Scientific Journal of Impact Factor (SJIF): 4.72

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 2, February -2017

A NOVEL APPROACH FOR GRAIN STORAGE SYSTEMS

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Abstract-*Now-a-days, the applications of WSN are many and varied, and the applications in agricultural are still incipient. The safety of food storage is a significant issue concerning people's living quality and national economic development. In India 20% of food grains are going as waste due to change in environmental conditions and improper infrastructure facilities for storage. The factors mainly affect grain quality are temperature, humidity and CO2 gas release. In the food and agricultural industry, sensors are being used for process control, monitoring quality, and accessing safety. The proposed system is an integrated system to monitor and control the environmental factors like temperature, humidity, CO2 concentration of food depots using wireless sensor network.The system makes use of the concept 'IOT' for the wireless transfer of data and for maintaining the database*.

Keywords-*Atmega328P, Temperature Sensor, Humidity Sensor, CO2 Sensor, Wireless Sensor Networks*

1. INTRODUCTION

Grain storage is plays very important role in the economy and the overall development of the society. In that main thing is quality and safety of grain storage are sub related to the hundreds or millions of society people. Now in India form last decade grains storages problems occurs in rainy season. In the process of grain storage, temperature and humidity are two major factors that can produce a direct effect on the grain quality. Therefore, this parameters should maintenance becomes very important issue in front of us.

Temperature, humidity must be monitor by real-time system. Due to the seasonality of grain production, the storage of grain is on top priority task it relates to people life. Now, we are still using our old method of storing the crops and because of this grains are spoiling soon. Also, we are unable to maintain the quality of the stored grains. To overcome these problems, the automatic monitoring of the grain storage based on Atmega328P and iot is implemented in which it helps us to improve the levels of grains storage and reduce the grain losses during storage procedure and reduce the labour intensity also.

Maintaining optimum temperature, relative humidity and proper moisture content in the storage facility are the challenges faced in Grain acquisition. Seasonal and daily climate fluctuations influence quality of Grain to the greater extent results in mold growth, insect activities. The optimum temperature range for mold growth inside the depot is around 25-30°C, and temperatures above 15°C (Celsius) are ideal for insect growth and reproduction. Insect metabolic activity in dry commodities below 15% moisture content can result in heating up to 42°C (Mills 1989). A major contributor to the spoilage of grain is growth of variety of mold species, including several that produce mycotoxins. Mycotoxins are natural chemicals produced by fungi that are detrimental to the health of grain. These activities release CO2 in Grain depot so CO2 concentration can be effectively used to monitor early detection of spoilage during storage.

Now we are still using our old methods to store various cultivated crops, traditional methods of grain condition monitoring and controlling is limited to simple manual temperature and humidity testing and grain situation analysis without any effective means of processing and regulation. Usually these are carried out by means of ventilation, drying and circulative fumigation which are relatively backward and results in wastage a lot of manpower and resources hence it not only brings great inconvenience to the grain storage management but also hidden security risks. The advancement in technology allows us to develop real-time monitoring system of remote locations, which makes it easier to control and monitor conditions from any place at any time.

The Real-time monitoring of the grain storage system is designed based on Atmega328P, which helps us to improve the level of grains storage and reduce the grain losses during storage procedure and also reduce man power and labour intensity. The objective is to design a granary monitoring system by combining Embedded and IoT technology.

2. RELATIVE WORK

A]The Design of Granary Environmental Monitoring and Control System Based on ARM9 and ZIGBEE: Grain storage is a vital component in the economy and the society. The quality and safety of grain storage are related to the hundreds of millions of people. In the process of grain storage, temperature and humidity are two major ecological factors that can affect the grain quality. Therefore, the parameters of temperature, humidity must be in accurate and real-time monitoring by supervisory systems in large granaries.

ZigBee wireless sensor network technology. Using ZigBee wireless sensor network to complete acquisition and transmission of environment parameters and using ARM9 to achieve precise control of the barn environment as system data controller and using GSM to achieve the system's remote control, it greatly improves the flexibility and scalability of the warehouse management which sends available data to grain depot manager (Database management) in time and filters invalid data on the spot. It makes many important aspects not need manager to complete on the scene, which saves a lot of manpower and material resources and improves labor productivity.

B]Enabling Autonomous Environmental Measurement Systems with Low-Power Wireless Sensor Networks: Wireless Sensor Networks appear as a technology, which provides the basis for a broad field of applications, drawing interest in various areas. On the one hand, they appear to allow the next step in computer networks, building large collections of simple objects, exchanging information with respect to their environment or their own state. On the other hand, their ability to sense and communicate without a fixed physical infrastructure makes them an attractive technology to be used for measurement systems.

Although the interest in Wireless Sensor Network research is increasing, and new concepts and applications are being demonstrated, several fundamental issues remain unsolved. While many of these issues do not require to be solved for proof-of-concept designs, they are important issues to be addressed when referring to the long-term operation of these systems. One of these issues is the system's lifetime, which relates to the lifetime of the nodes, upon which the system is composed.

C]Advanced system for Monitoring and controlling of the grain condition based on ARM7: An intelligent system for monitoring and controlling of the grain condition is designed. The system is based on embedded ARM7 controller, using GSM for the lower machine control unit. The grain environment Information such as temperature, humidity, CO2 and fire concentration is collected and stored by Multi-sensor unit. Then the data is processed via multi-regional information fusion. The levels of the grain condition are predicted based on the sensor network. The article focused on the hardware circuit design of the grain condition intelligent monitoring system and the principle of the multi-regional weighted fusion.

This project describes the design and testing of a group of sensors and communication systems based on GSM technology. Analog and digital sensor data is read using arm7 microcontroller. The sensor systems allows data to be sent from a remote location using WSN. The sensor systems have successfully gathered data from a variety of sensors including temperature, humidity, CO2 and fire sensors. The data is transferred to present any collected structural data in understandable format and stored in sd card. The input and output functions status will be displayed on LCD.

3. GRAINSTORAGESYSTEMDESCRIPTION AND WORKING

The objective of the proposed system is to develop an integrated system where the monitoring and control of different food products viz., rice, wheat, rava and maida is done to prevent food storage losses and to ensure food security.

In the previous systems, each sensing end device consisted of wireless microcontroller along with the zigbee and sensors.

In this system, the sensors are interfaced to the microcontroller Atmega328Pat the transmitter which is connected to the receiver with the help of wifi module. At the receiver another microcontroller interfaced with loads which are used to control the increase in the parameters measured at the transmitter, is used Thisimproves the use of the system to a great extent.

4. BLOCK DIAGRAM

There are maintly two parts first one is transmitter circuit which contains viz; Atmega328P, sensors like temperature sensor, humidity sensor,CO2 sensor,LCD and WiFi module.

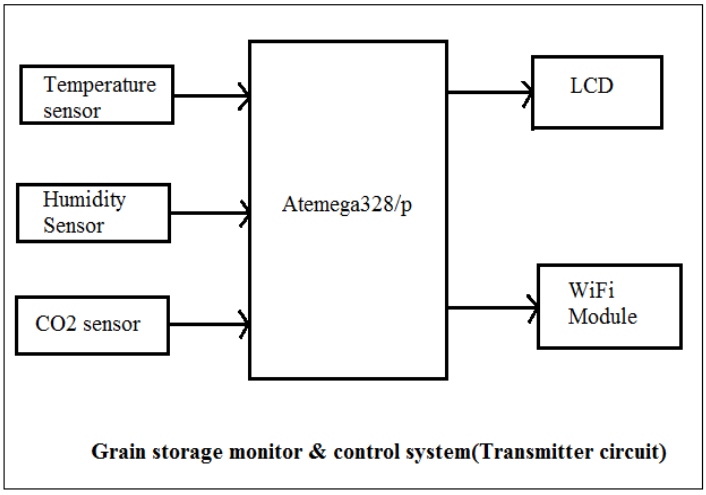

Figure-1

The second is receiver part which is used for controlling purpose contains Atmega328P, loads like electric fan, Electric heater, buzzer,LCD and Wifi module.

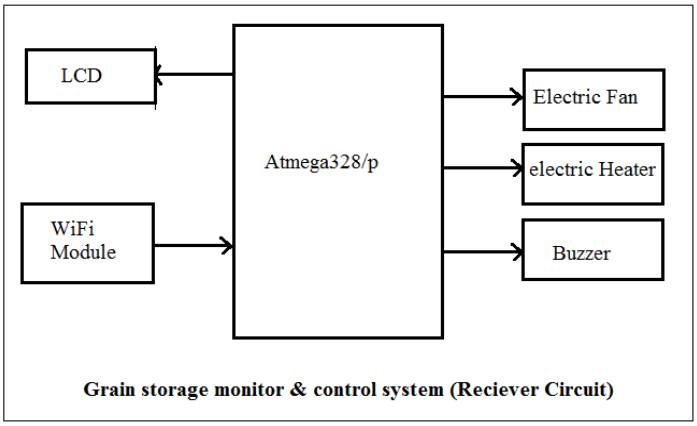

Figure-2

5. COMPONENT DESCRIPTION

A] Atmega328P

It is High Performance, Low Power AVR® 8-Bit Microcontroller having Advanced RISC Architecture High Endurance Non-volatile Memory Segments. It has 32KBytes of In-System Self-Programmable Flash progam memory,256/512/512/1K Bytes EEPROM,512/1K/1K/2K Bytes Internal SRAM .

• Peripheral Features

It has two 8-bit Timer/Counters with Separate Prescaler and Compare Mode, One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode and Real Time Counter with Separate Oscillator. This microcontroller is having 8-channel 10-bit ADC in TQFP and QFN/MLF package and 6-channel 10-bit ADC in PDIP Package.And Programmable Serial USART, Master/Slave SPI Serial Interfacewith Six PWM Channels.

B] Temperature sensor

The LM35 series are precision integrated-circuit temperature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling.

The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies

C] Humidity sensor

Relative humidity/temperature and relative humidity sensors are configured with integrated circuitry to provide on-chip signal conditioning. Absorption-based humidity sensors provide both temperature and %RH (Relative Humidity) outputs. On-chip signal processing ensures linear voltage output versus %RH. Sensor laser trimming offers +5% RH accuracy and achieves 2 %RH accuracy with calibration. Packages are chemically resistant and operate in ranges of -40 °C to 85 °C [-40 °F to 185 °F] to accommodate harsh environments.

D] Co2 sensor

A carbon dioxide sensor or CO2 sensor is aninstrument for the measurement of gas. The mostcommon principles for CO2 sensors are infrared gas sensor and chemical gas sensors. CO2 absorbs infrared light therefore CO2 sensor consists of a tube containing an infrared source at one end and an infrared detector atthe other end.

The infrared detector detects the infrared light which is not absorbed by CO2 between source and detector. Infrared radiation which is not being absorbed by CO2 produces heat so the temperature will increase. The infrared detector measures the temperature. A voltage is produced due to the temperature increase in the infrared sensor. We can read amplified voltage into the data logger.

E] Wi Fi Module(ESP8266)

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network.The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end

module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the Documents section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming this module into an IoT (Internet of Things) solution!

6. FLOW CHART

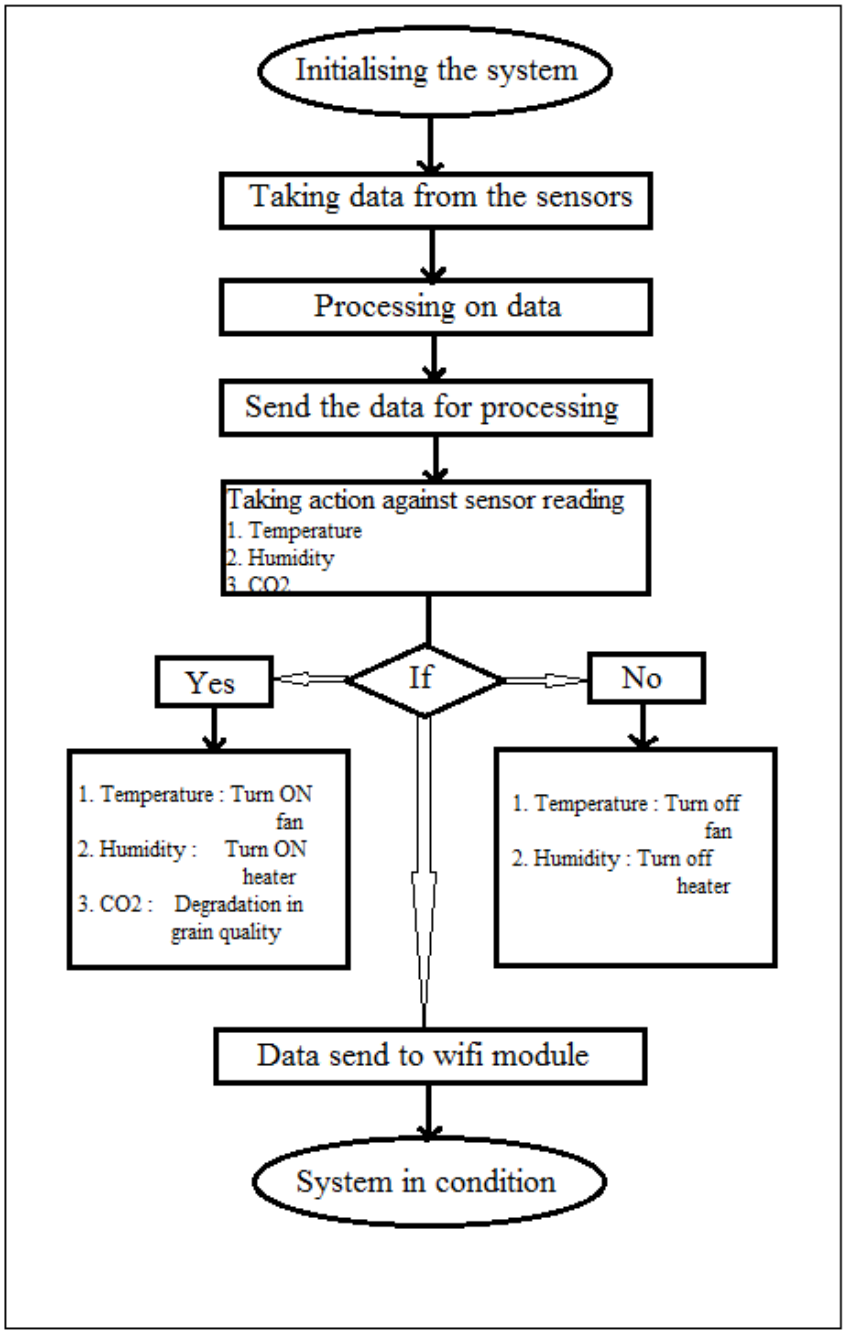

Figure-3
Flow Chart of Effective System ForGrain Storage

7. SIMULATION

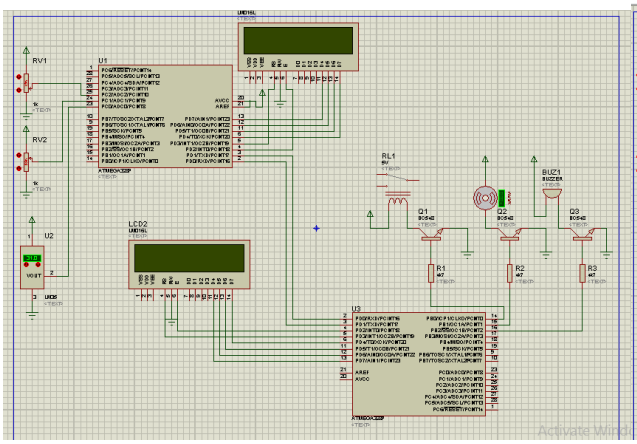

Figure-4

Circuit digram with respective connections of sensors With microcontroller and Lcd Interfacing on transmitter Side. And controlling devices on receiver side with Lcd Display.

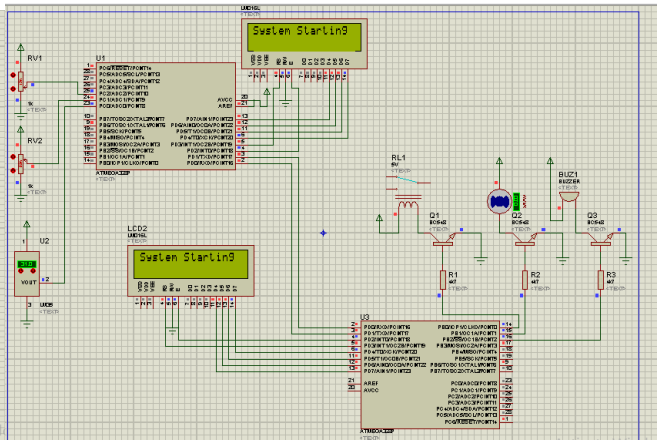

Figure-5

Simulation of the system- Displaying message on LCD Display (System Started).

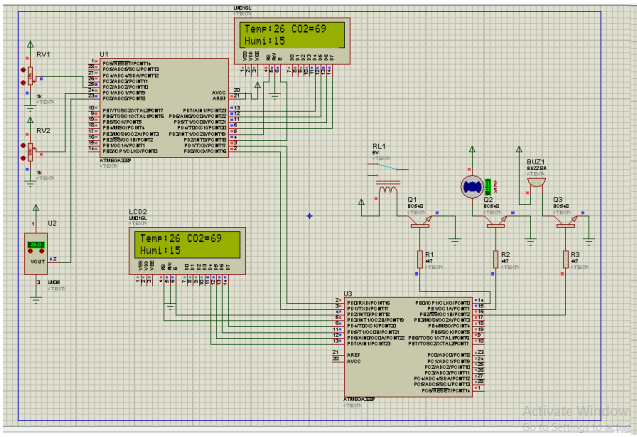

Figure-6

Simulation of System- All the sensor's values displayed On LCD Display on both transmitter and receiver Side.

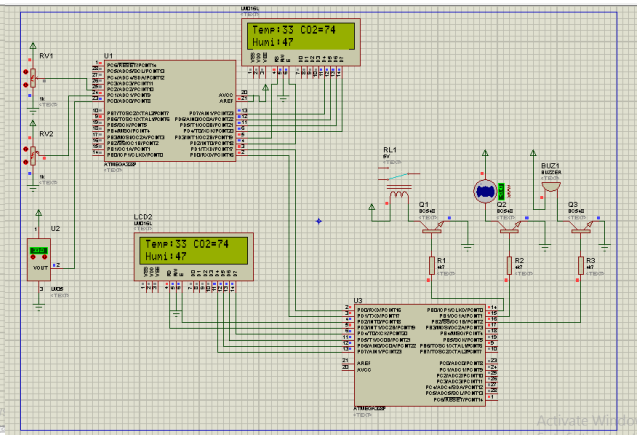

Figure-7

Simulation of System- As there is increase in temprature, Fan (controlling device) on receiving side starts. And respective values displayed .

8. CONCLUSION

This system aimed at designing advanced system for monitoring and controlling of the Grain condition based on Atmega328P and IOT based system with good performance, clear structure and good scalability.

This is used to transferring data, it can guarantee the data collected transmitted to user, real-time at environmental timely and make right decisions. The system not only save the energy consumption but also reduce the labor intensity and material resources. