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TEMPERATURE MONITORING SYSTEM IN IOT NETWORK BASED ON ESP8266 MICROCONTROLLER AND THINGSPEAK SERVICE

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Система моніторингу температури в мережі IoT на базі мікроконтролеру ESP8266 та сервісу ThingSpeak

В роботі обговорюється проблеми підвищення температури в Україні та необхідність її моніторингу та використання технології Інтернет речей для контролю температури. Проаналізовано перспективи Інтернет речей в найближчі 25 років. Описано схему мережі системи моніторингу температури, її елементи та принцип роботи. Створена практична макетна модель на базі цифрового датчика температури, мікроконтролеру Node MCU ESP8266, вентилятору та сервісу ThinkSpeak.

The rise in temperature in Ukraine and other countries due to global warming has led to an increase in the importance of monitoring the room temperature and maintaining it within acceptable room standards. As IoT (Internet of Things) is one of the most promising soon, it plays an important role in gathering information from sensors and transferring information to other devices that process the data received. Currently, the number of services that can analyze data is increasing. For example, services such as ThingSpeak, dweet.io, Blynk, and others.

It is expected that shortly IoT sensors will become active participants in our lives, where they will be able to exchange information and interact with each other without or through human intervention. To do this, they must respond autonomously to changes in the real world.

TechJury, a software company analyzing forecasts from various companies, predicts that by 2025, the number of devices connected to the Internet of Things will reach 64 billion. At the same time, marketing company Grand View Research predicts that the Internet of Things market will reach $ 949.42 billion in the same year.

The steadily accelerated growth in the production of various types of sensors also speaks to the growth of the Internet of Things industry. Updating the hardware and software of sensors and systems based on them is happening at a rapid pace, and it is expected that in the next 25 years the size of the sensors will be significantly reduced, and sensors themselves will be even "smarter" and cheaper, which in turn will increase the scale of their use [1].

The system consists of the following elements:

1) temperature sensor DS18B20;
2) Node MCU ESP8266 microcontroller;
3) electric relay;
4) electric fan;
5) gateway (router);
6) ThingSpeak service;
7) computer with Internet access.

