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IoT Based Smart Poultry Farm

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ABSTRACT: Smart poultry farms can emancipate the farmers from the traditionally tedious procedures which were outdated and time consuming. In preliminary stage, a smart poultry farm shows many distinctive features such as, automated food and water supply, egg collection, maintaining precise environmental factors etc. In this paper, Safety measures such as fire protection, anti-thief features which ensures an overall surveillance of the farm has been incorporated. Data storage through IoT is another enticing trait of this work which enables the users to Fig. out the required pre steps to adopt before any endangerments can occur.

KEYWORDS: Poultry Monitoring, IoT, Microcontroller, Temperature, Humidity Air Quality

I. INTRODUCTION

Electric railways are becoming increasingly eco-friendly due to regenerative braking, which captures energy during deceleration. However, effectively reusing this energy requires intelligent power flow control strategies. This paper delves into embedded-based control systems specifically designed for managing regenerative braking energy. By seamlessly integrating these embedded systems with railway power converters, we aim to achieve a multi-pronged approach. Optimizing energy recapture during braking is a primary goal, but this solution will also improve the stability of the railway's power supply and contribute to a significant enhancement in the overall efficiency of the electric rail system.

1.1 PROBLEM STATEMENT

- Inefficient tasks like feeding and cleaning
- Difficulty maintaining optimal conditions for bird health
- Increased risk of disease outbreaks
- Limited data for informed decision-making

1.2 OBJECTIVE

- Optimize bird health through real-time environmental control, early disease detection, and efficient feeding/watering.
- Enhance farm management with remote monitoring, potential automation, and data-driven decision making.
- Improve overall efficiency by potentially reducing waste, energy use, and disease risk.
- Use fancy gadgets to keep the temperature just right, the air fresh, and the food and water flowing automatically. This keeps your feathered friends healthy
- Check on your coop from your phone, even if you're at the beach! The system can also warn you of any problems and even collect the eggs for you
- Make poultry farming easier: Less time running around means more time for other things, like napping in a hammock (or whatever farmers do for fun). Plus, you can use the data to figure out how to get even more eggs from your happy chickens.

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- Collect and analyze real-time data on bird health, farm environment, and production metrics.
- Generate insights for optimizing flock management practices, feed rations, and overall farm performance.
- Facilitate data-driven decision making for improved farm profitability and long-term sustainability.

1.3 SCOPE AND STUDY

The scope of the project involves will investigate the application of embedded-based power flow control systems to manage regenerative braking energy (RBE) in electric rail networks. Sensor Selection Choosing the right sensors for cost-effectiveness, durability in the farm environment, and compatibility with the overall system is crucial. Automation Design Developing robust automation systems for tasks like feed and water dispensing, ventilation control, and even egg collection requires engineering expertise. Data Management & Security Secure data storage and transmission protocols are essential to protect sensitive farm data. Cloud platforms with robust security features are a must. Cost-Benefit Analysis While the initial investment can be significant, increased bird health, optimized resource use, and improved farm efficiency can lead to substantial long-term returns.

II. COMPONENTS

2.1 COMPONENTS AND SPECIFICATIONS:

- Arduino
- Gas Sensor
- Hall Effect Sensor
- Temperature & Humidity Sensor
- IR Sensor
- GSM & WIFI Module
- Dc Motor
- Buzzer
- Water Pump

2.1.1 GAS SENSOR

The onboard microcontroller provides initial heating interval after power up and then starts to measure LPG sensor output. If it found the LPG contents above settled value, it will inform the Host controller by pulling the Output Pin to High and Starts to blink an onboard status LED.

2.1.2 TEMPERATURE SENSOR

Temperature sensors are vita l to a variety of everyday products. For example, while temperature is generally sensed by humans as “hot”, “neutral”, or “cold”, chemical engineering requires precise, quantitative measurement temperature in order to accurately control a process.

2.1.3 HUMIDITY SENSOR

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. Thera to of moisture in the air to the highest amount of A capacitive humidity sensor monitors RH using a thin metal oxide strip (whose electrical capacity fluctuates with RH) sandwiched between two electrodes. The two thermal sensors conduct electricity based on the humidity in the air. The difference between the two measures humidity.

