

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320-088X

IJCSMC, Vol. 3, Issue. 5, May 2014, pg.893 – 897

RESEARCH ARTICLE



Design and Implementation of a Weather Forecasting System Based on Temperature and Light Sensors

Pranjali U. Wankhede¹, Amit Pimpalkar²

¹Department of C.S.E, G. H. Rasoni Academy of Engineering and Technology, Nagpur, Nagpur University, India

²Department of C.S.E, G. H. Rasoni Academy of Engineering and Technology, Nagpur, Nagpur University, India

¹pranjaliwankhede22@gmail.com, ²amit.pimpalkar@raisoni.net

Abstract- The main objective of the project is to design and development of web enabled system for weather monitoring and forecasting. The paper mainly focuses of use of different sensors and interfacing of sensor with Atmega8 Microcontroller. Proposed system uses LDR based light Sensor Module; Temperature Sensor Module connected to the Web based computer system via microcontroller through USB to TTL module. We are using IIS services for web monitoring for Windows based operating system. Computer running a real time sensor data acquisition application. The main objective of this paper is to forecast the Weather. Based on the current and previous statistics of the weather, future weather is forecasted and the report is generated.

Keywords – Weather Monitoring and Forecasting; Web based System; LM35 Temperature Sensors; Light Sensor

I. INTRODUCTION

Information technologies played importance role in the worldwide organizations due to their efficiency with low costs, especially for developments in computer system, information systems and data management systems. The World Wide Web is not only used to networking, sharing information, sell products and conduct business etc. but it can also be used to improve design engineering systems and manufacture them as well as testing them for final products. As weather is the statement of the physical conditions at an instant, forecasting is of concern to all living creatures all over the globe.

In this 21st century, weather monitoring and forecasting holds great importance and is used in several areas ranging from keeping track of agricultural field weather conditions to that of industrial conditions monitoring. Weather monitoring would help in keeping record of different climatic behaviors which includes light intensity, temperature and temperature. Weather Monitoring System can either be wired or wireless one. Just in case of wireless communication, the connectivity will be more

suitable and user friendly and weather monitoring would not require physical presence of the person at the location [1]. Wireless communication is the transfer of information over a distance without the use of wires. The distances involved may be long or short. GSM equipment is the cheapest and the most convenient technology now being used for wireless communication. The wireless weather nursing system fundamentally requires few basic modules such as GSM module, sensors and microcontroller module, display module [2] [3]. Weather plays a vital role in the operation of industries and various facilities in the world. As weather is the statement of the physical condition of that instant, so forecasting the weather is of concern to one and all living bodies on the earth. Forecasting can be done globally or region based. The region based forecasting over a small area is much more accurate and of high resolution while global based are not much accurate but better forecasts for long-range [4].

In the rest of the paper Section 2 describes the proposed work of the model which gives the detailed structure of the web based model having Sensors, microcontroller attached to the PC via the USB-TTL module. Also the idea behind the weather forecasting system is given. Section 3 gives the result and the discussion of the weather monitoring and forecasting model. Finally, Section 4 specifies the Conclusion and future scope.

II. PROPOSED WORK

A) System Architecture

The System architecture is shown in Figure 1. The block diagram of the hardware system - The light and temperature detecting sensors connected to the hardware will generate an analog value. This analog value generated from the current statistics will be passed to the Atmega8 ADC port. The program or microcontroller code will send the signal in the TTL format. These TTL signals will be unreadable for the PC. So, TTL signals will be converted into the serial (PC readable) ASCII Code. The serial/USB port managed by the Operating system in the format of COM port. Com is the logical addressing scheme for any hardware port. Whatever the value comes on the COM X port, code will be written in any particular language say Dot Net to read that value. Dot Net then provides a serial port control to read/write the data on the specific port [8].

