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AUTOMATED POULTRY FEEDING USING IOT AND MACHINE LEARNING

Mrs Sudha R[1], Ranil K[2], Riyaas Kumar P[3], Sachithanantham A[4], Raghul R P[5]

[1,2,3,4,5]*Department of Electronics and Communication, Sri Shakthi Institute of Engineering and Technology, Tamil Nadu, India*

r.sudha@siet.ac.in [1], ranilk21ece@srishakthi.ac.in [2], riyaaskumarp21ece@srishakthi.ac.in[3], sachithananthama21ece@srishakthi.ac.in [4], raghulrp21ece@srishakthi.ac.in [5]

Abstract-Most of the poultry farms in Brunei are manually monitored and controlled. Temperature, humidity, air quality level, lighting, ventilation and food feeding are the important factors that are needed to be monitored and controlled. These factors are directly related to the poultry production. Currently, the mortality rate of broiler chicken in Brunei is higher than the normal rate. This research project is aim to produce healthy chickens and reduce the mortality rate of chicken to improve the productivity in Brunei by automating the process of monitoring and maintaining the temperature, humidity, air quality level and food feeder effectively using Internet of Things (IoT) and Wireless Sensor Networks (WSN). We focus on the latest developments by focusing on the hardware and software parts used to analyse the poultry data with some examples of various representative studies on poultry farming. Notably, hardware parts can be classified into camera types, lighting units and camera position, whereas software parts can be categorized into data acquisition and analysis software types as well as data processing and analysis methods that can be implemented into the software types. This project concludes by highlighting the future works and key challenges that needed to be addressed to assure the quality of this technology prior to the successful implementation of the poultry industry. A prototype was created using IoT and WSN technologies and the above parameters were tested against threshold values. When these parameters exceeded the threshold values, corrective processes are initiated automatically that can help to reduce the mortality rate of chickens in the farm. And we proposed an attention encoder structure to extract chicken image features, trying to improve the detection accuracy. The final experimental results show that by applying the attention encoder structure, Densenet can improve the accuracy of chicken maturity detection. This system also sends automatic alert notification to the user through SMS. A Web interface is also created to monitor and display these parameters.

Index Terms – Poultry farms, Quality Checking , IoT , WSN , chicken maturity detection , SMS , food feeder, data acquisition

I. INTRODUCTION

Poultry farming plays a vital role in India's agricultural economy due to the growing demand for eggs and meat. Layer chickens, which lay up to 300 eggs annually, require optimal conditions such as temperature, humidity, and air quality for healthy growth. This project aims to automate monitoring using IoT to ensure better productivity and chicken welfare. Determining the day-age of chickens is crucial for proper feeding and disease prevention. Traditional physical methods are imprecise and Labor intensive, hence the need for AI-based solutions to improve accuracy and efficiency. Day-age helps in targeted feeding, health prediction, and quality meat selection . Deep learning, a subfield of machine learning, excels in automatic feature extraction using neural networks. CNNs, RNNs, and autoencoders are among the top techniques. These models are effective in image classification, essential for recognizing chicken maturity through visual data. Image processing involves pre-processing steps like resizing and normalization. To overcome data limitations, image augmentation techniques such as rotation and flipping are used, improving classification performance with minimal training data.

I. LITERATURE SURVEY

Paper(1)-**A Review on Computer Vision Technology for Monitoring Poultry Farms** *Authors:* Nur Syazarin , Natasha Abd Aziz et al. This study reviews the role of computer vision in poultry farming, focusing on productivity metrics such as Feed Conversion Ratio (FCR) and economic management. The paper categorizes developments in hardware (cameras, lighting, etc.) and software (data acquisition, processing, and analysis). It emphasizes the need for consistent standards and future improvements in vision-based poultry monitoring.

Paper(2)-**IoT-Based Smart Poultry Farm in Brunei** *Authors:* Muhammad Faiz Haji Hambali, Ravi Kumar Patchmuthu, Au Thien Wan. This research targets reducing broiler chicken mortality in Brunei by automating key parameters like temperature, humidity, air quality, and feeding. Using IoT and Wireless Sensor Networks (WSN), a prototype system triggers automatic responses and sends alerts via SMS, email, and WhatsApp. A web interface visualizes real-time data\

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Paper(3)-**Web-Based Poultry Farm Monitoring Using WSN** *Authors:* Mohsin Murad, Yahya M. Khawaja, Ghulam Mubashar Hassan. This project developed a WSN-based poultry monitoring solution using Telos motes and commercial sensors. Data is uploaded to an online platform for real-time monitoring. Deployed in a Pakistani university farm, the system was tested for data reliability and environmental anomaly detection, showing strong potential for scalable online monitoring.

II. METHODOLOGY

The methodology adopted in this project involves the design and implementation of an automated poultry feeding system integrated with environmental monitoring using IoT and Machine Learning technologies. The system is divided into the following key modules:

3.1 System Design & Planning: The design includes hardware and software architecture tailored to monitor temperature, humidity, air quality, and food levels. These environmental parameters are crucial for poultry health and egg production.

3.2 Hardware Setup: Sensors including DHT11 (for temperature and humidity), MQ-135 (for air quality), IR sensors, and weight sensors are interfaced with ESP-32 microcontroller. A relay module controls feeding and ventilation mechanisms.

3.3 Data Acquisition: Sensor data is continuously collected and transmitted via Wi-Fi to a cloud platform (Thing Speak) for monitoring and logging.

3.4 Automation Logic: When environmental parameters exceed predefined thresholds, the system automatically triggers corrective actions like activating fans, alarms, or feed motors using relays.

3.5 ML-Based Chicken Classification: Convolutional Neural Networks (CNN) are trained to classify chicken maturity (matured/unmatured) based on image data, improving feeding schedules and breed management.

3.6 Alert & Display System: Real-time values and alerts are displayed on an LCD screen, and notifications are sent to users through web and SMS interfaces.

3.7 Testing and Validation: The prototype was tested under different environmental conditions to validate its response time, accuracy, and system stability.

III. HARDWARE COMPONENTS

4.1. **Arduino Uno**

Arduino Uno is an open-source microcontroller board based on the ATmega328P. It serves as the central controller, processing inputs from various sensors and triggering outputs. It supports multiple digital and analog pins for interfacing.

4.2. **Power Supply**

A regulated power supply provides the necessary voltage and current to power the entire system. It ensures stable operation of sensors, actuators, and the microcontroller, typically delivering 5V or 12V.

4.3. **DHT11 Sensor**

The DHT11 is a digital temperature and humidity sensor. It provides calibrated digital output and is widely used in environmental monitoring. It helps maintain optimal conditions in the poultry environment.

4.4. **Gas Sensor (MQ Series)**

The gas sensor detects the presence of harmful gases like ammonia or CO2. It outputs analog signals based on gas concentration, helping to ensure air quality in the poultry shed.

4.5. **Door Magnet Sensor**

This sensor uses a magnetic switch to detect the open or closed status of doors. It helps in monitoring unauthorized access or automation of door-related processes.

4.6. **IR Sensor**

An infrared sensor detects the presence of objects or motion. It is used for counting chickens, obstacle detection, or motion-based triggers within the poultry environment.

4.7. **RTC Module (Real-Time Clock)**

The RTC module keeps accurate track of time even when the system is powered off. It is used for scheduling feeding times or maintaining logs with timestamps.

4.8. **Relay Board**

A relay board acts as an electrically operated switch, allowing the Arduino to control high-voltage devices like motors or lights. It ensures safe switching between different power sources.

4.9. **DC Motor**

The DC motor is used to automate feeding mechanisms or operate ventilation fans. It converts electrical energy into mechanical motion, controlled via the relay or motor driver.

4.10. **LCD Display (16x2)**

The 16x2 LCD displays real-time data such as temperature, humidity, gas levels, or system status. It enhances user interaction by providing visual feedback directly on the device.

4.11.**Wi-Fi Module (ESP8266 or similar)**

The Wi-Fi module enables wireless connectivity, allowing the system to upload data to cloud platforms or send alerts. It plays a crucial role in making the system IoT-enabled.

4.12,**Buzzer**

A buzzer provides audible alerts in response to specific conditions such as high temperature, gas leaks, or system errors. It enhances safety by drawing immediate attention to critical issues.

