

Cowshed Monitoring and Automation System

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Abstract: This paper presents an automated cowshed monitoring system utilizing Internet of Things (IoT) technology, sensors, and remote-control platforms to improve livestock facility management. The system integrates an ESP8266 microcontroller with multiple sensors, including a DHT11 for temperature and humidity measurement, ultrasonic sensors for monitoring water and feed levels, and an MQ135 for air quality control. Actuators such as servo motors and relay modules automate critical functions, including gate control, temperature regulation, and lighting. The system connects to the Blynk IoT platform, allowing real-time data visualization and control via a mobile interface. This solution aims to reduce manual labor, enhance livestock welfare, and optimize cowshed operations by automating key environmental control systems.

A cowshed monitoring and automation system helps farmers take care of their cows using technology. It uses sensors and devices to check things like temperature, humidity, air quality, and light in the cowshed. This ensures the cows live in a comfortable environment. The system can also track the cows' health, spot unusual behavior, and handle tasks like feeding, milking, and cleaning automatically.

Farmers can see all the information in one place, like on a phone or computer, and get alerts if something is wrong. This system reduces manual work, improves cow health, increases milk production, and makes farming more efficient and sustainable.

A cowshed monitoring and automation system uses advanced technology to make dairy farming more efficient and productive. By employing sensors to track environmental factors like temperature, humidity, air quality, and lighting, the system ensures a healthy and comfortable environment for cows. It also monitors cow health, including activity levels, body temperature, and milk production, enabling early detection of issues.

Keywords: Sensors, ESP8266, Blynk App.

I. INTRODUCTION

Cowshed automation represents a significant shift from traditional agricultural practices toward more efficient, data-driven, and automated livestock

management systems. With the increasing demand for improved productivity and animal welfare in the agricultural industry, integrating automation through IoT technology has become critical.

Traditional cowshed management requires continuous human monitoring and manual labor to ensure optimal environmental conditions, leading to inefficiencies, delays, and human error. This paper focuses on developing an automated system that utilizes sensor networks, IoT, and mobile applications to remotely monitor and control the cowshed environment in real-time.

Managing a cowshed can be a challenging job, requiring a lot of time and effort to ensure the cows are healthy and productive. Traditional methods often involve manual work, which can lead to delays in spotting issues like poor conditions or sick cows. With the increasing demand for milk and dairy products, farmers need better solutions to manage their cowsheds effectively.

A cowshed monitoring and automation system provides a modern way to handle these challenges. It uses sensors to keep track of important factors like temperature, humidity, and air quality, ensuring the cows stay comfortable. The system also automates tasks like feeding, cleaning, and milking, making the farmer's work easier and faster.

By using this technology, farmers can take better care of their cows, improve milk production, and save time. The system also sends alerts when problems arise, helping farmers fix them quickly. This makes farming more efficient, productive, and better for the cows.

II. SYSTEM ARCHITECTURE

Hardware Components

The hardware selection in this system is based on low-power, cost-effective components that can handle real-time data processing and control:

1. ESP8266 Microcontroller: This Wi-Fi-enabled

controller is the core of the system, responsible for processing data from sensors and communicating with the Blynk IoT platform.

2. DHT11 Sensor: Measures both temperature and humidity in the cowshed to ensure the optimal environmental conditions for livestock.

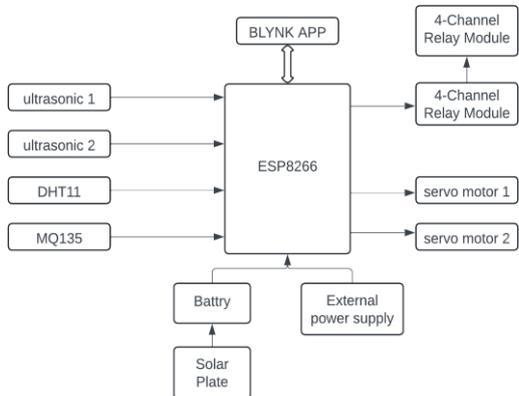


Fig. 1. Block diagram of proposed system

3. HC-SR04 Ultrasonic Sensors: Used for monitoring feed and water levels in storage tanks and feeding troughs.

4. MQ135 Air Quality Sensor: Monitors the concentration of harmful gases such as methane and ammonia, ensuring good air quality for the livestock.

5. Servo Motors (SG90): Control gate mechanisms within the cowshed, allowing automated access control for livestock.

6. 4-Channel Relay Module: Enables the switching of electrical components like fans, lights, water pumps, making them responsive to sensor data.

