GSM Based Telemetry System

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Abstract-In this modern lifestyle most of the people are suffering from cardiac diseases. They have to stay at hospital under observation. In this thesis we propose a GSM based telemetry system .It has been proved as boon for both doctors and patients. Patients can remain at home and enjoy family life while doctor can also examined data of ECG and temperature of the patient every one hour in his/her mobile phone via messages .The values of ECG and temperature in mille volts and temperature respectively. Data will be transmitted anywhere around the globe where there is 2G network coverage.

Index Terms—GSM module, microcontroller, Temperature Sensor, ECG.

I. INTRODUCTION

In this project, strength of GSM network plays an important role. GSM module SIMCOM SIM 300 is used with microcontroller 8051c . Our project is blessing for both doctors and patients with cardiac diseases. This project will provide freedom to the patients to live home and get relaxed from the environment of the hospital. This project facilitates mobility to the doctor. He can see ECG and temperature of the patient at anytime and anywhere around the globe using GSM technology. The work conducted here can provide a system that will be of enormous benefit to the considerable population affected by heart diseases. In this project we also provide convenience to the doctor, he can also view the value of the ECG in mille volts and temperature in the centigrade via sms using global system for mobile communications. Doctor using mobile phone, so it will be eliminating the use of the laptops and Pcs and mobile phones are always on and require low maintenance. Doctor or nurse with a trouble-free approach to the patient’s ECG/temperature signal. For patients in rural and regional areas an ECG report could be sent to a doctor for examination. Telemetry system using mobile phone which is very versatile and convenient option .The elimination of the laptop greatly simplifies the hardware requirement. Using GSM as wireless network technology can speed up the monitoring of the patient by speed up internet access,e-mail,sms etc.....For start up of any GSM module AT commands are necessary. Programming of this project plays an important role. Programming is done in a “C” language with use of AT commands.

II. SYSTEM CONCEPT

The proposed telemetry system is shown in figure. It Consists of an ECG acquisition module and temperature sensor . Outputs of both are digitized by an A/D converter , and then programmed in P89V51RD2. Microcontroller followed by the GSM/GPRS MODEM SIMCOM 300. The patient (client) and the health-care professional can be located anywhere in the globe where there is 2G cellular network coverage. The primary purpose is to
monitor patient's cardiac activity and temperature continuously via sms.

Figure 1: The block diagram of the Proposed system

III PATIENT UNIT

Patient unit consists of ECG acquisition unit and temperature sensor.

Generally, twelve leads are used to monitor cardiac signals. We use here Lead I for observing ECG of the patient. Signals from Lead I measure the variations in potential between the right arm and the left arm, with the electrode of the right leg acting as ground. The Electrocardiograph (ECG) is the electric signal generated by the heart. The amplitude of the ECG Signal varies anywhere from 0.1 mV to 5 mV. The frequencies of interest lie within the range of 0.05 Hz to 100 Hz. Clamp electrodes are used instead of surface electrodes for noise free ECG. Jelly is used for good contact with the skin.

A. SIGNAL CONDITIONING CIRCUIT

Normally the frequency range varies between 0.01 to 500 Hz.

Figure 3: ECG filtering circuit mounted on breadboard

The figure shows circuit implemented on the breadboard.
1. INSTRUMENTATION AMPLIFIER

Instrumentation amplifier is used to amplify the signal range from mille volt to the volt. So that filtering can be performed. The ECG leads go into the INPUT 1 and INPUT 2 terminals. The gain set is of 1000.

2. SECOND ORDER LOW PASS FILTER

A low pass filter is a Butterworth filter with a cut-off frequency of 150 Hz. Therefore, it rejects unwanted frequencies above 150 Hz, reducing noise.

3. NOTCH FILTER

This filter is used to remove 60 Hz power line noise.

B. TEMPERATURE SENSOR

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. We use LM35 temperature sensor which are relatively very cheap and accurate. The LM35 thus has a advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. It has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range

III. ANALOG TO DIGITAL CONVERSION

The MCP3201 12-bit Analog-to-Digital Converter (ADC) combines high performance and low power consumption in a small package, making it ideal for embedded control applications. We use 12 bit ADC for digitalization of the ECG waveform and temperature. The MCP3201 features a successive approximation. The Microchip Technology Inc. MCP3201 is a successive approximation 12-bit Analog-to-Digital (A/D) Converter with on-board sample and hold circuitry.
IV. MICROCONTROLLER 8051

Figure 7: block diagram of P89V51RD2

The P89V51RD2 is an 80C51 microcontroller with 64 kB Flash and 1024 bytes of data RAM. A key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks per machine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI. The Flash program memory supports both parallel programming and in serial In-System Programming (ISP). Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The P89V51RD2 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running.

V. GSM MODULE

GPRS module is a breakout board and communicates with microcontroller via AT Commands. To control a phone are called AT commands. AT commands direct a phone to dial (D), answer (A) and hang up (H) and sms (CMGS) Every AT command starts with “AT” (Attention). This is the command line prefix.

To send sms to the microcontroller there are two modes

Figure 8: GSM Module
1. sms mode
2. pdu mode

For selection of the sms mode “at+cmgf=1” and then at+cmgs=“number” send to the Microcontroller.

VI. CONCLUSION

A low cost patient monitoring system based on GSM system has been proposed. A temperature sensor LM35 and ECG module communicate to the mobile via GSM technology. This telemetry system allow the doctor to observe the data of ECG and temperature of the patient via messages on mobile phone whenever required. After successful completions of this project it can conclude that the microcontroller based system can be effectively used as communication medium in conjunction with GSM.

VII. REFERENCES

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