Chapter 4
Transmission of Signal

4.1 Overview of Transmission

Over the past two decades portable physiologic signal acquisition system have been developed that are light, small and capable of recording multiple signals for up to number of hours. These systems are used in electrocardiography studies to detect infrequent cardiac arrhythmias or transitory cardiac functions often related to the tensions of daily life.

Figure 4.1 Basic Principle in Transmission of ECG signal
Today’s patients face a depressing situation confined to a fixed area tethered to their monitoring equipments [37]. However recent advancements in wireless technologies make it possible to free patients from their equipment, allowing greater freedom and even making possible monitoring by their health provider while the patient is on the go. The purpose of this research work is also to make sure that the people in remote localities should be benefited. Hence emphasis has been given to use wireless transmission facility for sending the information regarding health of the patients to the medical experts. In this work the system is so designed that patient can be monitored with all its details related to cardiovascular system will be available on the HMI. In case of emergency, the same data can be send via short message service to any doctor for expert opinion.

SMS can be sent through COM ports (serial port) using AT commands. COM Port can be accessed either through HyperTerminal or through various platforms designed using C++, JAVA, MATLAB, etc.

4.2 GSM Module

As per the problem statement for sending SMS information we need a GSM Module interfaced to the motherboard via RS 232 port. **Global System for Mobile communications (GSM)** is the most popular standard for mobile phones in the world. It is a cellular network, which means that mobile phones connect to it by searching for cells in the immediate vicinity. One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as a **SIM card**. The SIM is a detachable smart card containing the user's subscription information and phonebook. This
allows the user to retain his or her information after switching handsets [90].

![GSM Connection Overview](image)

**Figure 4.2: GSM Connection Overview**

### 4.3 AT Commands

#### Phone Control Commands

- **AT+CGMI** Request Manufacturer Identification
- **AT+CGMM** Request Model Identification
- **AT+CGMR** Request Revision Identification
- **AT+CGSN** Request Product Serial Number Identification
- **AT+CMEE** Report Mobile Equipment Error
- **AT+CPAS** Phone Activity Status
  
  - **AT+CPBR** Read Phone Book Entry
- **AT+CSQ** Signal Quality

#### SMS Commands Text Mode

- **AT+CSMS** Select Message Service
- **AT+CPMS** Preferred Message Storage
- **AT+CMGF** Message Format
AT+CSCA    Service Centre Address
AT+CSMP    Set Text Mode Parameters
AT+CSDH    Show Text Mode Parameters
AT+CSCB    Select Cell Broadcast Message Types
AT+CSAS    Save Settings
AT+CRES    Restore Settings
AT+CNMI    New Message Indications to TE
AT+CMGL    List Messages
AT+CMGR    Read Message
AT+CMGS    Send Message
AT+CMSS    Send Message from Storage
AT+CMGW    Write Message to Memory
AT+CMGD    Delete Message

**Sending SMS**

<table>
<thead>
<tr>
<th>AT+CMGF=1</th>
<th>To format SMS as a TEXT message</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT+CMGS=&quot;+919820171005&quot; &lt;Enter&gt; &gt; HI!!! HOW R U &lt;Ctrl-Z&gt;</td>
<td>To send a SMS</td>
</tr>
</tbody>
</table>
4.4 Program to Send SMS

% Set COM port.
    s = serial(‘COM4’);
%Open COM port.
    fopen(s);
%Set the baud rate.
    set(s,’BaudRate’,9600);
%Set Terminator as Carriage return.
    set(‘Terminator’,’CR’);
%To Set Text Mode.
    fprintf(s,’AT+CMGF = 1’);
%to accept mobile no. as it is.
    format(‘long’,’g’);
%Read Mobile No. of the recipient from excelsheet
    mobno = xlsread(‘F:\book2’,’A1:A1’, ’basic’)
    mobno= num2str(mobno);
    send_cmd = [‘AT+CMGS’,’,’,’=’,’’,’,’mobno];
%Write the mobile no. on COM port
    fprint(s,send_cmd);
%Set Terminator as Ctrl-Z.
set(s,’Terminaor’,’SUB’);

%Text Message to be sent.

sms_number = num2str(sms_number);
date = datestr(now,’dd-mm-yyyy ; HH:MM:SS’);
hosp_no = num2str(hosp_no);

pm_number = num2str(pm_number);

send_msg = [date,’ Msg No: ‘ , sms_number, ‘ ; Hosp No.: ‘ ,
hosp_no,’ ; PM nO:’,pm_number,’ ; Status: Patient Unhealthy.’];

%Send the SMS

fprint(s,send_msg);

%Close Com port.

fclose(s);

The program has been developed in MATLAB successfully which
communicates through serial port. GUI using visual basic has an additional
feature to send the message in the required format to the doctor.

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