Investigating weather forecasting using Cube-Sat monitoring

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Abstract

Knowing the weather conditions is very important. To know the weather conditions, it is necessary to design an independent small cube satellite that can provide weather information. Here is a hardware model designed and implemented that can provide instant weather report. It can be used to compare the data of a place with different altitudes and also for different moments, the main goal in this article is to accurately check weather conditions with less human effort, reliable and efficient data. The results show that the construction of this system is simple, portable, economical, low consumption and reliable. Its advantage is that the system does not use the Internet, so data transmission is less expensive, and also this system is able to record different weather parameters for 4 months with changing altitude and time interval. And it is very important from a practical point of view that this system will have a positive impact on agriculture and production.

Keywords: Wireless communication, sensors, data transmission, data processing.

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Introduction

In the past, people were able to predict environmental conditions from the 19th century. The only difference between the primitive and modern system is the advancement of technology. The measurement tool has become small, efficient, reliable and more accurate to provide instant weather report without manpower. Weather being a natural phenomenon always changes with the change of various atmospheric parameters. However, average or mean conditions can be predicted that ultimately characterize the climate of a geographic area over a long period of time [1]. These are the most important parameters that affect atmospheric conditions, air pressure, temperature and humidity. All these parameters are subject to change with the change of altitude, length of day (intensity of sunlight changes), environmental components (tropical region, or temperate region, etc.), the angle of the sun at a particular point, etc [2].

subject:

In this paper, a hardware model system has been designed and implemented that can provide real-time weather reports. It can be used to compare the data of the same location with different heights and also for different moments [2].

In the following:

This article will be as follows: an introduction to weather forecasting using monitoring, the issue of the requirement to check weather forecasting using Cube-Sat monitoring, designing a weather forecasting system using Cube-Sat monitoring, system review Weather forecasting using Cube-Sat. The result of the Cube-Sat system review by researchers, the general results of the research.

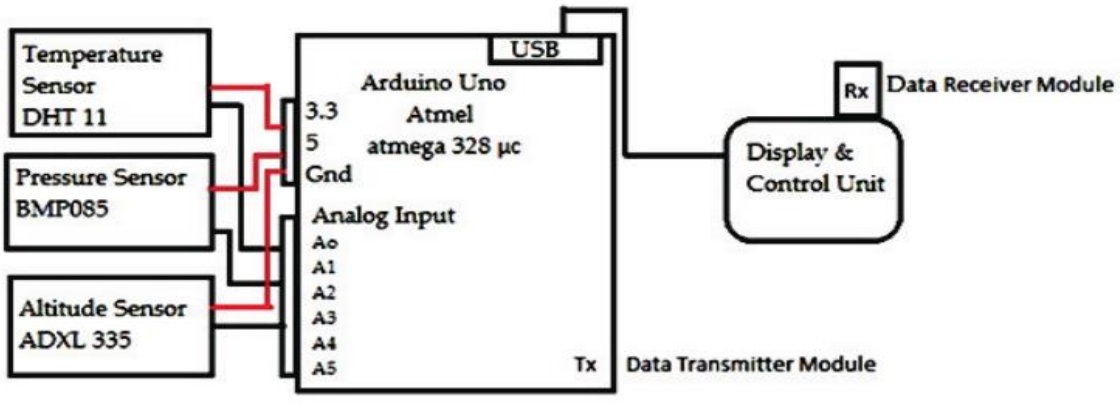
definitions

In a modern weather forecasting system, environmental data is sent to a computer system through a data acquisition system (DAS). The multiple parameters are multiplexed and finally forwarded through a single channel to the computer to display the data for broadcast. And it is shown on TV or on the Internet broadcast media [2].

Fig.1. Block Diagram of the Complete System.

✓ Literature review

Weather monitoring is not a new issue. However, locating a precise monitoring system without using a



network is rare 1, 2. Most of the previous works show a complex hardware system and different devices were built to analyze different weather parameters 3, 4. In the early days, satellite-based systems did not cost much, and many tasks have been done using embedded applications. The proposed cube satellite model is affordable, reliable, and the simplest design. Graphical analysis of data taken for 4 consecutive months in Calcutta with the help of gas balloon shows that this system works. Properly. The statistical data obtained from the device for different heights and at different times is a unique feature. The device provides about 90% and more accurate and similar data compared to existing networks [2].