2.1.4 IR SENSOR

The white LED here is an IR LED which works as the transmitter and the component next to the IR LED is a photodiode that works as the receiver in the IR sensor. The IR transmitter continuously emits the IR light and the IR receiver keeps on checking for the reflected light. If the light gets reflected back by hitting any object in front it, the IR receiver receives this

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light. This way the object is detected in the case of the IR sensor.

2.1.5 WIFI MODULE

The ESP8266 is the most widely used Wi-Fi module. It is a low-cost microchip with a full TCP/IP stack and microcontroller capability, produced by Es press if Systems. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections.

- Operating Voltage(V): 12
- 2.4 Ghz Wi-Fi
- General-purpose input/output (16 GPIO)
- Inter-Integrated Circuit (I²C) serial communication protocol
- Analog-to-digital conversion (10-bit ADC)

2.1.6 WATER PUMP DC MOTOR

DC water pumps operate using direct current (DC) power sources and are usually driven by DC motors with voltages below 36V. These can be categorized into brushed DC water pumps and brushless DC water pumps, based on the motor type used. .

- Employing advanced brushless DC technology and contemporary design processes, these pumps boast a lifespan exceeding 20,000 hours. Operating temperatures remain low and consistent over extended periods.
- Incorporating innovative shock-absorption and noise-reduction designs, DC water pumps maintain noise levels below 40db, even with prolonged usage.
- Brushless DC pumps rectify the issues of low energy efficiency, bulkiness, and noise associated with AC pumps. Generally, DC pumps of equivalent size exhibit 2-3 times the efficiency of AC pumps.
- Intelligent Control: Unlike AC pumps, brushless DC pumps can be integrated with custom control functions, including speed regulation, temperature differential control, reverse voltage protection, dry-run protection, over-current protection, and over-voltage protection.

2.1.7 BUZZER

Magnetic buzzers operate using electromagnetic principles. When power is applied, current runs through the coil of wire inside the buzzer, which produces a magnetic field. The flexible ferromagnetic disk is attracted to the coil when the magnetic field is activated, then returns to rest when the magnetic field is off.

2.1.8 WATER LEVEL SENSOR

The water level sensor is that when it is put into a certain depth in the liquid to be measured, the pressure on the sensor's front surface is converted into the liquid level height. The calculation formula is $P=\rho.g.H+Po$, in the formula P is the pressure on the liquid surface of the sensor, ρ is the density of the liquid to be measured, g is the local acceleration of gravity, Po is the atmospheric pressure on the liquid surface, and H is the depth at which the sensor drops into the liquid.

- Operating Voltage – 5V DC
- Working Current – <20mA
- Sensor Type – Analog
- Detection Area – 40 x 16mm
- Mounting Hole Size – 3mm
- Safe Operating Temperature – 10°C to 30°C

2.1.8 BATTERY

Stores the electrical energy generated during regenerative braking for later use. The battery can be charged during

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braking and discharged during acceleration or when additional power is required. There are many different types of 12v batteries, including lead-acid, flooded lead-acid, sealed maintenance-free (SMF) lead-acid, gel cell, absorbed glass mat (AGM), and lithium-ion. Each type of battery has its own advantages and disadvantages.

- Voltage Per Unit: 12 V
- Nominal Capacity: 150Ah at a 10-hour rate to EOD of 1.8V per cell at 25°C
- Maximum Discharge Current: 1500A (5 sec)
- Recommended Max Charging Current: 45A
- End of discharge voltage: Varies from 10.5V to 10.8V

III.DESIGN OF A IOT BASED SMART POULTRY FARM

3.1 WORKING

The ATmega328 serves as the central processing unit to control and coordinate the various components of the system. Temperature sensor Monitors the temperature inside the poultry farm to ensure it stays within the optimal range for the health of the poultry. Humidity sensor Measures the humidity levels within the poultry farm to maintain a comfortable environment for the poultry. Fire sensor Detects any signs of fire or overheating within the farm to prevent potential disasters. Gas sensor Monitors the levels of gases such as ammonia, carbon monoxide, and methane, which could pose a threat to the health of the poultry. DC Motor Controls ventilation systems or feed dispensers to regulate airflow and provide food to the poultry. Wi- Fi modules Enables communication with external systems or remote monitoring/control of the poultry farm via Wi-Fi connectivity. LCD Display Provides real-time feedback to the farmer about the current conditions inside the poultry farm, such as temperature, humidity, gas levels, and any detected alarms.

