta V_O/\Delta T$ | $I_O$= 5mA | | - | -0.8 | - | mV/ °C |
| Output Noise Voltage | $V_N$ | f = 10Hz to 100KHz, $T_A$=+25 °C | | - | 42 | - | µV/Vo |
| Ripple Rejection | RR | f = 120Hz<br>$V_O$ = 8V to 18V | | 62 | 73 | - | dB |
| Dropout Voltage | $V_{Drop}$ | $I_O$ = 1A, $T_J$ =+25 °C | | - | 2 | - | V |
| Output Resistance | $r_O$ | f = 1KHz | | - | 15 | - | mΩ |
| Short Circuit Current | $I_{SC}$ | $V_I$ = 35V, $T_A$ =+25 °C | | - | 230 | - | mA |
| Peak Current | $I_{PK}$ | $T_J$ =+25 °C | | - | 2.2 | - | A |

**Note:**

1. Load and line regulation are specified at constant junction temperature. Changes in $V_o$ due to heating effects must be taken into account separately. Pulse testing with low duty is used.

## 16.2MC 7809 IC (12V to 9V converter)

### Electrical Characteristics (MC7809)

(Refer to test circuit ,0°C < $T_J$ < 125°C, $I_O$ = 500mA, $V_I$ =15V, $C_I$= 0.33µF, $C_O$= 0.1µF, unless otherwise specified)

| Parameter | Symbol | Conditions | | MC7809 Min. | MC7809 Typ. | MC7809 Max. | Unit |
|---|---|---|---|---|---|---|---|
| Output Voltage | $V_O$ | $T_J$ =+25°C | | 8.65 | 9 | 9.35 | V |
| | | 5.0mA≤ $I_O$ ≤1.0A, $P_O$ ≤15W<br>$V_I$= 11.5V to 24V | | 8.6 | 9 | 9.4 | |
| Line Regulation (Note1) | Regline | $T_J$=+25°C | $V_I$ = 11.5V to 25V | - | 6 | 180 | mV |
| | | | $V_I$ = 12V to 17V | - | 2 | 90 | |
| Load Regulation (Note1) | Regload | $T_J$=+25°C | $I_O$ = 5mA to 1.5A | - | 12 | 180 | mV |
| | | | $I_O$ = 250mA to 750mA | - | 4 | 90 | |
| Quiescent Current | $I_Q$ | $T_J$=+25°C | | - | 5.0 | 8.0 | mA |
| Quiescent Current Change | $\Delta I_Q$ | $I_O$ = 5mA to 1.0A | | - | - | 0.5 | mA |
| | | $V_I$ = 11.5V to 26V | | - | - | 1.3 | |
| Output Voltage Drift | $\Delta V_O/\Delta T$ | $I_O$ = 5mA | | - | -1 | - | mV/ °C |
| Output Noise Voltage | $V_N$ | f = 10Hz to 100KHz, $T_A$ =+25 °C | | - | 58 | - | µV/Vo |
| Ripple Rejection | RR | f = 120Hz<br>$V_I$ = 13V to 23V | | 56 | 71 | - | dB |
| Dropout Voltage | $V_{Drop}$ | $I_O$ = 1A, $T_J$=+25°C | | - | 2 | - | V |
| Output Resistance | $r_O$ | f = 1KHz | | - | 17 | - | mΩ |
| Short Circuit Current | $I_{SC}$ | $V_I$= 35V, $T_A$ =+25°C | | - | 250 | - | mA |
| Peak Current | $I_{PK}$ | $T_J$= +25°C | | - | 2.2 | - | A |

**Note:**

1. Load and line regulation are specified at constant junction temperature. Changes in $V_O$ due to heating effects must be taken into account separately. Pulse testing with low duty is used.