✓ System overview

The design of this proposed system is simple. Three different temperature and humidity sensors are used here: sensor (DHT11), pressure sensor (BMP085) and accelerometer (ADXL-335). The Arduino's data processing unit is the Uno, a low-cost embedded system platform. The data can be recorded and analyzed on a PC in a simple Android-based mobile phone with an Arduino application installed. For data transmission, the cube on which the monitoring device sits, the transmitter and receiver modules are used. An RF module with a frequency of 433 MHz has been used for this data transmission. A gas balloon has been used to maintain and transport the cube satellite [3].

Working Principle

The data control unit is an embedded system platform. Arduino Uno is used here. It is powered by a 9V battery and programmed for specific applications using Arduino open source software (Arduino 1.6.1). DHT 11 temperature and humidity sensor is connected to Arduino Uno. Pin number 1, 2 and 4 of DHT11 are connected with pin number GND (ground), A0 and 5V (supply) respectively. The DHT11 collects environmental data and sends it to the Arduino Uno for digital data analysis. The BMP085 pressure sensor collects pressure data from the environment. Connecting the BMP085 to the Arduino Uno is as follows: Vcc to 3.3V, SDA to A4, SDL to A5 and GND to GND. ADXL 335 accelerometer is used. Connecting the accelerometer to Arduino is done as follows: X to A1, Y to A2, Z to A3, pin 5 to pin 5 (supply), GND to GND. All these modules are placed in a cube box. Due to the small dimensions, a transmitter and receiver module is also connected to the system. A 433 MHz RF transceiver module is used for wireless data transmission. The seating cube can be placed anywhere. The block diagram of the complete system is shown in Figure 1. The working prototype and cube satellite model are shown in Figure 2.

Results

Pressure, humidity temperature against variation of altitude in Kolkata has been measured in the month of July,2015. Table 1 shows the comparison of pressure, humidity and temperature with respect to the variation of altitude [3,4,5,6].

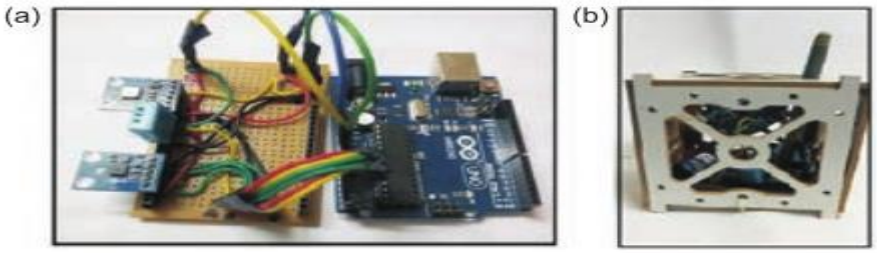


Fig2 . (a) Working Prototype; (b) Cube Satellite Model.

Table 1. Comparison of Pressure, Humidity and Temperature Data with respect to the variation of Altitude.

Altitude X axis	Y axis Z	Axis	Pressure (Pa)	Current Humidity Temperature (Celsius)
992 1008 1007	752	86.50%	34.00	
997 1022 1022	748	85.00%	32.00	
998 1024 1024	742	84.00%	31.50	

1008 1046 1046	740	82.00%	30.00
1020 1068 1068	715	78.00%	27.50

Table 2. Comparison of Temperature Data with respect to Time Variation.

