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Research Article

DEVELOPMENT OF AN ARDUINO WIRELESS TEMPERATURE MONITOR WITH A RADIO MODULE FOR RESEARCHING SOLAR CELLS UNDER HEAT AND HUMIDITY CONDITIONS

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ABSTRACT

The article covered the process of developing a wireless temperature monitor with a radio module for researching solar cells under heat and humidity conditions. Through this, the possibility of using the equipment and panels installed in the solar power plant in the organization of technical service was considered. The possibility of improving the quality of service has increased if the workers know the temperature and humidity of the solar cells while monitoring the amount of energy produced. In this article, we have implemented wireless communication between two Arduino microcontrollers and temperature and humidity monitoring using an NRF24L01 radio module, DHT11 sensor and display.

KEYWORDS

Arduino microcontroller, solar cells, solar power plant, wireless control.

INTRODUCTION

Today, the use of solar cells is increasing with fast photos, their performance is strongly dependent on temperature and humidity, and continuous measurement of these parameters causes some inconvenience. Therefore, it helps to monitor

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environmental changes in convenient conditions using wireless communication tools.

To do this, we connect the DHT11 humidity and temperature sensor to the transmitter Arduino microcontroller with the NRF24L01 receiver module and connect the receiver Arduino microcontroller to the Arduino microcontroller with an LCD display to display the information along with the wireless receiver NRF24L01 module for temperature and humidity data.

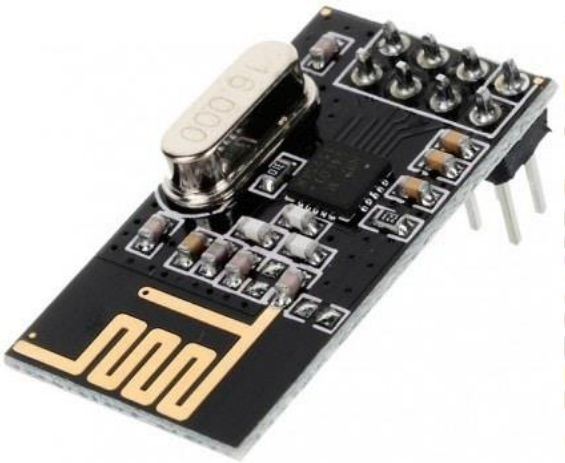

Figure 1. NRF24L01 radio module.

These radio modules are very popular among Arduino project makers. The nRF24L01 is used in a variety of projects that require wireless control because each module can transmit and receive data. These modules are inexpensive advanced models that can transmit data up to 1200 meters and can be used with any microcontroller.

We assembled two separate circuits to establish wireless communication between two NRF24L01 receiver modules. The first circuit shown in the image below is the final part of the transmitter and consists of an Arduino Uno, an nRF24 and a DHT11 humidity and temperature sensor.

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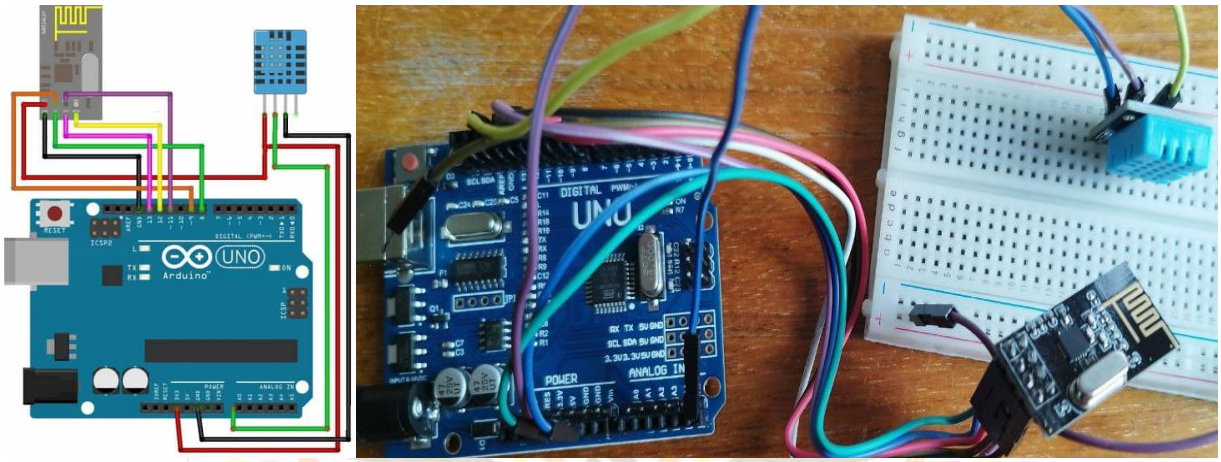

Figure 2: Schematic of a device that transmits temperature and humidity data.

The picture below shows the connection diagram and the assembled prototype of the receiver, which can be used to continuously monitor the temperature and humidity of the environment where the solar cells are located.

