

Integration of GPS and GSM for the Weather Monitoring System

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Abstract

This paper describes the design, implementation and results of Weather monitoring system. This System provides solution for Weather monitoring of remote places. The system consists: GPS receiver, GSM modem and microcontroller board for the purpose of weather monitoring. The system basically sense the weather parameter like temperature, humidity, Carbon Monoxide Level, level of Alcohol Gases, Light level of the Area in which system is located. By using a GPS technology, track the location of the area in terms of latitude and longitude. All the data of Sensors and GPS data can be accessed by using GSM Technology with the help of GSM modem. It can send the data to the user in the form of SMS in case of on request. The system can also be configured to transit the data on critical or threshold level of parameter is detected or at preset intervals to the user.

Keywords: GPS, GSM, SMS, AT Commands, NMEA 0183

1. Introduction

Continuous advancements in technology have made the deployment in Weather Monitoring System. In earlier days, a analog or men monitored weather station to be available at there a manual record of the data to be kept and use for analysis and forecasting. Where as in case of remote places like forest, habitat or any unmanned remote places It's difficult to utilize the convention weather station. Today, growth is coming from global expansion and services. A new surge of growth will come through new technology production at the lowest cost for global distribution, and fast time-to-market. This led to the emergence of such kind of Weather monitoring system which can be availed at remote places. And this is the main focus of our present work.

Now days the no of mobile phones user has rapidly grow in little period. In most of the country a GSM technology to be availed. So, GSM is most common wireless technology to communicate between the user and system. It's also a cost effective and efficient too. So we selected the GSM as part of communication technology between system and user. The primary aim of this paper is to propose the concept of development of weather monitoring system for remote areas using the combination of GPS Receiver, GSM modem and various weather sensors, Microcontroller board. By using all this Weather Parameter like Temperature, Humidity, Carbon Monoxide (CO) Level, Alcohol Level, and Light Level can be measured. With the help of GPS, location detail to be tracked like latitude, longitude, time and date. And all these devices and components are controlled and command by microcontroller board. Microcontroller manages the all the task and function the devices. Utilizing a GSM modem all above detail to be sent in the form of SMS to the requested user or we can say on request detail. And all measured parameter displayed on the LCD at locally on system.

2. Functional Block Diagram and Description

The Functional block diagram of the system is as shown in Fig.1. It consists of GSM Modem, GPS Receiver, Microcontroller Board, LCD Display and Various sensors. GSM Modem and GPS Reviver interfaced with serial port of Board. GSM modem communicates with the microcontroller in bi-directional mode. Arduino Duemilanove Microcontroller board consists of 8 bit AT Mega 328 Microcontroller. Temperature sensor is most common LM-35, a precision centigrade temperature sensor. Humidity Sensor is form Honeywell's HIH Series CMOS Sensor

HIH-4000-002. It gives the analog output according to humidity. Gas Sensor is MQ-3 and MQ-7 for Alcohol and CO Gas sensing respectively. Sensitive material of MQ-3 gas sensor is SnO₂, which with lower conductivity in clean air. When the target alcohol gas exist, the sensor's conductivity is higher along with the gas concentration rising. By using a simple circuit to converting change of conductivity to correspond output signal of gas concentration. MQ-7 sensor composed by micro AL₂O₃ ceramic tube, Tin Dioxide (SnO₂) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. It gives the equivalent output corresponding CO gas level.

