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# Prevention of Post Harvest Losses

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**ABSTRACT:** Real time monitoring provides an efficient way to take absolute control of the environment. We can control the devices no matter where we are and can constantly receive updates at a consistent basis.The core of this study is to develop real-time monitoring and controlling system for food grain storage in the warehouses. In a country where agriculture constitutes a major share of its GDP,the basic objective is to provide an effective, safe viable storage in unpredictable conditions of weather. Every year we find that losses to farmers keep increasing at an alarming rate leading to the decline of the agricultural sector. In the process of storing grains in the warehouse, temperature, fire, moisture, humidity and natural disasters are all the factors that can affect the grain quality and losses incurred to the farmers. Vibration,moisture, gas, humidity and temperature sensors are identified as potential instruments to be employed inside the warehousefor increasing the shelf life of stored grains drastically. The main purpose of this system is to acquire data about the conditions present in the warehouse. The sensors present in the warehouse constantly monitor the conditions inside. The measured readings are stored in cloud. If any changes are detected alerts are sent to the concerned officials regarding the issue via messages or email. An alarm goes off to intimate the immediate surroundings about the issue. The proposed system has good reliability, maintainability and cost effectiveness.

**KEYWORDS:** IoT (Internet of Things), GDP (Gross Domestic Product), Cloud, Sensors, Wi-Fi, alarm.

## I. INTRODUCTION

India as we all know is one of the most populated countries in the world. With a population of more than 1.2 billion the Indian subcontinent is mainlyan agricultural dependent country. The backbone of Indian economy is the agricultural sector. The agricultural sector used to consist of more than 40 percent of the GDP in the 1940s.But slowly the once king of the Indian economy is slowly dwindling. Unpredictable climatic conditions, droughts, scarcity of rainfall are major factors for the steady decline of the agricultural sector. But the bulk of issue revolves around the fact that improper storage conditions still prevail in many parts if rural India. The storage facilities are not properly maintained leading to huge losses for the farmers. It is roughly estimated that an average Indian agricultural family losses due to improper storage of grains incur to 18000 rupees. So to avoid the post harvest losses, we present a solution to monitor the conditions of the warehouse on a constant basis and provide regular updates to the people concerned. Sensors are present in the grain storage warehouse to constantly monitor the conditions. The inputs are obtained from the sensors present in the warehouse. The input is processed in the micro controller where the changes of the environment are recorded. The recorded values are sent to the cloud for constant monitoring and storage. In case of any abnormalities in the environment or any disasters, the message alerts are sent to the respected officials regarding the situation within seconds. The appropriate counter measures are hence taken effectively. The alarm also goes off to alert the immediate surroundings.

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## II. RELATED WORK

Jia Jiang and Huanhuan Shen of the Hebei University of Science and Technology proposed a fire warning program of Cotton warehousing based on IoT technology. They proposed an IoT architecture based application scheme of fire warning system in a cotton warehouse. Data acquisition and transmission was done using ZigBee protocol and made a warning by using background intelligent fire analysis system. The application scheme finally made an effective control for disasters induced by fires by triggering the corresponding fire joint action equipment by a scientific fire emergency decision system.Vinay Sambhaji Suryawanshi and Mahesh S. Kumbhar of the Shivaji University developed a realtime monitoring and controlling system for food grain storage. In agriculture field the most important objective is to provide a safe storage in unpredictable weather conditions. The overall structure of the proposed grain storage system consists of two components, the host computer and prediction of grain situation and the lower computer terminal in the granary with grain data acquisition. The main purpose of the system is to acquire data from different sensor and transmit this data over Ethernet. If wired network crashes then connectivity will be established by the wireless network. The proposed system has good reliability, maintainability and cost effectiveness.HariprabhaV, Vasantharathna S of CIT Coimbatore proposed the Monitoring and Control of food storage depots using wireless sensor networks. The ZigBee mesh networking technology is used to send the parameters from food depots.The LabView software is used to obtain the environmental factors and the varying external conditions. The images ofthe food product are captured from remote end. An automated aeration control strategy is implemented to maintain the temperature and moisture content within the estimated limits for each of the food products.

