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Survey on Intelligent Grain Storage Monitoring System

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ABSTRACT*:* Agriculture is the major activity in India. People are mainly dependent on agriculture products. Warehouses are intended for the storage and physical protection of goods.Farmersstores agricultural products in warehouse. Agriculture is the backbone of any nation's economy and there is a dependency between agricultural growth and economicprosperity. As India is an Agriculture country where70% of the population depends on farming, the storage ofgrains plays a crucial role in national economy. Losses occur mainly due to various environmental conditions in warehouse and it changes the physical volume of product, quality, and nutrition value of products. Such losses automatically reduce economic value. Hence to avoid such losses technology plays a very important role in the preservation of food products. Effectively monitoring warehouse room temperature, humidity, fire and other environmental conditions is very important. In This work, we use the technology in warehouse to prevent loss of food products and food grains.

KEYWORDS*:* Temperature &Humidity, IOT-Internet Of Things, GSM Module.

I. INTRODUCTION

The grain management system is an advanced solution for monitoring the physical parameters within warehouse. The system deals with monitoring and controlling the various environmental conditions in a warehouse by using temperature sensors, humidity sensors, smoke detectors, fan, microcontroller GSM. The system helps farmer to prevent food losses during harvesting. Maintaining quality and safety of grain storage are related to the hundreds of millions of people in India. Grain storage therefore occupies a vital place in the economies of developed and developing countries.
This system is placed within warehouse or grain storage. If sensors detects any variation in the environment in warehouse it automatically updates its value to the web server through the GSM (global positioning system), and it automatically takes necessary action to minimize danger level within a warehouse. A web server in the system provide the access to the user interface functions, to the device through a device web page in which it is using internet. A web server is embedded into any device that can be linked to the Internet, hence the devices can be tested and controlled from remote places through internet. This system reduces the man power, saves the time and works efficiently without human interference.

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Fig: 1.1 Intelligent Grain storage Monitoring system

II.RELATED WORK

1.SMART TEMPERATURE AND HUMIDITY DETECTION SYSTEM USING SENSOR:

Temperature & Humidity is the key to safe grain storage. When grain goes out of condition, regardless of the cause, there is always an unusual increase in temperature. For those who manage grain, temperature is the best indicator of grain quality. Grain is a living organism.Like other living things, it breathes (respires) and it may become sick. Excessive moisture, high temperature, and poor grain condition (damaged kernels) are generally considered the most important factors that lead to trouble in stored grain. The three specific causes of heating are respiration of the grain itself (metabolism of viable grain), micro flora (microorganisms such as fungi and bacteria), and insect infestation.

There are a few ways to obtain the grain temperature:

1.The **"Feel and Smell"** method. All that is required here is for the grain manager to feel the side of his bin and smell inside the bin in an attempt to detect heating. Obviously, this method has its drawbacks. If you can smell it, the damage is already happening.

2. The **"Probe"** method is another way to read temperatures. With this method, pipes are inserted into the grain mass and a thermometer lowered into them. After a time, the thermometer is raised and the temperature read for that point. This method also has several serious drawbacks. a) It is very time consuming, b) a thermometer is not designed to furnish quick readings, c) very limited areas can be tested.

3. The **"Temperature Cable"** method. Temperature cables are suspended at equidistant points from the roof of the structure. These cables have multiple temperature sensing points along the length of each cable which record the grain temperature and communicate it to a reading device. This could include a hand-held instrument and/or a smart phone that can retrieve info from any place on the planet that has cell phone coverage. Temperature cables are custom made for grain temperature monitoring.Remember, temperature& Humidity is the key to SAFE and SUCCESSFUL grain storage.Grain will deteriorate faster as temperature and moisture content increase.

Table 2.1:-Test To Check Quality Of Grain

TEST 1	Grain humidity Content % 46	Grain Temperature (0C) 28	Test conduced On good quality of grain
TEST 2	Grain humidity Content % 72	Grain Temperature (0C) 39	Test conduced On decomposed Quality on grain.

Different sensor Used for Grain Storage Monitoring:-

1. DHT11
2. DHT22
3. LM35DZ, LM335, LM34
4. BMP180
5. TMP36
6. LM75
7. BME280
8. DS18B20
9. Waterproof DS18B20

Fig:2.1 affordable temperature sensors compatible with the Arduino

2.EST

The EST series is a grain temperaturemonitoring system for use in monitoring grain quality in storage through multiple pointtemperature measurement within each grain bin.The product line consists of two types of sensorcables, the EST110 grain temperature monitoring cable and the EST120 temperature/level monitoring cables

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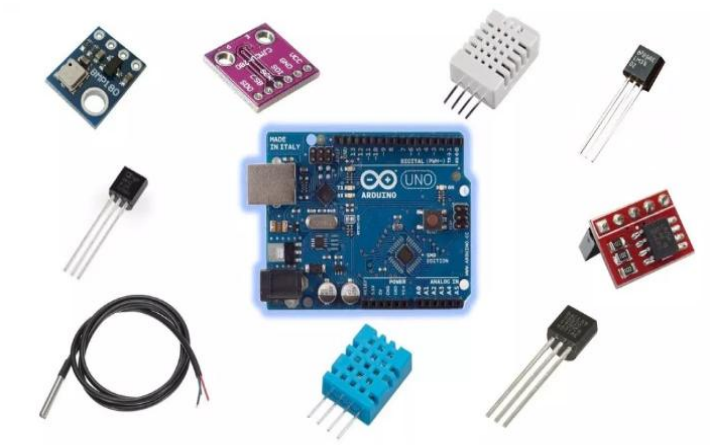

Fig:2.2 EST Sensor

3. GSM Module:-

When you're talking about a mobile device, you're either talking about a GSM device, or a CDMA device. GSM stands for **Global System for Mobile** Communications and is the network standard for much of the world. Of the four major carriers here in the United States, T-Mobile and AT&T use GSM technology.