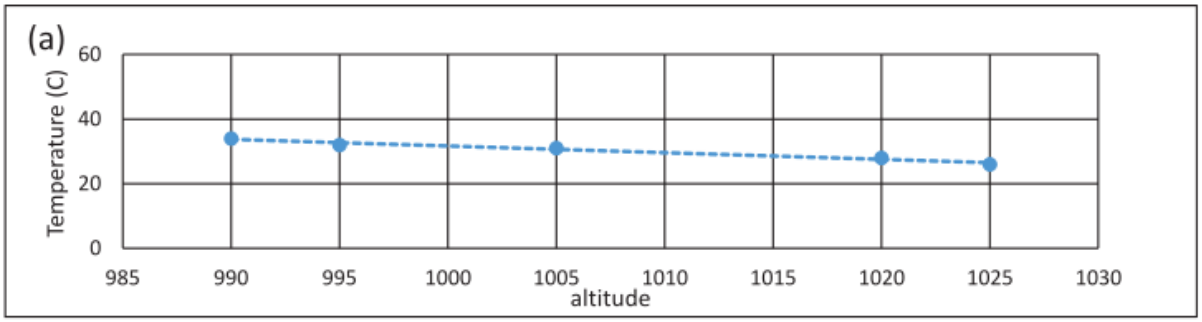
Month	Day	Temperature (average in Celsius)
July	1st	32.00
July	15th	34.50
August	1st	28.00
August	15th	33.00
September	1st	30.50
September	15th	32.00
October	1st	35.00
October	15th	31.00

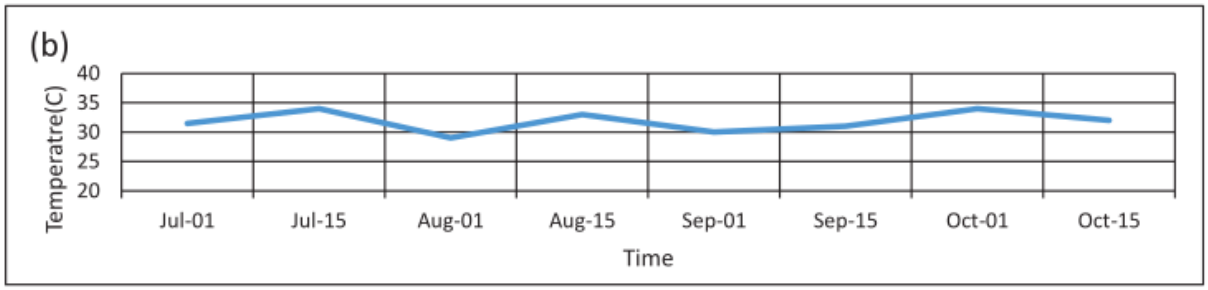
Fig. 3. (a) Graphical Analysis for Temperature versus Altitude Data from Table 1; (b) Graphical Analysis for Temperature versus Time Data from Table.

It is worth noting that among all these three parameters, temperature changes have the greatest impact on industrial applications such as production, construction, etc. October, 2015 in Kolkata. The recorded data is compared with the available web-based data and the Indian Meteorological Department's weekly meteorological report [7,8,9].

Conclusions

We have designed and implemented a cube-based weather monitoring system. This system is simple to build, portable, economical, less energy consuming and reliable. We design the hardware and data acquisition system. The recording of various weather parameters for 4 months with changes in altitude and time period have shown. Since the system does not use the Internet network, the data transfer costs little, which offers a lot of cost in terms of applications. It will have a positive impact on agriculture and production. Limitations such as the device may not communicate over long distances without a powerful





transceiver section, data records at higher altitudes with the help of a gas balloon may be problematic. Parts may be damaged by rain or prolonged use [10,11].

The results

Conclusion and discussion

The result indicates that in this article, a cubic weather monitoring system with hardware and data collection system has been designed and implemented. And the construction of this system is simple, portable, economical, low consumption and reliable. In this system, different weather parameters are recorded for 4 months with changes in altitude and time period. Its advantage is that the system does not use the Internet, so data transmission costs less and is very important in terms of application, this system will have a positive impact on agriculture and production. Limitations such as the device may not communicate over long distances without a powerful transceiver section, recording data at higher altitudes with the help of a gas balloon may be problematic. Parts may be damaged by rain or long-term use, my findings are almost the same as the researchers' findings and there is no significant difference[12].

Proposa

Promotion and use of this system due to the fact that the system does not use the Internet, and less cost in data transmission, introducing this system for use in agriculture and making more efforts to culture its use.

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