IoT - Based temperature monitoring and automated ventilation for poultry farms

Jayapoorani S[1], Saravanan N[2], Salinth D[3], Bharath Kumar M[4], Vinoth V[5]

[1]Professor, Department of ECE, Sri Shanmugha College of Engineering and Technology, Sankari, Salem, Tamilnadu, India.

[2,3,4,5]UG student, Department of ECE, Sri Shanmugha College of Engineering and Technology, Sankari, Salem, Tamilnadu, India.

Abstract - **This proposal presents a cost-effective automated system to maintain optimal temperatures in poultry farms. Through constant condition monitoring and management of cooling components including fans and misting systems, the system maintains a constant temperature of 35°C. It reduces the need for manual intervention by automating the process with a Wi-Fi-enabled microcontroller and an inexpensive temperature sensor. Furthermore, real-time remote monitoring and control are made possible by the system's connection to an Internet of Things (IoT) platform. This feature guarantees prompt reactions to temperature changes, increases efficiency, and lowers labor expenses. By creating a steady atmosphere, the system enhances poultry health, boosts productivity, and maximizes energy use. Small and medium-sized farms can benefit from this solution's affordability and scalability, especially in developing nations where more costly options are not feasible. In the end, this automated system provides a dependable, easy-to-use method of controlling temperature, which is advantageous for both farmers and the production of poultry.**

Keywords: Temperature monitoring, automated ventilation, poultry farming, Internet of Things, and remote monitoring.

I. INTRODUCTION

The world's food supply depends heavily on poultry farming, yet preserving ideal environmental conditions is crucial to protecting bird health and increasing yield. In poultry production, temperature regulation is especially crucial because high temperatures can cause heat stress and higher bird mortality. To monitor and control temperature, farmers have historically used manual techniques, which are labor-intensive and prone to human error. The Internet of Things (IoT) and automation technologies, however, have led to the development of more dependable and effective environmental control techniques.

The purpose of this paper is to review the many methods and tools used in poultry farms to control temperature and ventilation. Additionally, it suggests a novel Internet of Things (IoT)-based automated system for real-time temperature monitoring that incorporates intruder detection techniques and boosts productivity. The device eases the strain on farmers by continuously monitoring important environmental conditions. This project uses smart sensors, microcontrollers, and Internet of Things platforms to enhance the poultry farming process. By using intelligent automation, it aims to improve farm productivity and bird health.

II. LITERATURE SURVEY

The production of food depends heavily on poultry farming, but maintaining ideal environmental conditions such as humidity and temperature remains a significant difficulty. Numerous scholars have investigated automation and Internet of Things-based techniques to successfully tackle this problem.

An IoT-based temperature control system for chicken farms was proposed by Prof. K. Ramanan et al. [1], incorporating sensors such as DHT22, MQ135, LDR, and PIR. This system maintains a steady temperature of about 35°C by using microcontrollers like the ESP32 or Arduino to monitor and manage fans, sprayers, and ventilation. Real-time monitoring and notifications are provided by cloud platforms like ThingsBoard and Firebase, which increase productivity and cut down on manpower.

A smart lighting and temperature management system was created by Prof. Dr. N. Sivashankar et al. [2] utilizing ESP32, DHT11, and LDR sensors. By automating lighting and heating/cooling changes based on sensor data and enabling remote environmental monitoring via the Blynk app, their technology improves productivity and the well-being of birds.

Using heaters and cooling fans controlled by a microcontroller, Prof. P. Prakash et al. [3] created an automatic temperature control system. By ensuring ongoing environmental monitoring and automatic reaction, this configuration lowers the need for human interaction while increasing bird comfort and productivity.

A more complete system that addresses feeding, watering, disease detection, and temperature and humidity was suggested by Mr. Pratik Landge et al. [4]. Their method seeks to optimize resources, enhance health monitoring, and modernize chicken farming through the use of IoT sensors and real-time data collection.

In their discussion of the wider ramifications of automation in chicken farming, Dr. Suma et al. [5] emphasized the advantages of this technology, including higher production, lower labor costs, and improved animal care. They also discussed the drawbacks, such as the requirement for technical expertise and the significant upfront expenses.

General environmental monitoring was the topic of other pertinent investigations. IoT-based weather monitoring systems utilizing NodeMCU and sensor networks were demonstrated by Satyabrata Mishra et al. [6] and Puja Sharma et al. [7]. These initiatives highlight how crucial cloud integration and real-time data collecting are to environmental management.

