Design and Implementation of an IoT- Based Weather Monitoring System for Enhanced Chicken Farm

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Abstract:- The goal of the project is to address the difficulties faced by chicken farmers in properly controlling the environmental conditions of their farms through the design and implementation of an Internet of Things- based weather monitoring system. It investigates how Internet of Things (IoT) technology can be used to remotely monitor and regulate weather conditions that are critical to the health and productivity of chicken. The overall goals of the initiative are to maximize production efficiency, enhance animal welfare, and improve management methods on poultry farms. Chicken farms are extremely vulnerable to changes in temperature, humidity, and air quality, among other environmental factors. Unpredictable or unfavorable weather patterns can cause stress, lower egg production, and higher bird mortality rates. The goal of the project is to create an affordable, user-friendly weather monitoring system that will enable farmers to keep an eye on, control, and maintain the perfect environment for their chickens. The project's primary design focus is on placing wireless sensors all throughout the chicken farm to continuously monitor important meteorological factors. Through a user-friendly online or mobile application, farmers can obtain real-time weather data and receive alerts thanks to the sensors' connection to a central IoT network. In order to adapt the heating, cooling, and ventilation systems to variations in the weather, the system also includes automated actuators. The Internet of Things (IoT)-based weather monitoring system showed considerable advantages for chicken farmers after undergoing extensive testing and deployment.

Keywords:- *Environmental, Efficiency, IoT, Weather Monitoring.*

I. INTRODUCTION

The growing demand for animal protein around the world is largely met by poultry production. However, because weather variations can have a substantial impact on the health and productivity of poultry, poultry producers confront several obstacles in maintaining ideal environmental conditions for their flocks. Stress, lower egg production, and higher bird mortality rates can result from extreme temperatures, humidity swings, and poor air quality. The idea of designing and implementing an Internet of Things (IoT)-based weather monitoring system for poultry farms comes as a revolutionary solution as a result of the realization of how important it is to address these issues. On the other hand, keeping the right temperature in cold weather is crucial to avoiding frostbite and preserving bird comfort. Real-time and farm-specific data are typically lacking in traditional weather monitoring systems. Hand measurements or broad weather forecasts are often used by poultry producers; however, these methods may not adequately capture the microclimates found inside the poultry buildings. Due to this constraint, a novel and specialized strategy that guarantees accurate and ongoing weather monitoring suited to the particular requirements of chicken farms is required. One innovative technology that solves the drawbacks of traditional approaches is the Internet of Things-based weather monitoring system. Farmers may quickly make data-driven decisions by using the system to collect real-time meteorological data straight from the poultry houses by utilizing the power of IoT sensors and connectivity. Positioned thoughtfully over the farm, wireless sensors offer a comprehensive perspective of temperature, humidity, air quality, and other critical characteristics. Farmers are therefore able to remotely monitor the weather conditions on their farm thanks to the analysis and presentation of this data via intuitive interfaces. In conclusion, a critical development in precision agriculture has been made with the design and deployment of an Internet of Things-based weather monitoring system for chicken farms. This creative approach seeks to provide a link between weather forecasts and farm-specific conditions in order to enhance poultry health, boost output, and promote sustainability and productive agricultural techniques.

II. LITERATURE REVIEW

A vital component of the agricultural sector, poultry farming supplies the world's need for high-quality protein. Nonetheless, maintaining ideal environmental conditions for their flocks presents substantial hurdles for chicken growers. Variations in climatic conditions, including temperature, humidity, and air quality, can have a significant effect on the well-being and output of chickens. The inadequacy of conventional weather monitoring techniques in delivering precise and up-to-date information relevant to farms highlights the necessity for a creative and effective solution. An extensive

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analysis of the creation and application of an Internet of Things (IoT)-based weather monitoring system intended especially for chicken farms is presented in this article. Through the provision of precise and up-to-date weather data, the initiative seeks to enable proactive farm management and enhanced wellbeing for poultry farmers.

A. Examining Contrasting Current IoT- Powered Weather Traking Systems for Agriculture

➢ *Strengths:*

- Real-Time Data: This feature allows for quick reactions to changes in the environment by providing real- time weather data. Remote Access: Farmers can increase the effectiveness of farm management by remotely monitoring weather patterns and managing environmental parameters.
- Data Analysis: To offer suggestions and insights for improved poultry wellbeing, the system examines meteorological data.