GSM is a digital cellular technology used for transmit voice and data. It acts a communication interface between microcontroller and web server.

Fig:-2.3 GSM Module

GSM will allow communication anywhere, anytime, and with anyone. The functional architecture of GSM employing intelligent networking principles, and its ideology, which provides the development of GSM is the first step towards a true personal communication system that enough standardization to ensure compatibility.

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III. SYSTEM ARCHITECTURE

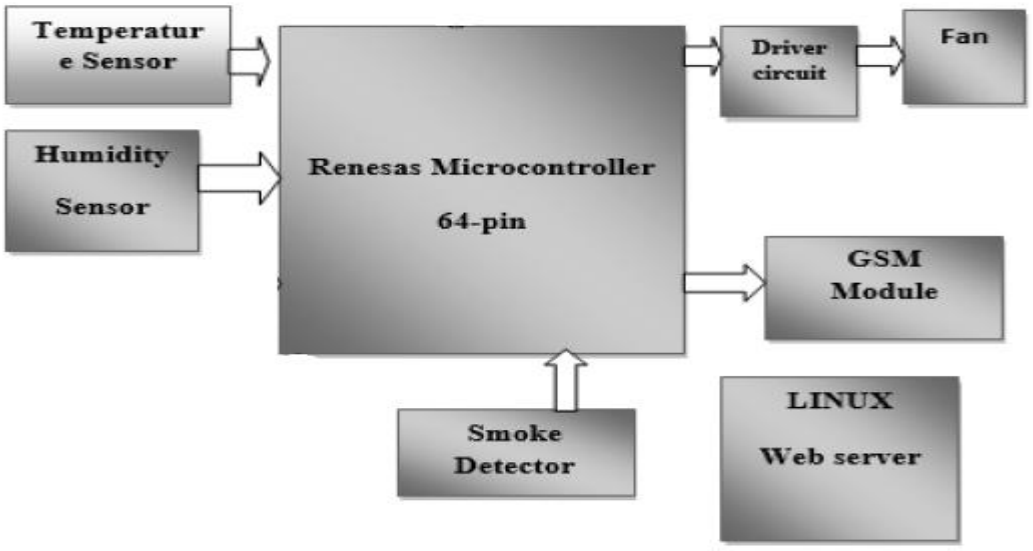

Fig:-3.1 System Architecture

The system consist of sensors node, microcontroller node, web server. Sensors node monitor temperature, humidity, and smoke in warehouse. Microcontroller gathers sensor value from sensors node and it transmit to GSM module, later it transmit to web server.

IV. WORKING

If sensor senses high temperature, sensor send temperature value to the microcontroller as per the code fan automatically starts rotating communicates the data further to GSM module. If sensor senses high humidity fan automatically stops and sends humidity value to the web server to take necessary action to control danger level.
Fire is detected by using smoke detector, microcontroller receives sensor data and later transmit web server to take necessary action.

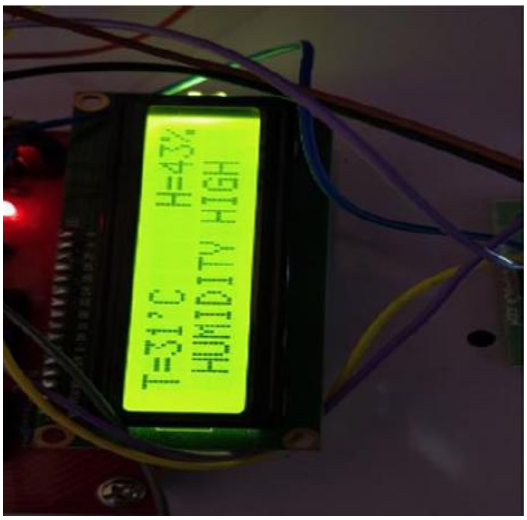

Fig: 4.1 Sensor value is displayed

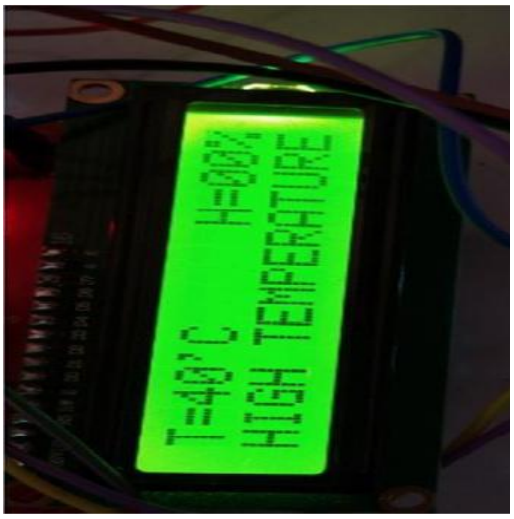

Fig: 4.2 Sensor value is displayed

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Advantages:-

1. low power consumption.
2. good maintainability .
3. simplicity and low cost.
4. It saves time .
5. less man power required.
6. Efficient and reliable.

V. CONCLUSION

Food management System is done through the combination of various sensors, microcontroller and GSM communication module. It will help farmer to prevent food losses in warehouse. It will save the time of man for checking every time food products.

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