All things considered, the literature study backs up the increasing trend of IoT-based automation in chicken farms, showing how well it works to improve environmental management, lower labor costs, and improve productivity and animal welfare.

III. METHODOLOGY

Small farms occasionally cannot afford the high expenses, complexity, and limited scalability of existing automation technologies, despite their advantages. Because they are typically expensive, require highly skilled technical workers, and are primarily designed for large industrial farms, they are less practical for smaller enterprises, especially in resource-poor places. An Internet of Things-based automated system for real-time temperature monitoring is suggested as a solution to these issues:

- **Temperature Control:** To avoid heat stress and improve bird welfare, the system should automatically keep the farm temperature at or below 35°C.
- **Real-Time Alerts:** To enable farmers to take prompt corrective action when the temperature surpasses the threshold, these should have real-time monitoring and instant alert systems.
- **Energy Efficiency:** The system should be built to use as little energy as possible, which will save money and make it sustainable.
- **Scalability and Flexibility:** Both small- and large-scale poultry operations should be able to use it since it should be adaptable to different farm sizes.

The goal of this suggested solution is to construct an efficient and reasonably priced temperature control system that increases agricultural output while lowering operating expenses and manual labor by combining smart sensors, microcontrollers, and Internet of Things platforms.

Proposed System Working:

Using sensors such as the DHT11, the system continuously checks the temperature inside the chicken farm. The ESP8266 microcontroller receives real-time data from these sensors and determines whether the temperature has risen above 35°C. The microprocessor then automatically activates a cooling system, like a Water Misting Fogger System, which cools the area by sprinkling a thin mist of water. This effectively and swiftly reduces the temperature without upsetting the birds.

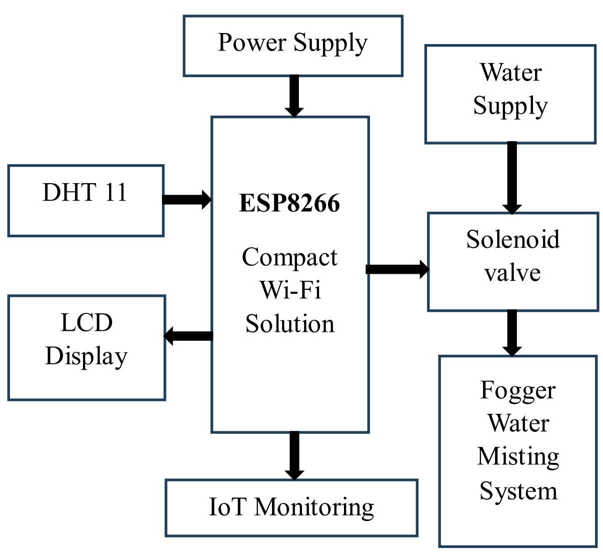

Fig. 1: Block Diagram of Proposed System

The technology also notifies the farmer by mobile if the temperature keeps rising above the safe threshold. This enables the farmer to be cognizant of the circumstances and respond appropriately. By operating automatically, the technology helps the farmer save time and prevents the hens from being overheated. Additionally, it is scalable, so it can be applied to farms of various sizes to guarantee a steady and wholesome environment for the chickens.