IV. FLOWCHART FOR METHODOLOGY

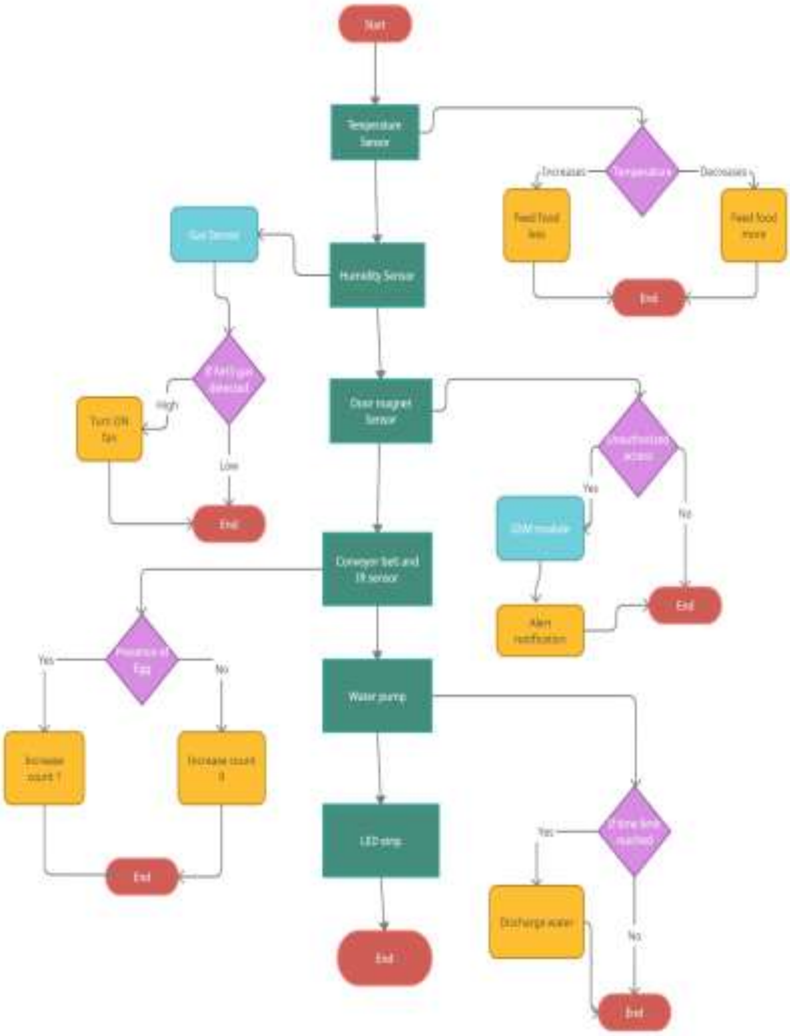

Fig 1: Flowchart for Methodology

V. BLOCK DIAGRAM

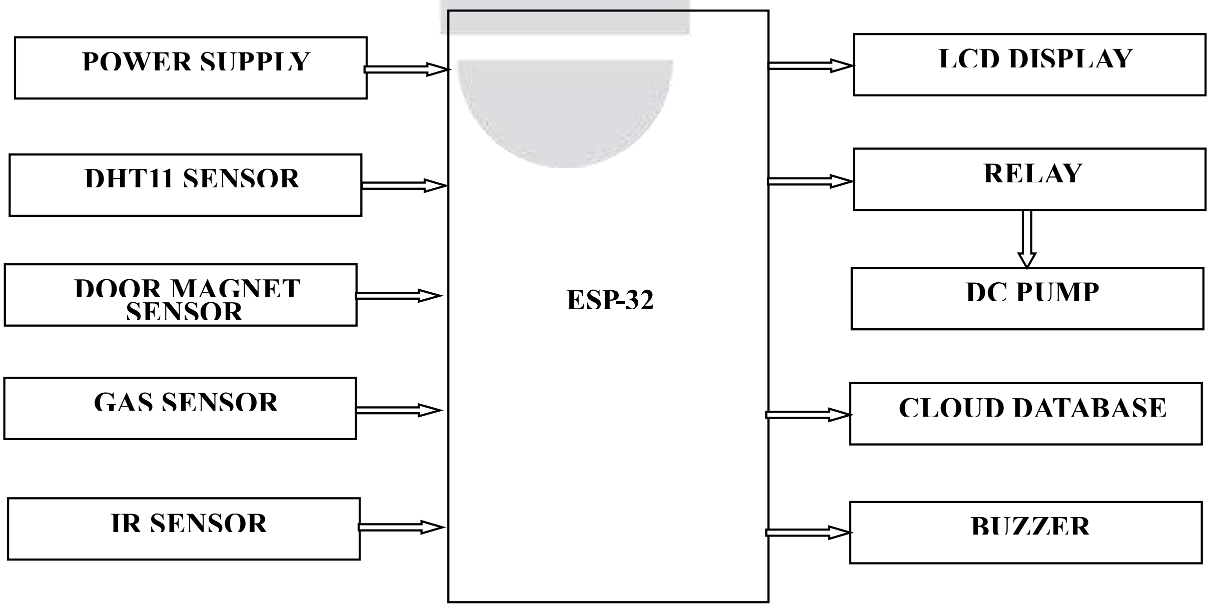

Fig 2: Block Diagram

VI. FLOWCHART

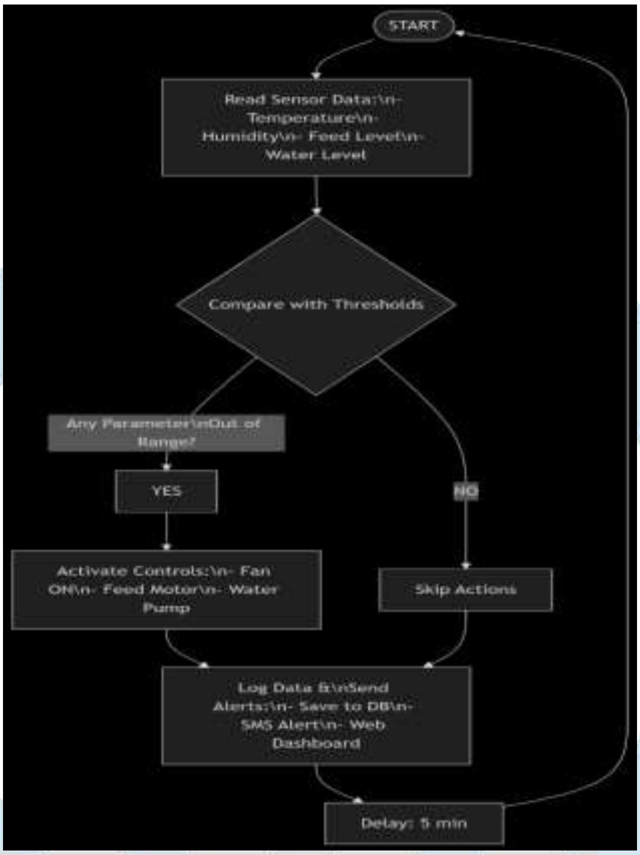

Fig 3 : Flowchart

VII. WORKING PRINCIPLE

The automated poultry feeding system functions by integrating sensors, a microcontroller (Arduino Uno), actuators, and IoT connectivity. Various sensors including DHT11 (temperature and humidity), gas sensors, IR sensors, and feed level detectors are deployed throughout the poultry shed to monitor environmental and operational parameters. These sensors feed real-time data to the Arduino for processing.

Once the Arduino receives sensor inputs, it compares the data against predefined threshold values. If any parameter exceeds or drops below the acceptable range—for example, high gas concentration or low feed level—the system automatically triggers the necessary actuators. This could involve switching on a fan, activating a feeding motor, sounding a buzzer, or opening/closing a gate. This ensures a safe and controlled environment for the poultry.

The system also uses a Real-Time Clock (RTC) module to manage scheduled tasks such as regular feeding times. A Wi-Fi module is used to upload data to a cloud platform or web dashboard, allowing remote monitoring and alerting the user via messages or notifications. This IoT integration enables farmers to take timely actions even when they are off-site.

