Sudan University of Science and Technology

Collage of Engineering

School of Electronics Engineering

Controlling Robot Using GSM and Android Application

A Research Submitted in Partial fulfillment for the Requirements of the Degree of B.Sc. (Honors) in Electronics Engineering

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الآيـــة

قال تعالى:

{يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ }

(المجادلة: 11)
صدق الله العظيم

DEDICATION

This project is dedicated to…

Our beloved **parents** for their love, endless support, and encouragement

Our **teachers** who guided through this path of learning toward success

And to those who accompanied us in the path of **friendship**

ACKNOWLEDGMENT

We are thankful to almighty Allah, most Gracious, who in His infinite mercy has guided us to complete this project.

Special thanks to our supervisor Dr.Alaa Eldin Awoda. For the supervision and constant support. His invaluable help of constructive comments and suggestions throughout the experiment.

We would take this opportunity to express gratitude to all of the Department school members for their help and support.

Abstract

Controlling devices always been a subject of interest, led by robots to do the dangerous, precise and even boring work. Thus, the main objective of this thesis is devolving a low cost, secure and a user friendly robot controlling system and to overcome wireless controlled limited frequency range and limited control using GSM.

The novelties of the control system are its ability to control robot using android application through SMS send via the GSM. The station is comprised of several components, its main components are a linkIt one microcontroller, a GSM communication module and Android application.

المستخلص

ان التحكم بالاجهزة اصبح مجال اهتمام مؤخرا , خصوصا التحكم في الروبوتات حيث انها تقوم بالاعمال الخطرة ، والمهمة والدقيقة.

ان الهدف الاساسي لهذا المشروع هو عمل نظام تحكم باقل تكلفة و ويضيف قدر عالي من الأمان و يمكن المستخدم العادي من استعماله بدون تعقيدات. بالاضافة للتغلب على عيب انظمة التحكم اللاسلكية الاخرى التي تستخدم تقنية البلوتوث والانترنت حيث يكون نطاق التحكم محدود مما يحد استخدام الروبوت في اماكن محصورة باستخدام شبكات الهواتف المحمولة.

نظام التحكم الذي تم تصميمه في المشروع يمكن المستخدم من التحكم في الروبوت باستخدام تطبيق اندرويد مصمم خصيصا عبر ارسال رسائل نصية قصيرة بواسطة نظام الاتصالات GSM ، يتكون نظام التحكم من عدة مكونات ، المكونات الرئيسية المستخدمة هي تطبيق اندرويد و نظام الاتصالات GSM بالاضافة لمتحكم مضمن في وحدة LINKIT ONE.

TABLE OF CONTENTS

List of Tables

List of Figures

Abbreviations

GSM - Global system for mobile communication

SMS - Short message service

GPS - Global positioning system

IOT - Internet of things

GPRS - General packet radio service

SDK - Software developing kit

UART - Universal Asynchronous receiver/transmitter

SD card - Secure digital card

SIM card - Subscriber identity module card

DC - Direct current

USB - Universal serial bus

TDM - Time division multiple access

MS - Mobile station

IC - Integrated circuit

IDE - Integrated development environment

LCD - Liquid crystal display

SOC - System on chip

Chapter one

Introduction

Chapter one

Introduction

1.1 Introduction

1.2 Problem statement

1.3 Proposed solution

1.4 Objectives

1.5 Methodology

1.6 Thesis outlines

Chapter one

Introduction

1.1 Introduction

Controlling devices was one of the important fields, led by robots to do the dangerous, precise and even boring work, the embedded systems study had the main role and contribution in making such control convenient, as it acquire measures, process readings and control actuator The suggested solution is to control robot using GSM based control system, well as approaching the problem without using PC as processing and conditioning unit.

GSM based Control System implements the emerging applications of the GSM Technology. Using GSM networks, a control system has been proposed that will act as an embedded system which can control appliances and other devices locally using built-in input and output peripherals.

Remotely the system allows the user to effectively control the robot via the mobile phone set by sending commands in the form of SMS messages and receiving the appliances status. The main concept behind the project is receiving the sent SMS and processing it further as required to perform several operations. The type of the operation to be performed depends on the nature of the SMS sent. The principle in which the project is based is fairly simple. First, the sent SMS is stored and polled from the receiver mobile station and then the required control signal generated .

1.2 Problem statement

Acquiring the data for analysis and decision making was very important part of life, earlier acquiring these data was done through wires media, but one of the clear limitations that wired communication requires cables and that has a significant difficulties in the longer destination. Most of the control systems is complicated and not affordable for many users.

1.3 Proposed solution

The system which have proposed is an extended approach to automating a control system. Building GSM based controlled robot with android application understanding and use of the project quite simple to the user.

Embedded systems were a great addition to control systems domain, cost and size wise Microprocessor based embedded systems is different from microcontroller based ones, as the first has greater .

1.4 Objectives

The main objective of this project is to design a remote controlling robot through android software. To achieve this objective:-

- Control system for robot is to be proposed.
- Simulation of the proposed control system will be run.
- Hardware implementation of the control system will be done
- Performance evaluation of the system should be highlighted.

1.5 Methodology:

after determine the objectives of the project and how to achieve them, the project has been divided into 2 sections, one is transmitter part which is GSM and android application , the second section include microcontroller , and motors . each part has been studied separately simulated , tested and then a hardware prototype has been built .

1.6 Thesis outlines

- Chapter one includes introduction, problem statement, proposed solution and methodology.
- Chapter two includes definitions for the components and related works.
- Chapter three includes specification for the used components, design block diagram, flow chart and the system scenario.
- Chapter four includes the system simulation design and the hardware implementation.
- Chapter five includes conclusion and recommendation.

Chapter two

Literature review

Chapter two

Literature

review

2.1 Back ground

2.2 linkIt one

2.2.1 Features

2.2.2 Specifications

2.2.3 Hardware Overview

2.2.4 Procedure Overview

2.3 Android

2.4 GSM

2.5 Drive circuit

2.6 DC Motors

2.7 Related works

Chapter two

Literature review

2.1 Back ground

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2.2 LinkIt ONE

The LinkIt ONE development platform is an open source, high performance board for prototyping Wearables and IoT devices. It is based on the world's leading SoC for Wearables, MediaTek Aster (MT2502) combined with high performance Wi-Fi (MT5931) and GPS (MT3332) chipsets to provide you with access to all the features of MediaTek LinkIt. It also provides similar pin-out features to Arduino boards, making it easy to connect various sensors, peripherals, and Arduino shields.

LinkIt One is an all-in-one prototyping board for IoT/wearables devices. Integrating GSM, GPRS, Wi-Fi, GPS, Bluetooth features into a basic Arduino form factor.

LinkIt ONE is a co-design product by Seeed Studio and MediaTek. It brings together both parties' technology in open hardware and industrial leading reference designs for Wearables and IoT devices to create a powerful development board.

LinkIt ONE board comes with a lot of features and its SDK(Software Development Kit) is quite comprehensive. Read this document thoroughly once before using the board. Being a co-design product basic level Technical Support for hardware is provided at Seeedstudio LinkIt One Forum. Advanced Technical support is available at MediaTek LinkIt One Forums. These forums have a good number of FAQs about this board. Please search solutions for your requirements/issues first before posting questions for saving your time, **[2]**

2.2.1 Features

1. Includes ARM7 EJ-S™, GSM, GPRS, Wi-Fi, Bluetooth BR/EDR/BLE, GPS, Audio codec, and SD card connector on a single development board.
2. Pin-out similar to Arduino boards, including Digital I/O, Analog I/O, PWM, I2C, SPI, UART and power supply, compatible with Arduino.
3. Provides various interfaces for connecting to most sensors, peripherals, Groves, and other widgets.
4. You are what you wear. Using LinkIt ONE together with MediaTek LinkIt SDK (for Arduino) you will be able to easily turn your ideas into practical prototypes and make them a reality with the Seeed productization and agile manufacturing service. **[2]**

2.2.2 Specifications

Table 2-1: Specifications of Linkit one

Parameter	Value
Chipset	MT2502A (Aster, ARM7 EJ-S (TM))
Clock Speed	260MHz
Dimensions	3.3x2.1 inches
Flash	16MB
RAM	4MB
DC Current Per I/O Pin	1mA
Analog Pins	3
Digital Output	3.3V
Analog Input	5V
UART	Software based(**Serial**) ,also known as USB Modem Port and Hardware Serial(**Serial1**, D0&D1)
SD Card	Up to 32GB(Class 10)
Positioning	GPS(MT3332)
GSM	850/900/1800/1900 MHz
GPRS	Class 12
Wi-Fi	802.11 b/g/n
Bluetooth	BR/EDR/BLE(Dual Mode)

2.2.3 Hardware Overview

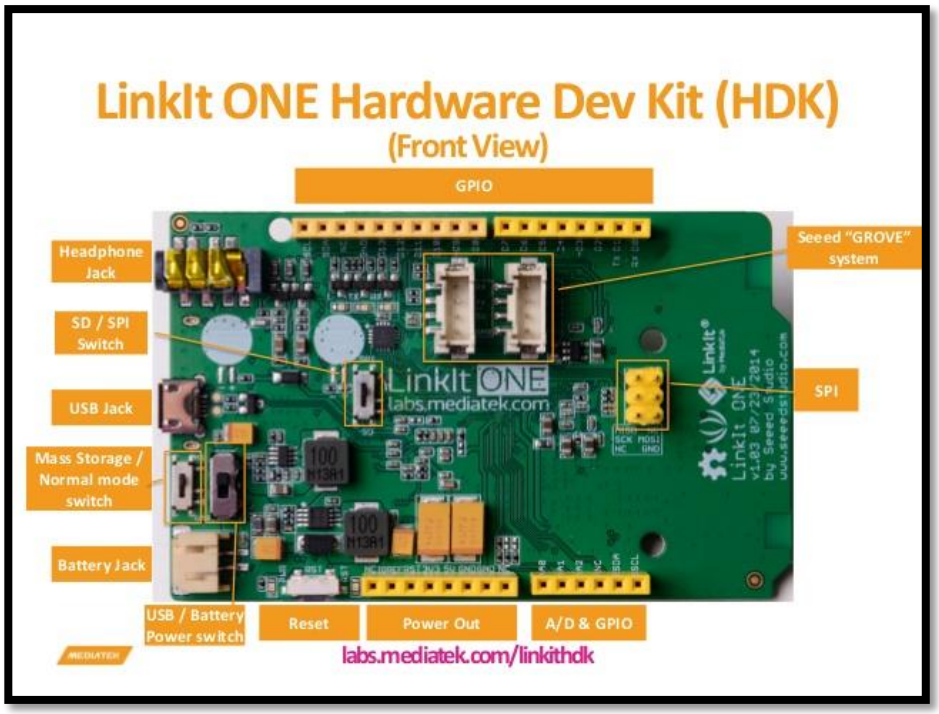


Figure 2-1: Linkit one and connections.

The steps for Installing Drivers are

1. Disable Signature Enforcement if you are using Windows 8/8.1 OS. Read instructions.
2. Put the MS/UART slide switch to UART position and connect LinkIt ONE to PC.
3. Open Device Manager, the following COM ports will be displayed.

