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IOT Based Onion Storage System "A Review Paper"

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Abstract*: The agricultural sector has seen significant advancements with the integration of Internet of Things (IoT) technologies, aiming to enhance productivity and sustainability. This research focuses on the development and implementation of a Smart Farming Monitoring System (SFMS) for onion storage, utilizing IoT to mitigate the challenges of onion bolting and improve storage conditions. Onion bolting, a premature flowering process, detrimentally affects the quality and yield of onion crops. The proposed SFMS aims to provide a technological solution to monitor and control environmental factors critical for onion storage, thereby reducing bolting instances and improving onion production in storage environments*

Keywords: Smart Farming Monitoring System

I. INTRODUCTION

The Onion Storage System is a groundbreaking solution for agricultural storage. It integrates hardware components with cloud-based monitoring to extend shelf life and reduce spoilage, resulting in a higher economic viability of onions. At the core of the Onion Storage System is the Arduino microcontroller which orchestrates the functions of the various sensors and actuators.

The DHT11 temperature and humidity sensor monitors the storage environment to prevent premature decay, while the gas sensor detects the presence of ammonia, which can accelerate spoilage. When ammonia levels surpass safe thresholds, the system triggers alerts and initiates corrective measures.

Technical Requirements

The following are requirements

- Arduino Microcontroller
- DHT11 Temperature and Humidity Sensor
- Gas Sensor
- Moisture Sensor
- Display Module
- Exhaust Fan
- Peltier Plate
- Buzzer
- Humidity Sprayer
- ESP8266 Wi-Fi Module

II. METHODOLOGY

The methodology section outlines the various techniques employed to present the results. This involves the utilization of Wi-Fi for connecting and interfacing with the hardware components. The hardware setup includes a range of sensors such as Temperature sensors, Humidity sensors, Moisture sensors, along with an Arduino board, Wi-Fi module ESP8622, and Weather Temperature sensors.

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Temperature sensors are instruments designed to measure temperature by converting it into an electrical signal. One common example is the thermocouple, which consists of two different metals that produce an electrical voltage directly related to temperature changes. Another widely used temperature sensor is the LM35, which offers temperature readings in an electrical output that correlates with the temperature in Celsius.

Compared to thermistors, the LM35 provides more accurate temperature readings and generates a higher output voltage than thermocouples, eliminating the need for voltage amplification.

The output voltage of the LM35 is directly proportional to the Celsius temperature, with a scale factor of 0.01V/°C. The Humidity sensor operates at a voltage of 3.3 V-5 V and can measure humidity within a range of 20 percent to 95 percent, with an accuracy margin of +/- 5 percent. It can also measure temperature from 0 to 50 degrees Celsius with an error margin of +/- 2 degrees.

The DHT11 digital temperature and humidity sensor module integrates both temperature and humidity readings into a single calibrated digital signal output. The Arduino platform, known for its open-source and user-friendly hardware and software, enables the reading of inputs such as light on a sensor and converts it into outputs like activating a motor, lighting an LED, or posting data online. Through the use of an Android application and Wi-Fi connectivity, the system interfaces with the hardware components to display the results, employing various hardware such as Temperature sensors, Humidity sensors, Moisture sensors, Arduino, Wi-Fi module ESP8622, and Weather Temperature sensors.

In essence, the methodology employs a sophisticated array of sensors and the Arduino platform, interconnected through Wi-Fi, to accurately measure and report environmental conditions such as temperature and humidity.