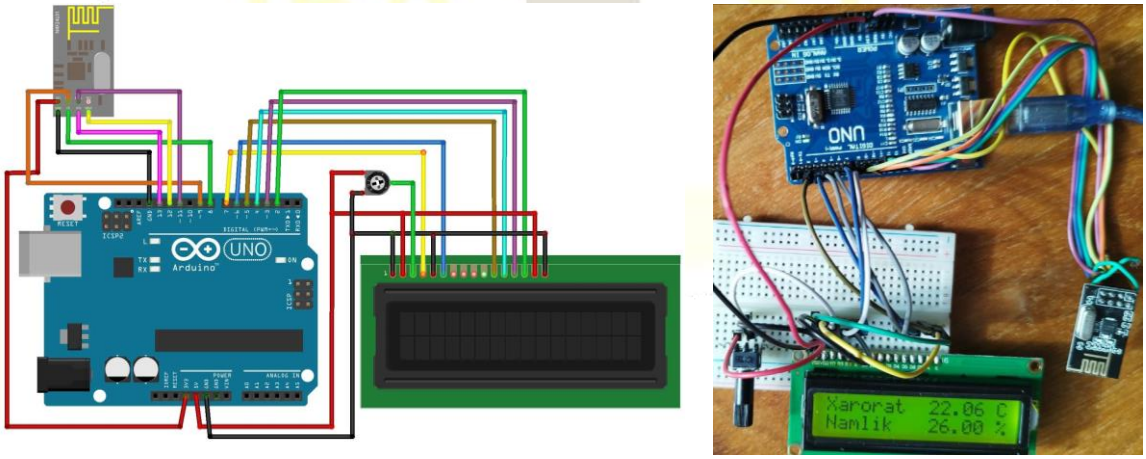

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Figure 3. Schematic of the receiver consisting of Arduino Uno, nRF24L01 and LCD display

Several factors affect the efficiency of a solar cell, including heat, dust, humidity, external temperature, and other factors that affect the recombination current in the PN junction. When a solar cell is too hot, the FIC that it produces electricity decreases, resulting in reduced efficiency and accelerated battery degradation. Humidity, in turn, can reduce efficiency. Water droplets and water vapour can collect on solar panels and reflect or refract sunlight from solar cells, reducing sunlight penetration and electricity production. Constantly hot and humid weather can shorten the life of solar cells. This applies to both crystalline silicon elements and thin film modules, but cadmium telluride (thin film) solar cells perform about 5 per cent better in hot, humid climates. Solar panel manufacturers are well aware of the effects of humidity on solar cells.

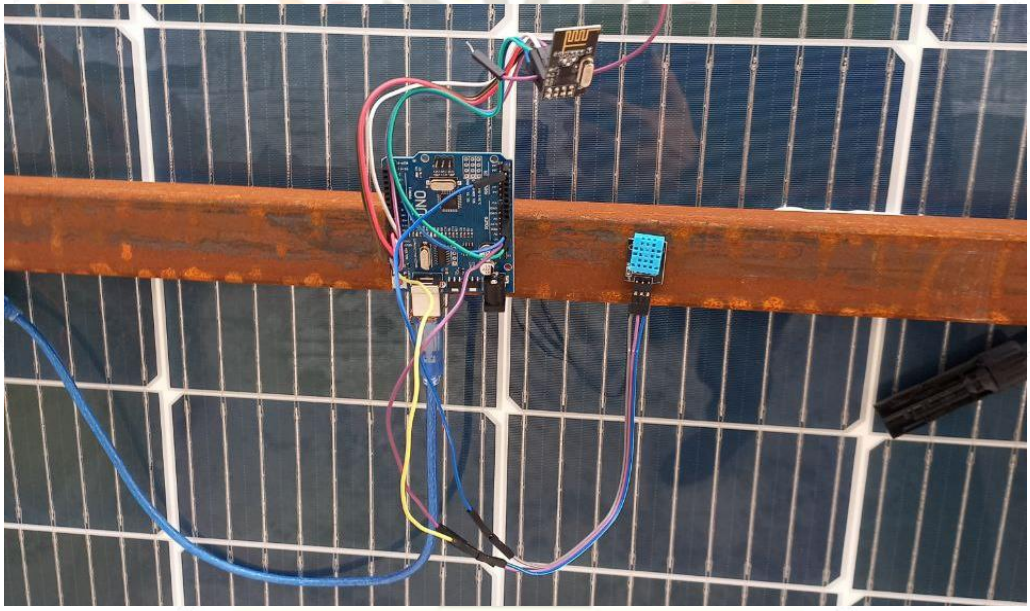

Figure 4. An 80 KW solar power station and a device for transmitting information about temperature and humidity are installed on the territory of the Fergana Polytechnic Institute.

The device developed by us is installed in the 80 KW solar power station located on the territory of the Fergana Polytechnic Institute. It allows you to use it to organize technical maintenance of the

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panels. The workers monitor the amount of energy produced and know the temperature and humidity of the solar cells. improves the quality of service.

The results showed that information about the temperature of solar cells was obtained from a distance of 100 meters. In the future, it is planned to put the obtained data on internet hosting and make it available for everyone.

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