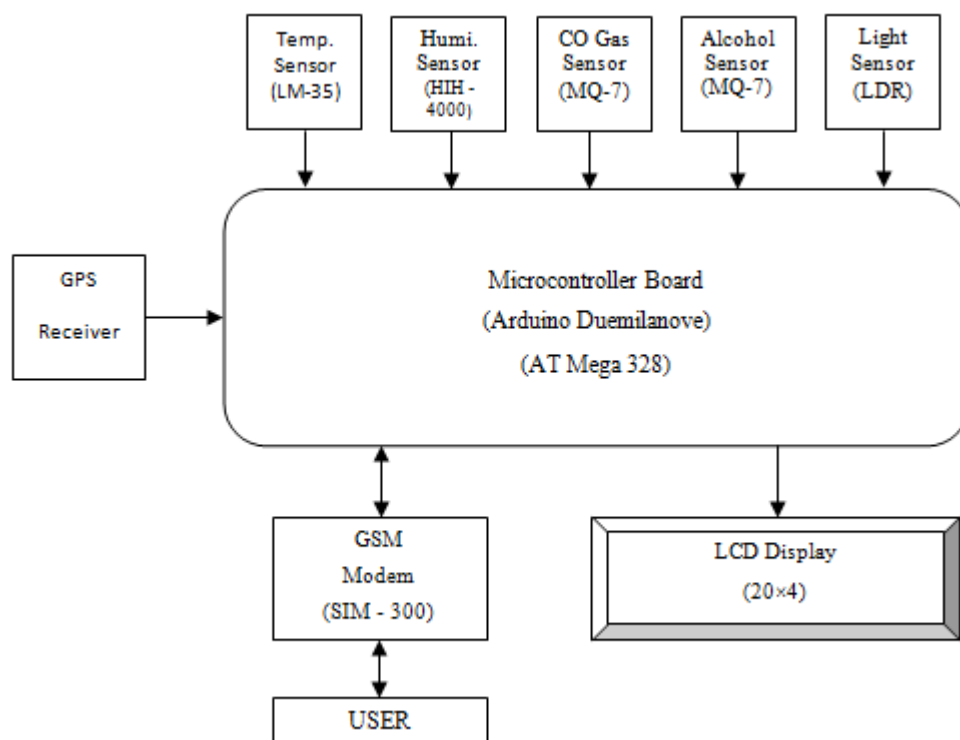


Figure 1. Functional Block diagram

3. Software Development

The software for the system is developed in C and The flowcharts depicting the monitoring of Weather parameter as show in Fig.2. As show in Flowchart, the Process to be done with the help of Microcontroller. The basic step with Initializing AT Mega 328 with its I/O Port, than Initialize the Serial port with predefined baud rate at 9600BPS. LCD initializing follow by the Previous. At the Same time Welcome Message do be displayed on the LCD. Now the Controller is busy in retrieve the location data for the GPS Receiver, which send the data serially at 9600BPS in form of NMEA 0183 sentences and among these we use \$GPRMS sentences to track the location data. After decoding the GPS data, it displayed on the LCD and then the Sensor data to be read on analog input pins of the board and using 10 bit ADC of the board it converts into 0-1024 range according to the measured quantity. After performing A/D the quantity calibration is done to display in desired form. All the calibrated data displayed on the LCD locally. By using a GSM modem a request from user can be scanned and if the request for data is detected, controller sends the all the data to that user in form of Text SMS. And in case of the Predefined threshold level is detected for any of the parameter, controller immediately sends the SMS to the predefined numbers. All these task well represented in the following flow chart in Figure 2.

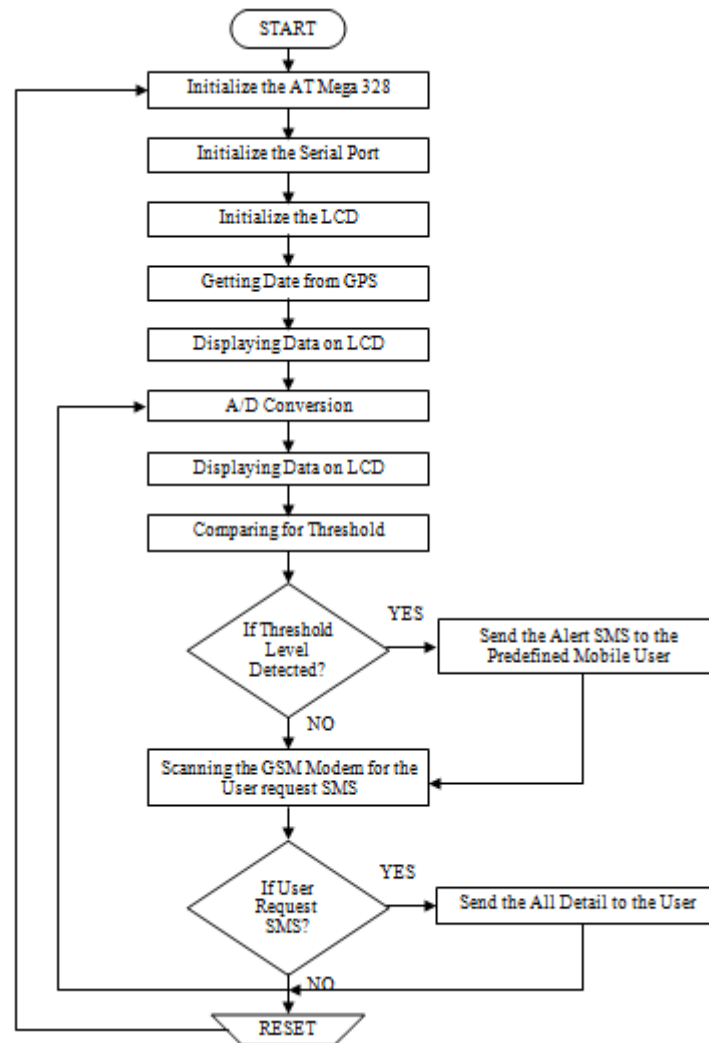


Figure 2. Flow chart of Software

4. Results

The results obtained by using the proposed system are discussed in this section.



Figure 3. Location detail from the GSP Receiver on LCD Screen



Figure 4 Weather Parameter form the Sensor on LCD

5. Conclusion

The system has provided a low cost, easy accessible, remotely monitored solution for remote areas has been introduced. The use of an Arduino, GSM module, Sensors and GPS Module provide exciting possibilities. However as far as the remote area applications are concerned this can be viewed as a low cost, customized wireless system. Thus this solution can be customized to suit to other requirement related to monitoring and other sensors are in use. The approach discussed in the paper is novel and has achieved the target to monitor the remote area weather and useful to many weather monitoring and recording agency. GSM SMS-based system satisfying user needs and requirements. GSM technology capable solution has proved to be controlled remotely, provide security and is cost-effective as compared to the previously existing systems. Hence we can conclude that the required goals and objectives of the system have been achieved.

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