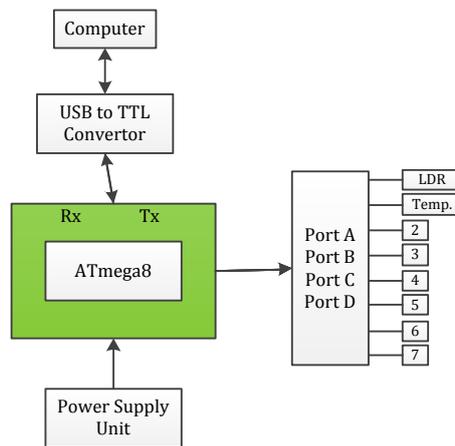


Figure 1. System architecture

The Proposed web monitoring model is shown in the Figure 2. The sensors will generate the value and this value is passed to the microcontroller. The microcontroller reads the analog value from the sensors and then converts it into the digital value so that it is readable by the computer [6].

B) Sensors

The hardware connected with the Computer has got some sensors attached to it [8]. Analog sensors are attached here because in case of digital sensor, the answer will only be displayed in the form of true/false or 0/1 or ON/OFF while in the case of analog sensor, it'll display a particular value. Following two sensors have been attached-

- 1) *LDR Sensor*- Photo resistors, also known as light dependent resistors (LDR), are light sensitive devices most often used to indicate the absence or presence of light, or to quantity the light intensity. In the dark, resistance of this devices is very high at times up to $1M\Omega$, but when the LDR sensor is exposed to light, the resistance falls intensely, down to a few ohms even, depending on the light intensity. LDRs have a sensitivity that fluctuates with the wavelength of the light which is applied and are nonlinear devices. They are used in many different applications but are sometimes made obsolete by other devices such as photodiodes and phototransistors.

- 2) *LM35 Temperature Sensor*- The LM35 series are precision integrated-circuit temperature sensors [9]. Its output voltage is linearly proportional to the Celsius temperature for a large range of temperature values. The LM35 thus has an upper hand 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 [10]. The LM35 need not use any external calibration or trimming to provide usual accuracies of $\pm 1/4^{\circ}\text{C}$ at room (moderate) temperature and $\pm 3/4^{\circ}\text{C}$ over a full -55 to $+150^{\circ}\text{C}$ temperature range.

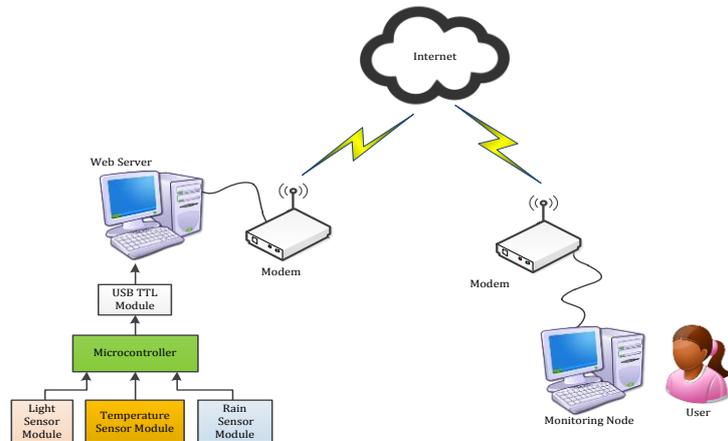


Figure 2. Proposed Web based monitoring model

C. SMS to the users

The messages or SMS can be sent in two ways to the people.

1) *GSM Modem* - The GSM Modem will broadcast the message to all. The connection of the internet is not needed here. Only the GSM SIM card must be there in order to send the message. But the disadvantage of GSM modem is it'll send SMS one by one and not at a time.

2) *Through SMS Gateway*- The Gateway technique will broadcast the SMS to all at a time. For this the connection of internet is needed.