III. METHODOLOGY



Fig 1. Fogger system in livestock shed

The system operates in a closed feedback loop, wherein data from the sensors are continuously transmitted to the ESP8266. Based on this data, the controller triggers appropriate actions, such as turning on the fan when the temperature exceeds a threshold or refilling the water when levels drop below a set point.

IV. DATA COLLECTION AND ANALYSIS

During the testing phase, we collected data on various environmental parameters within the cowshed over a period of one week. The system was able to maintain optimal temperature and air quality throughout the testing phase, even under fluctuating external conditions. Water and feed levels were automatically monitored and replenished without human intervention. Below are some of the key results and trends observed during the experiment

A. Temperature Regulation

Temperature was a key parameter monitored by the system. The fan was activated whenever the temperature exceeded 35°C, and the system consistently maintained temperatures within the optimal range of 25-30°C, which is ideal for livestock health.

B. Water and Feed Management

The water level and feed supply were maintained efficiently throughout the experiment. The system was able to automatically refill water troughs when the level dropped below 30%, and feed was replenished before it fell below 20%. This ensured that livestock had continuous access to both resources.

V. RESULTS AND DISCUSSIONS

The cowshed automation system successfully demonstrated real-time monitoring and control capabilities. During the testing phase, the sensors were able to consistently report accurate data, and the control mechanisms, including fans and pumps, were activated based on sensor inputs. The ability to remotely monitor and adjust conditions via the Blynk app was especially beneficial for reducing the labor required for cowshed management.

We observed in this research work that drastic increase in temperature affects milk production and animal health especially in western region of INDIA where temperature goes vary high in summer. We have also discussed various previous research work relate to cooling system for livestock farms. But this system is much reliable then previous implemented system.

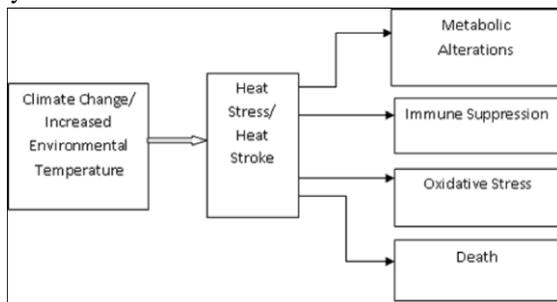


Fig. 2. Effect of climate change on cattle's life

VI. ADVANTAGES AND CHALLENGES

A. Advantages

The automation system offers several significant advantages over traditional methods of cowshed management:

1. **Reduced Labor:** The system significantly reduces the need for manual monitoring and intervention. Farmers no longer need to manually check water levels, feed availability, or environmental conditions.
2. **Increased Efficiency:** By automating resource management and environmental control, the system ensures optimal conditions for livestock, which can improve milk production and overall health.
3. **Real-time Monitoring:** The integration with Blynk allows farmers to monitor and control the cowshed from anywhere in the world, enabling them to respond to issues immediately.

B. Challenges

1. **Internet Dependency:** The system relies heavily on stable internet connectivity for real-time monitoring

and control. In remote areas with poor connectivity, this could present a challenge.

2. **Initial Cost:** While the long-term benefits of automation are clear, the initial cost of setting up such a system may be a barrier for small-scale farmers.
3. **System Failures:** Like any automated system, there is a risk of malfunction or failure. Regular maintenance is required to ensure the system operates smoothly.

C. Future Enhancements

1. **Machine Learning Integration:** By integrating machine learning algorithms, the system could predict issues such as equipment failure or resource shortages, allowing for proactive management.
2. **Extended Sensor Networks:** Future versions of the system could include additional sensors for monitoring other aspects of animal health, such as body temperature, motion, and behavior.
3. **Energy Efficiency Improvements:** While the current system includes solar panels for sustainable energy, further enhancements could improve energy efficiency and reduce power consumption.

VII. CONCLUSION AND FUTURE SCOPE

The cowshed automation and monitoring system described in this paper offers a comprehensive solution for improving the efficiency and sustainability of livestock management. By integrating sensors, IoT technology, and automation, the system enables real-time monitoring and control, reducing labor costs and improving animal welfare. Future enhancements, such as predictive maintenance and expanded sensor networks, will further improve the system's utility, making it a valuable tool for modern farming practices. In the long term, this technology has the potential to revolutionize agriculture by enabling smarter, more data-driven approaches to livestock management.

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