Additionally, a machine learning model can be trained using historical data to optimize feeding schedules and environmental adjustments. For example, it can predict the feed required based on the age and growth rate of the poultry or detect early signs of unfavorable conditions. This makes the system not only automated but also intelligent and adaptive over time.

VIII. OUTPUT TABULATION

S. No.	Parameter	Value	Time	Action Triggered
1	Temperature (Â°C)	36.2	10:05 AM	Fan Turned ON
2	Humidity (%)	58	10:10 AM	No Action
3	Feed Level	Low	10:15 AM	Motor Activated for Feeding
4	Chicken Maturity	Matured	10:20 AM	Updated Feeding Schedule
5	Air Quality Index	Safe	10:25 AM	No Action

Table 1: Output Tabulation

The table provides a log of monitored parameters in a poultry management system, detailing the values recorded, corresponding times, and the actions triggered. At 10:05 AM, the temperature was recorded at 36.2°C, prompting the fan to be turned on to maintain optimal environmental conditions. At 10:10 AM, humidity was measured at 58%, but no action was necessary. At 10:15 AM, the feed level was found to be low, resulting in the motor being activated for feeding. By 10:20 AM, the chickens were assessed as matured, leading to an update in the feeding schedule. Finally, at 10:25 AM, the air quality index was deemed safe, and no action was taken. The system demonstrates an automated response setup to ensure efficient poultry care and maintenance.

IX. OUTPUT IMAGES

TEMPERATURE

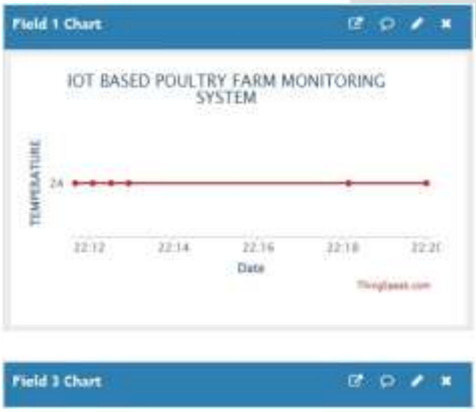

Fig 4: Temperature Vs Data Graph

HUMIDITY

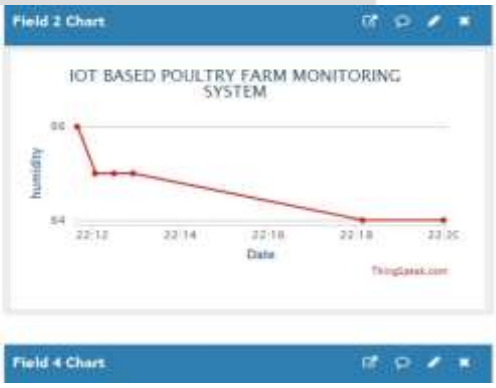

Fig 5: Humidity Vs Data Graph

EGG

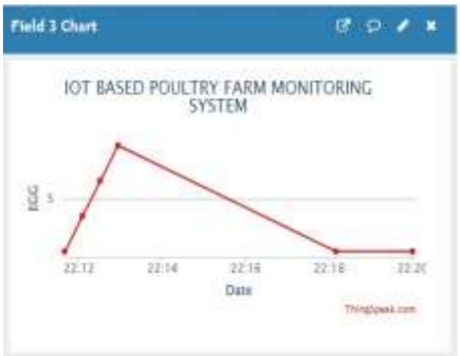

Fig 6: Egg Vs Data Grap

POLLUTION LEVEL

Fig 7: Pollution Vs Data Graph

X. PROTOTYPE

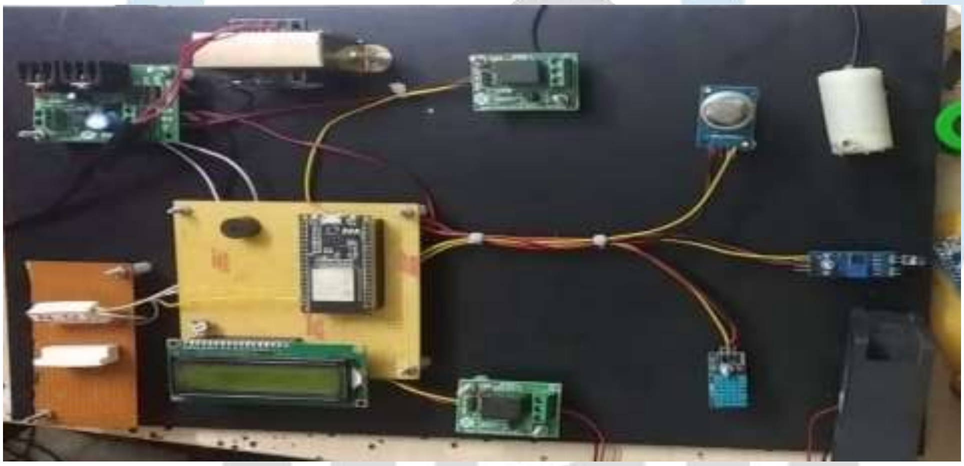

Fig 8 : Prototype of the project

XI. FUTURE SCOPE

The automated poultry feeding system presents vast potential for future enhancements and real-world applications. With further development, the integration of more advanced machine learning algorithms can enable predictive analysis for disease detection, behaviour monitoring, and customized feeding based on the health and growth stage of individual chickens.

Expanding the system with solar-powered modules can make it energy-efficient and suitable for rural or off-grid areas. Additionally, integrating computer vision through cameras can help in real-time flock monitoring, counting, and behaviour analysis, further enhancing automation and reducing manual labour.

The system can also be scaled for use in large commercial farms by adding support for mobile apps, multilingual interfaces, and data analytics dashboards. Cloud-based data storage and AI-driven insights could provide farmers with long-term trends, helping improve productivity and profitability.

In the long run, the integration of blockchain for traceability and food quality assurance can strengthen the poultry supply chain, offering transparency from farm to fork. These improvements would make the system more robust, intelligent, and aligned with the future of smart farming.

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