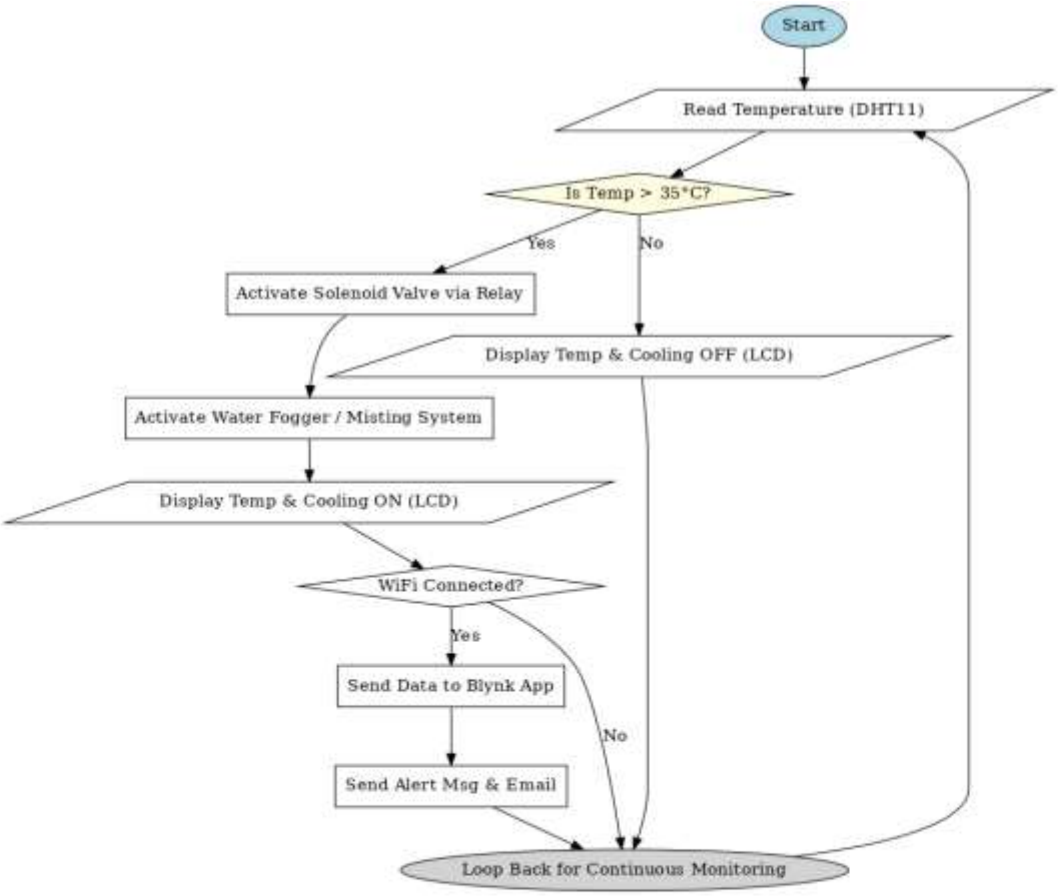

Fig. 2: Flow Chart for Proposed System

Algorithm:

Step 1: Start the system and initialize all components.

Step 2: Read the temperature from the DHT11 sensor.

Step 3: If temperature > 35°C:

a. Turn ON the solenoid valve using the relay

b. Activate fogger/misting system

c. Display temperature and "Cooling ON" on LCD

d. If Wi-Fi is connected:

i. Send data to Blynk app

ii. Send alert message and email

Step 4: If temperature ≤ 35°C:

a. Turn OFF the solenoid valve

b. Display temperature and "Cooling OFF" on LCD

Step 5: Repeat from Step 2 continuously.

Hardware Setup & Component Integration

- A DHT11 sensor to track humidity and temperature.
- A 16x2 LCD screen for readings in real-time.
- A 5V relay module to regulate fogging misting systems, an external cooling mechanism.
- A solenoid valve for accurate control of the misting.
- Actuators are powered by a 12V DC power source. The ESP8266 core microcontroller, which has integrated Wi-Fi for Internet of Things connectivity, connects and powers the components.

IoT Integration & Remote Monitoring

In the last phase, the ESP8266 is set up to send sensor data to the Blynk IoT platform:

- The temperature and humidity are shown in real time on a personalized dashboard.
- Remote users can receive alert notifications by email and the mobile app.
- Real-time data logging and historical analysis are made possible via the cloud interface, which provides insightful information about the conditions of poultry farms.

IV. RESULTS AND DISCUSSION

Important environmental factors like temperature and humidity are effectively monitored and controlled by the IoT-Based Temperature Monitoring and Automated Ventilation for Poultry Farms system. The following is a summary of the outcomes of the simulation and hardware testing:

A. Real-Time Monitoring

The system continuously monitored temperature and humidity levels using the DHT11 sensor. The values were displayed on the I2C-enabled LCD, and updates were transmitted to the Blynk mobile app in real time when Wi-Fi was available.

B. Automated Cooling Control

A relay module was integrated to control a solenoid valve based on temperature thresholds. For instance:

- If the temperature exceeded 35°C, the relay activated the solenoid valve.
- When the temperature dropped below the threshold, the solenoid valve automatically turned off.

This automation ensures better living conditions for poultry, especially during summer.