➢ *Weaknesses:*

- Limited Automation: In order to change environmental parameters, the system needs human intervention as it does not have automated environmental control.
- Complexity of Integration: Because of the current farm infrastructure, integrating actuators for automated control may provide difficulties.

B. Design Components

We are using temperature, humidity, and air quality sensors in this project to create an Internet of Things (IoT)-based weather monitoring system. Additionally, there is a very simple chip inside that converts analog to digital and outputs a digital signal that includes the humidity and temperature. The system is controlled by an MCU. The MCU's signal and input will be received by the sensor. MCU generates the signal, which software subsequently displays.

➢ *Component List*

Table 1: Component List

SL. NO	NAME	Quantity
1	NodeMcu	1P
2	Servo motor	1P
3	Lcd display	1P
4	Jumper Wire	
5	Battery	1P
6	Relay module	1P
7	Temperature sensor	
8 9	Humidity sensor Air quality sensor	
10	Humidifier	
11	Exhaust fan	

➢ *Node MCU*

For the ESP8266 WiFi SOC from Espressif, NodeMCU is an open source firmware based on Lua that makes use of an on-module flash-based SPIFFS file system. The NodeMCU is based on the Espressif NON- OS SDK and is implemented in C. Originally created as an add-on project to the well-liked ESP8266-basedNodeMCU development modules, the firmware is now a community-supported project.An IC's (Integrated Circuit) pin is known as a general-purpose input/output (GPIO). It can be an input pin or an output pin, andits behavior can be adjusted during operation.

Table 2: Node MCU Pin

Pin Names on Node MCU	ESP8266 GPIO Pin Number
D0	GPIO16
D1	GPIO5
D2	GPIO4
D3	GPIO0
D4	GPIO2
D5	GPIO14
D6	GPIO12
D7	GPIO13
D8	GPIO15
D9/RX	GPIO3
D10/TX	GPIO1
D11/SD2	GPIO9
D12/SD3	GPIO10

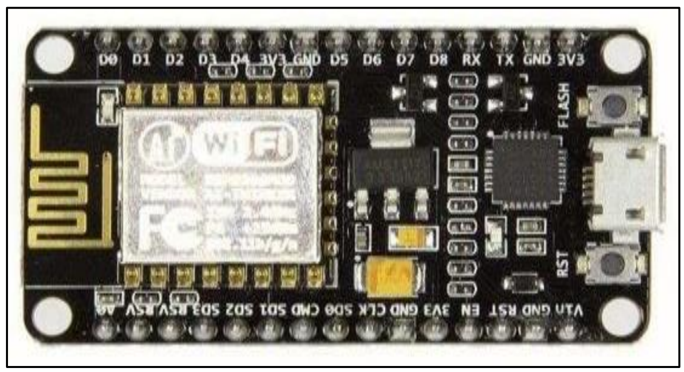

Fig 1: Node MCU

➢ *Servo Motor*

A controller's input signal can cause an electric motor, sometimes referred to as a servo motor, to spin or move to a specific location, speed, or torque. The Latin word servus, which meaning slave or servant, is the source of the English word servo.

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Fig 2: Servo Motor

➢ *Battery*

For our setup, two power supplies are required. One 12 volt DC for our pump and one for the entire apparatus. We use two 18650 Li-Po batteries that are connected in parallel to provide a 5 volt power source. These batteries only have 3.8 volts, so we also need to charge them with 5 volts. Thus, a step-up circuit is used. Which raise 5 volts from 3.5 to 4.9 volts.

Fig 3: 5V step up Circuit & 18650 Li-Po Battery

➢ *Relay Module*

A power relay module is an electrical switch that is powered by an electromagnet.

Fig 4: Relay Module

➢ *Humidity Sensors*

Electronic devices known as humidity sensors allow you to measure the relative humidity of the air, you're in and convert that information into an electrical signal that may be used for a variety of purposes.

