Lakshmi Narain College of Technology, Bhopal

Department of Electronics and Communication Engineering

CERTIFICATE

This is to certify that the work embodied in this Major Project Report entitled **" Simple Mobile Phone using Arduino and GSM "** has been satisfactorily completed by **Aashray Jain, Abhay Chouksey , Abhijeet Dubey and Ashutosh Shrivastav .** It is a bonafied peace of work, carried out under our supervision and guidance in the **Department of Electronics and Communication Engineering, Lakshmi Narain College of Technology, Bhopal**, for partial fulfillment of the **Bachelor of Technology** during the academic year 2019-20.

under supervision of

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Simple Mobile Phone using Arduino and GSM

A Minor Project Report

submitted in partial fulfilment of the requirement for the award of

Degree of Bachelor of Technology in Electronics and Communication

Submitted to

Rajiv Gandhi Proudyogiki Vishwavidhyalaya, Bhopal(M.P.)

Minor Project Report

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Session 2019-20

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Declaration

We, **Aashray Jain, Abhay Chouksey, Abhijeet Dubey and Ashutosh Shrivastav,** students of Bachelor of Technology, Department of Electronics and Communication Engineering, **Lakshmi Narain College of Technology, Bhopal**, hereby declare that the work presented in this Minor Project Report is outcome of our own work, is bonafide, correct to the best of our knowledge and this work has been carried out taking care of Engineering Ethics. The work presented does not infringe any patented work and has not been submitted to any University for the award of any degree or any professional diploma.

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Reasons can be given & they can be many but nothing can replace the efforts of numerous people behind the work, put in by the creator, giving us constant support all the way.

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Contents

List of Abbreviations

AC	Alternating Current
CDMA	Code Division Multiple Access
DC	Direct Current
ETSI	European Telecommunications Standards Institute
FDMA	Frequency Division Multiple Access
GSM	Global System for Mobiles
LCD	Liquid Crystal Display
Rx	Receiver
SMS	Short Message Service
TDMA	Time Division Multiple Access
Tx	Transmitter
USART	Universal Synchronous Asynchronous Receiver Transmitter

List of Figures

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Photograph of the Project

Simple Mobile Phone using Arduino

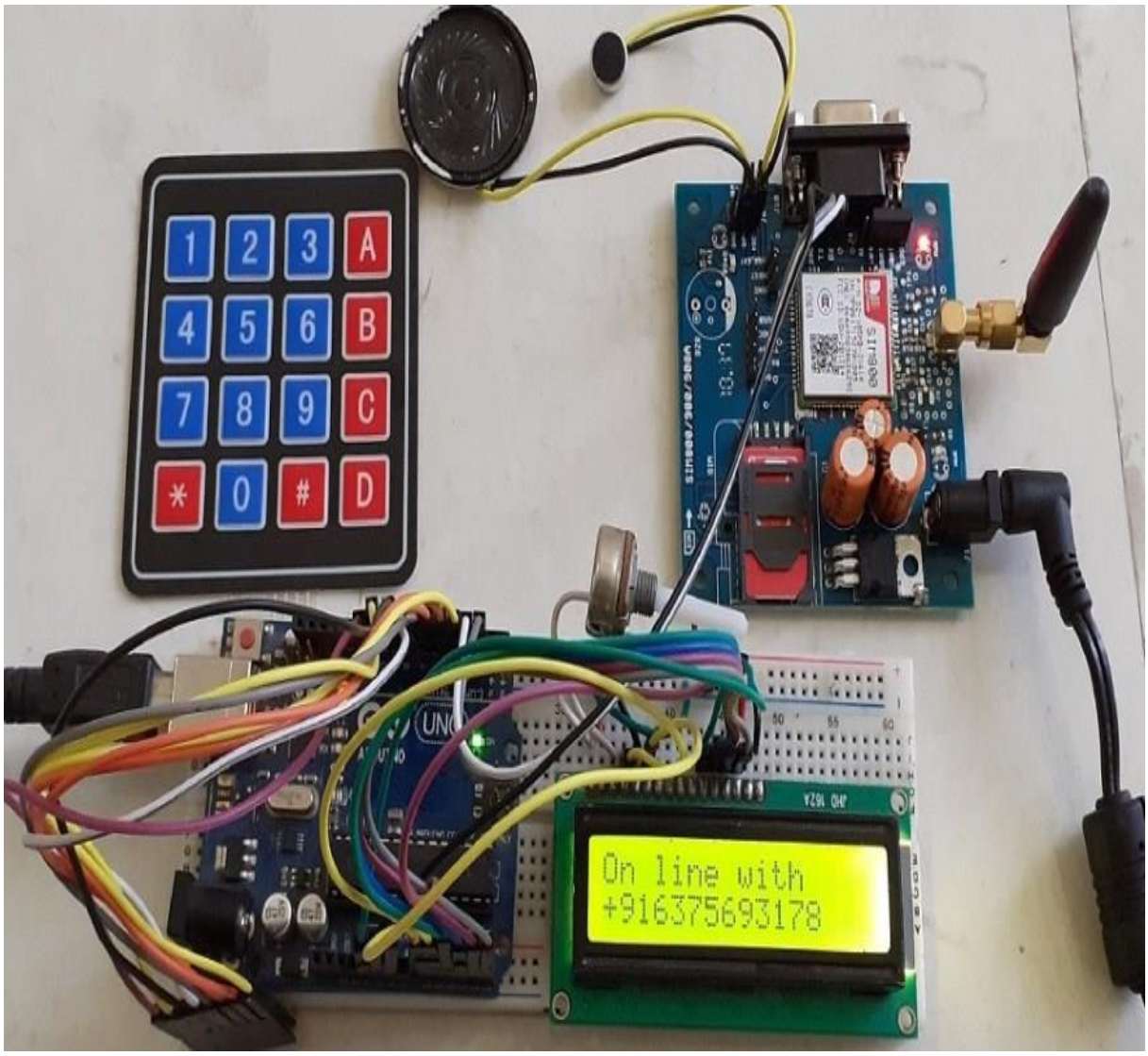

Fig. (i) Mobile Phone using Arduino and GSM Module

Abstract

Today, we are seeing an increasing need to stay connected. With expanding economic and technological scenario, the need of having a fast-track production has also increased.The industries explore and employ several techniques to stay ahead in the production line to fulfill the demand of their consumers. This requires an extremely good communication and co-ordination in the process pipeline. To facilitate this, a communication system should be deployed to enhance communication amongst the different sectors of the industrial workstation. The systems today offer monitoring and communication facilities of the work place or in general use a public address system to make general announcements which can be accessed from one fixed location. This project presents a technique to remotely make announcements using GSM. The proposed system aims to connect the owner or an authorized person from any part of the world to the workstation, thereby ensuring that distance is not an issue for communication.

GSM (Global System for Mobile communication) is a cellular technology used for transmitting mobile voice and data services. Two basic technologies in mobile phones, CDMA and GSM, represent a gap you can't cross. GSM (Global System for Mobile Communication) and CDMA (Code Division Multiple Access) are two dominanttechnologies for mobile communication. These two technologies differ in the way calls and data travel over the mobile phone networks take place. On comparing both the technologies GSM has some limitation when the call quality is concerned but still has more flexibility and an easy implementation relative to the CDMA technology.Out of all cell technologies in use today, GSM is the most widespread. However, it is important to know that although GSM is currently the industry standard in cell technology. According to Gsmworld.com, GSM has a harmonized spectrum, which means that even though different countries may operate on different frequency bands, users can transferseamlessly between networks and keep the same number. According to Gsmworld.com,GSM has a harmonized

spectrum, which means that even though different countries may operate on different frequency bands, users can transfer seamlessly between networks and keep the same number. As a result, GSM users essentially have coverage in over 218 countries.So in the changing technology where 5G has come into existenceOur aim is to provide a better call and message services using the arduino and GSM.

Module. Sometimes people find it difficult to use the GSM Module for its basic functions like calling, texting etc., specifically with the Microcontrollers. So here we are going to build a Simple Mobile Phone using Arduino, in which GSM Module is used to Make the Call, answer the Call, send SMS, and read SMS, and also this Arduino phone has Mic and Speaker to talk over this Phone. This project will also serve as a proper interfacing of GSM Module with Arduino, with all the Code needed to operate any Phone's basic functions.

Project Specifications

Table I - Project Specifications

S. No.	Parameter	Value
1.	Project type	Application Based
2.	Standard	IEEE 802.11
3.	Safety Standard	ICS 13.100
4.	Technology Used	Embedded System
5.	Operating Voltage	12V~2A AC
6.	Frequency	900/1800MHz
7.	Baud Rate	9600 – 115200

Chapter-1
Introduction

Chapter-1
Introduction

1.1 Introduction

This Arduino based Phone device is a microcontroller based System.The **Arduino Uno** is an open source microcontroller board based on the Microchip ATmega328P microcontroller. The Arduino Uno has a number of facilities for communicating with a computer , another Arduino board, or other microcontrollers.

Some people get confused between **Microcontroller and Arduino**. While former is just an on system 40 pin chip that comes with a built-in microprocessor and later is a board that comes with the microcontroller in the base of the board, bootloader and allows easy access to input-output pins and makes uploading or burning of the program very easy.

The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.

This is a Simple Homemade Phone using GSM Module and Arduino. This simple phone is capable of calling to another number as well as receiving an incoming call. Similarly, it can also be used to send an SMS as well as read a received SMS.

So we have interfaced GSM Module SIM900 with Arduino UNO Board. A 16×2 LCD is used for displaying the operations that are happening like displaying signal strength, carrier name, incoming or outgoing call, SMS sent received status and also time elapsed. The 4×4 Keypad is used to enter the number or type an SMS text using the alphanumeric keyboard. The mic is used to transmit the spoken sound and a speaker is used for ringing and listening incoming call/voice .

1.2 Block Diagram

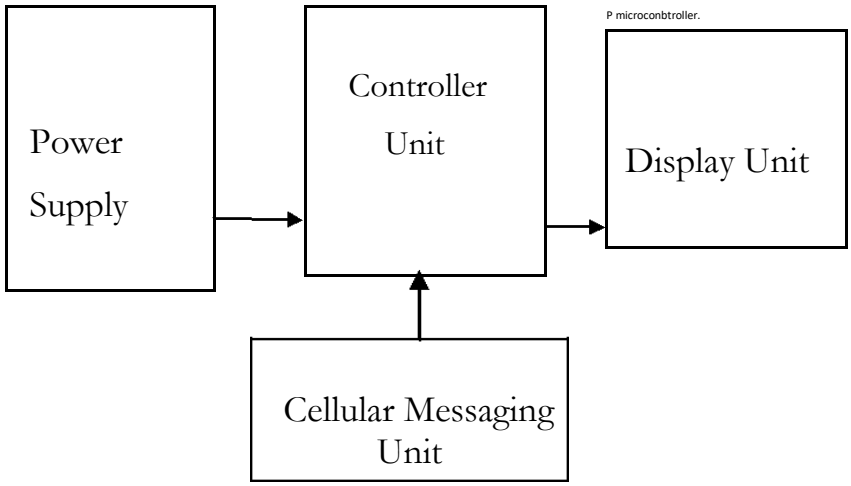

Fig. 1.1 Block Diagram

Fig. 1.2 Functional Block Diagram for Arduino Mobile Phone Project

1.2 Block Diagram Description

1.2.1 Controller Unit:

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can because as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button. Arduino Uno is based on AVR microcontroller called Atmega328.

This controller comes with 2KB SRAM, 32KB of flash memory, 1KB of EEPROM. Arduino Board comes with 14 digital pins and 6 analog pins. ON-chip ADC is used to sample these pins. A 16 MHz frequency crystal oscillator is equipped on the board.

1.2.2 Cellular Messaging and Calls Unit:

GSM Module is used to communicate with the network for calling and messaging purpose**.** So we have interfaced GSM Module SIM900 with Arduino UNO Board. I used the GSM SIM900A module to connect to the mobile network. It is an adorable all-in-one cellular module that lets you call, SMS. It works on frequencies 900/1800MHz and comes with the friendly RS232 which can be easilyinterfaced with any MCUs, the baud rate is adjustable from 9600 – 115200 through AT commands.

1.2.3 Display Unit:

For the better understanding of project, a 16×2 LCD is used as a display unit. A 4x4 Alphanumeric Keypad is used for taking all kind of inputs like: Enter mobile number, type messages, make a call, receive a call, send SMS, read SMS etc.16x2

LCD is used for showing messages, instructions and alerts. the LCD itself consists of an Interface IC. The MCU can either read or write to this interface IC.

Most of the times we will be just writing to the IC, since reading will make it more complex**.**LCD stand for liquid crystal display. LCD screen is an electronic display module .16x2 LCD is basic display that display 16 character per line and it has 2 such line. Each characters on LCD is displayed in 5x7 matrix.LCD has two register namely

1. Command register
2. Data register Fig 3:4 LCD

The Interface IC present in most of the LCD is **HD44780U.** The operations that are happening like displaying signal strength, carrier name, incoming or outgoing call, SMS sent received status and also time elapsed.

1.2.4 Power Supply:

In general, a 12VDC output is obtained from a 120VAC or 240VAC input using a combination of transformers, diodes and transistors. 12V power supplies can be of two types: 12V regulated power supplies, and 12V unregulated power supplies.12V regulated power supplies come in three styles: Switching regulated AC to DC, Linear regulated AC to DC, and Switching regulated DC to DC.Power supply is the circuit from which we get a desired dc voltage to run the other circuits. AC input voltage [VAC] 100-240 (50-60 Hz) DC output voltage [VDC] 12 Maximum output current [A] .This Adapter is general purpose adapter specially designed for GSM module.

1.2.5 Peripheral Devices:

1.2.5.1 Keypad:

This type of keypad use is a matrix keypad. This is a keypad that follows an encoding scheme that allows it to have much less output pins than there are

keys.A **4x4 Alphanumeric Keypad** is used for taking all kind of inputs like: Entermobile number, type messages, make a call, receive a call, send SMS, read SMS etc. The 4×4 Keypad is used to enter the number or type an SMS text using the alphanumeric keyboard. 4x4 **keypad** consists of **4** rows and **4** columns. Switches are placed between the rows and columns. A key press establishes a connection between the corresponding row and column, between which the switch is placed.

1.2.5.2 Mic:

The electret microphone is a type of condenser microphone. Condensers are essentially capacitors and condenser microphones are formed by a thin diaphragm mounted in front of a plate. Recall that a capacitor is formed by two conductors with an insulator, or dielectric, between them. Both the diaphragm and the plate are conductors. The smaller the distance between these two conductors, the higher the capacitance, given that the surface area of the conductors are unchanged.

When sound reaches the condenser, the diaphragm vibrates thereby changing the distance between the conductors and effectively changes the capacitance between the diaphragm and the plate. This capacitance is converted to voltage with the application of a sufficient charge on the condenser. The voltage is boosted through a built-in transistor inside the microphone as shown in the picture above.Now condenser microphones needs high voltages to maintain that charge. An electret microphone doesn't need high voltages because the diaphragm is made out of a special material that stores a high enough charge. This material, which is the electret, is like a permanent magnet but stores a permanent charge.The voltage changes that are produced by sound should be enough to be detected by an Arduino.

1.2.5.3 Speaker:

A 4 ohm **Speaker for** Voice **Call** and Ring sound is connected to the GSM Module.

Chapter-2

Theory

Chapter-2
Theory

The mobile communication technology has become extremely important in our modern day lifestyle. The popularity of the technology is owing to the fact that it ensures communication is always ubiquitous. People's need to stay connected has ever increased personally and professionally. A simple communication in form of technology developed in distant corner of world can serve lot many efforts of the industry or communication in form of knowledge about the trends and demands of the consumers reaching in time can earn profits to the industry. The success of anything lies on how effectively we communicate.

Talking of average industries the scenario in work station currently involves monitoring and communicating facilities. The communication is generally using a public address system accessible from the control room only. This system inherits a delay in case of emergency or even when an urgent communication is to be made.

We have seen many cases of public addressing systems that require the physical presence of the user to announce. This might not be possible in many cases like emergencies and rudimentary actions like repetitively speaking over the microphone, most of which either requires the presence of the human of recording of human voice. So due to the need to stay connected we need more efficient systems that can announce over a large range and do not require physical presence all the time. The use of GSM can bring about that change.

The GSM based mobile system is to design unit that can communicate wirelessly over a large dimension. The GSM modem is installed with a CCTV and a speaker at the required place. When the user wants to address something, he or she would call on the SIM fitted on the GSM. The SIM receives a call from the mobile phone and the call data is extracted by Microcontroller from the GSM modem and the call is connected. Now the user can communicated. This proposed system can be employed in many applications like educational institutions, organizations, traffic management, railways announcements, advertisements, large industries, etc. Being a user friendly, long range and fast product means conveying information are major strengths of this application. Another feature of this system is that only a registered number can call this unit. Unauthorized numbers are not answered by the system.

Sometimes people find it difficult to use the **GSM Module** for its basic functions like calling, texting etc., specifically with the Microcontrollers. So here we are going to build a **Simple Mobile Phone using Arduino**, in which GSM Module is used to **Make the Call, answer the Call, send SMS, and read SMS,** and also this Arduino phone has Mic and Speaker to **talk over this Phone.** This project will also serve as a proper **interfacing of GSM Module with Arduino**, with all the Code needed to operate any Phone's basic functions.

