UNIVERSITI TEKNOLOGI MARA SARAWAK

FINAL YEAR PROJECT REPORT

(EEE368)

WEATHER MONITORING SYSTEM

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ABSTRACT

In my Final Year Project 2 (EEE368), my focus culminated in the development of an innovative 'Weather Monitoring System.' This cutting-edge system relies on the utilization of an Arduino Uno microcontroller, seamlessly incorporating crucial sensors such as DHT11 for temperature and humidity, MQ-135 for gas detection, and BMP180 for atmospheric pressure readings. The Arduino Integrated Development Environment (IDE) played an important role in the coding process, enabling the seamless compilation of the code into the Uno microcontroller. This hardware and software capabilities empowers the system to efficiently process and transmit wide range environmental data to a designated cloud platform (ThingSpeak) which expected to be connected to server. The real-time weather monitoring system provides users with the ability to assess common environmental conditions, covering aspects such as ambient temperature, humidity, gas levels, and atmospheric pressure, thereby offering a comprehensive weather profile remotely and promptly. Users can conveniently access the system through a user-friendly interface, enabling them to check and retrieve up-to-the-minute weather parameters from any location with internet connectivity. This project incorporates a smart alert mechanism, ensuring that users receive prompt notifications if gas levels surpass certain thresholds or if critical weather conditions emerge, thereby offering practical guidance. This project signifies a significant leap towards more intelligent and efficient weather data collection and analysis, which shows the versatility of the Arduino Uno microcontroller and sensor integration in effectively addressing real-world challenges in weather monitoring.

Keywords: Weather Monitoring System, Arduino Uno, sensors (DHT11, MQ-135, BMP180), Arduino IDE, ThingSpeak, real-time monitoring, sensor integration.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

A weather monitoring system is a gadget or instrument that gives us weather-related data, such as temperature (measured in Celsius), humidity, barometric pressure, and so on. Weather data has always been significant since it is utilized in everything from space research to agriculture and is important in a variety of situations. For instance, monitoring the weather is crucial in the forest and egg hatching industries [1] as it gives information for further action to be taken therefore this system may be used anywhere to view the weather data.

Related to that, early meteorology was greatly influenced by the Greek philosophers, most notably Aristotle, however their predictions were probably inaccurate. Accurate forecasts were hindered by Aristotle's false beliefs that wind was not just air in motion and that west winds are cold because of the setting sun. His theories had shortcomings, but they did set the foundation for meteorology. The philosophical foundation, despite conceptual flaws, helped to advance the field of weather forecasting over time by providing a more accurate knowledge of atmospheric dynamics and temperature relationships with wind patterns. [2]

On the other hand, the first meteorological instruments were simple devices that were intended to detect temperature, humidity, and atmospheric pressure. Galileo Galilei invented the first gas thermometer, also known as a thermoscope, at the beginning of the 17th century. This was a simple gadget, just a glass tube with a ball attached at one end. Galileo warmed the ball a little before dipping the free end of the tube into water. The water rose up the tube because of atmospheric pressure when the ball's air cooled, and the internal pressure dropped. The water's height in the tube offered a way to measure the temperature. [2]

Moving on to the year 1892, the first weather balloons containing equipment to

CHAPTER 2

LITERATURE REVIEW

1.1 INTRODUCTION

A number of industries, including disaster management, transportation, and agriculture, depend heavily on weather monitoring. Real-time data capture and remote accessibility are two things that traditional weather monitoring systems sometimes lack. But new developments in microcontroller technology—the Arduino Uno, in particular—have completely changed the way weather monitoring systems are developed. This analysis of the literature examines how sensors can be integrated with the Arduino Uno microcontroller to create cutting-edge weather monitoring systems, emphasizing the microcontroller's importance, capabilities, and uses.[6]

Modern weather monitoring systems are built on the Arduino Uno microcontroller because of its cost, ease of use, and adaptability. It offers a stable framework for data processing, information transmission to cloud platforms, and sensor interface. [7] The open-source Arduino Integrated Development Environment (IDE) makes coding and compilation simple, empowering programmers to design solutions that are specifically suited to the needs of weather monitoring projects.

The DHT11 for temperature and humidity sensing, the MQ-135 for gas detection, and the BMP180 for atmospheric pressure readings are important sensors that are integrated with the Arduino Uno for weather monitoring. For an accurate assessment of environmental conditions, these sensors' high precision, dependability, and real-time data collecting capabilities are crucial. The system's ability to give thorough weather profiles that include temperature, humidity, gas levels, and atmospheric pressure is improved by the integration of several sensors.

Arduino-based weather monitoring systems store, analyze, and visualize data