C. LCD Display Functionality

The LCD displayed:

- Temperature (°C)
- Cooling Status (ON/OFF)

This allowed farmers or supervisors to get instant physical feedback from the setup without relying on the app.

D. Optional Wi-Fi Connectivity

Even in the absence of Wi-Fi, the system continued to function effectively by displaying the parameters locally on the LCD and operating the relay.

E. Remote Monitoring (Blynk App)

When connected to Wi-Fi, data was pushed to the Blynk IoT platform. Users could:

- View live sensor readings (Temperature (°C) and Humidity (%)).
- The system sends a notification and plays an alert sound when the temperature goes above the set limit.
- It also sends email alerts with the date and time of the event.

Real-Time System Response and Hardware Integration Results

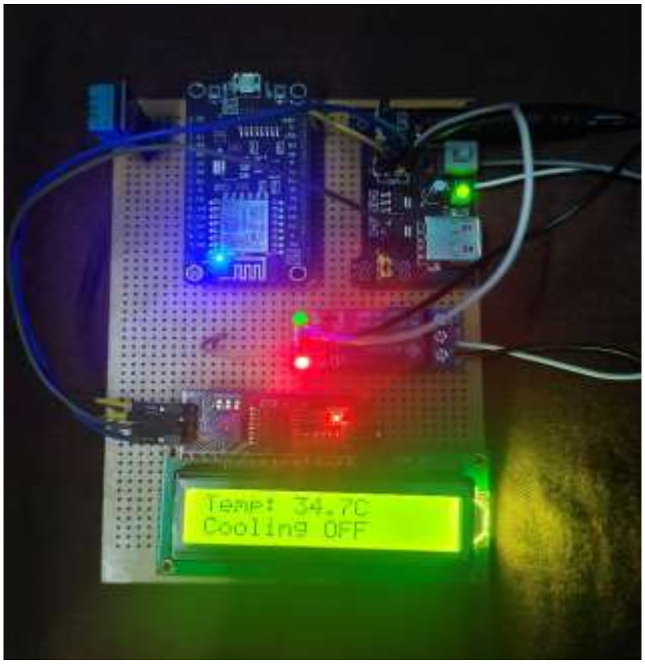

Fig. 3: Temperature Controller with LCD Display Monitoring

Fig. 4: Solenoid Valve Controller with Fogger Misting System

Cloud-Based Monitoring and IoT Data Visualization

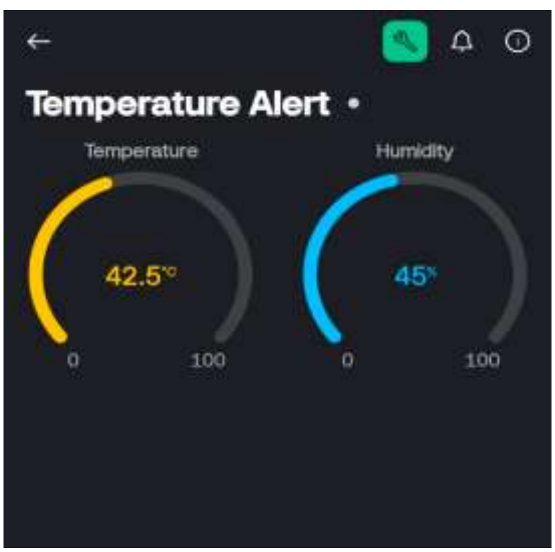

Fig. 5: Blynk Mobile App Custom Dashboard Display Monitoring

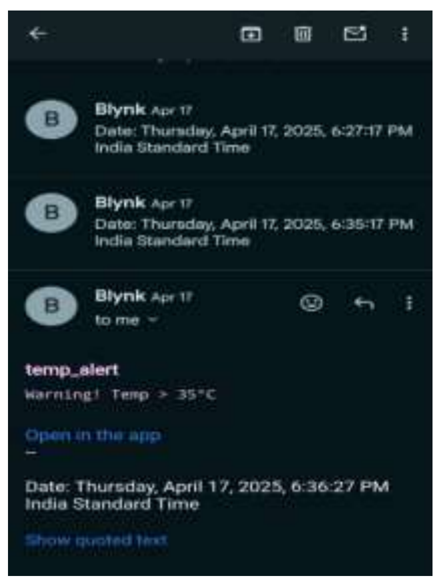

Fig. 6: Alert message through email (When Temperature > 30ºC)