Chapter-3
Circuit Details

Chapter-3

Circuit Details

3.1 Circuit Layout

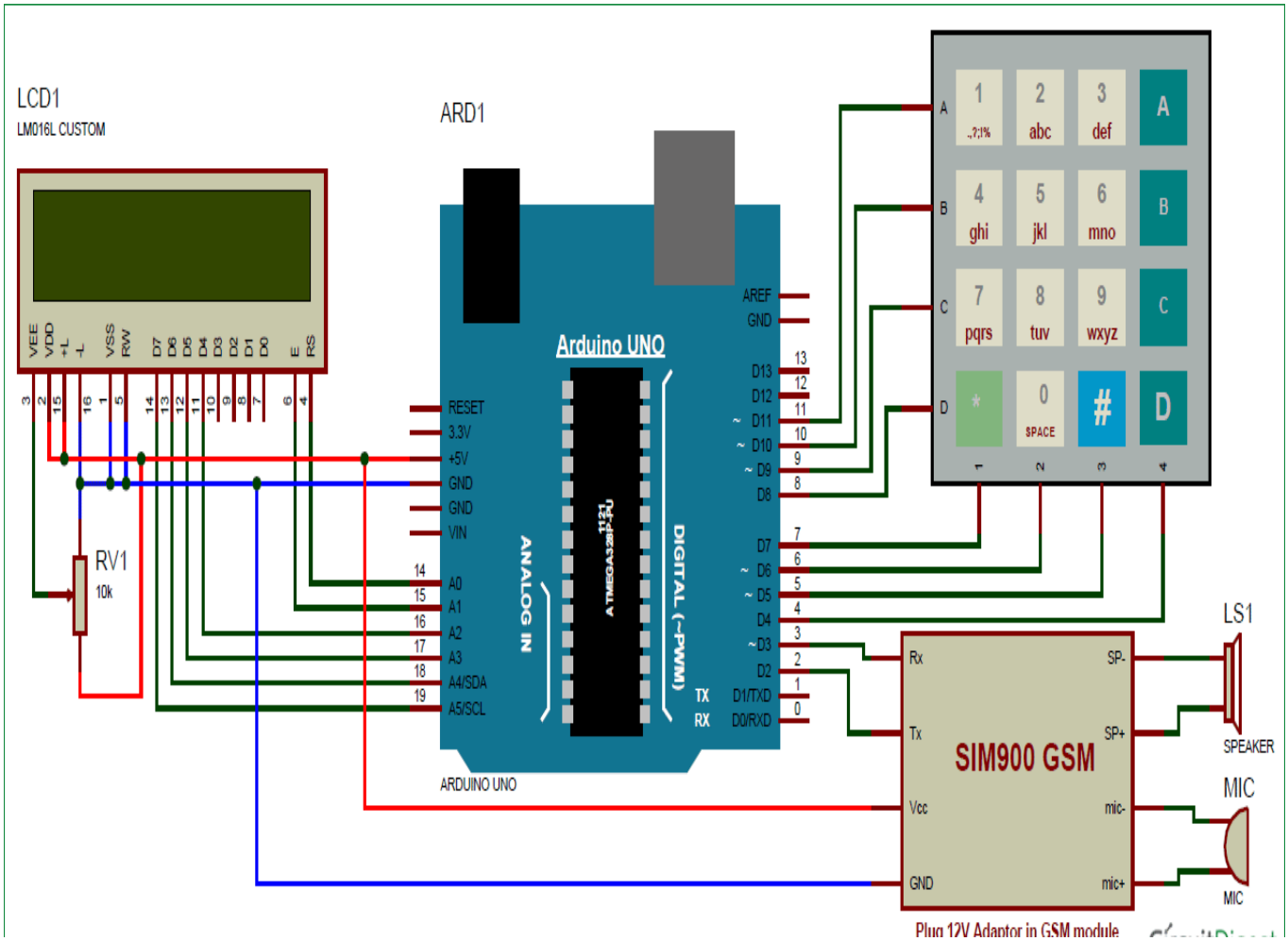

Fig. 3.1 Circuit Layout of Mobile Phone using GSM and Arduino

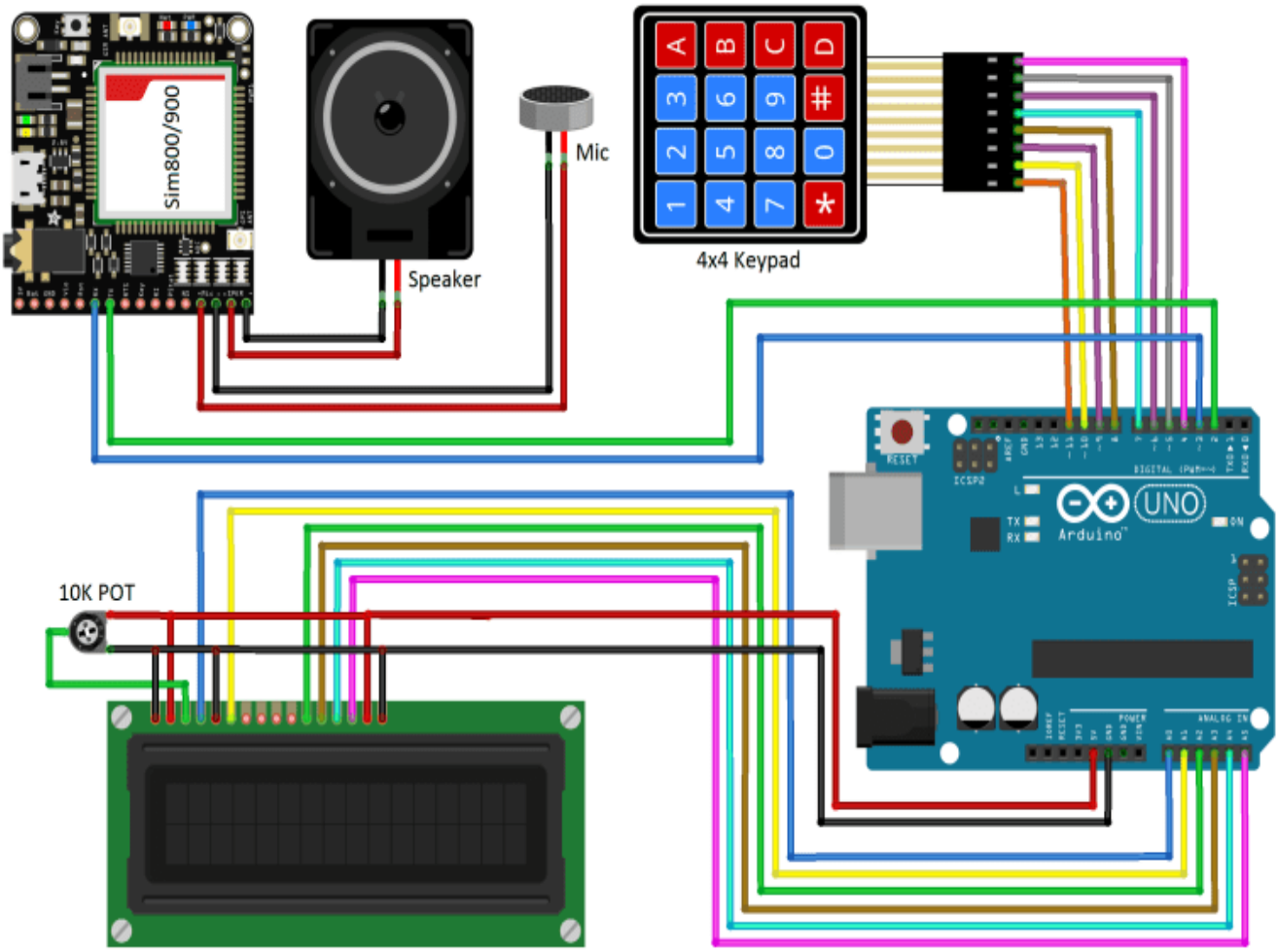

Fig. 3.1 Circuit Layout of Mobile Phone using GSM and Arduino

3.2 Circuit Description

This Simple Mobile Phone is divided into ten small circuit parts:

1) Power Supply
2) GSM Module SIM900
3) 16x2 LCD
4) 4x4 Keypad
5) Breadboard
6) Connecting jumper wire
7) Arduino Uno
8) Speaker
9) MIC
10) SIM Card

1) Power Supply – In this part 12 volt DC adapter is to ON the device.The adapter pin is directly connected to the PWRKEY Pin of the GSM Module.Voltage input for PWRKEY. PWRKEY should be pulled low to power on or power off the system.

2) GSM Module SIM900– The Arduino GSM shield allows an Arduino board to connect to the internet, send and receive SMS, and make voice calls using the GSM library.

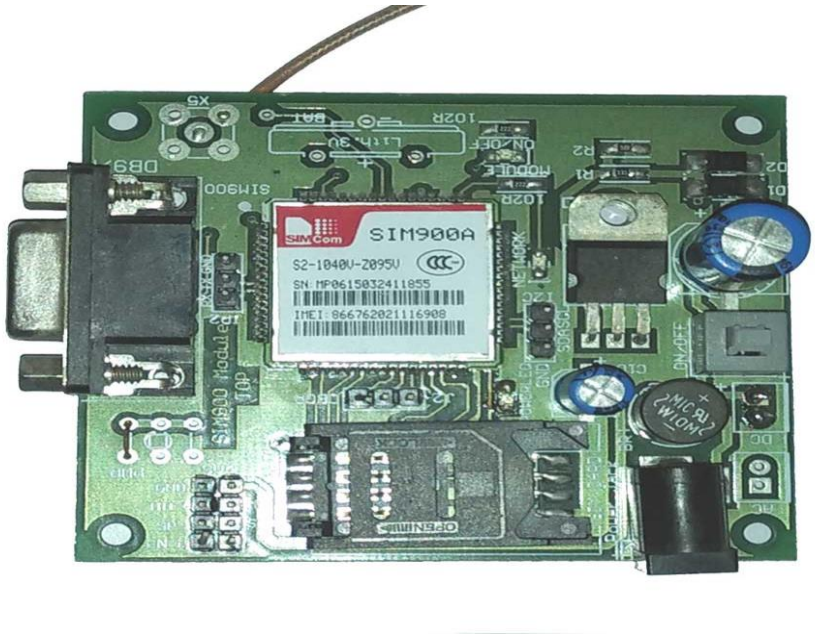

Fig. 3.2 SIM 900A GSM Module

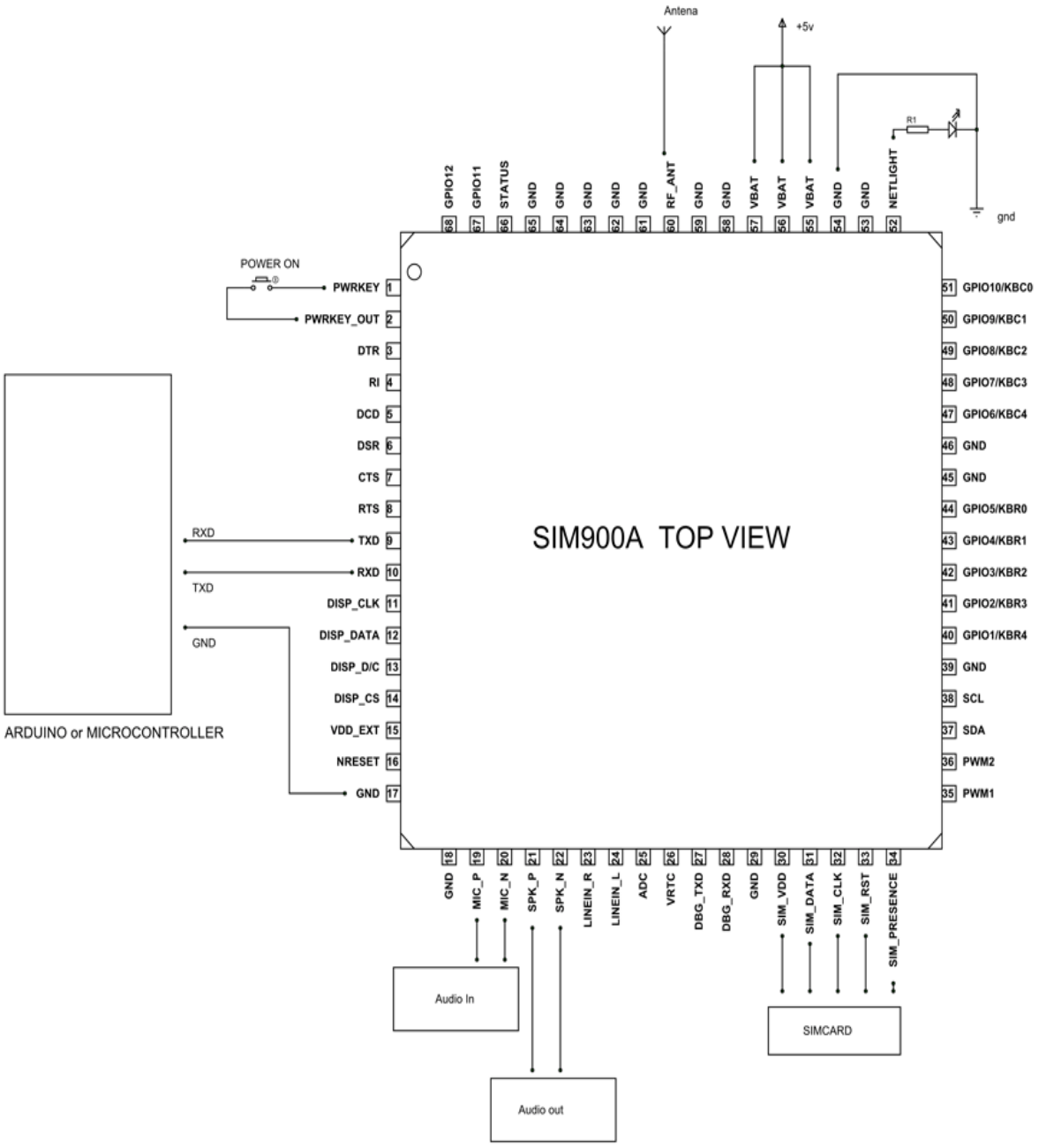

Fig. 3.3 Pin Diagram of GSM Module

The communication with this module is done through UART or RS232 Interface. The data is sent to the module or received from the module though UART interface.The module is typically connected to +12.0V standard power supply.

It can work on +12V regulated power and any higher voltage may damage the module. And the power source should be able to deliver a peak current of 2A. The UART interface is established as shown in figure. All you need to do is connect RXD of module to TXD of Arduino and TXD is connected to RXD of ARDUINO. GSM Module's Rx and Tx pins are directly connected with Arduino's pin D3 and D2 respectively (Ground of Arduino and GSM must be connected with each other).The ground of controller and module must be connected for voltage reference. Here AUDIO IN (MCP and MCN pin) is connected to MIC and AUDIO OUT (SPP and SPN pin) is connected to a speaker or headset. And at last we need to connect a working GSM SIM card to the module. On powering the module the NETLIGHT LED will blink periodically to state successful connection.+VCC is connected to the common +Vcc of arduino in breadboard.

3) 16x2 LCD Module –

Fig. 3.4 16x2 LCD Display Module with HD44780 Controller

16x2 LCD pins RS, EN, D4, D5, D6 and D7 are connected with pin number 14, 15, 16, 17, 18 and 19 of Arduino respectively. Connect the 16×2 LCD to Arduino analog pins A0, A1, A2, A3, A4, A5.A 10 k variable resistor is connected to VEE , VDD and –L pinof LCD display.

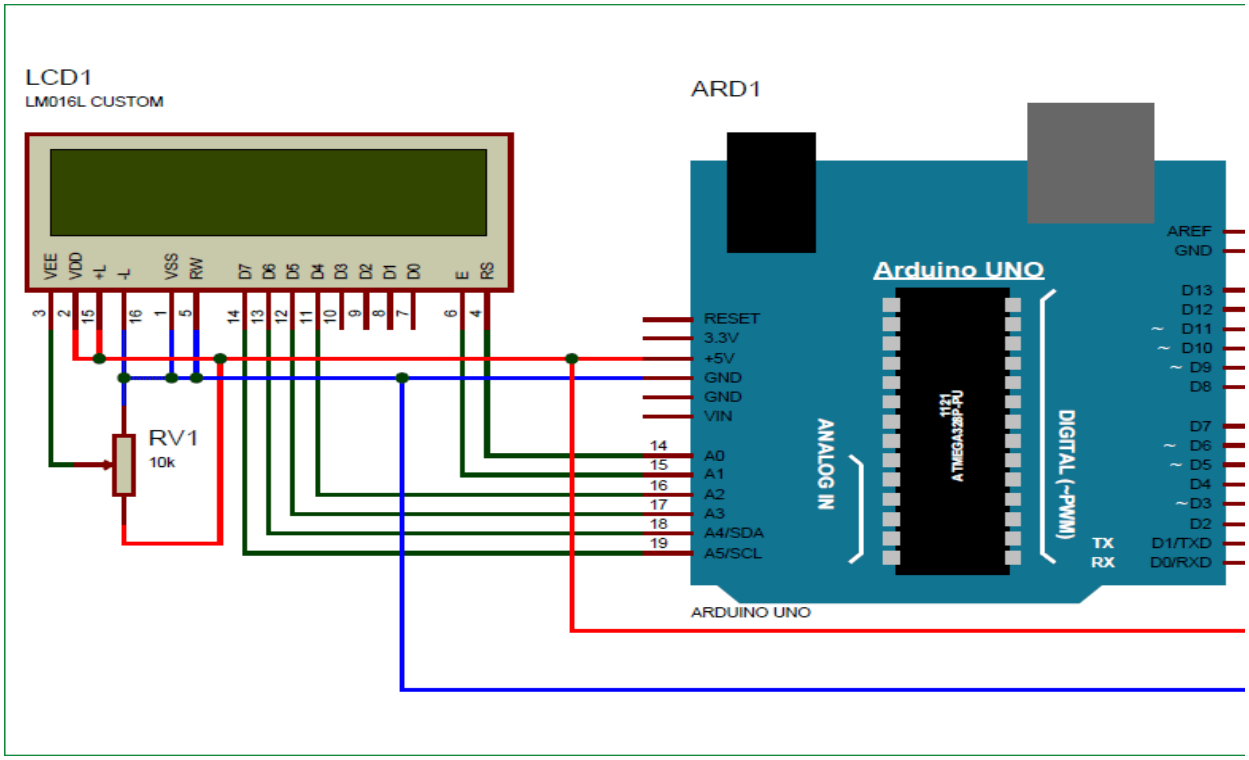

Fig. 3.5 Interfacing 16x2 LCD Display with Arduino

4) 4x4 Keypad– 4x4 keypad Row pins R1, R2, R3, R4 are directly linked to pin number 11,10, 9, 8 of Arduino and Colum pins of keypad C1, C2, C3 are linked with pin number 7, 6, 5, 4 of Arduino.

Fig. 3.6 4 x 4 Matrix Keypad

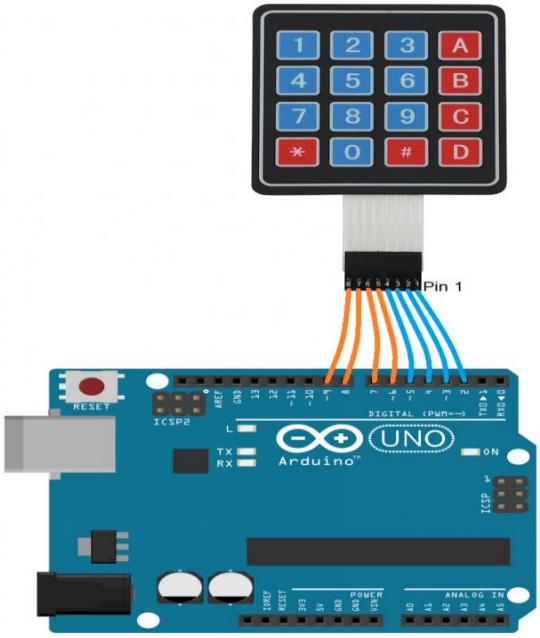

Fig. 3.7 4 x 4 Matrix Keypad with Arduino Digital Pin

5) Arduino Uno– The 14 digital input/output pins can be used as input or output pins by using pinMode(), digitalRead() and digitalWrite() functions in arduino programming. Each pin operate at 5V and can provide or receive a maximum of 40mA current, and an internal pull-up resistor of 20-50 KOhms which are disconnected by default. Out of these 14 pins, some pins have specific functions as listed below:

- **Serial Pins 0 (Rx) and 1 (Tx):** Rx and Tx pins are used to receive and transmit TTL serial data. They are connected with the corresponding ATmega328P USB to TTL serial chip.

Fig. 3.8 Arduino Uno Diagram

- **External Interrupt Pins 2 and 3:** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM Pins 3, 5, 6, 9 and 11:** These pins provide an 8-bit PWM output by using analogWrite() function.

- **SPI Pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK):** These pins are used for SPI communication.

- **In-built LED Pin 13:** This pin is connected with an built-in LED, when pin 13 HIGH – LED is on and when pin 13 is LOW, its off.

Along with 14 Digital pins, there are 6 analog input pins, each of which provide 10 bits of resolution, i.e. 1024 different values. They measure from 0 to 5 volts but this limit can be increased by using AREF pin with analog Reference() function.

- Analog pin 4 (SDA) and pin 5 (SCA) also used for TWI communication using Wire library.

- Arduino Uno has a couple of other pins as explained below:

- **AREF:** Used to provide reference voltage for analog inputs with analogReference() function.

- **Reset Pin:** Making this pin LOW, resets the microcontroller.

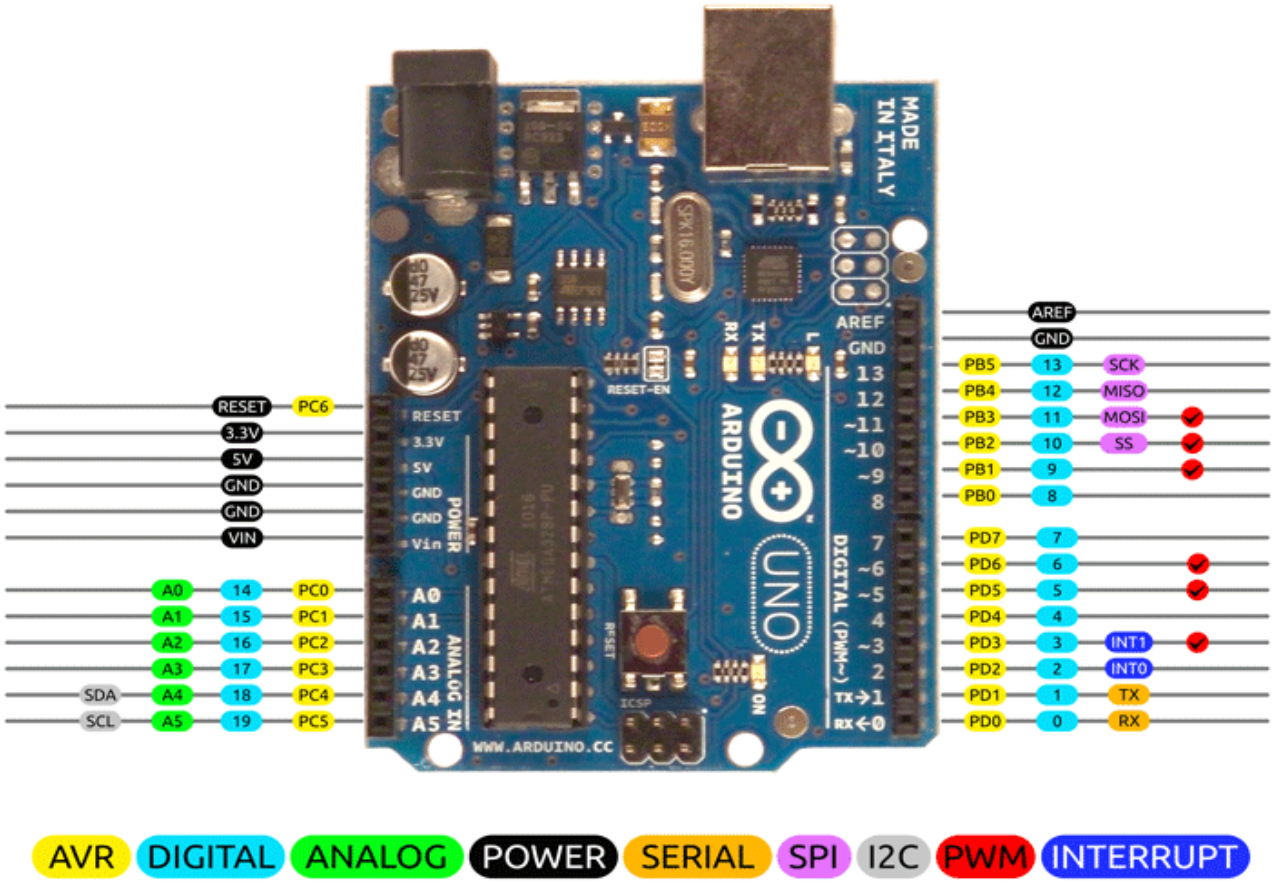

Fig. 3.9 Arduino Uno PIN Diagram

6) SIM Card – Slide the SIM all the way into the bracket and put the SIM in the GSM Module.

Fig. 3.10 GSM SIM Slider

3.3 Bill of Materials

Table 3.1 Bill of Materials

S.NO	NAME OF THE COMPONENT	PRICE PER COMPONENT	QUANTITY	TOTAL PRICE
1.	Arduino Uno	450	1	450.00
2.	SIM 900A GSM Module	1200	1	1200.00
3.	16x2LCD	130	1	130.00
4.	4x4 Matrix Keypad	150	1	150.00
5.	10k Potentiometer	05	1	05.00
6.	Connecting Wires	100	1	100.00
7.	Breadboard	70	1	70.00
8.	12V/2A Adapter	180	1	180.00
9.	Electret Mic	25	1	25.00
10.	Speaker(4 ohm)	15	1	15.00
Total				**2325.00**

Chapter-4
Working

Chapter-4

Working

Arduino uno with a GSM shield is used to perform four cellular operations. These are

1.Make calls

2.Receive calls

3.Send SMS

4. Recieve SMS

What are AT commands?

AT commands are commands which are used to control the modems where AT stands for Attention. These commands were derived from Hayes commands which were used by the Hayes smart modems. Every wireless, as well as the dial up modems, require an AT command to interact with a computer machine. These AT commands along with other extended commands also require Hayes command set as a subset.

Usage

The AT commands can be used with GSM module and GPRS MODEMs or phone to access these services and information:

- SMS
- MMS
- Fax
- Voice link and other data over mobile network

- Information and configuration concerning the mobile device.

- **Types of AT Command**

There are 4 basic types of **AT commands**:

1. **Test:** The test command is utilised to check the compatibility of a command by a modem.

SYNTAX: AT=?

2. Read: Read command is used for extracting the mobile or modem settings required for operations.

SYNTAX: AT?

3. Set: This commands is used to make changes into mobile phone or modem settings required for the operation.

SYNTAX: AT=value1, value2, …, valueN

4. Execution: As the name suggests, this command is used to execute the said operation.

SYNTAX: AT=parameter1, parameter2, …, parameterN

Most Commonly Used AT Commands

The below 7 are the most commonly used AT commands:

1. **AT:** Used to check the interaction between the computer and the module. This command is usually replied with an OK if the port and the module can connect correctly, else wise it comes back with a result code ERROR.

2. +CMGF: Used to setup the SMS mode. By adding 1 or 0 with the command text or PDU mode can be selected. Here the text mode is easy to operate although it allows a few limited features of SMS. Where as the PDU mode allows a more detailed access to the SMS service, although to use this you require some basic knowledge of TDPU.

SYNTAX: AT+CMGF=<mode>

3. **+CMGS:** Used to send SMS to a particular phone number

SYNTAX: AT+CMGS= serial number of message to be send.

4. ATD: Used to make call to a particular number

SYNTAX: ATD;(Enter)

5. **ATA:** Used to answer the incoming calls. The calls are denoted by a message 'RING' which duplicated for every ring of the call. After the call ends a message saying 'NO CARRIER' is displayed.

SYNTAX: ATA(Enter)

6. **+CMGW:** Used to store a message in the SIM. After the execution of the command, the '>' sign appears in the next line where the message can be entered.

SYNTAX: AT+CMGW=" Phone number"> Message to be stored Ctrl+z

7. **ATH:**this commaned is utilized to disconnect a remote user with the GSM module.

SYNTAX: ATH (Enter)

Explaining Four Features of Arduino Mobile Phone:

1. **Make a Call:**

To make a call by using our Arduino based Phone, we have to press 'C' and then need to enter the Mobile Number on which we want to make a call. Number will be entered by using alphanumerickeypad. After entering the number we again need to press 'C'. Now Arduino will process for connecting the call to the entered number by using AT command:

```
ATDxxxxxxxxxx; <Enter>     where xxxxxxxxx is entered Mobile Number.
```

2. **Receive a Call:**

Receiving a call is very easy. When someone is calling to your system SIM number, which is there in GSM Module, then your system will show 'Incoming…' message over the LCD with incoming number of caller. Now we just need to Press 'A' to attend this call. When we press 'A', Arduino will send given command to GSM Module:

```
ATA <enter>
```

3. Send SMS:

When we want to send a SMS using our Arduino based Mobile Phone, then we need to Press 'B'. Now System will ask for Recipient Number, means 'to whom' we want to send SMS. After entering the number we need to press 'D' and now LCD asks for message. Now we need to type the message, like we enter in normal mobile, by using keypad and then after entering the message we need to press 'D' to send SMS. To Send SMS Arduino sends given command:

```
AT+CMGF=1 <enter>

AT+CMGS="xxxxxxxxxx" <enter>     where: xxxxxxxxxx is entered mobile number
```

And send 26 to GSM to send SMS.

4. **Receive and Read SMS:**

This feature is also simple. In this, GSM will receive SMS and stores it in SIM card. And Arduino continuously monitors the received SMS indication over UART. We just need to Press 'D', to read the SMS, when we see the New Message symbol (like a envelope). Below is the **SMS Received indication displayed on the Serial port** is:

```
+CMTI: "SM" <SMS stored location>

+CMTI: "SM",6  Where 6 is message location where it stored in SIM card.
```

When Arduino gets this 'SMS received' indication then it extracts SMS storing location and sends **command to GSM to read the received SMS**. And show a 'New Message Symbol' over the LCD.

```
AT+CMGR=<SMS stored location><enter>

AT+CMGR=6
```

Now GSM sends stored message to Arduino and then Arduino extract main SMS and display it over the LCD and then after reading this SMS Arduino Clear the 'New SMS symbol' from the LCD

We interface Arduino with GSM shield using AT commands. So, take an overview of some commonly used AT commands:

1. **AT**: Test weather GSM shield respond
2. **AT+CIMI**: Request International Mobile Subscriber Identity
3. **ATD+91XXXXXXXXXX**: Dial the specified number (replace x with the number)
4. **AT+CMG=1**: Switch on the messaging mode of gsm
5. **AT+CNMI=2,2,0,0, 0**: Turn on the message indicator
6. **ATH**: Halt call
7. **ATA**: Pick up an incoming call
8. **AT+COPS**: Get the service provider name
9. **AT+CSQ**: Get the signal strength

The code uses keypad library *#include <Keypad.h>* for interfacing simple keypad for entering numbers.

And for entering alphabets with the same keypad, we have created function *void alfakey()*. Means we have made every key multi functioning and we can enter any character or integer by using only 10 keys.Like if we press key 2 (abc2), it will show 'a' and if we presses it again then it will replace 'a' to 'b' and if again we press three times then it will show 'c' at same place in LCD. If we wait for some time after pressing key, cursor will automatic move to next position in LCD. Now we can enter next char or number. The same procedure is applied for other keys.

```
#include <Keypad.h>

const byte ROWS = 4; //four rows

const byte COLS = 4; //four columns

char hexaKeys[ROWS][COLS] =

{

  {'1','2','3','A'},

  {'4','5','6','B'},

  {'7','8','9','C'},

  {'*','0','#','D'}

};

byte rowPins[ROWS] = {11, 10, 9, 8}; //connect to the row pinouts of the keypad

byte colPins[COLS] = {7, 6, 5, 4}; //connect to the column pinouts of the keypad



//initialize an instance of class NewKeypad

Keypad customKeypad = Keypad( makeKeymap(hexaKeys), rowPins, colPins, ROWS, COLS);
```

```
void alfakey()
{
 int x=0,y=0;
 int num=0;
  while(1)
  {
    lcd.cursor();
    char key=customKeypad.getKey();
    if(key)
    {
      if(key=='1')
       {
         num=0;
         lcd.setCursor(x,y);
         .... .....
        ..... ....
```

Apart from operating keypad, we have created many other functions like *void call()* for calling feature of Phone, *void sms()* for messaging feature, void *lcd_status()* for display LCD status *void gsm_init()* for initializing the GSM Module etc.

Chapter-5

Source Code

Chapter-5

Source Code

****

Chip type : ATmega8L

Program type : Application

AVR Core Clock frequency: 8.000000

MHz

Memory model : Small

External RAM

size : 0

Data Stack size : 256

****

Code

```
#include <SoftwareSerial.h>
SoftwareSerial Serial1(2, 3); // RX, TX
#include<LiquidCrystal.h>
LiquidCrystal lcd(14,15,16,17,18,19);
byte back[8] =


{
  0b00000,
```

```
 0b00000,
  0b11111,
  0b10101,
  0b11011,
  0b11111,
  0b00000,
  0b00000
};
String number="";
String msg="";
String instr="";
String str_sms="";
String str1="";
int ring=0;
int i=0,temp=0;
int sms_flag=0;
char sms_num[3];
int rec_read=0;
int temp1=0;

#include <Keypad.h>
const byte ROWS = 4; //four rows
const byte COLS = 4; //four columns
char hexaKeys[ROWS][COLS] =

{
  {'1','2','3','A'},
```

```
{'4','5','6','B'},
  {'7','8','9','C'},
  {'*','0','#','D'}
};
byte rowPins[ROWS] = {11, 10, 9, 8}; //connect to the row pinouts of the keypad
byte colPins[COLS] = {7, 6, 5, 4}; //connect to the column pinouts of the keypad

//initialize an instance of class NewKeypad
Keypad customKeypad = Keypad( makeKeymap(hexaKeys), rowPins, colPins, ROWS,
COLS);
String ch="1,.?!@abc2def3ghi4jkl5mno6pqrs7tuv8wxyz90 ";
void setup()
{
  Serial1.begin(9600);
 lcd.begin(16,2);
  lcd.createChar(1, back);
  lcd.print("Simple Mobile ");
  lcd.setCursor(0,1);
  lcd.print("System Ready..");
  delay(1000);
  gsm_init();
  lcd.clear();
  lcd.print("System Ready");

  delay(2000);
}
```

Chapter-6
Results and Conclusion

Chapter-6
Results and Conclusion

Implementation of the following can be done by using the above equipment. Taking all the factors required for the implementation a working module can be prepared with suitable programming and connections.However measures are to be taken regarding security and working of the project. The GSM module is connected to a speaker and the mic .This project has a lot of scope for improvement and upgrade. The module can be further advanced with using various other components such as LCD module to provide visual messages and calls, Bluetooth connect to transfer data over a short range, Connect a microphone to enable two-way communication between announcer and listener. The project can be used in large scale industries, in public places where announcements are to be made like Railway Stations and Bus Stands, and in declaring emergencies at places struck with natural or man-made disasters.

BEFORE EXECUTION:

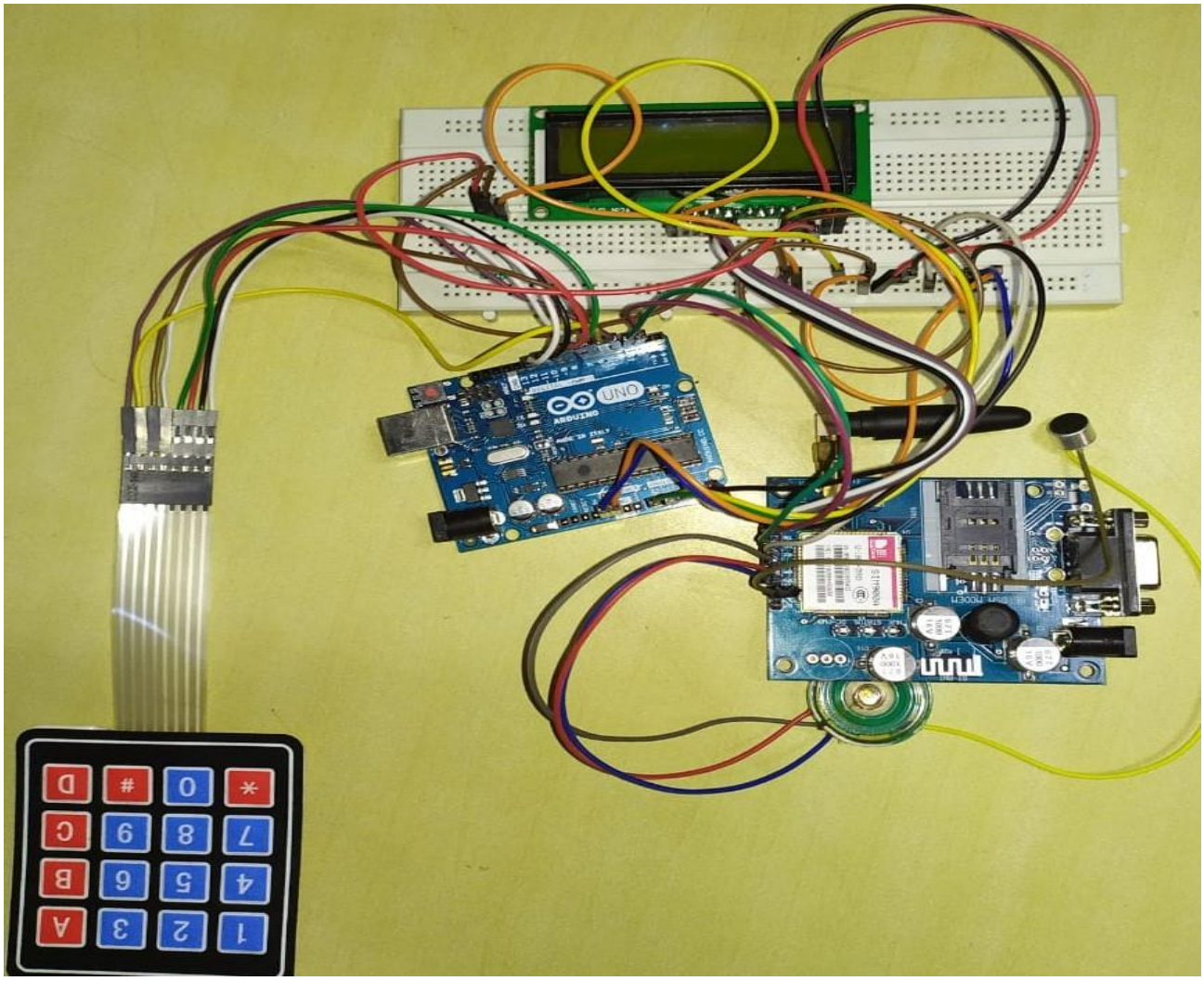

Fig. 6.1 Initialization

AFTER EXECUTION:

WHILE PHONE RINGING:

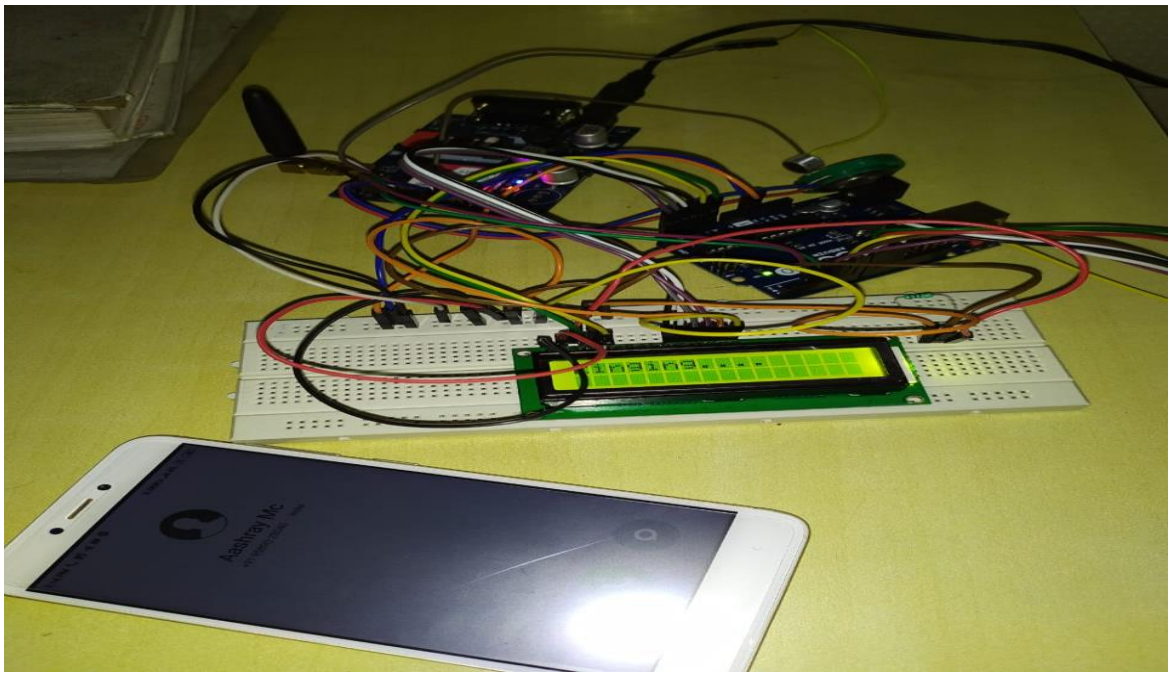

Fig. 6.2 While Calling to the device

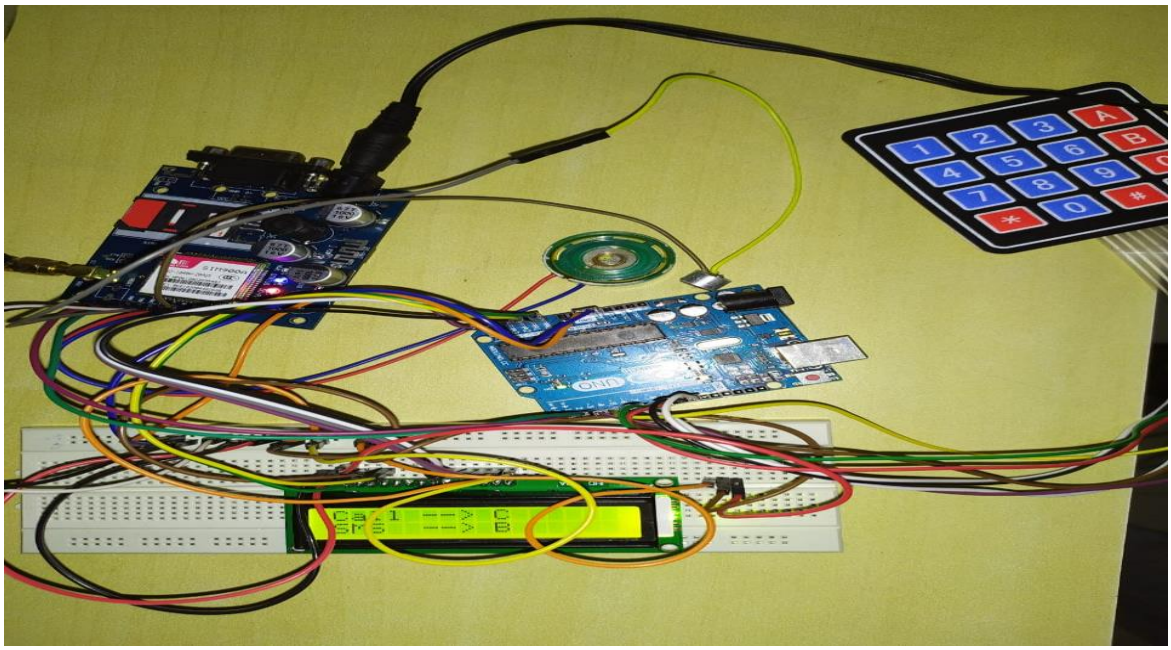

Fig. 6.3 Display Unit of the Project

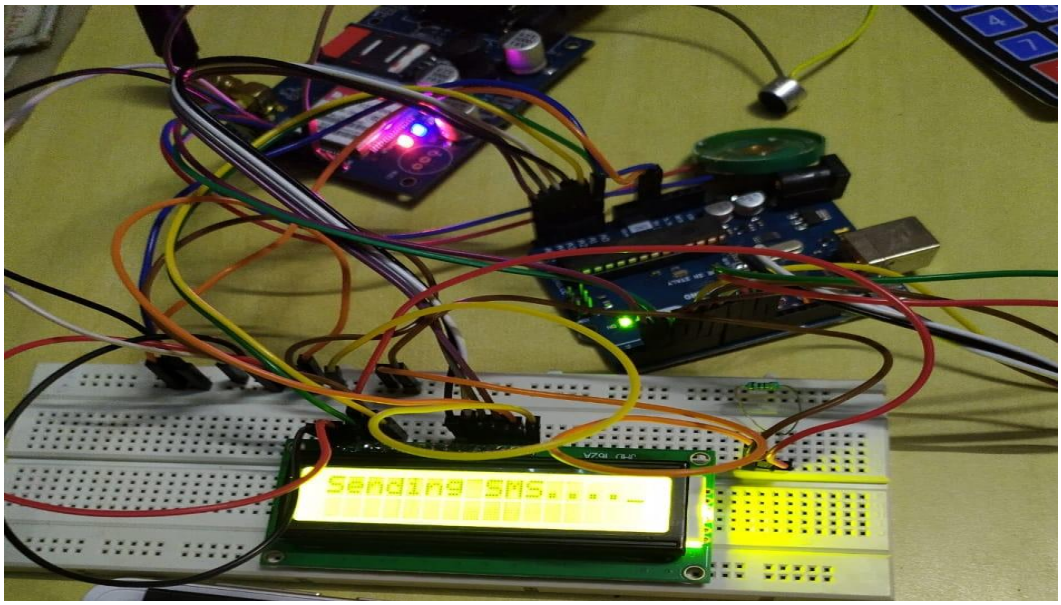

Fig. 6.4 While sending SMS to other device

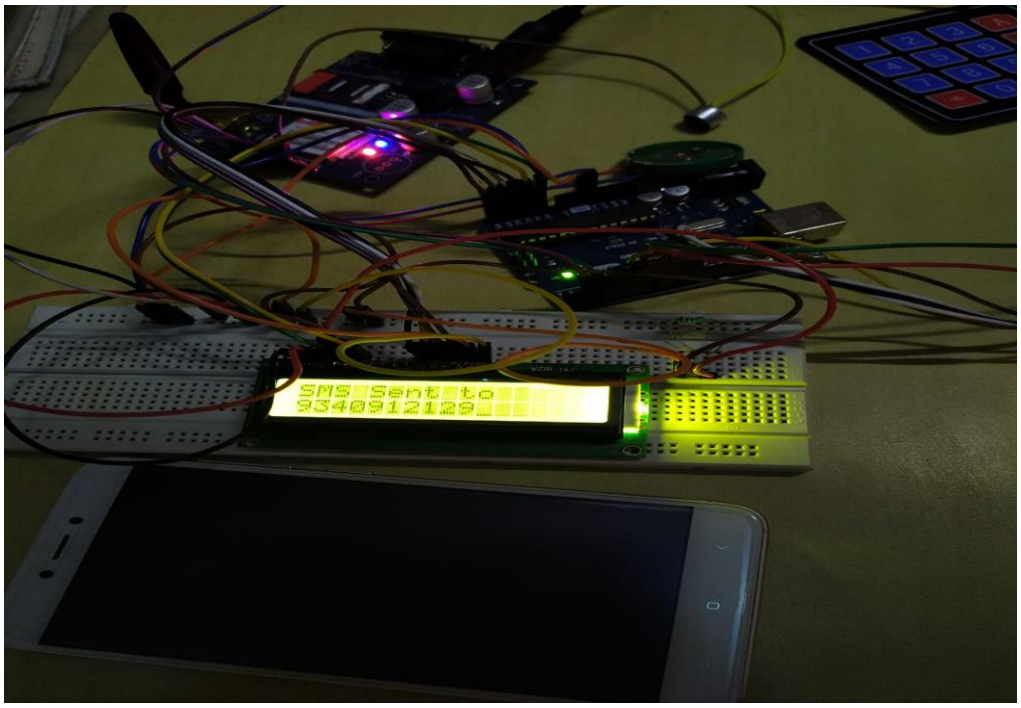

Fig. 6.5 Displaying the message to the LCD display

Chapter-7

Advantage and Disadvantage

Chapter-7

Advantage and Disadvantage

The advantages of this circuit are that it can be used for long distance communication, does not require physical presence of a user or personnel to operate the module since it automatically picks up the calls, can be usedinstantly at choice, has a particular number feature whichallows to prevent unwanted calls from random numbers,and is cheap, small and portable. The disadvantages of thiscircuit are that it depends on GSM communication i.e. ifthere is no signal at that particular place then it will not be able to pick up the calls. Also if the user decides to changehis or her number then the code has to be changed accordingly to identify the new number.

Chapter-8

Literature Survey

Chapter-8

Literature Survey

The project was chosen as it has wide scope in future. This project is an outcome of combination of several ideas gathered from various sources. The sources are listed under the headings of references.

Mazidi & Mazidi – '8051 Microcontroller and Embedded Systems', 2006 second edition This book helped in study and understanding of programming of microcontroller. It provided great deeper learning regarding algorithms, coding and interfacing of microcontroller with different components.

Ms. Neha R. Laddha – 'A Review on Serial Communication by UART' ISSN: 2277 128X

This paper presents implementation of UART with different methods. Different techniques which were using with UART are discussed for reliable data transmission. This paper helped in understanding coding for GPS module.

The datasheet **Megawin, "MPC82G516 ATmega8L Microcontroller",** product datasheet, Ver. A4, Dec. 2008 helped us in using the proper specifications standard microcontroller and other components involved in our project. These books and research papers helped a lot in providing the complete prerequisite knowledge for this project.

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Annexure I

Impact on Society

Annexure I

Impact on Society

In most cases, the cycle of smartphone production begins in a remote mine in the Democratic Republic of the Congo (DRC). In a country blighted by conflict minerals, over 50 per cent of mines are controlled by armed groups or violent, independent militias. Among these groups is the Democratic Forces for the Liberation of Rwanda (FDLR) located in eastern Congo, one of the last fragments of the Hutu rebel group responsible for the Rwandan genocide. In these cases, the local mining populations work under appalling conditions. Situated firmly within the criterion of human rights abuse, women and girls are regularly sexually abused and brutalised as militias move into mining areas. Making an average of 1 USD a day in an environment lacking in health or safety standards, workers as young as 10 years old dig for tin, tantalum, and tungsten. These mineral ores (the 3Ts), in addition to gold, happen to be the fundamental elements in the production of electronic goods, including smartphones.

The environmental implications of this are enormous. This constant updating has produced a huge amount of e-waste (less than 16 per cent formally recycled in 2014), most of which ends up in a landfill where harmful chemicals can leak into groundwater and affect both human and plant life. By 2020, it's estimated that the EU will generate more than 12 million tonnes per year of waste from electrical and electronic equipment. Though campaigns around the world work to raise awareness about safe recycling or reusing practices, most of the environmental impact happens before the phones even make it to stores. Still heavily dependent on fossil fuels, the manufacturing process generates waste that is 200 times the weight of the phone.

Annexure II

Environment and Sustainability

Annexure II

Environment and Sustainability

The mobile industry is a relatively low energy intensity industry, contributing much more to the economy than its proportion of national energy usage. For example, in the case of the UK the mobile industry is responsible for about 0.3% of greenhouse gas emissions and around 1.8% of gross domestic product (GDP).1 Energy use is growing as subscriber numbers increase. The Global e-Sustainability Initiative estimates that in 2002, the mobile industry composed about 43% of the global information and communications technology (ICT) energy related emissions and this could rise to 51% by 2020.

There are several industry initiatives evaluating alternative energy options to power base stations and about 1,000 pilot sites are in operation around the world. This is also driven by the demand for new mobile services in areas with no or unreliable grid electricity. Many network upgrade contracts now include take-back provisions for used equipment that may be resold in another market.

Mobile communications has the potential to make direct and indirect contributions to reducing the environmental impacts of other industries. For the total ICT sector the potential indirect benefits are estimated to about 5 times the direct benefits. As an example, it has been estimated that the environmental burden of a business roundtrip travel between Berkeley and Chicago is 10 to 1,000 times greater than conducting the meeting as a wireless teleconference.