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Intelligent Quality Monitoring System for Food Grain Storage Using IoT

Prof Khallikkunaisa[1], Ayesha Nabeela[2], Asra Firdows[2], Harshitha M[2], Shwetha Ramadas[2]
[1]Associate Professor, [2]Student
Department of Computer Science and Engineering, HKBKCE, Bangalore, Karnataka, India

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ABSTRACT

A Developing country like India which is among the most important agricultural manufacturer within the globe has about 179.9 million hectares of its land under cultivation. About 70% of the rural population relies on cultivation for their livelihoods, since it is their sole source of income. The total food grain production in India is projected to increase 2% by the year2023 with about 303 million tons being produced each year which is a lot compared to other counties. A major problem stems from the fact that most of these food grains are mass-produced, which causes them to be wasted if they have been damaged by rains, floods, variations of temperature and humidity, attacks of rodents, insects. It is imperative to reduce the number of food grains being wasted, which can be achieved through the application of proper storage techniques. This is accomplished with the aid of automation, such as the Internet of Things (IoT), which enables continuous monitoring and tracking of food grains at storage warehouses. Hence, the proposed method utilizes an IoT System with sensors that collect data such as humidity, temperature, and C02 percentage. The data is notified to the user when parameters change and control measures are taken to ensure that the food grains remain in optimum conditions for the best quality.

Keywords: Quality of Food Grains, Safeguard food grain, Humidity sensor, Gas sensor, Temperature sensor.

I. INTRODUCTION

Grains, which are hard and dry seeds that grow on grass-like plants known as cereals, are the world's single largest dietary energy supply. Grains have played a significant role in human history, and grain agriculture is one of the major advancements that has led to the modern world's development. In present-day agriculture corn, rice, wheat, oats, barley, and rye are the most commonly cultivated and consumed grains. As grains are the basic requirement for preparing all kinds of food, it is crucial to store grains properly with optimum conditions for storing food grains. These conditions vary according to factors such as the weather, seasons, many others.

The project was motivated by the fact that there is up to 30% wastage of the produce during harvests and during storage. Internet of Things (IoT) is a promising technique for resolving these issues. In today's world, the IoT has brought new changes through combining digital and physical worlds, making individuals more

clever and perspective. In order to overcome these problems, communication technologies are being added to the sensors and the communication modules. Based on IoT, the model proposes to implement a system for monitoring food grain quality in storage warehouses that utilizes multiple types of sensors. As a part of basic working based on sensor data, the system monitors the parameters inside a storage system so as to detect variations in the parameters that are mostly responsible for food grain spoilage, and it communicates those variants to the user with the aim of taking the necessary control measures.

II. EXISTING SYSTEM

Quality management practices are increasingly being adopted in the agricultural industry to improve the efficiency of production. As food safety and security become increasingly important, grain handling operations management is an area that should be improved to meet the growing standards. Quality management systems are growing in use in agricultural environments as a result of growing interest in the production agriculture industry. Prior to the present case study, we compared selected quality metrics like temperature or humidity only to examine the impact of implementing an integrated quality management system.

Hence it is observed that grain quality detection done in previous system practices are limited to a specific grain only like wheat or basmati rice.

Also, most of these systems used only one quality parameter like temperature, humidity, C02 gases. Moreover, most of these systems tend to give false alarms for slight parametric changes.

III. PROPOSED WORK

It is difficult to improve the stored grain's quality, but it is possible to maintain its initial quality. Multiple management operations, such as initial grain condition, temperature and moisture transfer, and ventilation, can cause the quality of stored grain to deteriorate. Grain keeps best in a cool, dry, and clean environment. Mold development and insect activity are both affected by changes in temperature and humidity. It's difficult to cool grain in a hotter environment. Reduce insect activity and mold growth by keeping grain temperatures below 60 degrees Fahrenheit for as long as feasible. Moisture content is one of the most critical factors in preventing deterioration during storage. As previously stated, the usage of sensors to check grain conditions will be monitored monthly or according to seasonal needs. Sensors and microcontrollers, as well as numerous internet-based apps and servers, can be used to create a proper system. The usage of cloud-based data storage and analysis services will help improve the system's efficiency and decision-making capabilities.

