Intelligent Food and Grain Storage Management System for the Warehouse and Cold Storage

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***Abstract*—Agriculture is the major activity in India. People are mainly dependent on agriculture products. Warehouse is a storage Area where it stores finished goods, electrical products, and agricultural products. Farmers stores agricultural products in warehouse and then exports them to another country. 20 to 30% of losses occur during the period from harvesting to retail marketing. Some products milk, fish, perishable and nonperishable requires reasonable priced refrigeration system for pre-cooling, refrigerated transport, cold storage, proper lighting to maintain quality. 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.**

Index Terms—GSM Module, LCD, renesas microcontroller, Sensors,

I. Introduction

The food 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, load cell, fan, LDR, microcontroller GSM. The system helps farmer to prevent food losses during harvesting.

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.

II. 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.

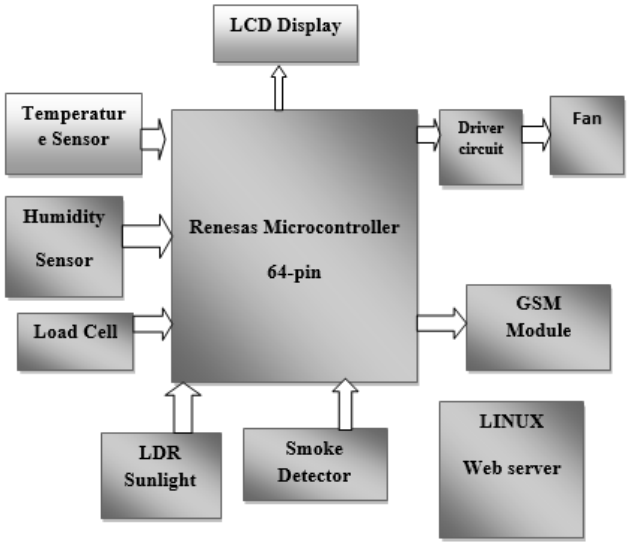

Fig. 1. System Architecture

III. 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. Some food products and grains requires proper lighting therefore LDR is used for providing proper light to food products. Fire is detected by using smoke detector, microcontroller receives sensor data and later transmit web server to take necessary action. The various whether conditioning may degrade the food products or changes its weights it can check by using load cell, according to weight changes it updates it's in web server.

IV. Implementation

1) Software Implementation:

C programming language have been used to develop software. It is integrated with Renesas cube suite +.

A) HTTP web page:

The environmental changes are displayed in HTTP web page through internet.

2) Hardware Implementation:

A) Renesas Microcontroller:

Renesas microcontroller is a 64-pin 16-bit microcontroller.

Most of the pins perform multitasking .This is used control actions, like display the sensor values within warehouse, send the messages to the web server through GSM module.

B) GSM module (Global Positioning System):

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

C) Sensors:

Sensors is responsible for detection of various irregularities in a warehouse or cold-storage environments.

- *LDR (Light Dependent Resistor):*
  Certain food products such as food grains need proper lighting to maintain quality, such location LDR are placed.
- *Humidity sensor:*
  Humidity sensor senses high humidity in a warehouse environment. And send this values into microcontroller.
- *Temperature sensor:*
  Temperature sensor senses high temperature in a warehouse and sends this values into microcontroller.
- *Smoke detector:*
  Smoke detector detects smoke if incase fire happens in warehouse and sends this values into microcontroller.
- *Load cell:*
  Load cell is used to check weight of food products, it happens in case of rat heating and degradation of food products.

3) Advantages:

- Reduces browning effect in food products.
- Decreases activity of micro-organisms.
- It saves time.
- Less man power required.
- Efficient and reliable.

V. Experimental Results

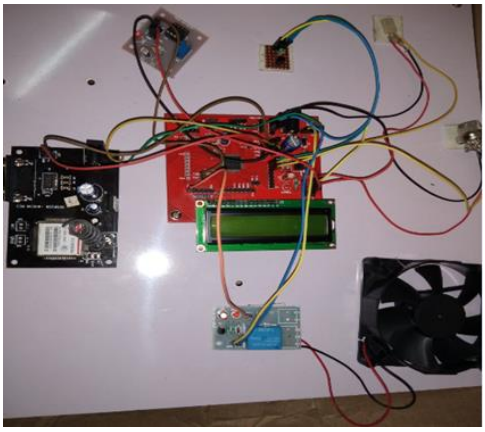

Fig. 2. Food and management system used in this project, it consist renesas microcontroller, group of sensors, GSM module, LCD

HTTP web server address:
http://www.campusnewstech.in/project/web_project/login.html

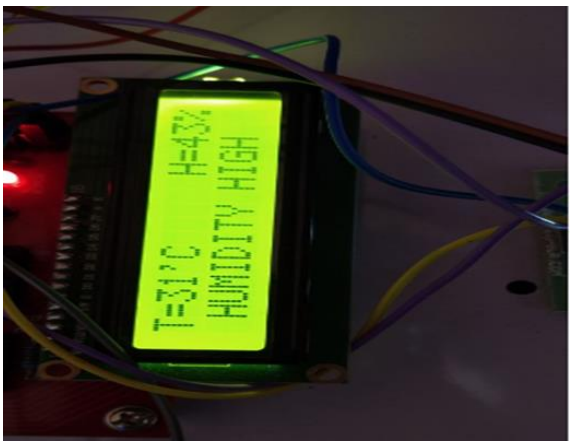

Fig. 3. Sensor values displayed in LCD

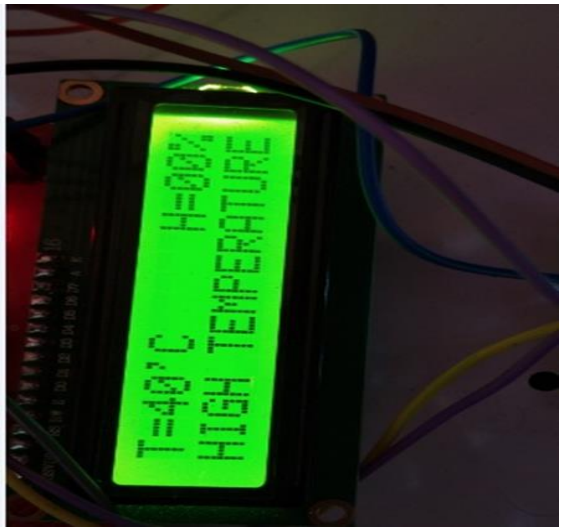

Fig. 4. LCD displayed when high temperature

Fig. 5. Sensor values displayed on webpage

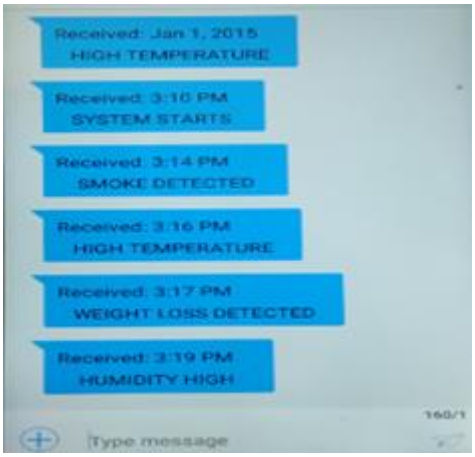

Fig. 6. Microcontroller sends message to the mobile phone

VI. Conclusion

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.

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