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Original Contribution

SYSTEM FOR REAL-TIME MONITORING OF TEMPERATURE, AIR HUMIDITY AND ATMOSPHERIC PRESSURE

Krasimir Kordov and Stanislav Vichev

KONSTANTIN PRESLAVSKY UNIVERSITY OF SHUMEN, SHUMEN 9700,
115 UNIVERSITETSKA STR.

E-mail: krasimir.kordov@shu.bg , s_vichev@mail.bg

Abstract: *In the present article, we present a system for monitoring the quality of air by measuring the temperature, air humidity and atmosphere pressure. The system uses Arduino microcontroller and BME280 for measuring and the obtained data is stored in database. The web based application provides real-time graphical representation of the data or the data for fixed period of time.*

Key words: *monitoring of temperature, air humidity, atmosphere pressure, Arduino, BME280*

Introduction

The use of various types of monitoring systems is an inevitable part of many spheres of our life, from industry to residential buildings, from agriculture to meteorology. Such systems are essential to maintain certain parameters of the work environment or the environment in optimal conditions. The need to monitor the environment and control the quality of the air we breathe is increasing each passing day. This is an important factor in improving the health and quality of life of every person. Such systems [1] enable prevention decisions to be made when necessary to prevent air pollution.

The main idea of creating such an independent system [2] is to ensure constant monitoring of the environment [3] by providing real-time information, which will be connected to a web-based platform that will visualize the data obtained. Users will be able to track and analyze information through graphs and charts.

Hardware components

One of the goals of the proposed real-time monitoring system is to be an affordable solution and still to be efficient. The hardware configuration is essential because it provides the connection between the sensors and the central system, converting the analog signals into electrical signals and transmitting them for processing and storage.

Arduino Uno

The Arduino UNO (Fig. 1) [4] is a microcontroller board suitable for universal use.

Fig. 1. Arduino Uno

It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, for battery or AC-to-DC adapter for independent use [5]. The power of the microcontroller can be provided via USB when it is connected a computer for software configuration with Arduino Software (IDE) provided by manufacturer.

BME280 sensor

The sensor required for monitoring of temperature, air humidity and atmosphere pressure is BME280 sensor (Fig. 2) [6].

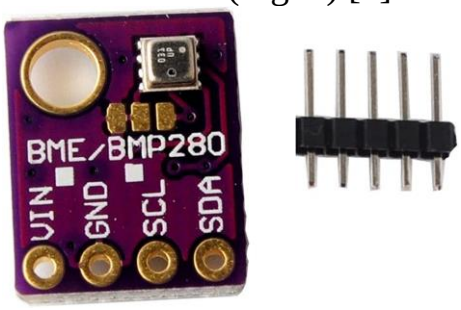

Fig. 2. BME280 sensor

The connection scheme between Arduino microcontroller and BME280 sensor is shown on Fig. 3.