## III. PROPOSED SYSTEM

Our proposed system realises the drawbacks of the previous existing systems and aims to overcome the disadvantages of the existing systems. Due to the advent of the IoT technology, real time monitoring is now possible. To start of with, a bulk of sensors are implemented in a single circuit. The temperature sensor, flame sensor, humidity sensor, moisture sensor, gas sensor and vibration sensors are all implemented as a single system. All these sensors monitor the conditions of the warehouse constantly. The external conditions serve as the input to the sensors. The sensors are connected to the NodeMCU micro controller. The micro controller obtains the values as analog or digital signals. These signals are decoded by the micro controller and are sent to the cloud for continuous storage and monitoring. The NodeMCU micro controller has an inbuilt WiFi module. This module is responsible for the transferring of the values to the cloud and also for sending the alert messages to the respective officials. Most of the output obtained is in the digital form as most pins of the NodeMCU micro controller is digital. The analog pin is connected with the gas sensor so as to obtain the exact reading of the sensors till two decimal places. As long as the conditions remain normal continuous and constant monitoring of the surroundings take place. When the values of any sensor exceed the threshold value specified to that particular sensor, the precoded alerts of that particular sensor are sent to the respective officials via email or text messages. This ensures that appropriate measures are taken to minimise the losses due to any disaster as the response time is drastically reduced. Since the external conditions are always measured post harvest losses are greatly minimized. Moreover this system can be implemented not only in warehouse but every storage facility available. The alarm is sounded to alert the immediate surroundings in case of any emergency.

## IV. ARCHITECTURAL DIAGRAM

The input is obtained from the external surroundings of the warehouse which is used to store the food grains. The input includes the readings from the various sensors that are used to monitor the conditions of the warehouse. The input is obtained in the digital format. The obtained input goes to the micro controller. From the micro controller the input is pushed to the cloud where the officials can view the conditions of the warehouse as graphs. Using these graphs, the officials determine if the conditions are favourable or not. In case any change occurs, the changes are immediately recorded and then messages are sent to the concerned officials regarding the issue.

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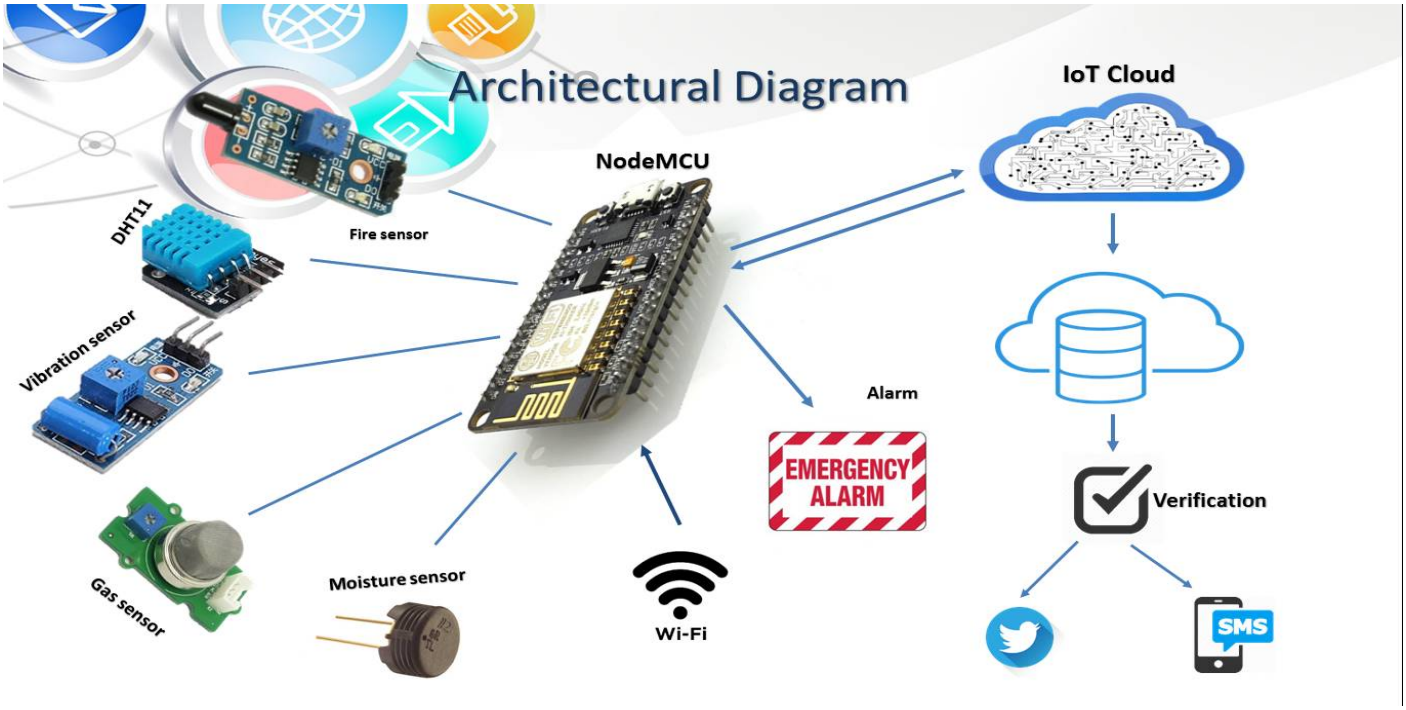