IV. LITERATURE SURVEY

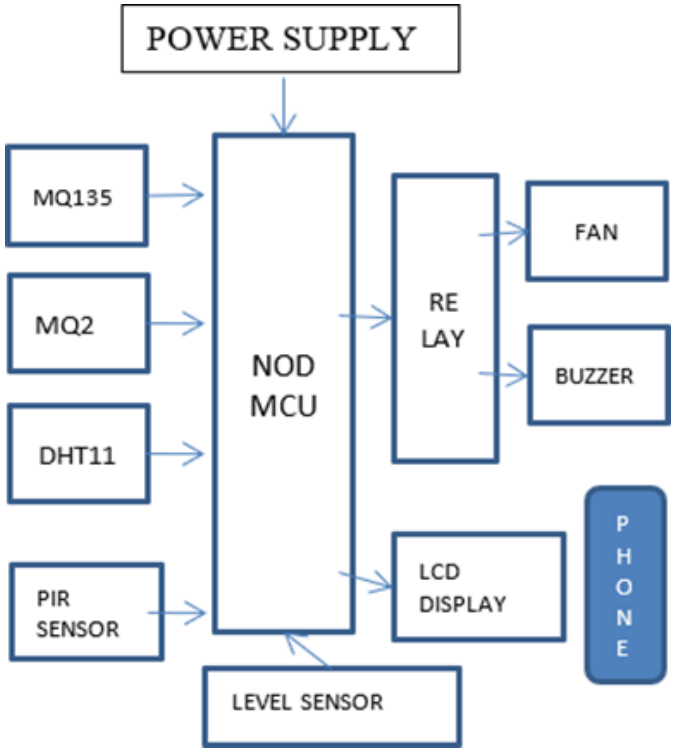
[1] In this paper, they have suggest a robust quality monitoring system for a fruit juice manufacturing company. Our system comprises of optimization production model establishment, production data recording, and food quality evaluations, which are undertaken during the manufacturing process and combine decentralized applications and machine learning technologies. If the sample quality at a production stage is declared unqualified, the next phases are skipped to avoid extra losses. Our technology uses the traceability of the block chain and the auto-execution of smart contracts to deliver reliable and efficient quality monitoring by integrating off-chain models with on-chain data. The proposed framework and methodologies can quickly be adapted to general food production, despite the fact that the production steps in our system are developed for fruit juice manufacturing. Our system's search approach, on the other hand, is still inefficient. As a result, we intend to improve the storage structure of data stored on the block chain in the future to improve search speed. In addition, contemporary IoT devices like as RFIDs and sensors [73], [74] can be integrated into our

system to provide a completely automated quality monitoring system. Food management system is done through the combination of various sensors, microcontroller and GSM communication module. It helps farmer to prevent food losses in warehouse. It saves the time of man for checking every time food products.

[2] This paper presents Top-Hat Transformation is a new method for solving the problem of non-uniform illumination of an image. This approach is quick, precise, easy to use, safe, non-destructive, and cost-effective. It is capable of achieving a high level of quality. It has a faster and more accurate classification system for rice grains. For counting Normal grains, Long grains, and Small grains, we determined Major Axis Length and Minor Axis Length. Rice grains having a higher proportion as compared to Normal grains for better quality. Foreign aspects are considered long and small grains. Since then, the normal grains of 1121 Basmati rice exceed the Sharbati Basmati rice grains. As a result, 1121 Basmati rice grains are better than Sharbati Basmati rice grains in terms of quality. For more effective and efficient outcomes, quality analysis can be performed with a larger number of parameters and by employing additional approaches and procedures.

[3] From January to April 2016, the Image Rice Grain Scanner was successfully deployed at Epagri's Rice Breeding Laboratory (LAMGEN). The scanner, as well as the software that came with it, proved to be simple to use, stable, and dependable. The data from samples taken during the 2015/2016 growing season is currently being used to identify the best genotypes, proving to be very dependable and beneficial to Epagri's rice breeding team. All of this allowed Epagri's breeders a real chance to analyze a large number of samples quickly and accurately. As a result, an effective quality selection is required. Figure 9 shows the Image Rice Grain Scanner which describes the quality features of Epagri's rice cultivars in this partial spreadsheet of a consolidate output data file. It was run using special seeds to ensure that several parameters, such as 'impurities,' were set to zero. The Rice Grain Scanner is a three-dimensional, fully automated evaluation of grain size and quality attributes. Crop Breeding and Applied Biotechnology - 17: 89-97, 2017 97 could be done during the early stages of breeding. Since various flaws can be measured, a decline in quality attributes can be properly detected and measured, this equipment may probably be used successfully in phytopathology or entomology investigations, or even studies under abiotic conditions like cold or heat at reproductive stages.

V. BLOCK DIAGRAM



VI. CONCLUSION

The project intelligent quality monitoring system for food grains using IOT leads in a technology prototype and an effective solution to the issue of grain storage management and wastefulness caused by improper preservation. As a result, by the end of the project, the problems regarding grain storage and management will be reduced significantly, and the system will be able to be maintained in proper environmental conditions and

with high-quality levels. And, once operational, the system can effectively reduce stored grain losses up to 80%. Lastly, the availability of food to the people in harsh environments and in the event of a natural disaster is the government's mandate, and this project will certainly contribute to achieving the same with minimal manual efforts and higher efficiency.

VII. FUTURE SCOPE

The system can further be designed to regulate Temperature by itself.

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