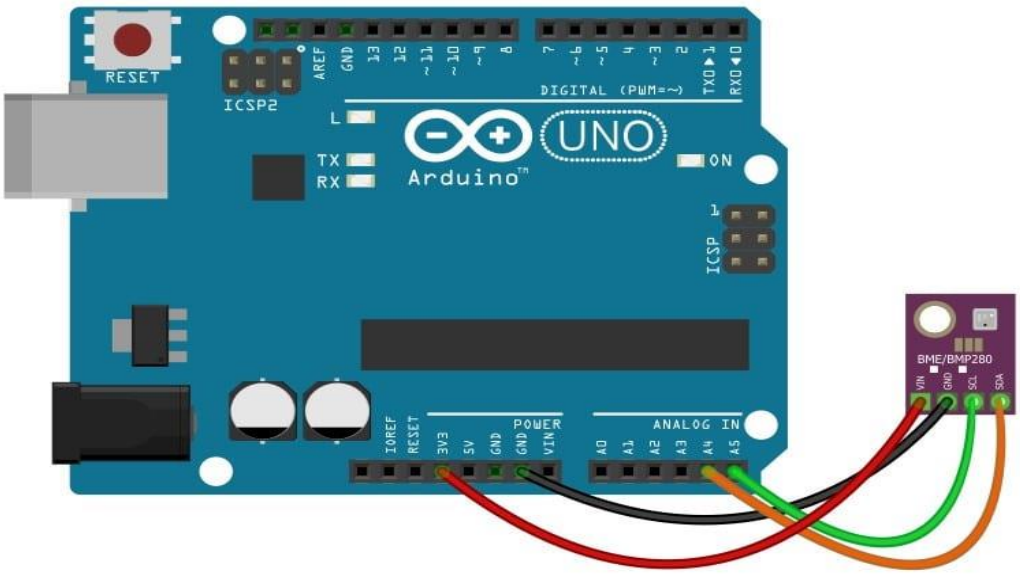

Fig. 3. Connection Arduino Uno – BME280

Software technologies

The functioning of the real-time monitoring system also requires some free for use software technologies:

Initialing of the hardware – C++ programing language is used for configuration (time intervals for reading data, type of the reading data, etc.)

Storing the data – Python programing language is used for saving the obtained data into database.

Database – MySQL database is used for distributing the values in tables for further display of the charts.

Web technologies – PHP programing language and HTML are used for creating web pages, available for real-time monitoring of the data. CanvasJS is JavaScript library used for displaying the data from the database in a form of charts.

Real-time monitoring

The web based approach is chosen because it allows the monitoring to be available for different users at the same time. The monitoring of the data is being updated immediately when new values are obtained (Fig. 4).

Fig. 4 Charts for real-time monitoring

The charts are graphical representation of the recorded values for temperature, air humidity and atmosphere pressure. The concrete values for specific date and time from the chart can be monitored by pointing (Fig. 5).

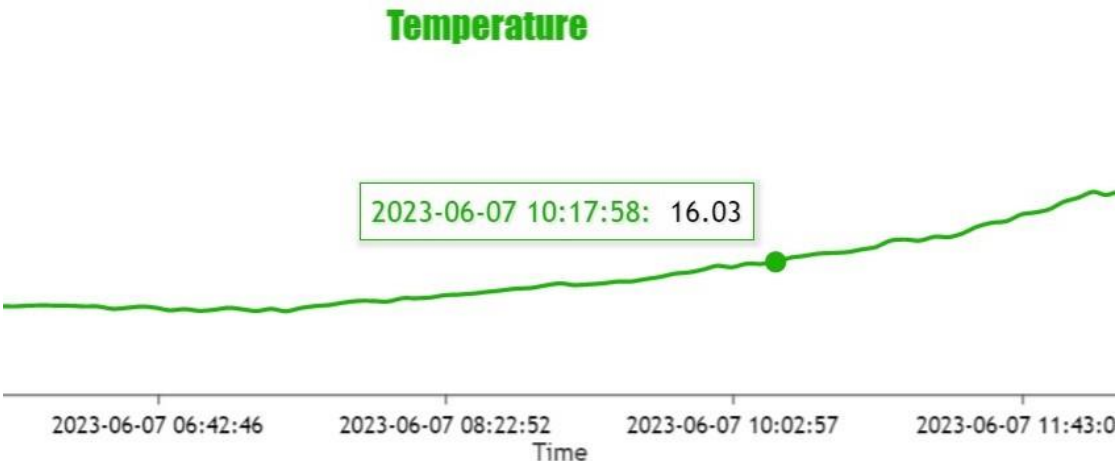

Fig. 5. Specific values from the chart

The monitoring of the temperature, air humidity and atmosphere pressure can be observed by specific period of time by custom selecting the start and the end date of the monitoring. The system automatically calculates the lowest and the highest values for the monitored period.

Conclusion

The paper presents independent system for real-time monitoring of temperature, air humidity and atmospheric pressure. The system is realized with minimum costs of hardware components including Arduino microcontroller and BME280 sensor. The system also includes web based interface for creating charts based on collected and stored data for temperature, air humidity and atmospheric pressure values. The charts are generated automatically in real time or based on specific period of time selected by the users.

Acknowledgments

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