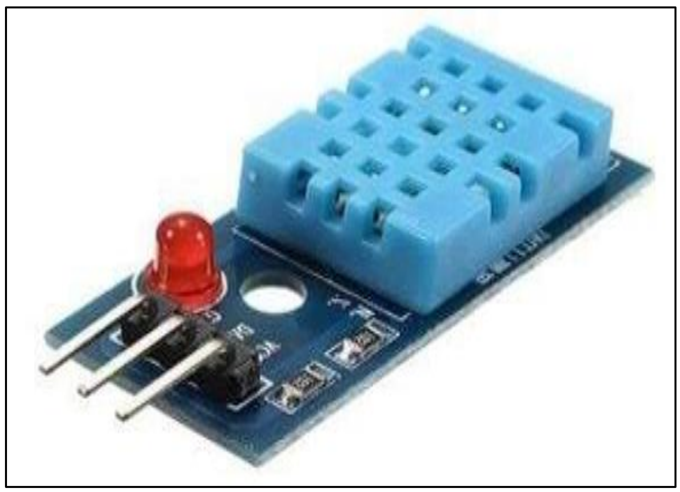

Fig 5: Humidity Sensor

➢ *Specifications*

- Product name: air humidifier booster board
- Color: as shown
- Voltage: DV 5V
- Current: 300mA
- Power: 2W
- Frequency: 110KHz
- Steel sheet diameter: about 16mm
- Silicone ring outer diameter: about 20mm
- Wire length: about 8cm
- Size: approx. 46*20*17mm/1.81*0.79*0.67″