II. BLOCK DIAGRAM AND IMAGES

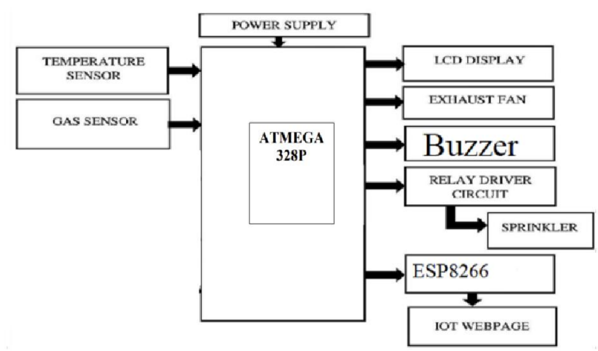

Figure 1: Sensors Block Diagram

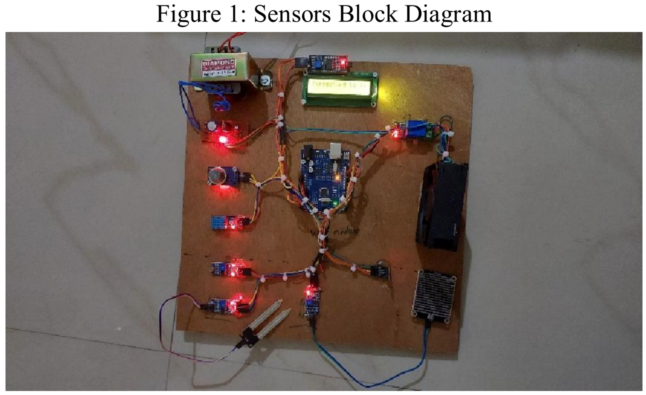

Fig 2: IoT Model

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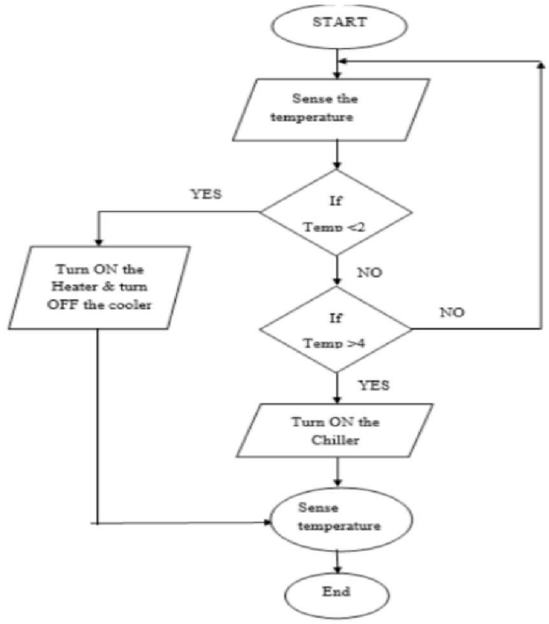
Flow Chart



III. DISCUSSION

The deployment of the Smart Farming Monitoring System (SFMS) prototype has underscored the effectiveness of IoT-based strategies in overcoming the hurdles associated with storing onions. Through the continuous observation and regulation of environmental factors, the SFMS ensures the preservation of ideal conditions for storing onions, thereby markedly diminishing occurrences of bolting and consequently averting onion wastage.

The affordability, straightforward installation process, and the system's reliance on readily accessible hardware components render it an attractive option for modernizing age-old onion storage methods. This transition not only enhances the efficiency and sustainability of farming practices but also aligns with the broader goals of advancing smart agriculture.

Advantages

The Smart Farming Monitoring System (SFMS) offers several key benefits that enhance the efficiency and productivity of onion farming:

- Affordability and Simplicity in Setup : Designed using hardware that is easily accessible locally, the SFMS stands out as an economical option for farmers. Its low-cost nature and straightforward installation processes make it an attractive solution for enhancing agricultural practices.
- Immediate Data Access and Notifications: The system empowers farmers with immediate data to monitor environmental parameters in real-time. It also alerts them to take timely preventive measures against any environmental conditions that might adversely affect the crop.

These advantages underscore the SFMS's role in transforming traditional onion farming into a more productive and sustainable practice, leveraging technology to mitigate challenges and improve outcomes.

IV. CONCLUSION AND FUTURE SCOPE

The integration of IoT technologies in the form ofmodule to the SFMS, the second module will be

The deployment of IoT technologies through the Smart Farming Monitoring System (SFMS) offers a promising solution for enhancing the outcomes of onion storage. By enabling real-time monitoring and management of crucial environmental factors, the system significantly diminishes the occurrence of bolting, thereby improving both the quality and quantity of the stored onion crops.

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Smart farming or smart agriculture, facilitated by IoT, involves the collection of data through sensors, processing this data via controllers, and executing automation processes through sensors. Despite the potential benefits, India's agriculture sector has yet to fully capitalize on modern technology due to traditional farming methods.

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