D. Weather Forecasting

Weather forecasting is mainly concerned with the prediction of weather condition in the given future time. Weather forecasts provide critical information related about future weather. There are various techniques to forecast the weather using different techniques using data mining, neural networks, numerical prediction and so on [4]. This part is the software part. The values generated by the Temperature and light sensors are recorded. Based on this previous values fetched for the weather and the current statistics, an algorithm like window sliding algorithm is implemented to predict the future values in order to forecast the weather. Based on some parameters like mean, variance and Euclidean distance [5].

III. RESULT AND DISCUSSION

Based on the web based weather monitoring system using sensors when connected to the computer via USB-TTL module has been generated. Figure 3 gives the frame when Com port is closed. The temperature and light flow is absent. Figure 4 gives the difference when the port is open and started the change in the temperature and light range is obtained. The Weather monitoring part is done successfully in the Figure 3 and Figure 4 [7]. The expected output of the weather forecasting is obtained as in Figure 5.

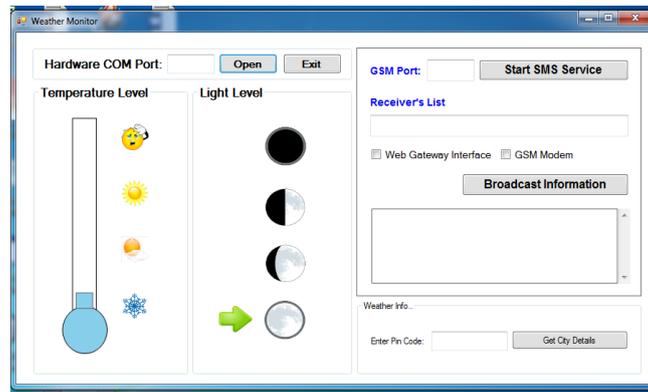


Figure 3. Hardware Com port is not connected

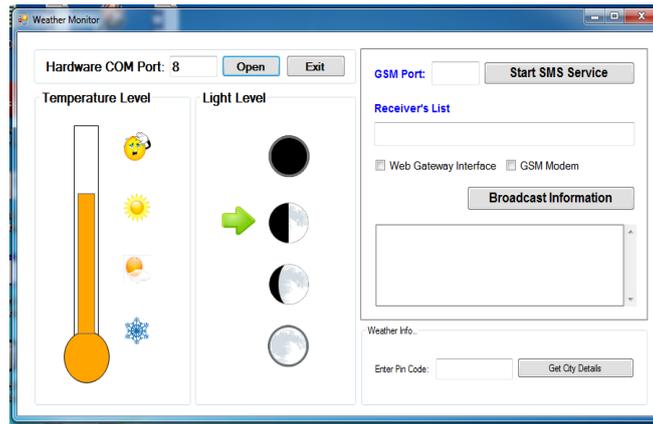


Figure 4. Hardware Com port is connected and open

From the above figures, we can see the fluctuations in the temperature and the light level. The second part of the GSM port and the SMS service is done by either web gateway interface or the GSM modem. The SMS regarding the current weather statistics will be displayed on the user's/receiver's cell phone. The weather to be forecasted based on the current and previous data will generate the expected result as shown in Figure 5.