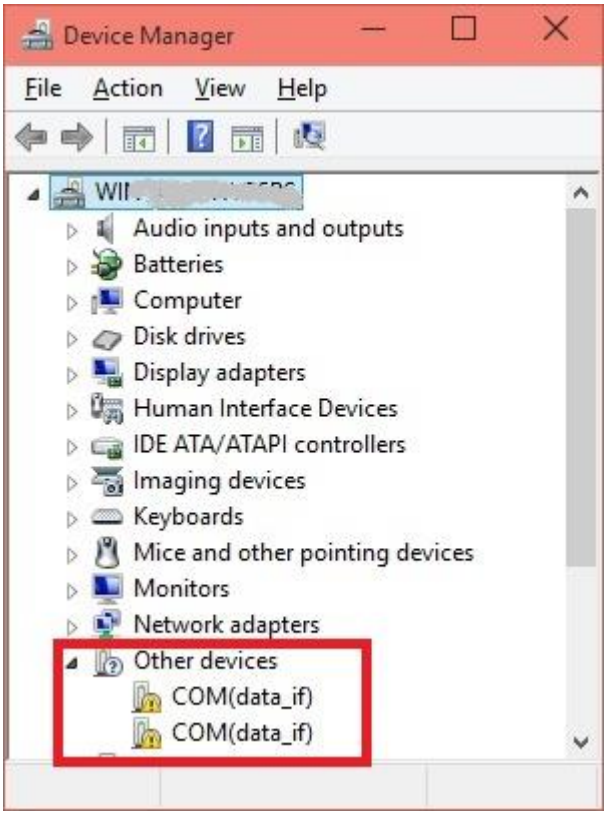


Figure 2-2: Device Manager before installing.

4.Install driver from ..\LinkIt_ONE_IDE\drivers\mtk folder.

5. After installing drivers, Device Manger should display the following two ports.
6. MTK USB Debug Port used for uploading code.

MTK USB Modem Port used for printing message, such as Serial.println()

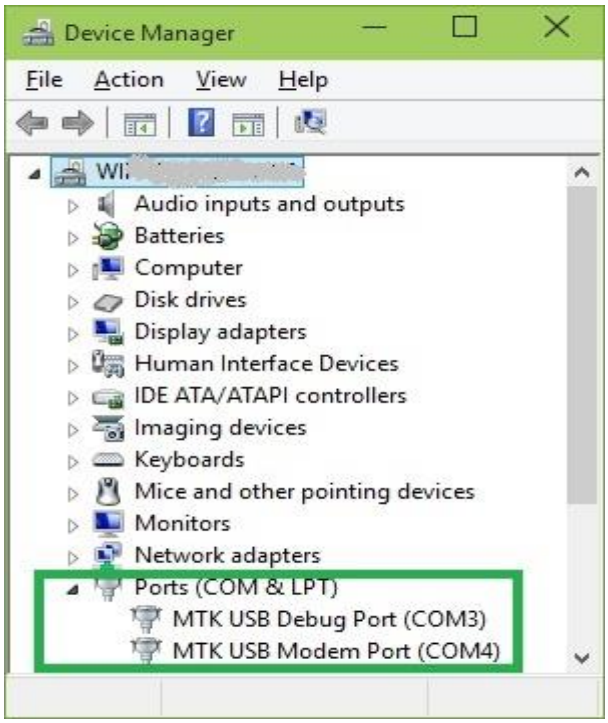


Figure 2-3: Device Manager after installing.

Uploading Code (Blinky) by first configured slide switches for firmware upload (i.e Put MS/UART in UART position and Power switch in USB position).

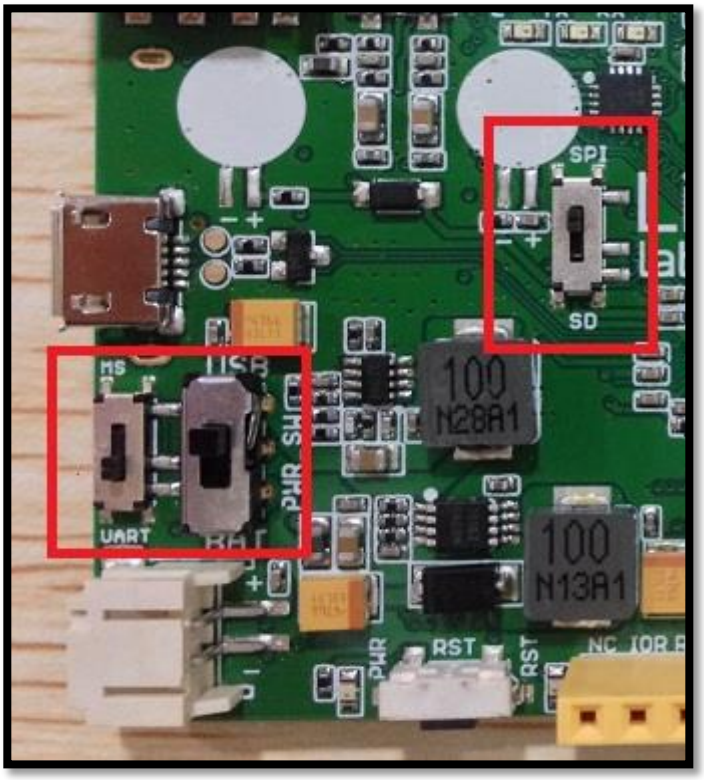


Figure 2-4: Adjust switch to upload code.

And then Open File -> Examples -> Basics -> Blink in LinkIt ONE IDE. Select the COM Port number corresponding to MTK USB Debug port in Tools -> Port. Compile and upload the code then LED marked L should blink.

After that we connect the Antennas there are three antennae provided with LinkIt ONE. They are used for:

- GSM/GPRS
- Wi-Fi/BT
- GPS

Connect the antenna as the following image.

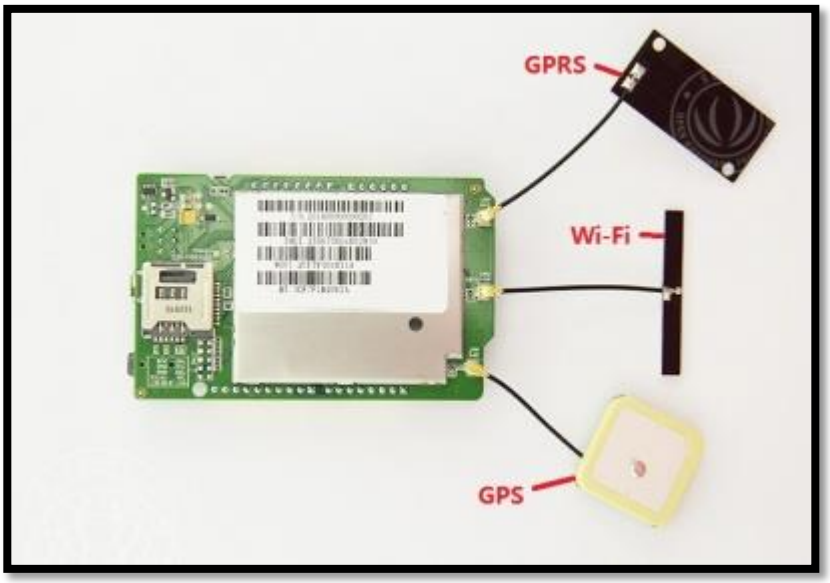


Figure 2-5: Connect the antennas.

Note:

1. While pulling the antenna from board, do it with care. Please Do not use brute force.
2. Try to use the force perpendicular to the direction of the board, otherwise you might damage the antenna pad.

Inserting SIM Card and SD Card LinkIt ONE accepts standard size SIM Card and Micro SD Card. insert them as per the following image:

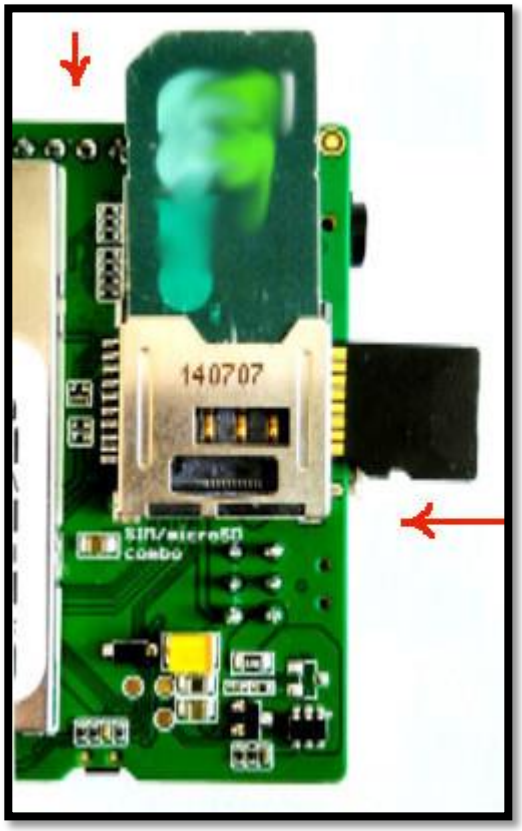


Figure 2-6: Insert size SIM Card and Micro SD Card.

2.3 Android

Android is a mobile operating system(OS) currently developed by Google , based on the Linux kernal and designed primarily for touch screen mobile devices such as smart phone and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input. In addition to touch screen devices, Google has further developed Android TV for televisions, android auto for cars, and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on notebooks, game consoles, digital cameras, and other electronics. As of 2015, Android has the

largest installed base of all operating systems.

Android's default user interface is mainly based on direct manipulation ,using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, along with a virtual keyboard. Game controllers and full-size physical keyboards are supported via Bluetooth or USB. The response to user input is designed to be immediate and provides a fluid touch interface, often using the vibration capabilities of the device to provide haptic feedback to the user. Internal hardware, such as accelerometers, gyroscopes and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented, or allowing the user to steer a vehicle in a racing game by rotating the device, simulating control of a steering wheel.

Android devices boot to the home screen, the primary navigation and information "hub" on Android devices that is analogous to the desktop found on personal computers. (Android also runs on regular personal computers, as described below). Android home screens are typically made up of app icons and widgets; app icons launch the associated app, whereas widgets display live, auto-updating content, such as the weather forecast, the user's email inbox, or a news ticker directly on the home screen. A home screen may be made up of several pages, between which the user can swipe back and forth, though Android's home screen interface is heavily customizable , allowing users to adjust the look and feel of the devices to their tastes Third-party apps available on Google Play and other app stores can extensively re-theme the home screen, and even mimic the look of other operating systems, such as Windows Phone. Most manufacturers, and some wireless carriers, customize the look and feel of their Android devices to differentiate themselves from their competitors. Applications that handle interactions with the home screen are called "launchers" because they, among

other purposes, launch the applications installed on a device.

Along the top of the screen is a status bar, showing information about the device and its connectivity. This status bar can be "pulled" down to reveal a notification screen where apps display important information or updates, such as a newly received email or SMS text, in a way that does not immediately interrupt or inconvenience the user. Notifications are persistent until read by tapping it, which opens the relevant app, or dismissed by sliding it off the screen. Beginning on Android 4.1, "expanded notifications" can display expanded details or additional functionality; for instance, a music player can display playback controls, and a "missed call" notification provides buttons for calling back or sending the caller an SMS message. **[3]**

2.4 GSM

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM supports voice calls and data transfer speeds of up to 9.6 Kbit/s, together with the transmission of SMS. GSM uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency. In the traditional GSM, data transmission is done using Circuit Switched Data (CSD) technique whereby the network allocates one radio channel to a MS when data is to be transmitted to the network and the radio channel remain occupied for the con Network structure

The network is structured into a number of discrete sections:

- Base Station Subsystem – the base stations and their controllers explained
- Network and Switching Subsystem – the part of the network most similar to a fixed network, sometimes just called the "core network"
- GPRS Core Network– the optional part which allows packet-based

Internet connections

• Operations support system (OSS) – network maintenance

GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network—macro, micro, pico, femto, and umbrella cells. The coverage area of each cell varies according to the implementation environment. Macro cells can be regarded as cells where the base station antenna is installed on a mast or a building above average rooftop level. Micro cells are cells whose antenna height is under average rooftop level; they are typically used in urban areas. Picocells are small cells whose coverage diameter is a few dozen metres; they are mainly used indoors. Femtocells are cells designed for use in residential or small business environments and connect to the service provider's network via a broadband internet connection. Umbrella cells are used to cover shadowed regions of smaller cells and fill in gaps in coverage between those cells.

