Environmental Monitoring IoT Device

Final Project Report

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CS3242- Microcontrollers and Applications

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1. **Scope of the Project**

The purpose of this project is to develop an IoT device to monitor temperature, humidity barometric pressure and ambient light level of an environment. A data logger server application is included to monitor the environmental parameters that is sent by the IoT device.

The CAP (Common Alerting Protocol) is used to transmit data to the remote server and the server is updated every 15 minutes from average and the standard deviation of the data over last 15 min.

Another consideration of this project is to operate the IoT device with low power and unreliable conductivity because the device is placed in a remote place. The micro-controller that is used for this device is NodeMCU ESP32. While data is sent to the server for 15 to 15 minutes, deep sleep mode can be used to save the battery life.

Self-recovery feature is included to recover the system from power, or other types of transient faults.

The data that are taken by the server can be viewed from the dashboard.

Graphical user interface, application, table, Excel

Description automatically generated

Figure 1 – data dashboard

1. **Special features**

Power saving is a special consideration of this device. Because this is an IoT device so, it is not practical to operate if it does not contain any power saving method.

I have included a power saving feature to this project.

MOSFETs are added to control power to the sensors. For each 3 minutes, power down the sensors and ESP32 goes into deep sleep mode. After 3 minutes, ESP32 wake up and power up sensors and then, read values. Then values are saved to EEPROM.

After 15 minutes, the last five value sets that are saved in EEPROM are got back and calculated the average and the standard deviation of that value sets.

The deep sleep mode in the ESP32 is not use without having a mechanism to power up and power down sensors while the ESP32 in the deep sleep mode. Because sensors consume power while the ESP32 is in the deep sleep mode. So, that’s why MOSFETs are included to control power to the sensors.

1. **High Level Design**
2. **List of components and their cost**

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Number of components | Cost (per each) | Reference |
| NodeMCU ESP-32S | 1 | Rs. 1350 | [1] |
| Wind Speed Sensor | 1 | $44.95 | [2] |
| DHT22 Temperature and humidity sensor module | 1 | Rs. 930 | [3] |
| LDR (RE0154) | 1 | Rs. 10 | [4] |
| 2N7000 MOSFET | 4 | Rs. 12 | [5] |
| BMP280 Barometric Pressure Sensor | 1 | Rs. 330 | [6] |

1. Diagram

   Description automatically generated with medium confidence**Schematic Diagram**

Figure – Schematic Diagram

\*a clear picture of the diagram added to the project folder as well.