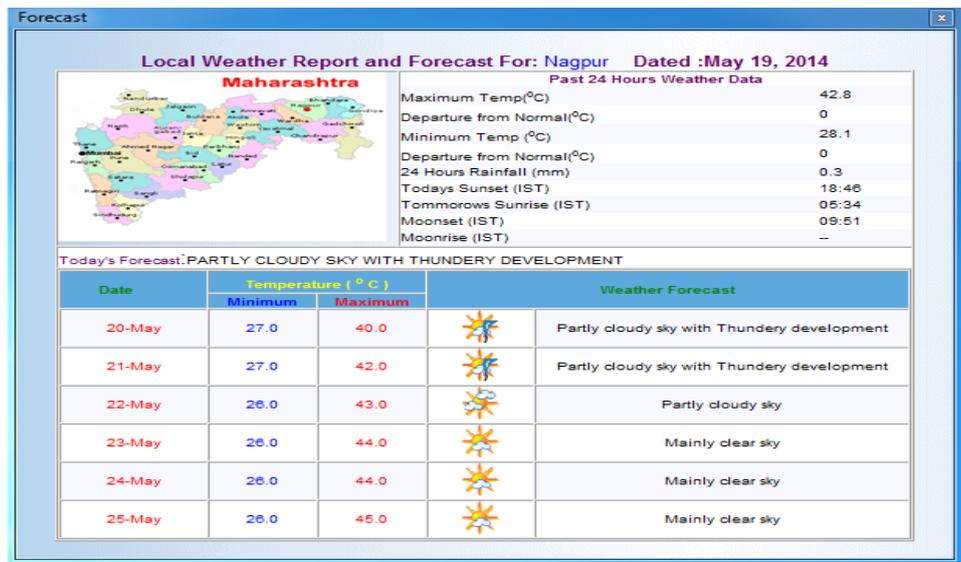


Figure 5. Weather forecast report

IV. CONCLUSION AND FUTURE WORK

In this paper, the web based weather monitoring system using the LM35 Temperature sensors and light sensors have been implemented. The system deals with designing a simple and low cost weather monitoring system using LM35, light sensor, LCD and ATMEGA-8 microcontroller unit to monitor weather conditions of a particular location and transmit it to a cell phone at distant location through SMS. Implementation of hardware as well as the software is seen in this paper. Also, the concept of web based model, GSM technology, modem, SMS gateway has been studied. The weather forecasting is the main objective of this paper and is done. The future scope of this paper can be that sensors such as pressure and humidity sensors can be attached to the microcontroller giving the more precise weather status.

REFERENCES

- [1] Mohammad Javad Manashti, Houshang Ghamarnia, Soheila Amirian, Ramin Mohamma Nezhad, "*Design GSM-SMS based system for old structured greenhouses with monitoring and logging network sensors*", International Research Journal of Applied and Basic Sciences, vol. 3, pp. 1497-1507, 2012.
- [2] T. Murugan, Azha.Periasamy, S. Muruganand, "*Embedded based Industrial Temperature Monitoring System using GSM*", International Journal of Computer Applications, vol. 58, p. 0975 – 8887, 2012.
- [3] Keshav kumar singh and S. Styline Chirmaxo, "*Design of Wireless Weather Monitoring System*", Department of Electronics & Communication Engineering National Institute of Technology Rourkela, 2013.
- [4] Pranjali Wankhede et al., "*A Review on Weather Forecasting Systems Using Different Techniques and Web Alerts*", International Journal of Advanced Research in Computer Science and Software Engineering 4(2), February - 2014, pp. 357-359.
- [5] Piyush Kapoor and Sarabjeet Singh Bedi, "*Weather Forecasting Using Sliding Window Algorithm*", Hindawi Publishing Corporation, ISRN Signal Processing, Volume 2013, Article ID 156540.
- [6] M. Kassim et al., "*A Web Based Temperature Monitoring System*", International Journal of Multidisciplinary Sciences And Engineering, Vol. 2, No. 1, March 2011.
- [7] G. V. Satyanarayana and Sd .Mazaruddin, "*Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBee and GPS*", Conference on Advances in Communication and Control Systems © 2013.
- [8] Mohd Nazri Ismail et al, "*A Prototype of Web Based Temperature Monitoring System*", 2010 2nd International Conference on Education Technology and Computer (ICETC), 978-1-4244-6370-11\$26.00 © 2010 IEEE.
- [9] U. Suneetha et al., "*Ethernet Based Remote Monitoring And Control Of Temperature By Using Rabbit Processor*", International Journal of Advanced Computer Science and Applications, Vol. 3, No. 9, 2012.
- [10] LM35 Precision Centigrade Temperature Sensors, © 2000 National Semiconductor Corporation, www.national.com.