Fig.1. Architectural diagram

## V. COMPONENTS REQUIRED

*1. NodeMCU:*It is an open source IoT platform. It includes firmware which runs on the **ESP8266 Wi-Fi SOC.** It has a storage capacity of 4MB. The power is obtained from USB. All the sensors used in our system is connected with NodeMCU. It is a single board micro controller.

Fig.2. NodeMCU micro controller

*2. Arduino:*Arduino is a computer hardware and software company, project, and user community.Its boards use a variety of microprocessors and controllers. The boards have both analog and digital input/output (I/O) pins that may be interfaced to various circuits. The Arduino project provides an integrated development environment (IDE) based on the language we use to program.

*3. ESP 8266:*The ESP 8266 WiFi module is a Wifi network where u can easily connect as a Wireless internet access interface to any micro controller. The power supply required is 3.3V. An add-on for the Arduino IDE was created by the community that allows you to program the ESP8266 using the Arduino IDE and its programming language.

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*4. Ubidots:* Ubidots is an Internet of Things (IoT) data analytics and visualization company. It helps to turn data from sensor into information that is used for making decisions and interactions with machine.

*5. Temperature sensor:* The temperature sensor is used to sense the temperature changes in the surroundings. Most temperature sensors include thermocouples and thermistors..They come in contact with the object they are to measure and record the temperature changes. Noncontact temperature sensors measure the thermal radiation of heat source to measure the temperature.

Fig.3. Temperature sensor

*6. Humidity sensor:*A humidity sensor senses the relative humidity in the air. It can be used to measure both moisture and the temperature of air.The sensor is composed of two metal plates. It contains a non-conductive polymer film between them. The moisture from the air is collected by this film which causes the voltage to change. These voltage changes are converted into digital readings.

Fig.4.Humidity sensor

*7. Gas sensor:* Gas sensor is used to detect the presence of gases in the surrounding environment. It can used to detect harmful gases present in the warehouse.

Fig.5. Gas sensor

*8.Vibration sensor:* Vibration sensor is used to measure vibrations in the external environment which cannot be detected by humans. All the vibrations however subtle they might be can be detected using these sensors. They can be used in the detection of both minor and major earthquakes.

Fig.6. Vibration sensor

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*Monitoring:* The temperature level, moisture level, humidity level, vibration level and gas levels of the external environment are recorded.The sensed data from the sensors are sent to the NodeMCU. Through WiFi the data is stored in the Ubidots cloud and can be viewed graphically. Accurate measurements are obtained.

