PROJECT OF METEOROLOGICAL STATION BASED ON ESP32 MICROCONTROLLER

Božo Ilić[1*], Branko Savić[1], Jovan Vujić[2], Dragan Rastovac[1]

[1]*The Higher Education Technical School of Professional Studies Novi Sad, Školska 1, Novi Sad, Serbia, ilic@vtsns.edu.rs**
[2]*Jugoinspekt Beograd a.d., Čika Ljubina 8/V, Belgrade, Serbia*

Abstract

Weather stations, thanks to precise sensors, enable the collection of meteorological data (on temperature, humidity, pressure, etc.) in real time and their display in the form of diagrams and reports, which allows better observation of weather trends and giving forecasts. Choosing an adequate location for the meteorological station is extremely important for obtaining accurate measurement results. The location should be chosen so that it is away from trees, buildings or other obstacles, as well as from reflective surfaces such as asphalt or water that can affect the accuracy of the measurement. The weather station should be placed on a high ground to avoid errors caused by odors and exhaust gases. The ideal height is from 1.5 to 2 meters. Plastic materials that are resistant to atmospheric influences were selected for the construction of the housing. For measuring meteorological parameters, the following were selected: temperature and humidity sensor, pressure sensor, wind sensor, precipitation sensor, UV radiation sensor, solar radiation sensor, visibility and fog sensor. The weather station can also measure the level of air pollution, which enables citizens to be informed about unfavorable conditions in a timely manner. Particle sensors (PM2.5 and PM10) and gas sensors (carbon dioxide CO_2, carbon monoxide CO, nitrogen dioxide NO_2, sulfur dioxide SO_2, methane CH_4, ammonia NH_3, radon) were selected for this. Multiple microcontrollers (Arduino, ESP8266, ESP32, Raspberry Pi, etc.) can be used for a weather station project. An ESP32 microcontroller was selected, which enables wireless communication via Wi-Fi and Bluetooth. It has more GPIO pins than the Arduino UNO. It is ideal for IoT (Internet of Things) projects and remote monitoring. Since there is usually no Wi-Fi network at the location where the meteorological station is located, the GSM/GPRS SIM 800 module connected to the microcontroller via serial communication (TX, RX pin) was selected for data transmission over the Internet. A lithium-ion battery was chosen to power the microcontroller and sensors, which is replenished with electricity from the photovoltaic panel via a voltage regulator. For the needs of the metrology station project based on the ESP 32 microcontroller, the ThingSpeak platform was chosen, as a service that is often used for IoT projects based on ESP 32 microcontrollers.

Keywords: *Meteorological station, ESP32 microcontroller, Internet of Things, ThingSpeak, STEAM project.*