3.2 APPLICATION

- Better environmental control for bird health.
- Automatic feeding and watering systems for efficiency.
- Improved egg collection and potential health monitoring.
- Enhanced biosecurity to protect the flock.
- Data-driven decisions to optimize farm operations.

3.3 ADVANTAGES

- Improved bird health and well-being: Sensors can continuously monitor environmental factors like temperature, humidity, and air quality. This allows farmers to automatically adjust ventilation, heating, and cooling systems to create optimal conditions for bird health, reducing stress and disease outbreaks.
- Increased egg production and weight gain: By maintaining ideal environmental conditions, smart poultry farms can promote better growth and egg-laying in birds.
- Reduced labor costs: Automation of tasks like feeding, watering, and waste removal can significantly reduce the need for manual labor. This frees up farmers' time to focus on other aspects of their business.
- Enhanced biosecurity: IoT systems can be used to monitor for signs of disease outbreaks, allowing for early intervention and preventing the spread of illness among birds.

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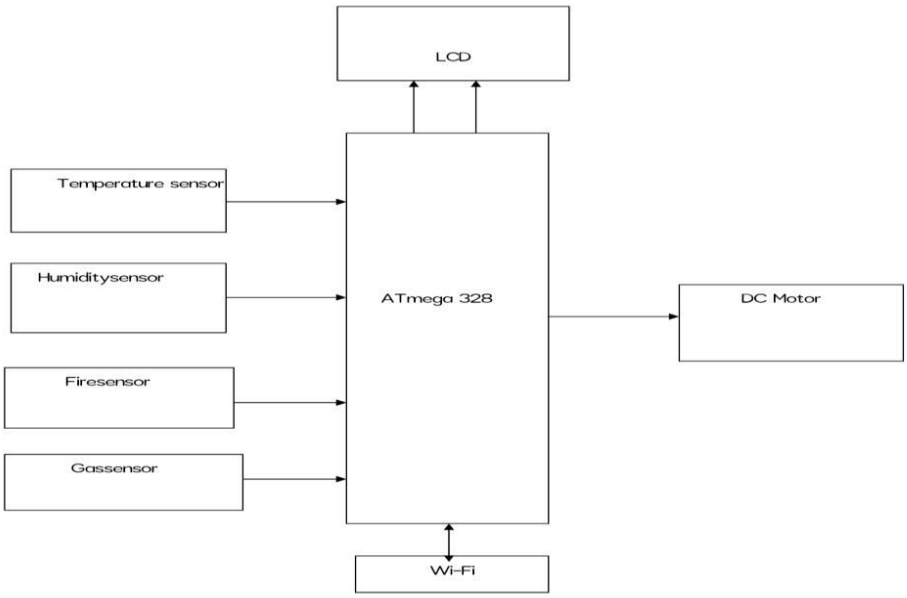
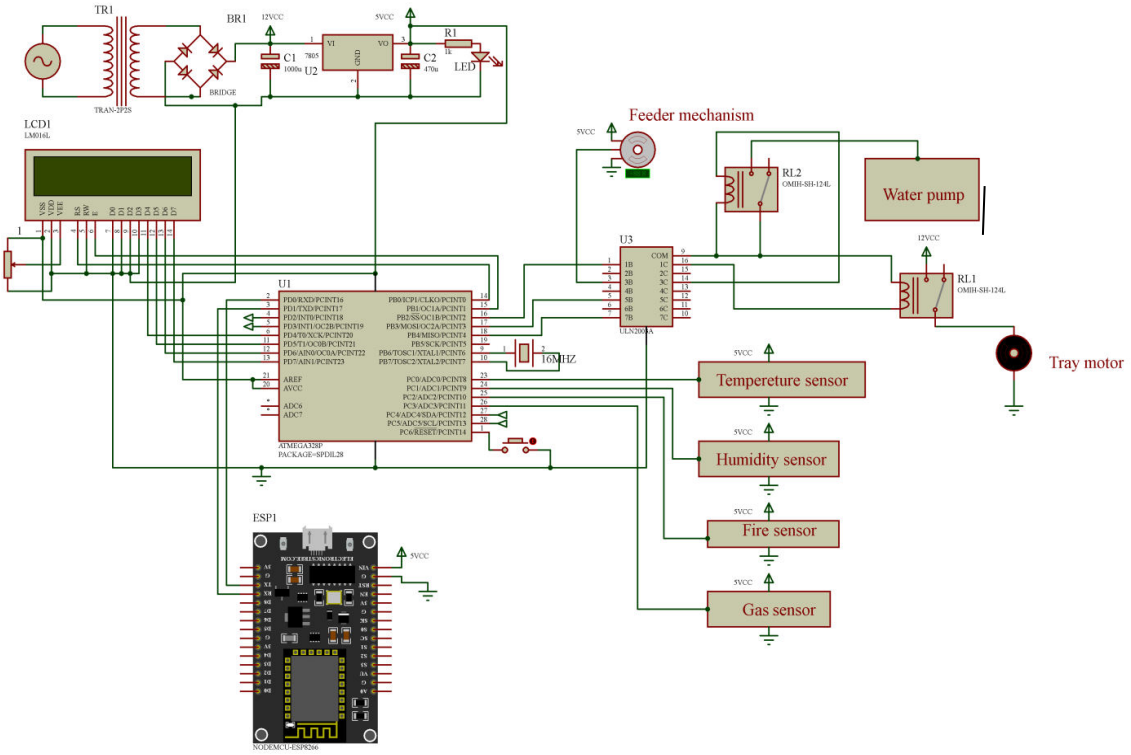
3.4 BLOCK DIAGRA



3.5 CIRCUIT DIAGRAM



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3.6 DISADVANTAGES

- Initial Cost: Setting up an IoT system requires investment in sensors, controllers, software, and potentially new infrastructure. This can be a significant upfront cost, especially for smaller farms.
- Complexity: These systems can involve various technologies working together. For some farmers, managing and troubleshooting these systems can be complex, especially if they are not familiar with technology.
- Reliability: The system relies on a constant internet connection and proper functioning of various sensors and electronics. If there are any breakdowns or connectivity issues, the automated systems may not function properly, potentially harming the birds.
- Data Security: IoT systems collect and transmit data, making them vulnerable to cyberattacks. Ensuring the security of this data is important.
- Limited AI Capabilities: While IoT systems can automate tasks and collect data, advanced decision-making often requires human intervention.

IV. RESULT AND DISCUSSION

An IoT-based smart poultry farm goes beyond simple automation. It ushers in a new era of data-driven poultry management. Sensors continuously collect information on critical environmental factors like temperature, humidity, ammonia levels, and lighting. This real-time data empowers farmers to Fine-tune environmental conditions: The system automatically adjusts ventilation, heating, and cooling systems to maintain the optimal environment for bird health and growth. This reduces stress, improves feed conversion rates, and minimizes the risk of respiratory illnesses. Optimize resource utilization: Smart feeders dispense feed based on actual bird requirements, eliminating waste and reducing feed costs. Similarly, water delivery systems can be automated to prevent overflows and maintain proper hydration levels. Proactive disease management: Advanced sensors can detect subtle changes in bird behavior, vocalizations, or feed intake that might indicate an impending illness. Early detection allows for prompt intervention, minimizing disease outbreaks and associated mortalities. Empowering Farmers Remote monitoring capabilities are another game-changer. Farmers can access real-time data and control systems from anywhere via a smartphone or tablet. This translates to: Improved biosecurity: Remote monitoring allows farmers to identify and address potential security breaches promptly, safeguarding their birds from external threats. Reduced labor costs: Automated systems take care of repetitive tasks like temperature control and feeding, freeing up farmers' time to focus on strategic planning and flock management. Data-driven decision making: Historical data analysis can reveal trends and patterns, enabling farmers to make informed choices about feed types, flock sizes, and breeding strategies. This data-driven approach fosters continuous improvement and farm optimization.