Cell horizontal radius varies depending on antenna height, antenna gain, and propagation conditions from a couple of hundred meters to several tens of kilometers. The longest distance the GSM specification supports in practical use is 35 kilometers (22 mi). There are also several implementations of the concept of an extended cell, where the cell radius could be double or even more, depending on the antenna system, the type of terrain, and the timing advance.
Indoor coverage is also supported by GSM and may be achieved by using an indoor Pico cell base station, or an indoor repeater with distributed indoor antennas fed through power splitters, to deliver the radio signals from an antenna outdoors to the separate indoor distributed antenna system. These are typically deployed when significant call capacity is needed indoors, like in shopping centers or airports. However, this is not a prerequisite, since indoor coverage is

also provided by in-building penetration of the radio signals from any nearby cell.

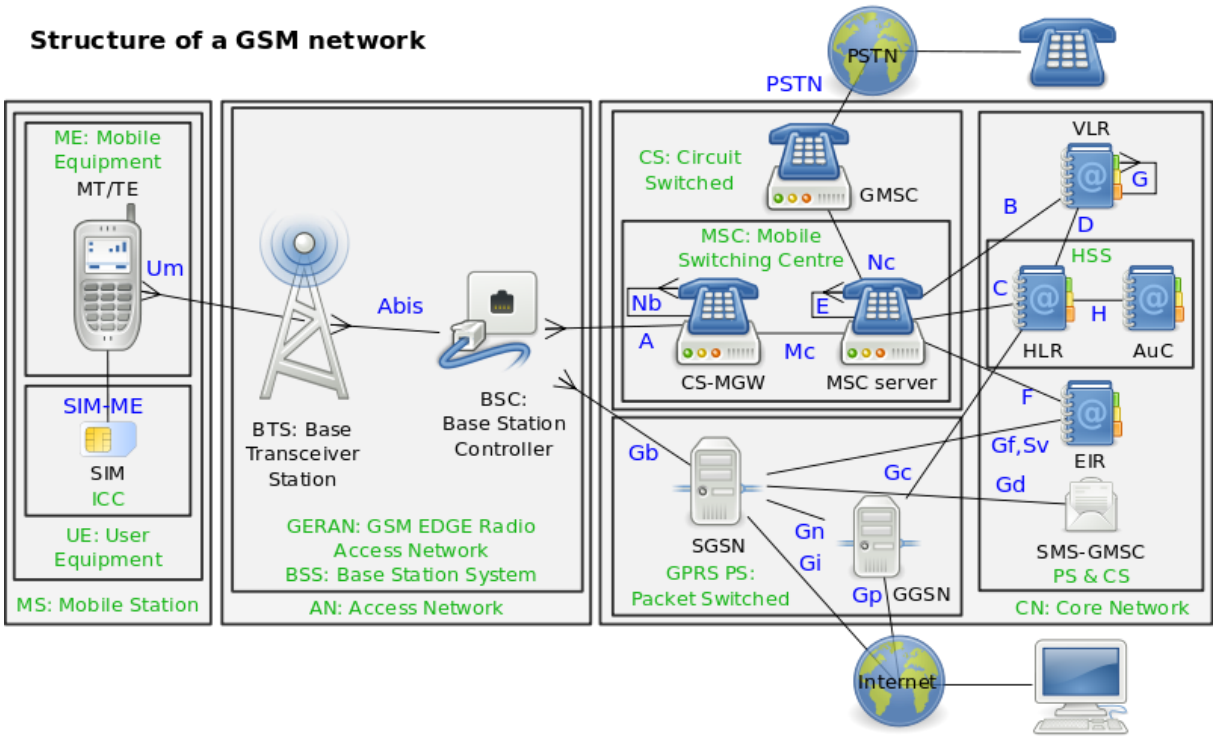


Figure 2-7: GSM Network

2.5 Drive circuit

L293d is dual H-Bridge motor driver integrated circuit (IC). Motor drivers acts as current amplifiers since they take a low-current control signal and provides higher current signal. This higher current signal is used to drive the motors[5].

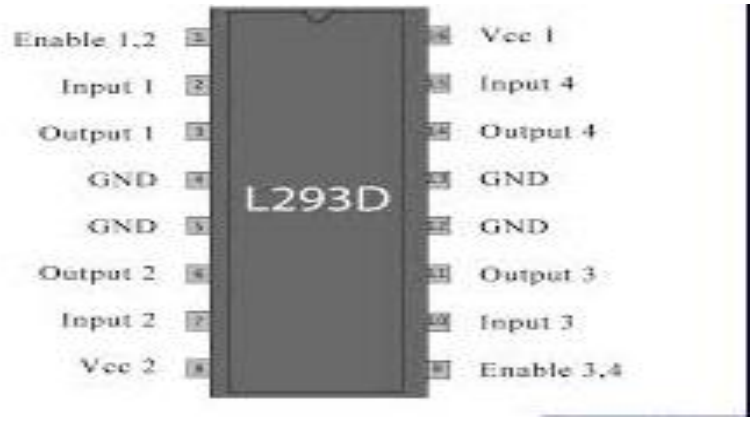


Figure 2-8: drive circuit(l293D)

Table 2-2: Pins Connections Descriptions in Drive Circuit:

PIN	CONNECTION
(EN1), (EN2), (VS), (VSS	are connected with voltage supply(5-30)V.
(IN1), (IN2)	connected to microcontroller
(IN30, (IN4)	are ground
(OUT1), (OUT2)	Connected to motor1.
(OUT3) , (OUT4)	Connected to motor2.

2.6 DC Motors

DC motor An electric motor is a machine which converts electrical energy into mechanical energy. It's based on the principle that when a current-carry conductor is placed in a magnetic field. Output of controller is given to the dc motor driver. In this project we are using dc motor for the movement of robot. Following controls can be carried out using the dc motor by the crane. In this car we use two 5V dc motors for their motion. These motors are fixed

with back wheels each with one. Front wheel is free to rotate. A motor is used for driving the robot i.e., whenever the signals are given by the user the robot moves forward, backward, right, left with the help of the motor.

Figure 2-9: DC MOTOR

2.6.1 DC principle of operation

Consider a coil in a magnetic field of flux density **B** (figure 2.8). When the two ends of the coil are connected across a DC voltage source, current I flows through it. A force is exerted on the coil as a result of the interaction of magnetic field and electric current. The force on the two sides of the coil is such that the coil starts to move in the direction of force.

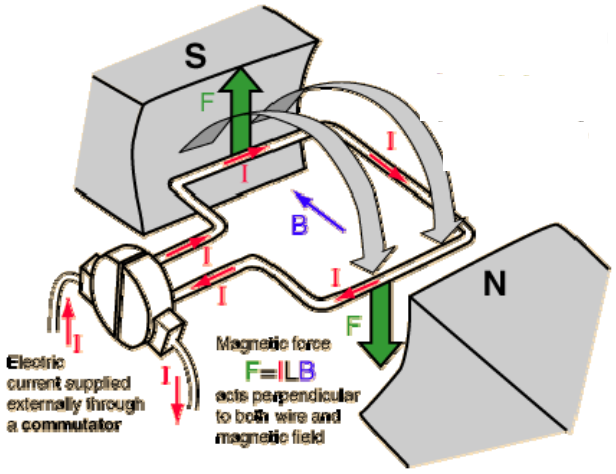


Figure 2-10: Torque production in a DC motor

In an actual DC motor, several such coils are wound on the rotor, all of which experience force, resulting in rotation. The greater the current in the wire, or the greater the magnetic field, the faster the wire moves because of the greater force created.

At the same time this torque is being produced, the conductors are moving in a magnetic field. At different positions, the flux linked with it changes, which causes an emf to be induced ($e = d\Phi/dt$) as shown in figure 5. This voltage is in opposition to the voltage that causes current flow through the conductor and is referred to as a counter-voltage or back emf.

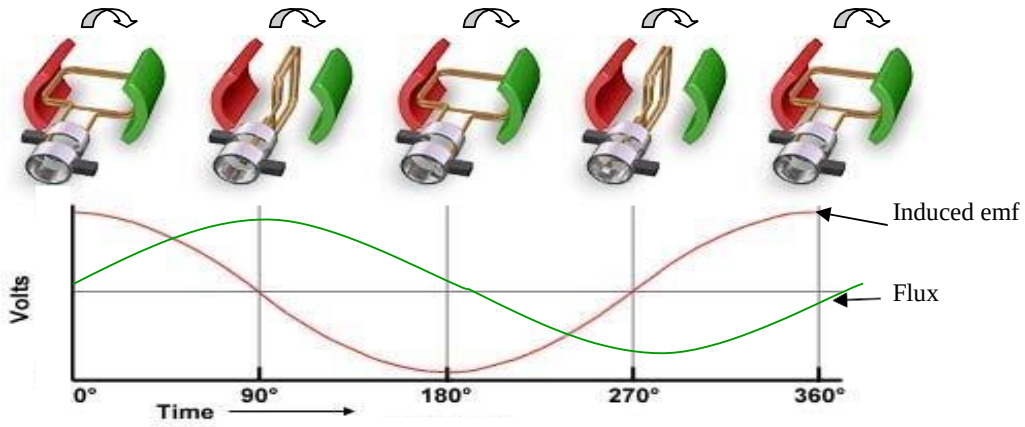


Figure 2-11: Induced voltage in the armature winding of DC motor

The value of current flowing through the armature is dependent upon the difference between the applied voltage and this counter-voltage. The current due to this counter-voltage tends to oppose the very cause for its production according to Lenz's law. It results in the rotor slowing down. Eventually, the rotor slows just enough so that the force created by the magnetic field ($F = Bil$) equals the load force applied on the shaft. Then the system moves at constant velocity[6].

2.3 Related works

The first paper is microcontroller based embedded system, it is designed to measure and control humidity using SMS, and it was done using LPC2148 ARM microcontroller, it works by measuring humidity using the humidity sensor which is connected to the controller using the ADC (Analogue to Digital Converter), having bulb indicator if exceeding threshold in addition to SMS alerts. It is flexible system and has track record as it sends the data frequently to the PC which load the data to a database and provide interface to the database using Visual Basic [7].

While the second paper was around home appliance control, it has been abbreviated as HACS and the aim of this research was to develop a new technique of home appliance control and monitor home thru SMS, and the system was divided into two subsystems, the appliance control system was to remotely control home appliances, the second was to alert of any security breach, the first subsystem was configured to advice the user via SMS to change the condition of the home appliance according to the user needs and requirements, The security subsystem was mainly for intrusion detection. [8].

The third paper is in the irrigation of the field and very good example of the embedded systems in the agricultural domain, it is used to sense the condition of the farm to evaluate whether it needs to be irrigated or not, and also the availability of the water in the field, controlled by the SMS to switch on the water or switch it off. AT89V51 microcontroller is used along with

motor driver, SIM300S GSM modem and moisture sensor, this system detect the status of the field using and sends alerts accordingly to the user, then the user can send a command SMS to switch on or off the motor. With This research added a great value to agriculture field as for some countries those who their economy depends the agriculture, so moving around the field will cost fuel and time as well, moreover such system will help scheduling irrigating [9].

The fourth paper is GSM Based Motor Monitoring and Speed Control In this paper, the design aspects of an embedded device which can control up to 8 devices by sending a specific SMS message from a mobile phone are presented. This controller is extremely handy at places where we have to control the ON and OFF switching of the devices but no wired connection to that place is available. To implement this, a GSM modem is connected to a programmed microcontroller which would receive the SMS from a reference cell phone. The control signal part of the received SMS is extracted and is changed to microcontroller-preferred format. A PC which is connected to the microcontroller using a serial communication through RS232 can be used for monitoring and transmission of the control signals to the modem. The monitoring is also done by interfacing a LCD to the microcontroller. AT commands were used for controlling the functionality of modem's (Global Systems for Mobile Communication) is vastly used because of its simplicity in both transmitter and receiver design, can operate at 900 or 1800MHZ band, faster, more reliable and globally network. Here the system is capable of controlling the motor by receiving control message from an authorized mobile number. Microcontroller is the heart of our system, which controls the overall operation of our system. System is always alert for receiving SMS from valid

number and that message can be displayed on the LCD (Liquid Crystal Display), in[10].

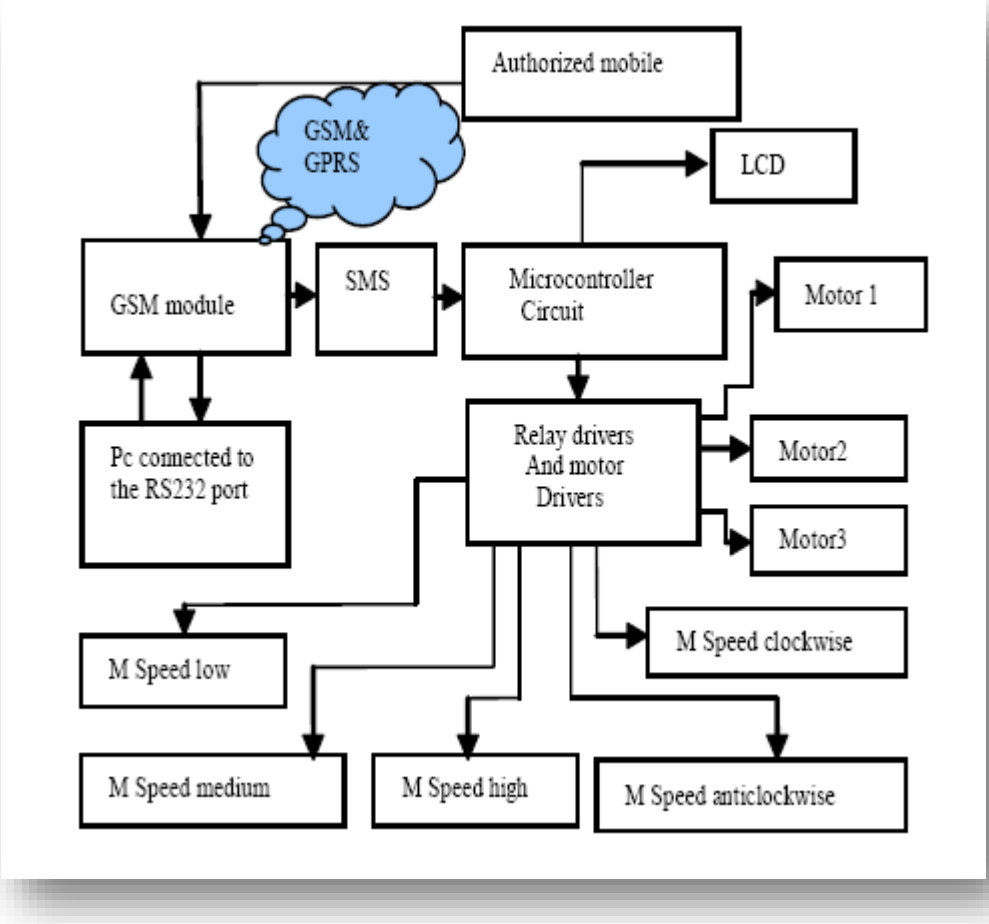


Figure 2-12: Block Diagram of GSM Based Motor Monitoring and Speed Control.

Chapter three

Methodology

Chapter Three
Methodology

3.1Overview

3.2 Transmitter system part

3.2.1Android Application

3.2.2 GSM

3.3 Control system part

3.3.1 Microcontroller Link It One plan

3.3.2 Motor driver (L293D)

3.3. DC Motors

3.4 System Flow Chart

3.5 System Block Diagram

Chapter Three
Methodology

3.1 Overview

The main aim of this thesis work is the implementation of the robot control system using android application and GSM module. To implement this a prototype robot set-up is considered which consists of two D.C .Motors ,keypad ,microcontroller and display module.

The hardware part of the work comprises a simple D. C. Motor android application is used for sending the message for microcontroller , which can control the movement of the car. This D. C. Motor is controlled through the microcontroller. every direction has button on the android application , one is used for forward movement and another is used for backward movement in addition to three more buttons for stop , left and right directions . Based on the button pressed, the car can move either in left , right , forward or backward directions.

3.2 transmitter system part

The GSM modem which is fixed at the robot receives the messages sent by the mobile using android application and gives the instructions to the microcontroller to control the robot directions. This system continuously checks for message to take the decision for controlling the robot using android application to send the message. The message is send by the android application to the GSM module it has 5 bottoms (forward, backward, right, left, stop)

3.2.1 Android Application

Instead of writing message every time we want to move the robot an application has been design that capable of sending the message without the need of writing over and over again. It consist of four buttons (right , left, forward , backward) once you click the button the message is send automatically to the number that written inside the code , this eliminate the need of writing and makes it more easier to control the robot .

Android manifest:

It give us the general information about the application package , theme and application name.

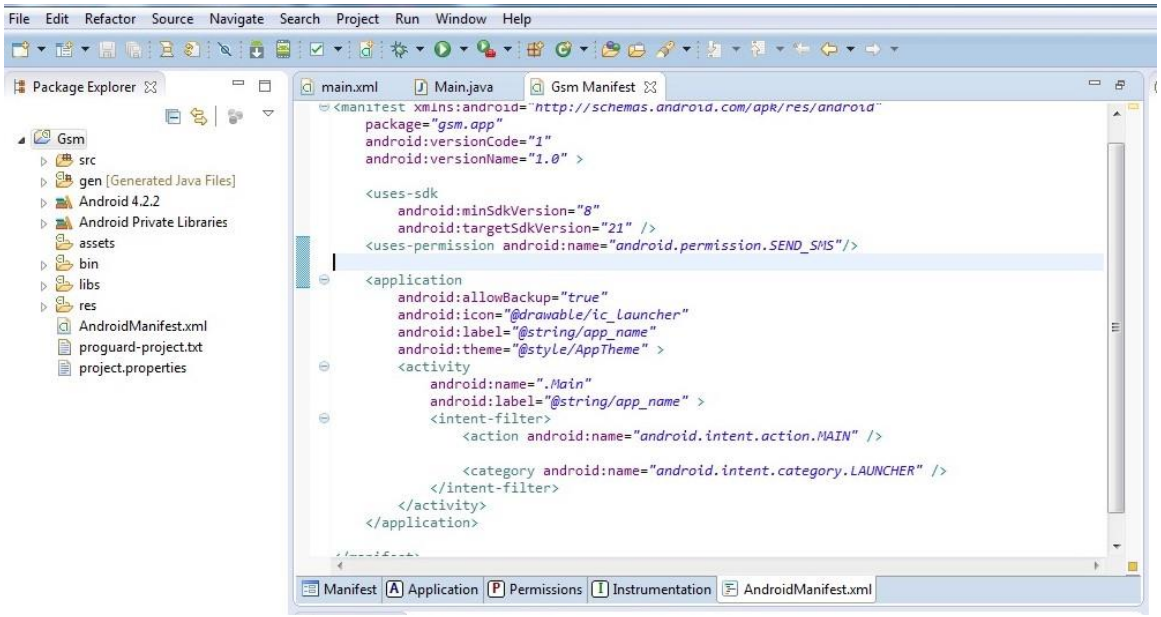


Figure 3-1: Android manifest

Android manifest permission:

The permission that the phone needed from the application is done by this manifest . here the permission is sending and receiving SMS , when the application is installed it let you know that this application needs permission for sending and

receiving .

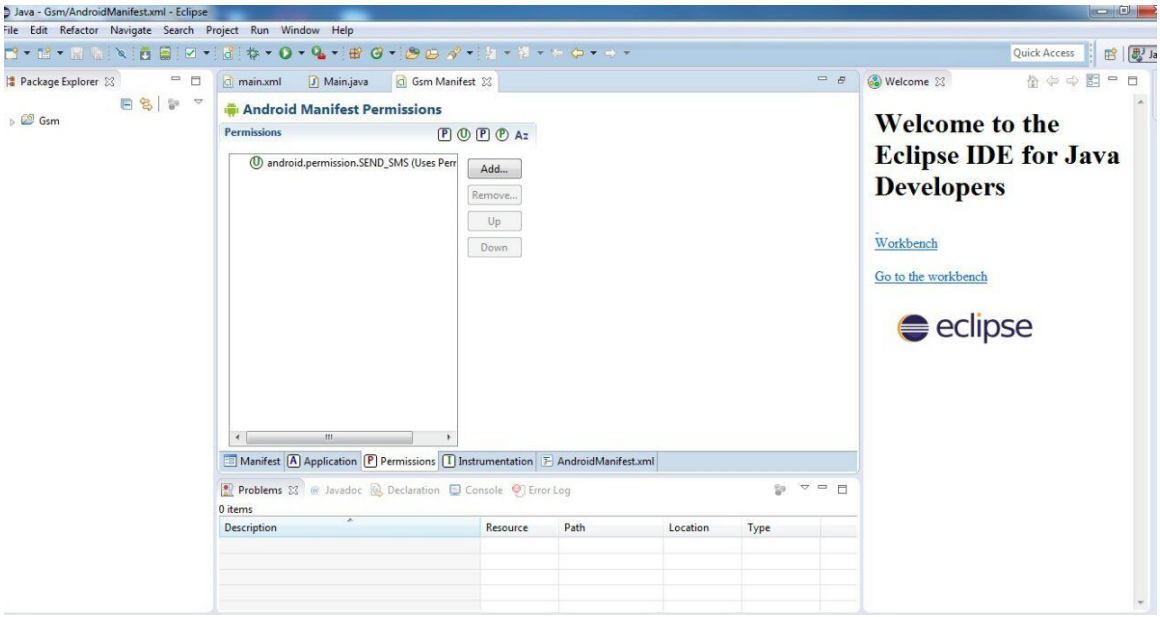


Figure 3-2: Android manifest permission

Android parts :

There are two parts of the android:

1. The first one is the java script code we write in it the function of each button as it shown in figure3.3

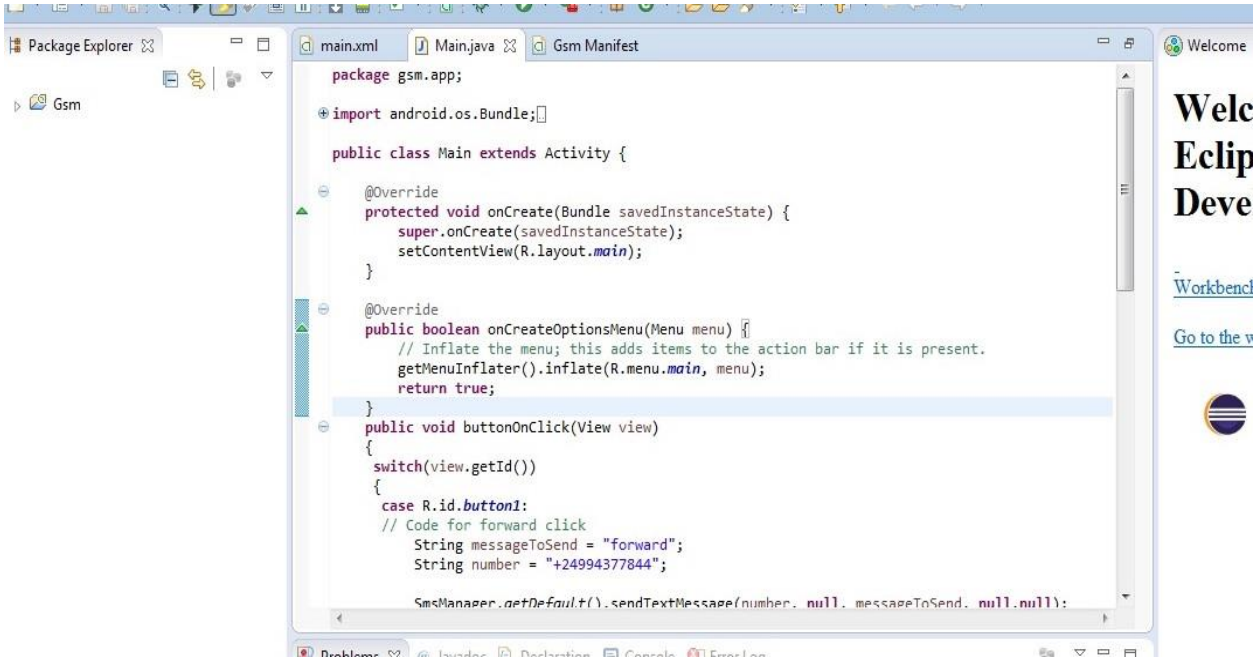


Figure 3-3: Java script code

2. The second part of the application is written in XML is about user interface it determined the place of the button and it's shape as shown in figure (3.4)