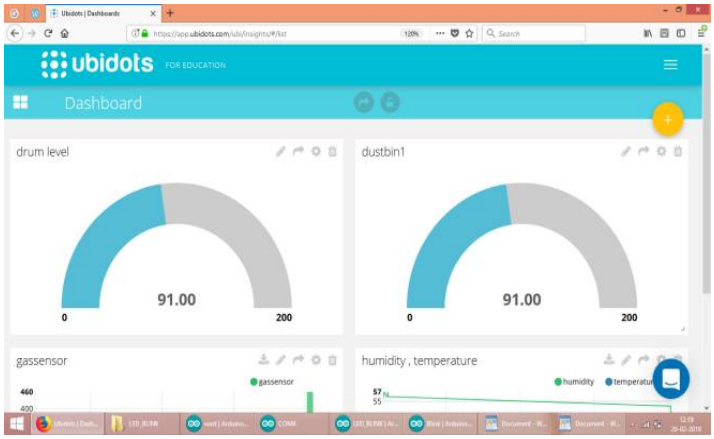


Fig.7. Output of sensor readings

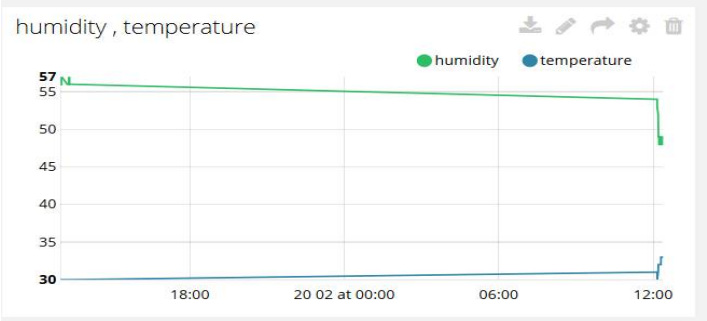


Fig.8. Graph showing the levels of humidity and temperature

*Notification:*When the threshold value of the sensors is exceeded or when there is a change in the external environment, precoded messages are sent to respective officials regarding the situation. Messages can be sent via email or through messages to the respective phones. This ensures that swift counter measures are taken to respond to the situation.

## VI. CONCLUSION

Thus we have presented a very effective system to minimize the losses occurred during the post harvesting period. It records the environmental conditions of the storage facility constantly. When there is a slight variation in the surroundings alert messages are sent to the officials to minimize the loss and decrease the response time.Real time monitoring has been achieved using IoT. Since we use a collection of sensors the environment can be diversified according to our needs. This system greatly reduces the loss incurred to the farmers and provides an excellent method to ensure food security.

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## REFERENCES

[1] Neha Deshpande and A. D. Shaligram, B. A. Botre, Satish Bindal and S. S. Sadistap, "Embedded E-nose application to sense the food grain storage condition", IEEE International conference on computational intelligence and communication networks, pp.608-611, 2010
[2] Graham Parkinson, Dominic Crutchley, Peter M Green, Michalis Antoniou, Mathew Boon, Peter N. Green, Peter R. Green, Robin Sloan and Trevor York, "Environmental monitoring in grain", IEEE Conference, pp.1-5, 2010
[3] Xiaodong Zhang, Xiujuan Li, Jie Zhang,"Design and implementation of embedded monitoring system for grain storage", IEEE Conference, pp.1-4, 2010
[4] Jian-guang JIA Zun-when HE Jing-ming KUANG Hong-bo YAN, Feng Wang, Li-jun Kong, Dong-yao Zou, Ying-shan Ai, "Application of multi-sensor information fusion on monitoring and controlling system of stored-grain condition", IEEE International conference on challenges in environmental science and computer engineering, pp.435-438, 2010
[5] Huiling Zhou, Fengying Zhang, Jingyun Liu and Fenghui Zhang," A Real-time Monitoring and Controlling System for Grain Storage with ZigBee Sensor Network" IEEE 5th international conference on wireless communication, networking and mobile computing ,1-4,2009.
[6] Santhosh kumar, Vishal Hiremath, Rakhee K, "Smart Sensor Network System based on ZigBee Technology to Monitor Grain Depot", International Journal of Computer Applications ,volume 50-No.21, 0975-8887, July 2012.
[7] Jian-guang JIA, Zun-wen HE, Jing-ming KUANG, Hong-bo YAN," Application of Wireless Sensor Network in Monitor System for Grain Depots" IEEE 5th international conference on wireless communication, networking and mobile computing ,5-10,2009.
[8] Halit Eren, Emran Fadzil "Technical Challenges for Wireless Instrument Networks - A Case Study with ZigBee," IEEE Sensors Applications Symposium San Diego, California USA, 6-8 February 2007 IEEE.
[9] Paul Armstrong, "Wireless data transmission of networked sensors in grain storage," 2003 ASAE Annual International Meeting, Paper Number 036157.
[10] Marshall R. E., Farahbakhsh K., "Systems approaches to integrated solid waste management in developing countries", Journal of Waste Management, vol. 33 (4), pp. 988-1003, April, 2013.