## 16.3LM 1117 IC (15V to 3.3V converter)

### LM1117 Electrical Characteristics

Typicals and limits appearing in normal type apply for $T_J$ = 25°C. Limits appearing in **Boldface** type apply over the entire junction temperature range for operation, 0°C to 125°C.

| Symbol | Parameter | Conditions | Min (Note 5) | Typ (Note 4) | Max (Note 5) | Units |
|---|---|---|---|---|---|---|
| $V_{REF}$ | Reference Voltage | LM1117-ADJ | | | | |
| | | $I_{OUT}$ = 10mA, $V_{IN}$-$V_{OUT}$ = 2V, $T_J$ = 25°C | 1.238 | 1.250 | 1.262 | V |
| | | 10mA ≤ $I_{OUT}$ ≤ 800mA, 1.4V ≤ $V_{IN}$-$V_{OUT}$ ≤ 10V | **1.225** | 1.250 | **1.270** | V |
| $V_{OUT}$ | Output Voltage | LM1117-1.8 | | | | |
| | | $I_{OUT}$ = 10mA, $V_{IN}$ = 3.8V, $T_J$ = 25°C | 1.782 | 1.800 | 1.818 | V |
| | | 0 ≤ $I_{OUT}$ ≤ 800mA, 3.2V ≤ $V_{IN}$ ≤ 10V | **1.746** | 1.800 | **1.854** | V |
| | | LM1117-2.5 | | | | |
| | | $I_{OUT}$ = 10mA, $V_{IN}$ = 4.5V, $T_J$ = 25°C | 2.475 | 2.500 | 2.525 | V |
| | | 0 ≤ $I_{OUT}$ ≤ 800mA, 3.9V ≤ $V_{IN}$ ≤ 10V | **2.450** | 2.500 | **2.550** | V |
| | | LM1117-2.85 | | | | |
| | | $I_{OUT}$ = 10mA, $V_{IN}$ = 4.85V, $T_J$ = 25°C | 2.820 | 2.850 | 2.880 | V |
| | | 0 ≤ $I_{OUT}$ ≤ 800mA, 4.25V ≤ $V_{IN}$ ≤ 10V | **2.790** | 2.850 | **2.910** | V |
| | | 0 ≤ $I_{OUT}$ ≤ 500mA, $V_{IN}$ = 4.10V | **2.790** | 2.850 | **2.910** | V |
| | | LM1117-3.3 | | | | |
| | | $I_{OUT}$ = 10mA, $V_{IN}$ = 5V $T_J$ = 25°C | 3.267 | 3.300 | 3.333 | V |
| | | 0 ≤ $I_{OUT}$ ≤ 800mA, 4.75V≤ $V_{IN}$ ≤ 10V | **3.235** | 3.300 | **3.365** | V |
| | | LM1117-5.0 | | | | |
| | | $I_{OUT}$ = 10mA, $V_{IN}$ = 7V, $T_J$ = 25°C | 4.950 | 5.000 | 5.050 | V |
| | | 0 ≤ $I_{OUT}$ ≤ 800mA, 6.5V ≤ $V_{IN}$ ≤ 12V | **4.900** | 5.000 | **5.100** | V |
| $\Delta V_{OUT}$ | Line Regulation (Note 6) | LM1117-ADJ | | | | |
| | | $I_{OUT}$ = 10mA, 1.5V ≤ $V_{IN}$-$V_{OUT}$ ≤ 13.75V | | 0.035 | **0.2** | % |
| | | LM1117-1.8 | | 1 | **6** | mV |
| | | $I_{OUT}$ = 0mA, 3.2V ≤ $V_{IN}$ ≤ 10V | | | | |
| | | LM1117-2.5 | | 1 | **6** | mV |
| | | $I_{OUT}$ = 0mA, 3.9V ≤ $V_{IN}$ ≤ 10V | | | | |
| | | LM1117-2.85 | | | | |
| | | $I_{OUT}$ = 0mA, 4.25V ≤ $V_{IN}$ ≤ 10V | | 1 | **6** | mV |
| | | LM1117-3.3 | | | | |
| | | $I_{OUT}$ = 0mA, 4.75V ≤ $V_{IN}$ ≤ 15V | | 1 | **6** | mV |
| | | LM1117-5.0 | | | | |
| | | $I_{OUT}$ = 0mA, 6.5V ≤ $V_{IN}$ ≤ 15V | | 1 | **10** | mV |

# REFERENCES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- Digital Electronics – R.P. Jain
- www.redcircuits.com
- www.alldatasheet.com
- www.elctronicsforu.com