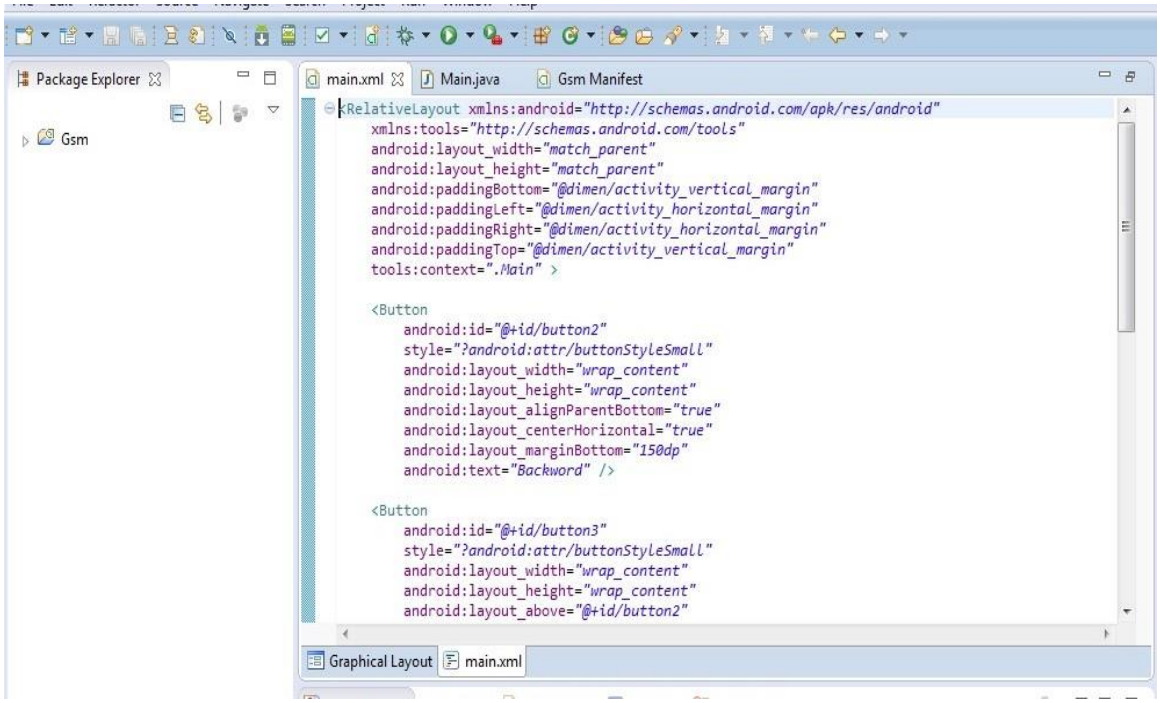


Figure 3-4: XML code

3.2.2 GSM

Global System for Mobile Communication (GSM) was used to receive the information signal from the micro and send it to . A GSM modem is a specific type of modems, which accept subscription to a mobile operator like a mobile phone.

3.3 Control system part

This section consists of two basic parts, microcontroller and DC motor. Figure 3.2 below shows that the microcontroller to give a control signal in order to control the DC motor. There were two switches, which controls electrical brake.

3.3.1Microcontroller Link It One plan

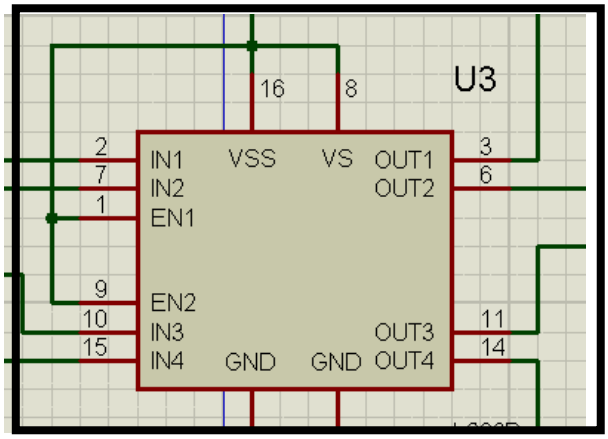
It is the headmaster component in this project. It is responsible for receiving the commands from mobile unit with “android application. By using Microcontroller, (Link It One). Depending on the received message the microcontroller take the decision that if DC motor will be stopped or move (right, left).

It is a collection of development platforms designed for the creation and prototyping of Wearables and Internet of Things (IoT) devices. These development platforms are offered in two distinct families Link It ONE, for simple application use wearable’s and (IoT) devices such as smart wristband, smart safety and tracking devices. These devices provide the user with feedback and control options on the device, and can exchange data and control messages with users, other smart devices, and applications using GSM messaging, GPRS, Wi-Fi or Bluetooth connections.

Link It ONE development board is an open source, high performance board. It‘s based on the world’s leading System-0n-Chip (SoC) for wearables MediaTek Aster (MT2502), which is combined with high performance Wi-Fi (MT5931) and GPS (MT3332) chipsets to provide a feature rich development board. It also provides similar pin-out to Arduino UNO for connections to various sensors and peripherals.

3.3.2 Motor driver (L293D)

The circuit includes a 5v supplied L293D to amplify the current (up to 600Amp) based on the motor left, right, forward or backward signal that comes from the microcontroller.



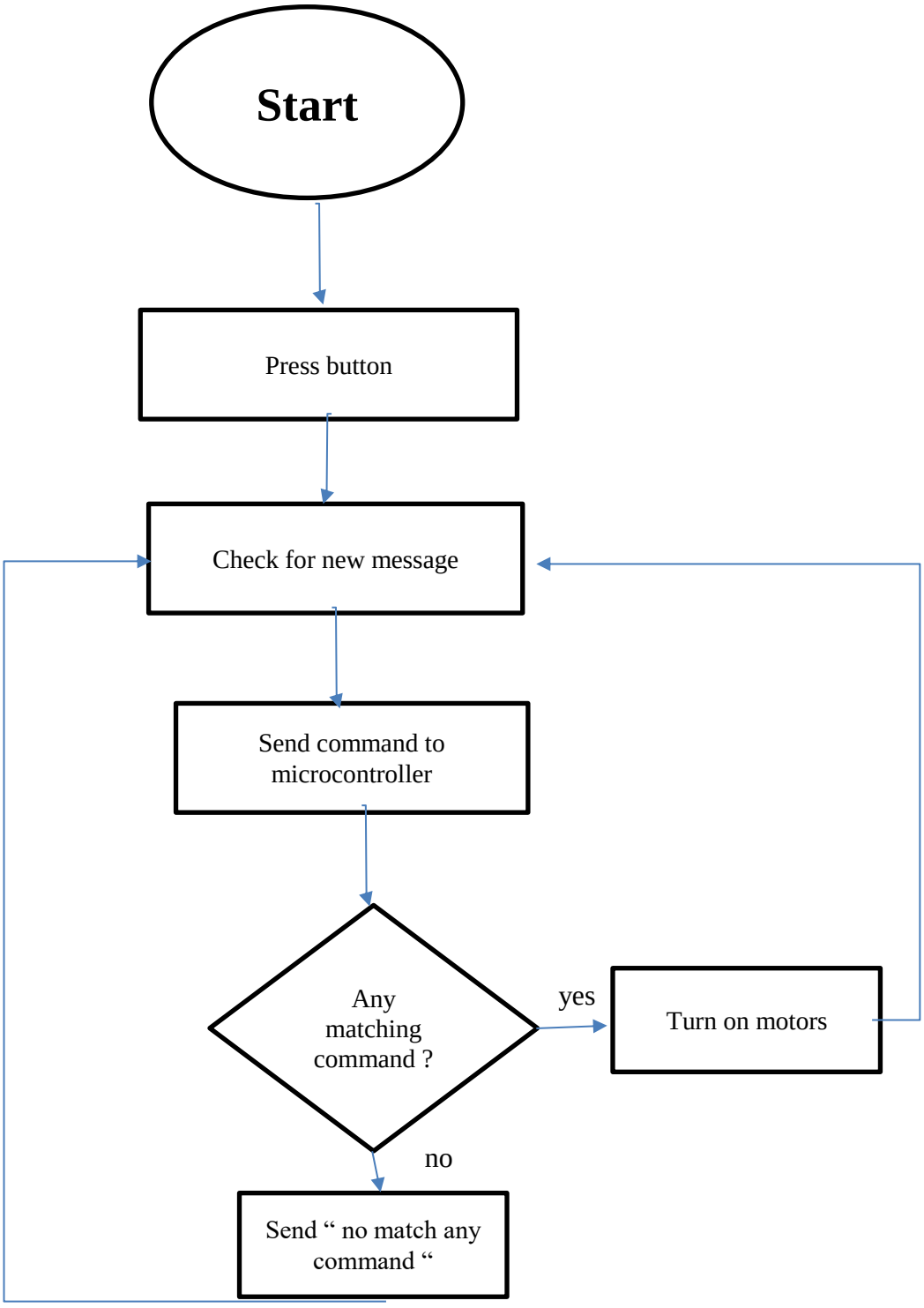
Figures 3-5 show the motor driver (L293D) circuits.

3.3.3 Motors

It makes the real work of all techniques implemented together .It converts the electrical energy to loco- motor energy. It makes the response of microcontroller tasks action when the message arrive .User can send SMS messages to control the motor. A GSM modem attached to the control unit handles automatic SMS sending and receiving process.

3.4 System Flow Chart

Figure 3-6: System Flow Chart



3.5 System Block Diagram

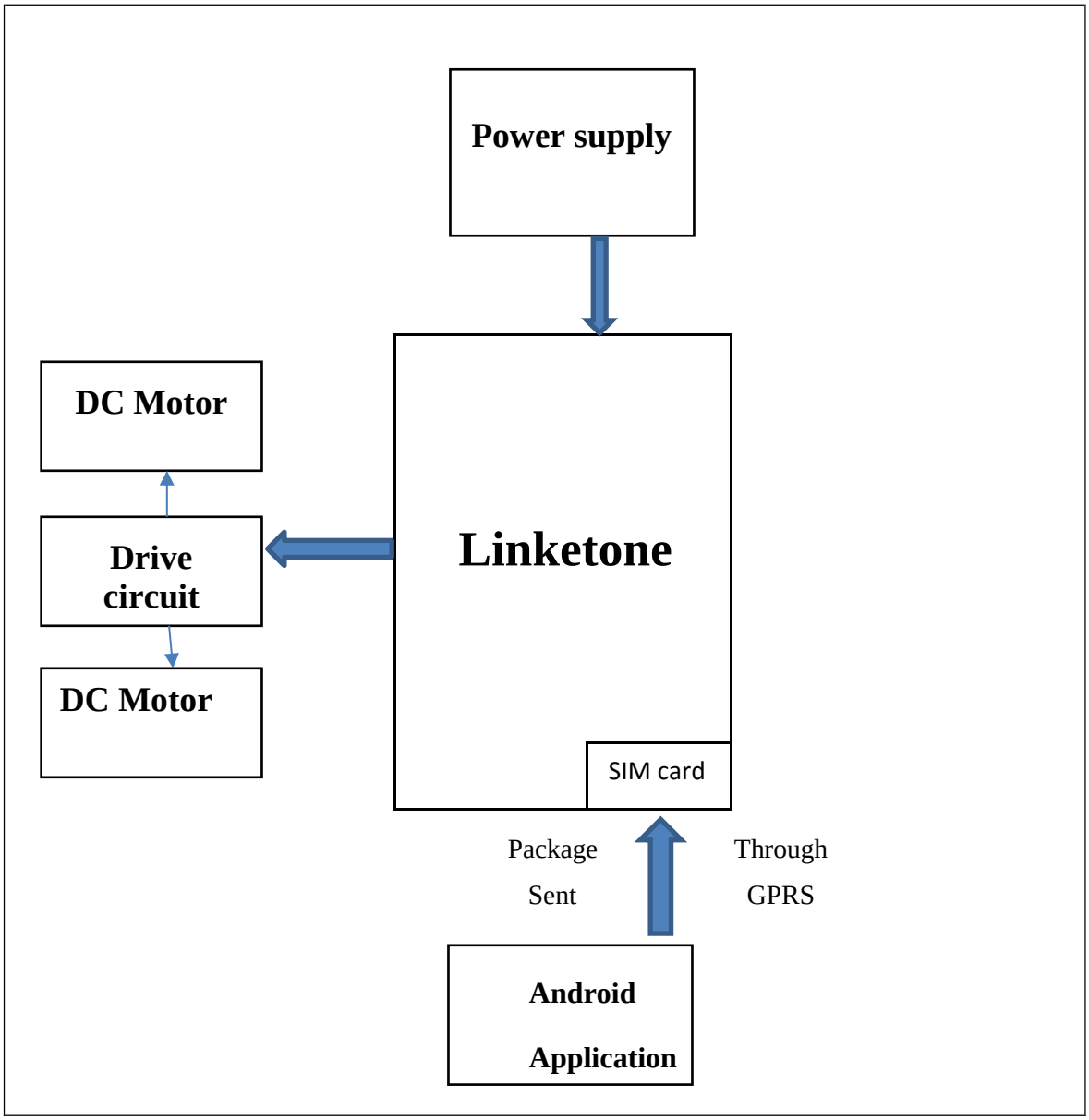


Figure 3-7: System Block Diagram

Chapter four

Simulation and Hardware

Chapter four

Simulation and hardware

4.1 Overview

4.2 Simulation results

4.2.1 Results of transmitter part

GSM and Android application

4.2.2 Result of the control part

4.2.3 DC Motor and keypad

4.3 Hardware implementation results

Chapter four

Simulation and Hardware

4.1 Overview

This chapter covers the results obtained from the design in all states avoiding and locating. The results in this chapter are divided in to three parts:

1 Results of transmitter part: GSM and Android application

2. Result of the control part: DC Motor and keypad

3. Hardware implantation results.

4.2 simulation results:

This part includes simulation results for the android application which has been built using android studio, and GSM module which has been tested using Arduino serial monitor and linkit one kit

4.2.1GSM and Android application

Android application was used for sending SMS and Arduino IDE for wrote code and Readings are displays on the serial monitor of the Arduino IDE.

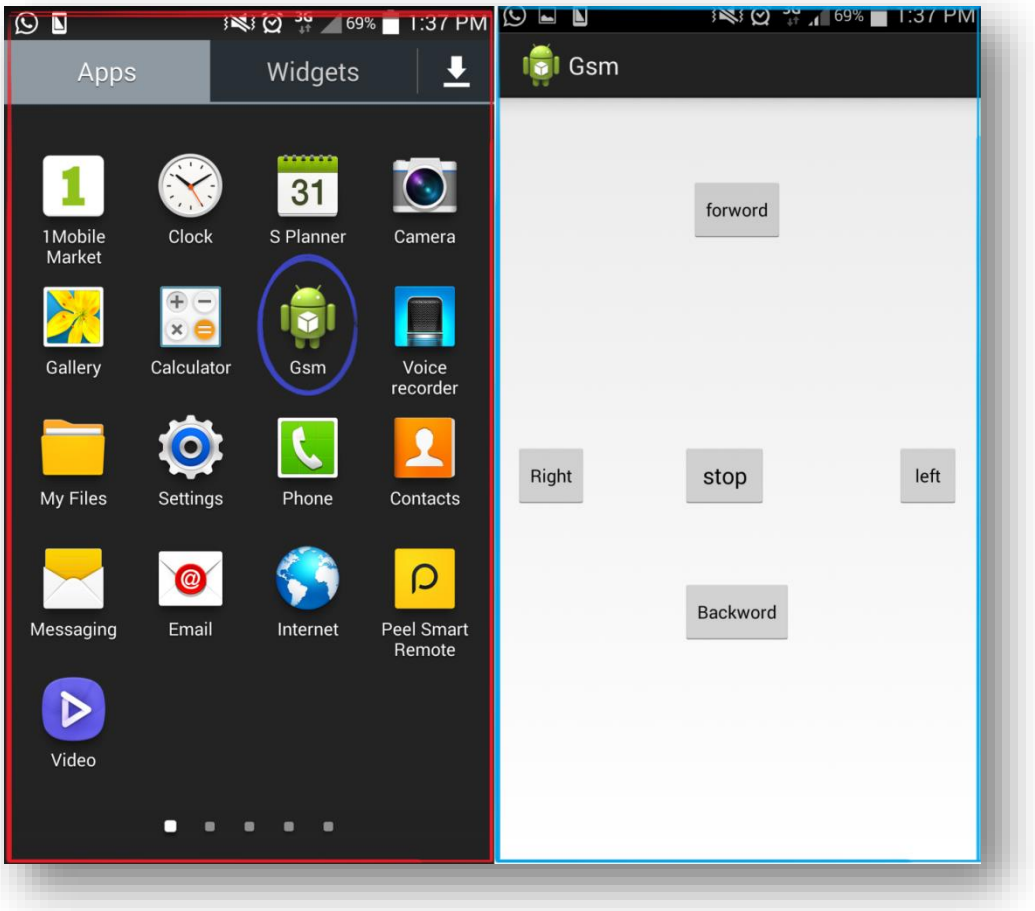


Figure 4-1: Android application

codefyp

```
LSMS.print("STOP has been activated");
LSMS.endSMS();

  }
  else if(strcmp(msg,"Right")==0 )
  {
    Serial.println("Right");
    digitalWrite(9, HIGH);
Serial.println("SIM ready for work!");
LSMS.beginSMS(buf);
LSMS.print("Led on has been activated");
LSMS.endSMS();

  }



  else
  {
    Serial.println("SIM ready for work!");
LSMS.beginSMS(buf);
LSMS.print("No Match eny Command");
LSMS.endSMS();
  }
```

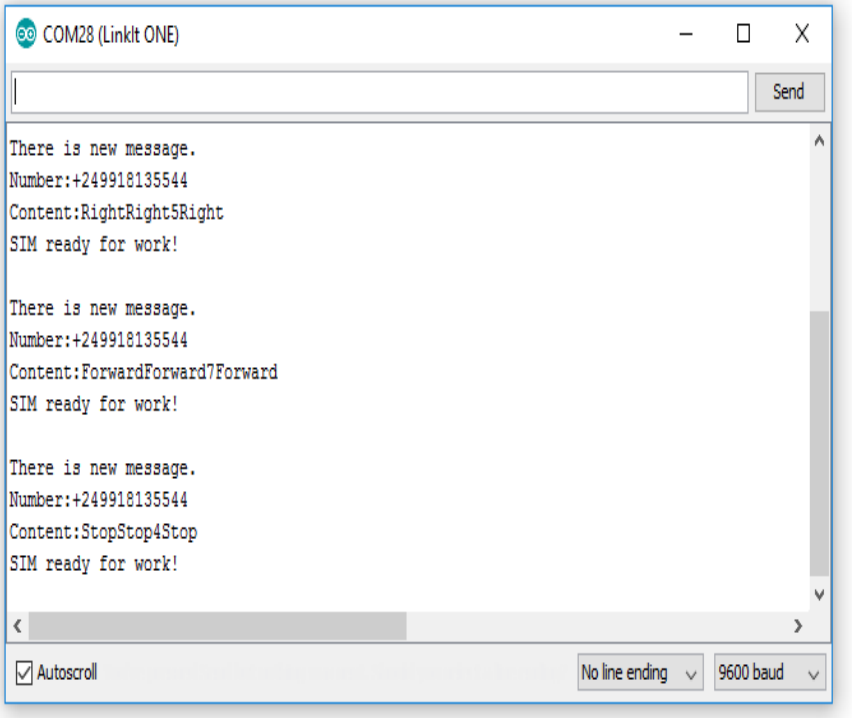


Figure 4-2: Arduino serial monitor

4.2.2 System simulation circuit

Proteus 7.9 Professional program was used for simulating components and Bascom AVR for wrote code.

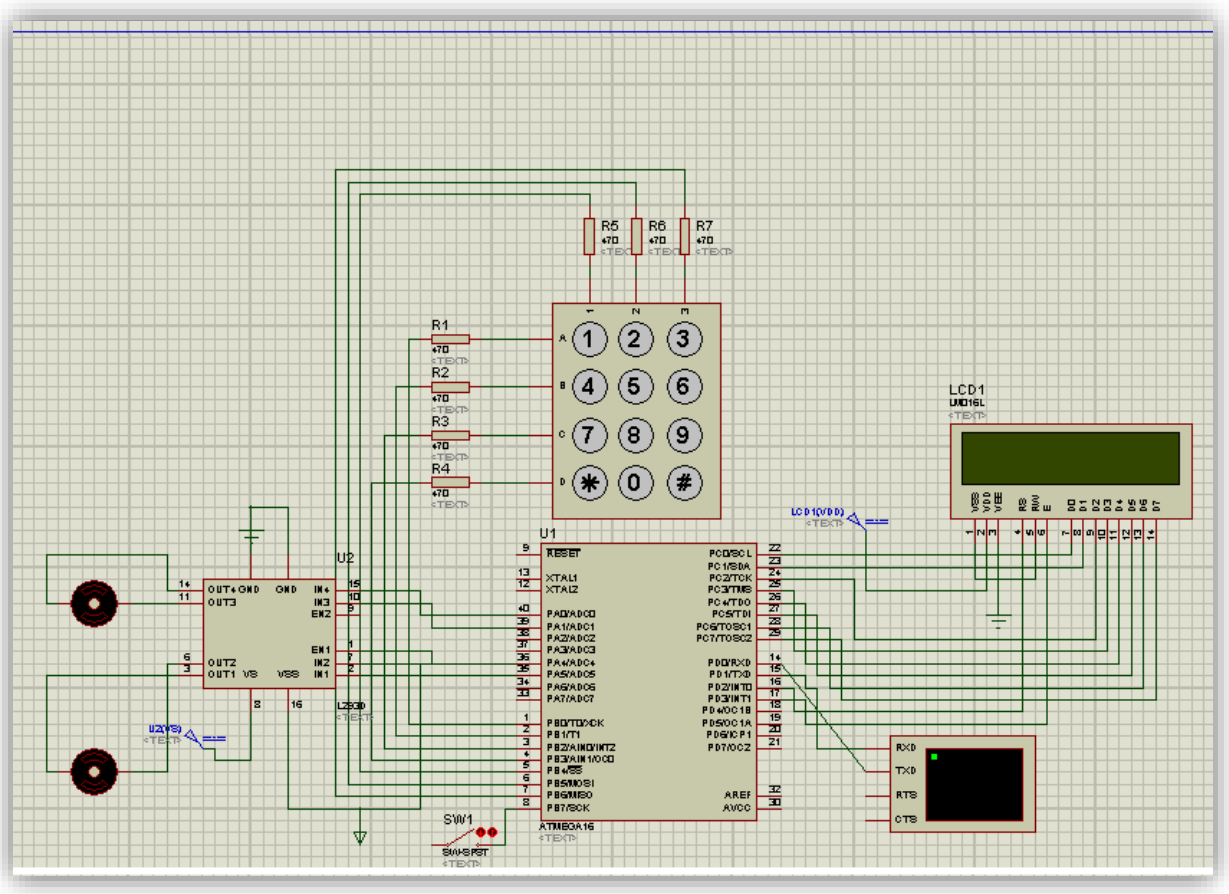


Figure 4-3: control system simulation

The figure above represents the control system using Proteus 7.9 , using keypad to send commands for the Motors drive circuit and LCD to display the message sent by the application .

Keypad buttons (2,8,4,6) represent the four buttons on android application forward ,backward , left ,right or stop .

Moving backward process:

Button 2 on keypad pressed the LCD display forward the microcontroller send signal to motor drive circuit to run motor 1 clockwise and stop motor 2 .

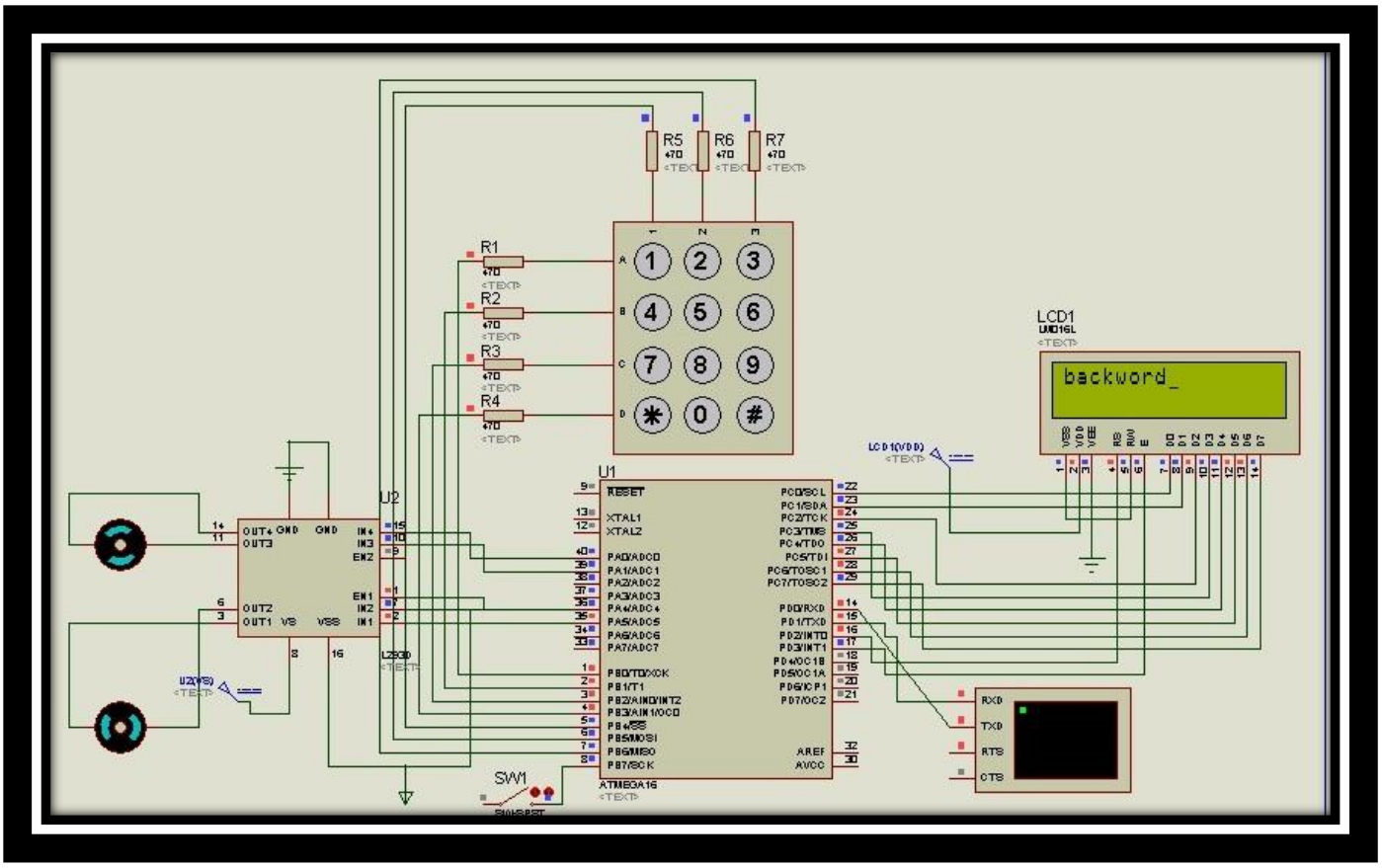


Figure 4-4: Moving backward process:

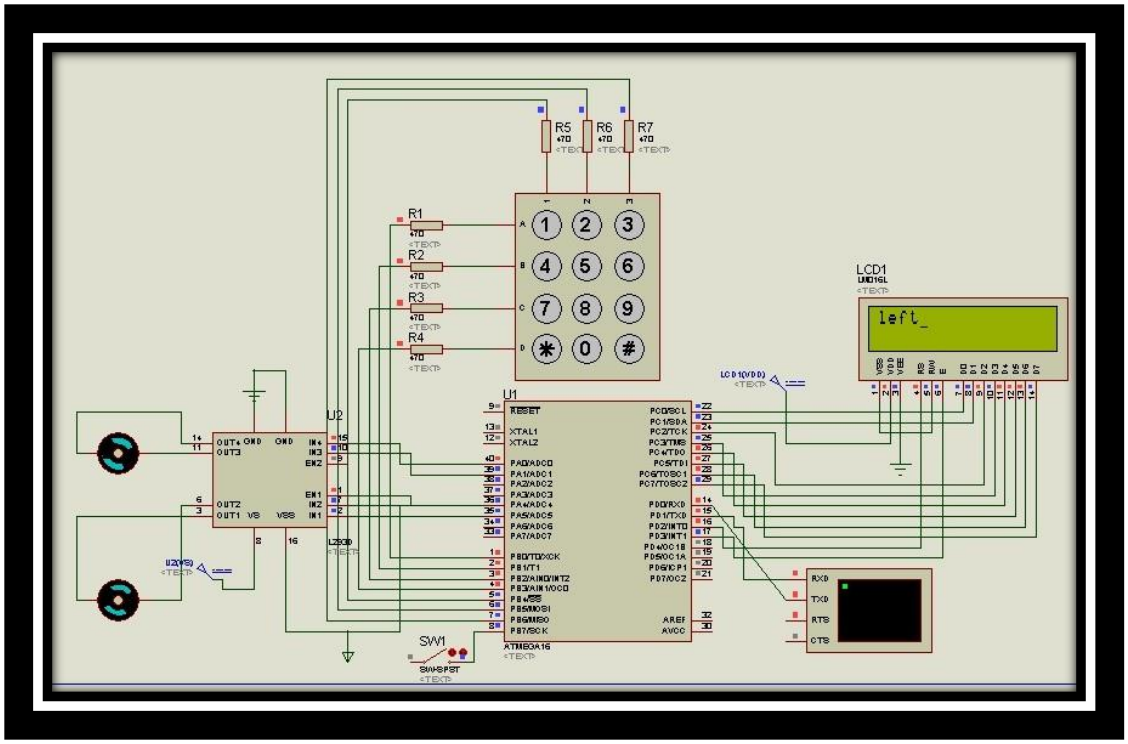


Figure 4-5: Moving left process:

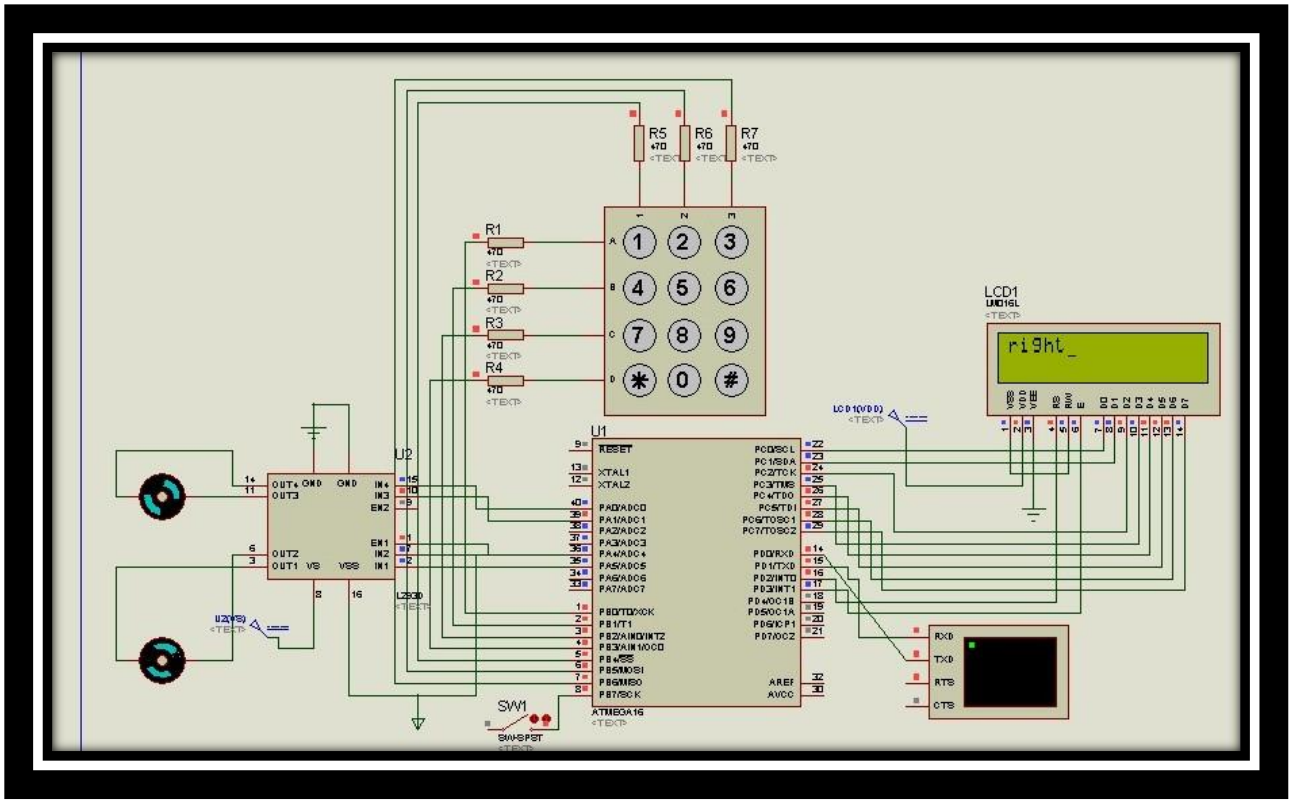


Figure 4-6: Moving right process:

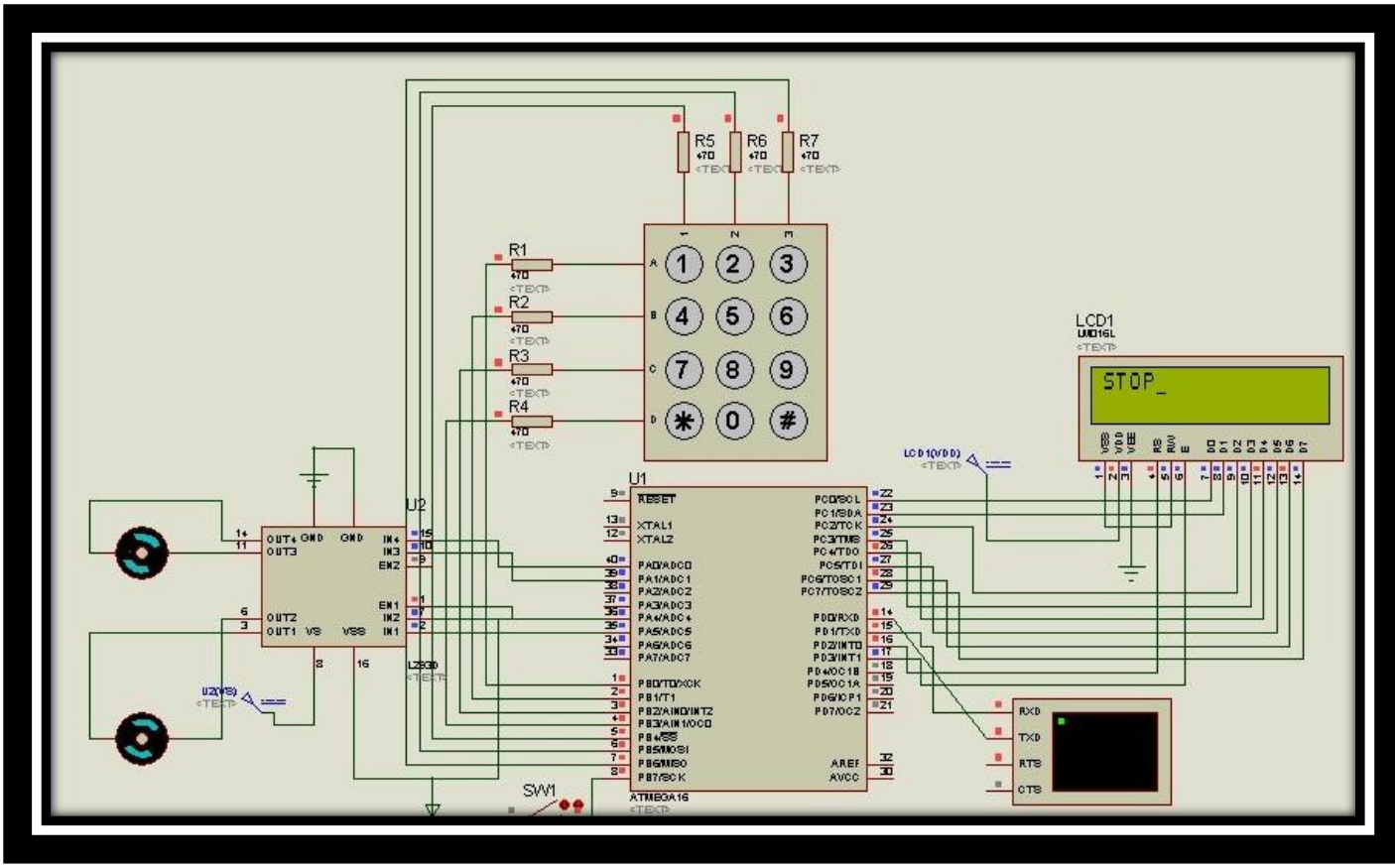


Figure 4-7: Stop Process:

4.3 Hardware

Demo implementation looks like simulation used linkit One controller includes Parts of GPS and GSM/GPRS systems, show below on figures

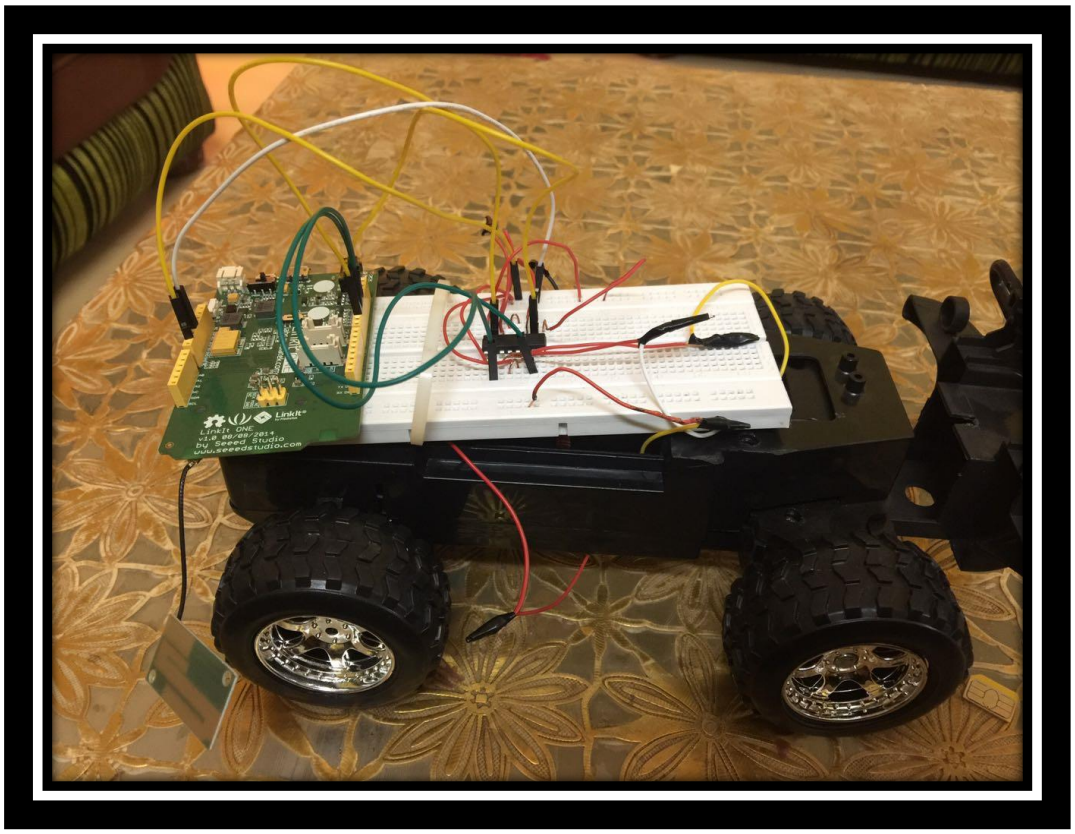


Figure 4-8: hardware implementation side view

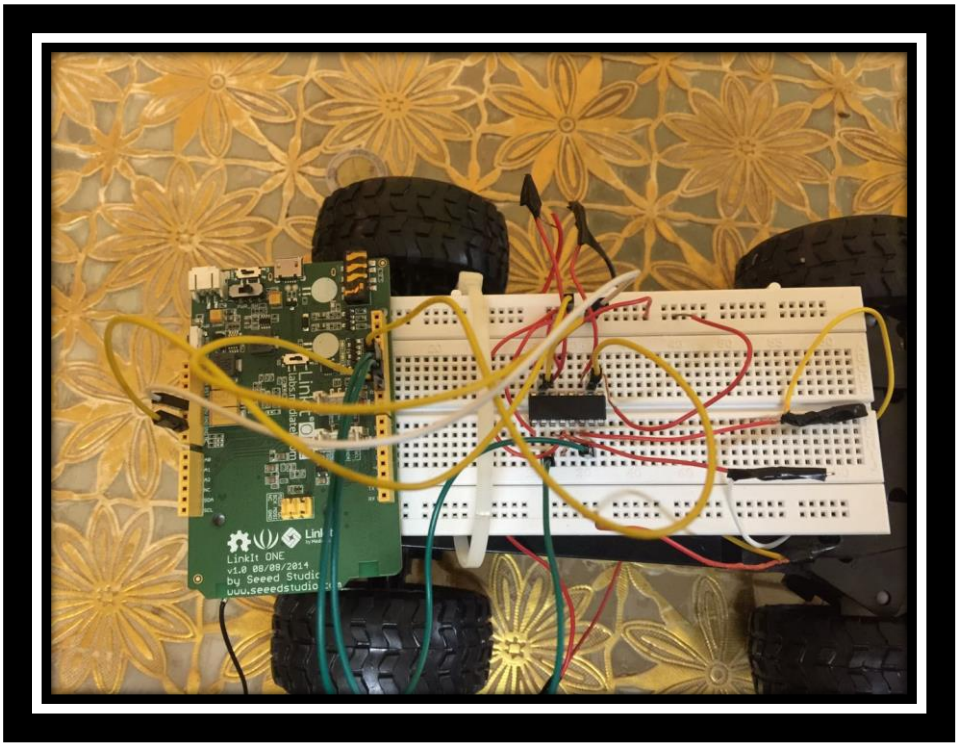


Figure 4-9: hardware implantations

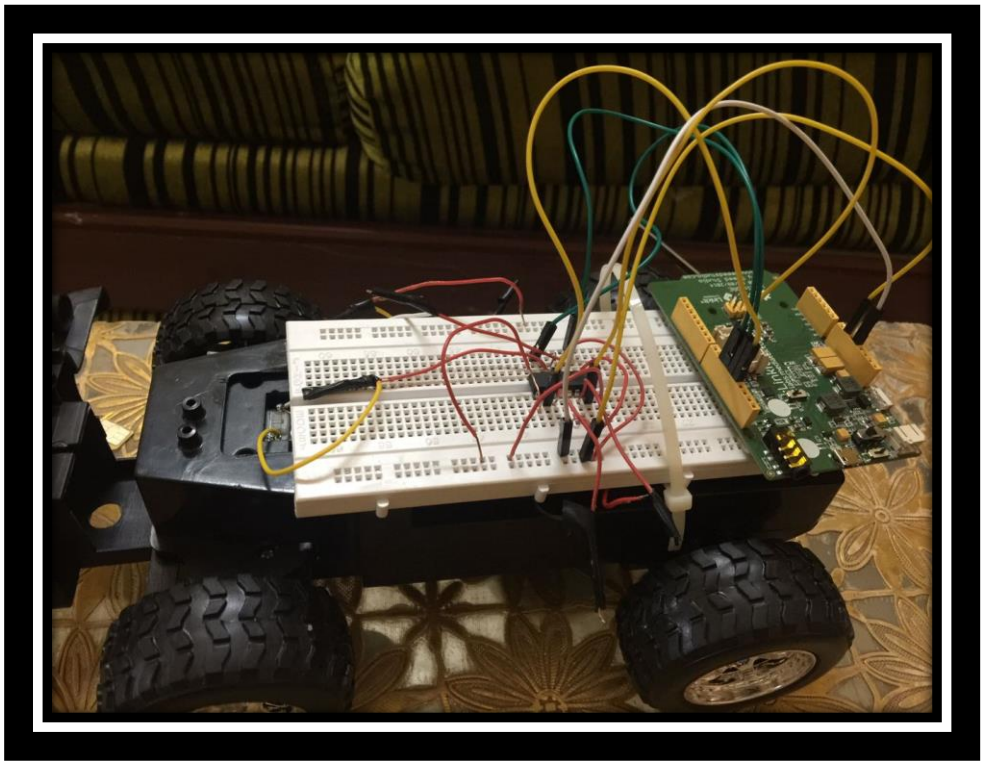


Figure 4-10: hardware implantation

Chapter five

Conclusion and Recommendation

Chapter five

Conclusion and Recommendations

5.1 Conclusion

5.2 Recommendation

Chapter five

Conclusion and Recommendations

5.1 Conclusion

Technology has advanced so much in the last decade or two that it has made life more efficient and comfortable. The comfort of being able to take control of devices from one particular location has become imperative as it saves a lot of time and effort. Therefore GSM controlled robot were designed in this thesis based on GSM, microcontroller and android application.

The core idea is about sending 1 SMS for 1 motion by the using android application which is secure and easy to use. When the message is received the microcontroller send signal to the DC motor and the motor moves the robot either right, left, forward, backward or stop.

The proposed project “Controlling robot using GSM and android application” has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Low cost, easy to use for rural areas, automated operation, secure, and Low Power consumption are the features of the robot. GSM as wireless data communication platform, the system is small, stable and reliable, with small delay, which can effectively overcome the past disadvantages of poor real-time and high operating costs existed in the system.

5.2 Recommendation

The project discusses the design of GSM based control robot. To increase the efficiency of this Robot, it's recommended to:

- Use advance GPS system to track robot location and modify vehicle unit by adding LCD and key pad.
- To design a well-proofed casing, it is important to make well protected against water, dust, heat, sunshine and other external weather factors.
- Adding different sensors for gathering data.
- Ultrasonic sensors can be used to automatically detect & avoid obstacles if the robot goes beyond line of sight. This avoids damage to the vehicle if we are maneuvering it from a distant place.
- If the current project is interfaced with a camera (e.g. a Webcam) robot can be driven beyond line-of-sight & range becomes practically unlimited as GSM networks have a very large range.

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