Smart Poultry Farming: Automated Monitoring and Control System Using IOT

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Abstract: The "Smart Poultry Farming" paper aims to enhance the efficiency and welfare of chickens by implementing an automated monitoring and control system. The system utilizes various sensors and relays, along with an Arduino Uno microcontroller, to maintain optimal environmental conditions and streamline the feeding and watering processes. The core components of the system include temperature and humidity sensors, which continuously monitor the climate inside the poultry house. When the temperature exceeds a preset threshold, indicating potential discomfort for the chickens, the system automatically activates a fan to provide ventilation and cooling. Similarly, if the humidity level falls below a specified range, suggesting a lack of moisture in the air, the system turns on a light to provide additional warmth and comfort to the chickens. In addition to these automatic controls, the system also features manual controls for a DC motor and a DC pump. The DC motor is used for food delivery, allowing the operator to feed the chickens at regular intervals. The DC pump, on the other hand, supplies water to the chickens, ensuring they have access to clean and fresh water at all times. Overall, the "Smart Poultry Farming" system offers a comprehensive solution for poultry farmers to monitor and manage their operations more efficiently, leading to improved productivity and animal welfare.

I. INTRODUCTION

The "Smart Poultry Farming" paper aims to enhance the efficiency and welfare of chickens by implementing an automated monitoring and control system. The system utilizes various sensors and relays, along with an Arduino Uno microcontroller, to maintain optimal environmental conditions and streamline the feeding and watering processes. The core components of the system include temperature and humidity sensors, which continuously monitor the climate inside the poultry house. When the temperature exceeds a preset threshold, indicating potential discomfort for the chickens, the system automatically activates a fan to provide ventilation and cooling. Similarly, if the humidity level falls below a specified range, suggesting a lack of moisture in the air, the system turns on a light to provide additional warmth and comfort to the chickens. In addition to these automatic controls, the system also features manual controls for a DC motor and a DC pump. The DC motor is used for food delivery, allowing the operator to feed the chickens at regular intervals. The DC pump, on the other hand, supplies water to the chickens, ensuring they have access to clean and fresh water at all times. Overall, the "Smart Poultry Farming" system offers a comprehensive solution for poultry farmers to monitor and manage their operations more efficiently, leading to improved productivity and animal welfare.

II. LITERATURE REVIEW

Aftar Ahmad Sami, Md Saidur Rahman Kohinoor, Mahbubur Rahman [2023],states that the swift expansion of smart farming is mainly attributable to the industry's noteworthy impact of the Internet of Things (IoT) and various sensors have revolutionized data collection across different farming aspects, encompassing machine performance and supply chain operations. Addressing this technological evolution, our paper introduces a comprehensive smart farming automation system, apt for multiple agricultural domains. Its primary focus is to bolster farm productivity through precise environmental monitoring and built-in analytics to interpret data trends over time, offering actionable insights and recommendations for optimal production growth. To illustrate its practical application, we specifically delve into its implementation in poultry farming, emphasizing sensors that track temperature and humidity, which are paramount for poultry well-being. Integrated features include Wi-Fi-based real-time monitoring, automation for food and water distribution, rain-protective curtain controls, and a dedicated mobile application paired with a web server, utilizing data scrapping APIs to discern and suggest optimal farming patterns based on accumulated and real-time data. This system also offers precise tracking of environmental factors and an alert mechanism,

leveraging IR sensors, to signal food storage deficits and extreme conditions. As such, this project presents itself as a feasible alternative to traditional farming practices, which typically pose environmental challenges and crave considerable labor through data-driven feedback and streamlined automation.

M. Amirthabowmiya, M. Reethika, S.R. Monisha, M. Kanthimathi, K. Sangeetha [2022], states that Nowadays, Automation plays an important role in everyday life. IoT based poultry farming is useful in situations where remote monitoring and maintenance is needed and this in turn modifies the conventional farm into a modern farm with various automated features. To improve chicken health and growth, various factors that affect the chicken health are regularly monitored. This gives an idea on how to setup Smart Poultry Farming System u IoT components. This system uses Atmega328 for interfacing with different sensors to sense the values for specific parameters and ESP8266 Wi-Fi Module to upload the data to the cloud. Various environmental factors are sensed in the poultry farm, which includes temperature, ammonia content in the air, food level and water level. The system not only monitors these parameters, but also uses a variety of automated techniques to effectively tune them. The proposed work is useful for farmers who follow traditional farming practices, as they can easily access and remotely control the poultry farm with a mobile phone, reducing manual monitoring and increasing the yield of the poultry farm.

Qurtubi, Chancard Basumerda, Melinska Ayu Febrianti, Mukhamad Nur Iskandar [2021], states that the poultry farm industry in tropical climates such as in Indonesia deals with various kinds of problems such as unstable cage temperature and cage smell. Biological conditions such as no sweat glands and fur that covers almost of its body make it difficult to remove body heat and makes the poultry has heat stress. Heat stress can cause a variety of diseases like slow growth, reduced egg production, and ends up with decreased profit. This study aims to present "Healthy Co-Fan" an innovative tool that combines temperature stabilizer and smell remover in poultry cages which will overcome unstable cage temperature problems and cage smell to increase poultry farms productivity. In data collection techniques, researchers collect secondary and primary data from journals, books, and other references. The method used for problem-solving is SWOT (strengths, weaknesses, opportunities, and threats). From the results of the SWOT analysis, an appropriate solution can be found by applying the Healthy Co-Fan. This tool will control the air temperature to be stable with the help of smooth air circulation around the enclosure. So that the output produced by the farm will be good and will increase productivity. Therefore, Healthy Co-Fan is an innovative poultry farm tool where this tool was created to overcome the problem of cage smell, unstable temperatures, and bacteria in poultry cages.

Olarn Kijpreedaborisuthi, Nathamanee Prombaingoen, Teerakiat Kerdcharoen, Theerapat Pobkrut, Wandee Aunsa-Ard [2021], states that Malodor emission from the poultry farms is a serious issue for the environment. This research proposes a fundamental study of malodor monitoring in the poultry farms using gas detecting equipment and electronic nose (e-nose) system in-lab developed for measurement and analysis of the livestock farm odors. This electronic nose consists of eight gas sensors, specifically selected for the main volatile compounds emitted from livestock farms. The main components of this e-nose include a sensor chamber, a sensor array, a microcontroller, a signal conditioning circuits and wireless sensor networks. Our e-nose machine can classify different odors and quantify the odor level. Principal component analysis and hierarchical cluster analysis pattern recognition technique were used to interpret the acquired data. In this paper, a poultry farm was studied by using a portable e-nose and an e-nose station that can perform real-time monitoring of the odor. Furthermore, a gas detector equipment was applied to measure ammonia, hydrogen sulfide and volatile organic compounds. The results have shown that electronic nose is able to identify the source of malodor, classify different odors and monitor malodor in real-time in poultry farm. Ammonia gas was found mostly inside the poultry house, where it accounts for the largest source of malodor.

III. METHODOLOGY

The proposed "Smart Poultry Farming" system aims to address the limitations of the existing system by introducing automation and real-time monitoring capabilities. By integrating sensors for temperature, humidity, and water level monitoring, the system can automatically adjust environmental conditions to ensure the comfort and well-being of the chickens. Additionally, manual controls for a DC motor and a DC pump allow farmers to easily manage food delivery and water supply. Overall, the proposed system enhances efficiency, reduces labor requirements, and improves animal welfare, leading to

increased productivity and profitability in poultry farming.

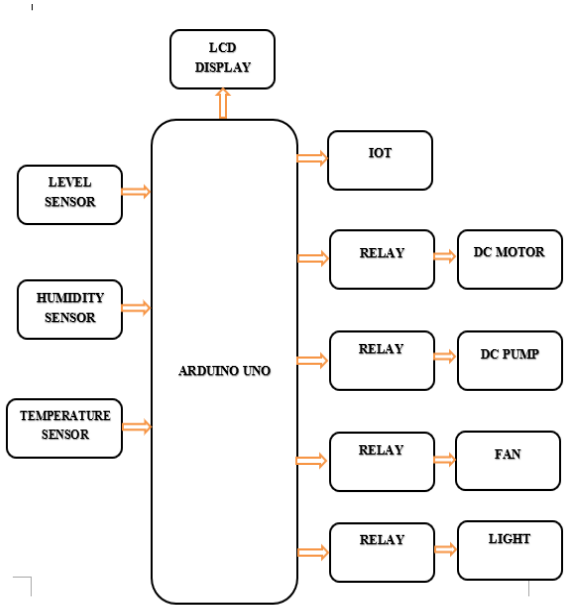

FIG 3.1 : SMART POULTRY FARMING BLOCK DIAGRAM

1.System Design: The "Smart Poultry Farming" system was designed to enhance efficiency and welfare by automating monitoring and control processes. The core components included an Arduino Uno microcontroller, temperature and humidity sensors, relays, a fan, a light, a DC motor, and a DC pump.

2.Sensor Integration: Temperature and humidity sensors were strategically placed inside the poultry house to continuously monitor environmental conditions. These sensors interfaced with the Arduino Uno microcontroller to provide real-time data.

3.Automatic Control Logic: Preset thresholds for temperature and humidity were defined based on optimal conditions for chicken welfare. When these thresholds were exceeded, the Arduino Uno microcontroller triggered the appropriate action, such as activating the fan for ventilation or turning on the light for warmth.

4. Manual Controls: The system also featured manual controls for a DC motor and a DC pump. The DC motor facilitated food delivery to the chickens at regular intervals, while the DC pump ensured continuous access to clean and fresh water.

5.Testing and Validation: The system underwent rigorous testing to ensure its functionality and reliability under various conditions. Parameters such as response time, accuracy of sensor readings, and effectiveness of control actions were evaluated.

IV. RESULT AND DISCUSSION

1.Improved Environmental Conditions: The implementation of the "Smart Poultry Farming" system led to significant improvements in environmental conditions within the poultry house. Temperature and humidity levels were maintained within optimal ranges, minimizing stress and discomfort for the chickens.

2. Enhanced Efficiency: Automation of monitoring and control processes reduced the need for manual intervention, saving time and labor for poultry farmers. The automatic activation of ventilation and heating systems ensured timely responses to environmental changes, contributing to overall operational efficiency.

3. Increased Productivity: By providing chickens with optimal environmental conditions and continuous access to food and water, the system contributed to improved productivity. Healthier and happier chickens are more likely to exhibit better growth rates and produce higher-quality products.

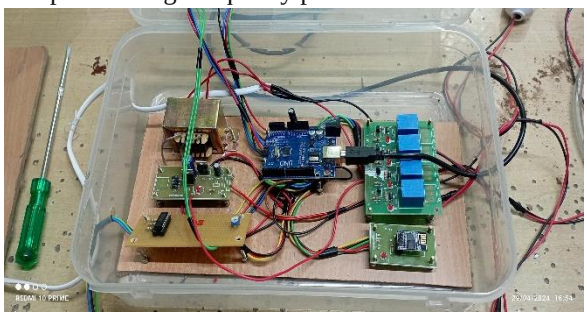

FIG 4.1: WORKING MODEL OF SMART POULTRY FARMING

Overall, the "Smart Poultry Farming" system represents a significant advancement in poultry farming practices, offering a comprehensive solution for improving both animal welfare and farm productivity. Further research and development in this area have the potential to drive continued innovation and sustainability in the agricultural industry.

V CONCLUSION

In conclusion, the "Smart Poultry Farming" project represents a significant advancement in poultry farming practices, offering a comprehensive solution for monitoring and controlling environmental conditions. By integrating sensors, relays, and an Arduino Uno microcontroller, the system automates the management of temperature, humidity, feeding, and watering, leading to several key benefits. Firstly, the project enhances efficiency by reducing the need for manual labor and optimizing resource utilization.

The automation of feeding and watering processes ensures that chickens have access to food and water at all times, improving their health and productivity. Additionally, the real-time monitoring capabilities allow for immediate response to changes in environmental conditions, ensuring that the chickens are kept in a comfortable and stable environment. Secondly, the project improves animal welfare by providing a more controlled and comfortable environment for the chickens. The automated control of temperature and humidity helps prevent heat stress and other health issues, while the customizable feeding and watering schedules allow for better management of the chickens' diet and hydration. Overall, the "Smart Poultry Farming" project offers a sustainable and efficient solution for poultry farmers to improve their operations. By implementing this system, farmers can expect increased productivity, reduced labor costs, and improved animal welfare standards. This project sets a precedent for the integration of technology in agriculture, showcasing the potential benefits of smart farming practices for the future.

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