Table 1. Discussion on Water and Time Needed to Reduce Temperature by 1°C in Poultry Farms

Area Covered	No. of Birds	Water Required to Reduce 1°C Temperature	Time Taken to Reduce 1°C
200–500 sq. ft	100–300 birds	5–7 liters	5–7 minutes
800–1500 sq. ft	500–1000 birds	12–15 liters	10–12 minutes
2000+ sq. ft	1500–3000 birds	25–30 liters	15–18 minutes

The above table summarizes the water requirements and time taken to reduce the ambient temperature by 1°C in small, medium, and large poultry farms using an automated misting system. As the farm size and bird count increase, both the water needed and cooling duration also rise due to higher heat generation and larger area coverage. Small-scale farms require around 5–7 liters of water and take about 5–7 minutes, while large farms may need up to 30 liters and 15–18 minutes for the same temperature drop. This comparison highlights the importance of scalable misting solutions and precise control systems to maintain optimal poultry conditions efficiently.

V. CONCLUSION

This project successfully developed an IoT-based automated temperature monitoring and control system tailored for poultry farms. Leveraging the DHT11 temperature sensor for real-time environmental data collection, the system employs the ESP8266 microcontroller to process sensor inputs and manage responses accordingly. When the temperature exceeds the critical threshold of 35°C, a water misting fogger system is automatically activated to cool the environment, ensuring a stable and healthy habitat for the poultry. Additionally, the system is capable of sending immediate alerts to farmers via connected communication platforms, enabling prompt corrective action and enhancing the overall responsiveness of farm management.

The integration of these technologies significantly reduces the need for manual intervention, minimizes human error, and supports consistent environmental conditions crucial for poultry health. As a result, the system contributes to better bird welfare, improved productivity, and more efficient resource utilization, aligning with the goals of sustainable and smart agriculture.

Future Enhancements:

- **Machine Learning for Predictive Control:** Implementing machine learning algorithms could enable the system to predict temperature trends and automatically adjust control mechanisms in anticipation of environmental changes.
- **Solar Power Integration:** To enhance energy efficiency and reduce dependency on conventional power sources, integrating a solar power system could make the solution more sustainable, especially in remote or rural areas.
- **Data Analytics and Reporting:** Adding a cloud-based analytics platform would help farmers analyze long-term environmental data, detect patterns, and make informed decisions to optimize farm operations.
- **Multizone Monitoring:** Expanding the system to support multizone monitoring and control would allow farmers to manage larger farms with varied microclimates more effectively.

By implementing these future enhancements, the system can evolve into a comprehensive smart farming solution that not only manages temperature but also supports broader aspects of livestock farming, driving innovation and efficiency in the agricultural sector.

VI. REFERENCES

[1] Prof. K Ramanan, Naveen J, Silambarasan A, Vimal M. (2025) “Temperature Regulation System for Poultry Farms Using IoT & Automation”, International Journal of Creative Research Thoughts (IJCRT), vol. 13.

[2] Prof. Dr. N. Sivashankar, Naveen Kumar M, Priyadharshini K, Pugazhenthi J. (2025) “A Smart Poultry Farm: Automated Temperature and Lighting Control System”, International Journal of Progressive Research in Engineering Management and Science (IJPREMS), vol. 05, pp: 627-630.

[3] Prof. P. Prakash, Rathish S, Mohammedshah K, Mohan Raj S, Sabareeswaran V. (2024) “Monitoring and Controlling of Temperature in Poultry Farms”, International Journal of Progressive Research in Engineering Management and Science (IJPREMS), vol. 04.

[4] Mr. Pratik Landge., Ms. Gloria Kiplinger., Ms. Vaishnavi Sakhare., Prof. Omprakash Rajankar., Prof. Bhausaheb Shinde. (2024) “Smart Poultry Farm Automation”, International Journal of Advanced Research in Science Communication and Technology (IJARSCT).

[5] Dr. Suma, Ashwin, S., Chitty Babu, S., Deepak, R., Kushal, GS. (2023) “Automation of Poultry Farm”, International Journal of Advanced Research in Science Communication and Technology (IJARSCT).