➢ *Circuit Diagram:*

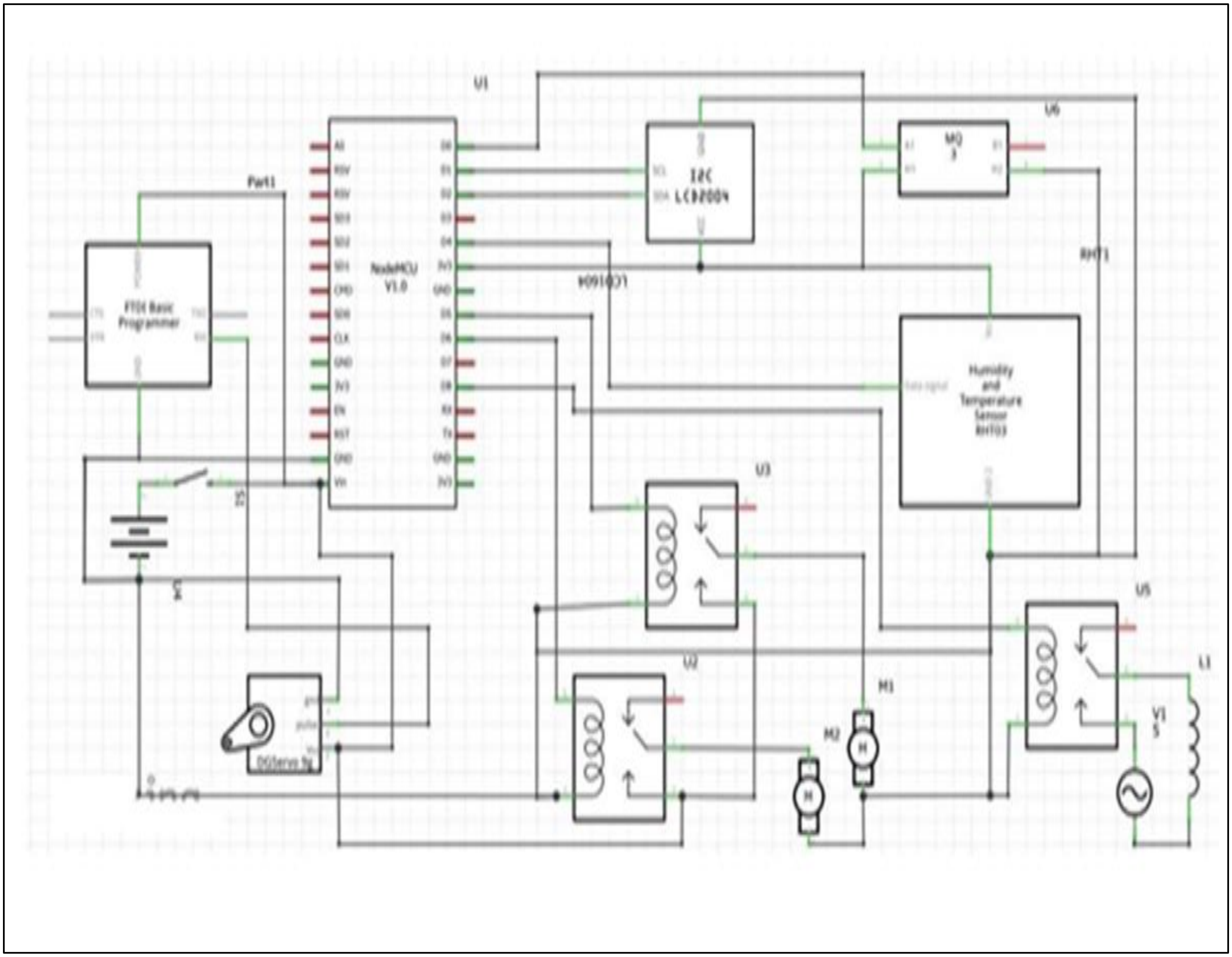

Fig 6: Circuit Diagram

➢ *Results*

The output from the functions is provided below in tabular form. Following the design and deployment of IOT-based weather monitoring for chicken farms, the project's primary observation was whether the intended output was occurring.

Table 3: Results

	Temperature	**Humidity**	**ON**	**OFF**
Exhaust Fan	T>30°C	H>70 %	ON	
	T<30°C	H<70 %		OFF
Humidifier		H>70 %		OFF
		H<70 %	ON	
Heater	T<25°C		ON	
	T>25°C			OFF

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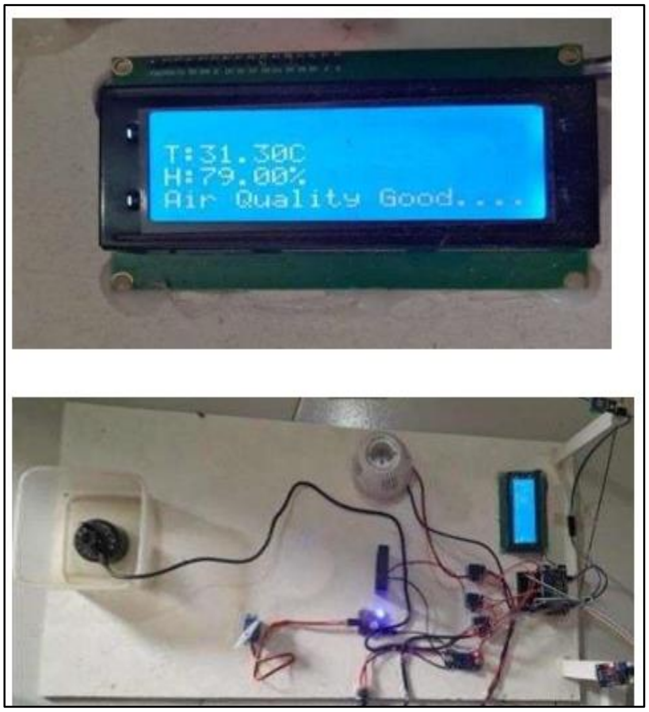

Fig 7: Result

III. CONCLUSION

The LCD display said that every device had successfully linked and was displaying the current weather conditions, including temperature, humidity, and air quality, after the device had been powered on and connected to an IOT device. The three interconnected devices—the heater, humidifier, and exhaust fan— as well as the temperature, humidity, and air quality sensors respond to the meteorological conditions of the moment. An ice bar is placed next to the temperature and humidity sensors to test the devices' ability tooperate flawlessly at preset values. The heating bulb turns on when the temperature drops below 25°C andturns off when it rises over that level. Exhaust fan is on when temperature is higher than 30°C and off whenit is lower. The humidifier is on or less off if the relative humidity is less than 70%. The air quality sensor transmits data more than 1000 times per second, and the display indicates whether the air quality is good or polluted. Even if every outcome is flawless, every mechanism occasionally experiences lagging and technological problems that cause it to take longer than expected to respond or require a connection check to ensure everything is working as it should. Furthermore, the environment plays a major role because temperature and humidity can change at different times. This can lead to problems while operating all the equipment because, in any case, if the temperature is low but the humidity is high, the exhaust fan may not work well. Despite the fact that it is not certain to occur. Therefore, if there are no technical problems or natural disasters, the project will be completed as planned and respond to requests for assistance on schedule.

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