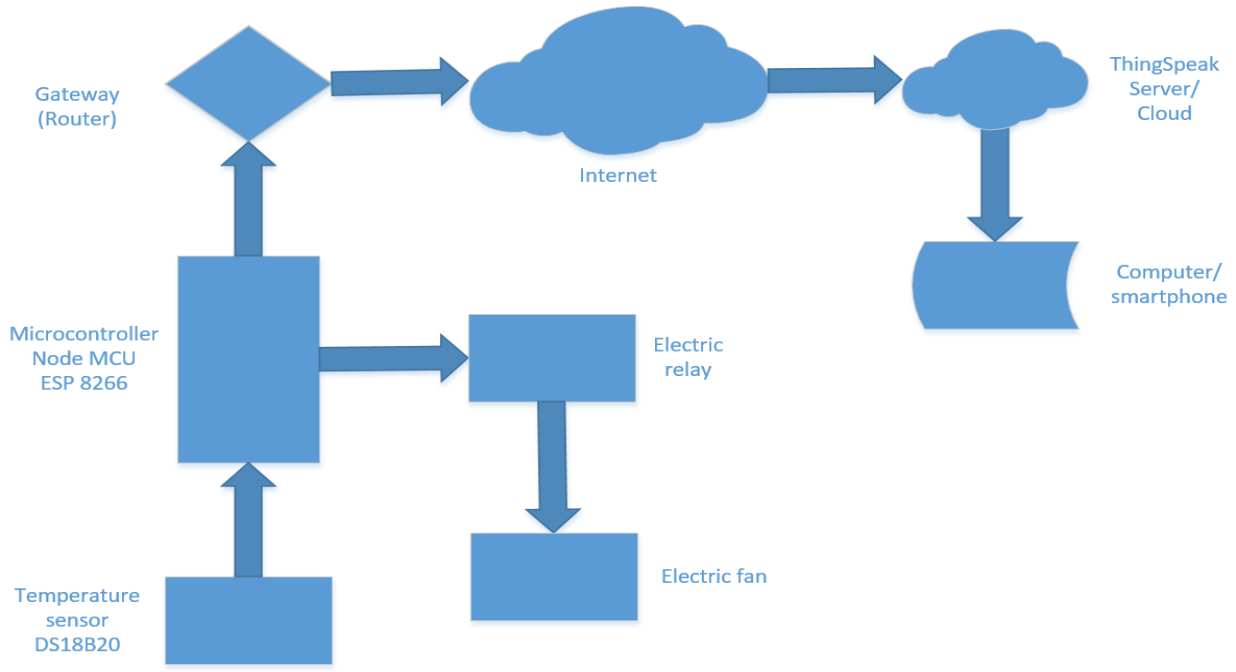

Figure 1. Block diagram of the system.

The principle of system operation is as follows. The digital DS18B20 sensor is read temperature. This sensor was selected because it has a sufficiently low measurement error, a large temperature range, and is powered by a voltage of 3.3 or 5B. Then signals are transmitted from the sensor using the 1-Wire protocol to the GPIO (General Purpose Input/Output) interface of the microcontroller with the Wi-Fi module Node MCU ESP8266 about temperature changes through the connecting wires.

A controller based on a written sketch in the Arduino IDE compares the temperature to the normal room temperature. If the temperature exceeds the threshold of normal temperature, a signal is transmitted from the microcontroller to the relay, which will switch contacts through the voltage supply and the fan will switch on. As soon as the temperature drops to normal, the fan shuts off.

The microcontroller then sends data from the Wi-Fi module through the gateway, in this case the home router via the Internet to the ThinkSpeak server.

Data from the sensor to the server is transmitted using the MQTT protocol.

The server collects and analyzes the data and builds a graph using Mathlab based on that data. Finally, we have a graph that allows us to track temperature within a few thousand kilometers of sensors.

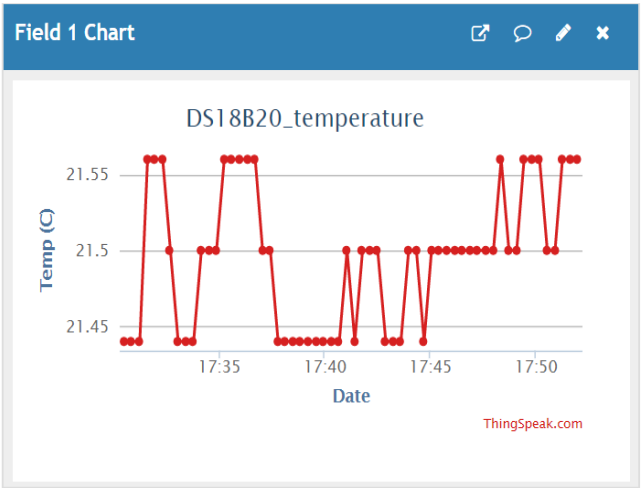

Figure 2. ThinkSpeak IoT Cloud Output result.

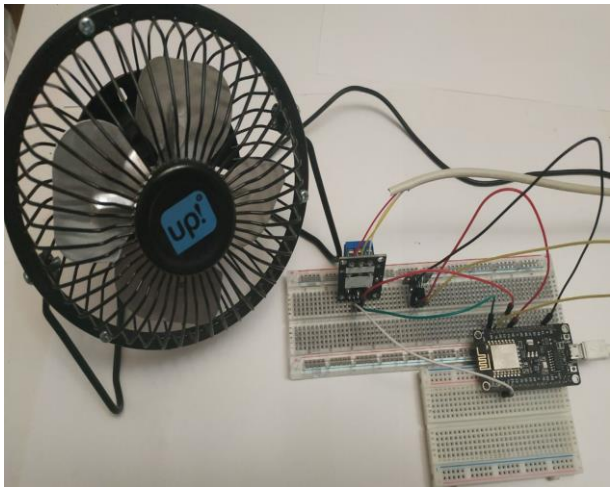

Figure 3. Hardware Setup.

Conclusion. To sum up everything, we can say that IoT will have a place. The Internet of Things will give us the ability to monitor temperature, humidity, water quality, air quality, and allow us to automate everything around us. This project can be scaled within the enterprise, the city using new data transfer technologies. In a few years, each house will have a smart fan, or air conditioning, or other appliances that will improve our lives.

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