[6] Satyabrata Mishra, Abhishek Bera, Jayanta Kumar Behera Jyostnamayee Behera. (2022) ‘WEATHER MONITORING SYSTEM’, UGC Care Group I Journal

[7] Puja Sharma and Shiva Prakash. (2021) 'Real-Time Weather Monitoring System Using IoT', ITM Web of Conferences 40, 01006

[8] Abolade O. Oladayo and Adigun A. Olayemi. (2021) "Design and Implementation of an Automatic Poultry Feeding and Watering System Using Microcontroller".

[9] Isabella M. McKeon and Christine J. Nicol. (2021) "The Impact of Automation on Poultry Welfare: A Review"

[10] S. Vidhya, S. Swetha, R. Pradeep, K. Vijay, K. R. Sowmia. (2023). Recent Trends in Computational Intelligence and Its Application: Proceedings of the 1st International Conference on Recent Trends in Information Technology and its Application (ICRTITA, 22) (1st ed.). CRC Press. https://doi.org/10.1201/9781003388913

[11] J. George, L. Mathew, and A. J. George. AI and IoT Integration for Poultry Farming Automation and Monitoring, International Journal of Engineering and Technology, vol. 8, no. 2, pp. 115–120, 2022.

[12] Pradeep, R., Christopher, M., Dharsan, A. R., & Kasmith, S. (2022, March). A Certain Investigation on Intravascular Optical Coherence Tomography for Clustering Based Image Segmentation. In 2022 8th International Conference on Advanced Computing and Communication Systems (ICACCS) (Vol. 1, pp. 2013-2016). IEEE.

[13] Pradeep, R., Nithishkumar, V., Kishore, J. L., & Jamsheedh, S. M. M. (2021). Monitoring and Safety Systems for Coalmine Using IOT. International Journal of Innovative Research in Computer and Communication Engineering, 9(3), 1113-1120.

[14] M. H. Hassan, S. M. Ahmed, and K. A. Zayed. Automation of Poultry Farm Using IoT and Machine Learning, Journal of Intelligent & Fuzzy Systems, vol. 39, no. 5, pp. 6987–6998, 2021.

[15] Pradeep, R., & Aarthy, A. (2020). A Review of Internet of Things Security Mechanisms. *IJSART*, *6*(12), 213-216.

[16] N. Sharma and B. S. Gill. Real-Time Environmental Monitoring for Poultry Farms Using Wireless Sensor Networks, Procedia Computer Science, vol. 167, pp. 2035–2042, 2020.

[17] A. Kumar, R. Verma, and P. Singh. IoT Based Smart Poultry Farm Monitoring System, International Journal of Advanced Computer Science and Applications, vol. 11, no. 3, pp. 177–183, 2020.

[18] Aarthi, A., & Pradeep, R. (2020). Data Security Using Time-Based Publisher Encryption Algorithm. *International Journal of Research in Engineering, Science and Management*, *3*(11), 101-104.

[19] "The Social Implications of Poultry Automation: A Case Study of the Delmarva Peninsula" by Sarah A. Scheckter and Bruce W. Ferguson (2019).

[20] T.S. Gunawan, I.R.H. Yaldi, M. Kartiwi, and H. Mansor. Performance Evaluation of Smart Home System using Internet of Things. International Journal of Electrical and Computer Engineering (IJECE), 8(1), pp. 400-411, 2018.

[21] Haiwei Fu, Youhua Jiang, Jijun Ding, Jingle Zhang, "Low-Temperature Cross-Sensitivity Humidity Sensor Based on a U-Shaped Microfiber Interferometer," IEEE Sensors Journal, Vol. 17(3), pp. 644-649, 2016.

[22] Xinpeng Chen, Xiangdong Chen, Ning Li, Xing Ding, Xuan Zhao, "A QCM Humidity Sensors Based On GO/Nafion Composite Films With Enhanced Sensitivity," 2016 IEEE Sensor Journal, Vol. 16(24), pp. 8873-8883, 2016.

[23] Ayyappan. V, Deepika.T, Divya Dharshini.S, Elayaraja.M, Shanmugasundaram. R, "IOTBased Smart Poultry Farm," South Asian Journal of Engineering and Technology Vol.3, No.2 (2017) 77–84. Future Internet 2015, 7, 329341; doi:10.3390/fi7030329

[24] Rao, B., Rao, K., & Ome, N. (2016) 'Internet of Things (IoT) based weather monitoring system', International Journal of Advanced Research in Computer and Communication Engineering, 5(9), 312-319.