V. CONCLUSION

In This Paper, An IOT Based Smart Control System For A Poultry Farm Was Designed And Constructed. The System Has The Ability To Monitor And Control Various Environmental Parameters In Real Time, In The Poultry House, With No Human Intervention. Besides, It Could Generate A Report Which Is Uploaded To The Cloud And Also Send A Text Message To The Farmer About The Conditions Of His Farm On A Registered Phone Number. Climate Exerts Constraining Influences On Livestock Production Through Its Associative Effects Of Humidity, Temperature, Precipitation And Air Movement, Hence The Need To Properly Monitor These Parameters.

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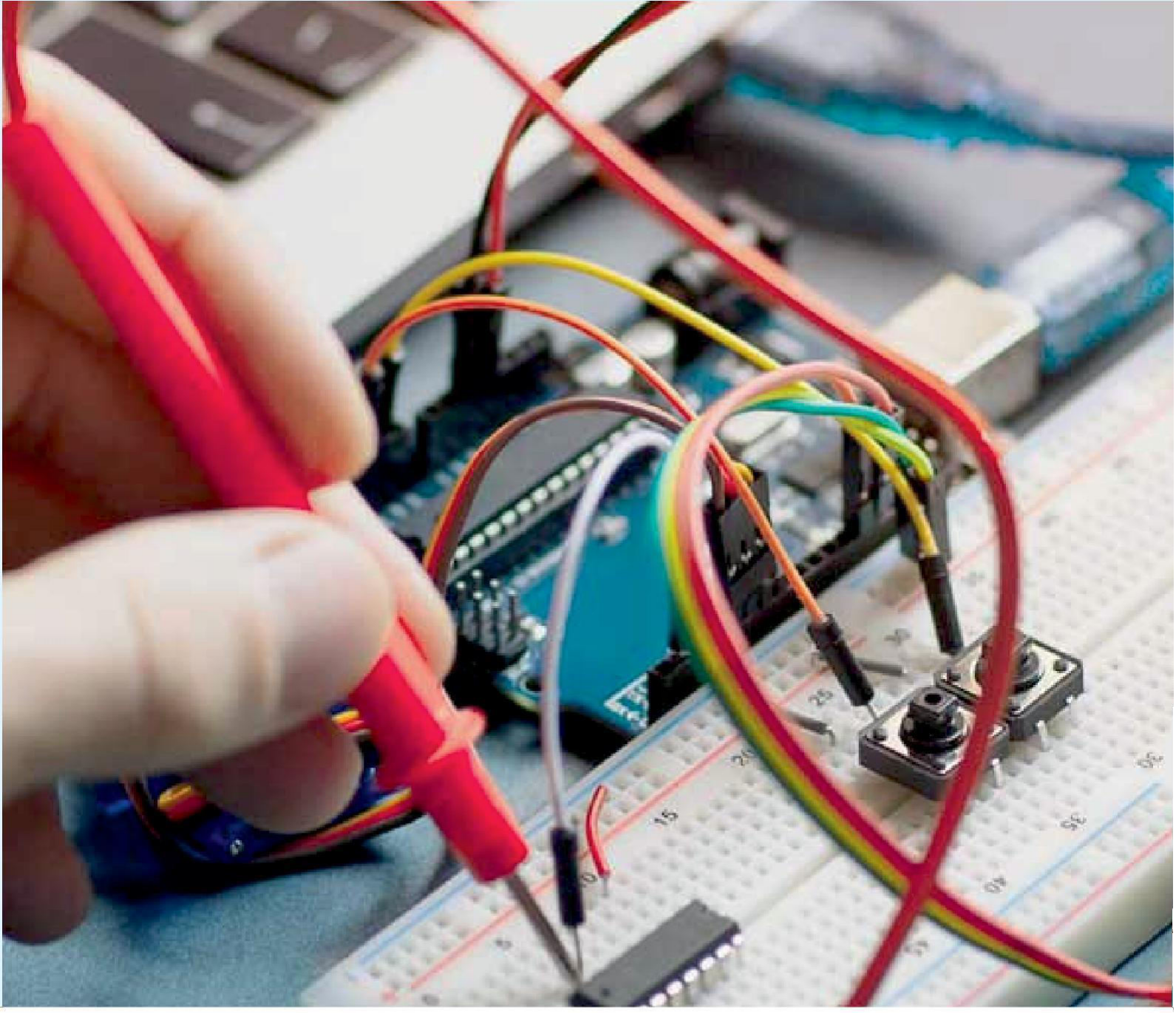

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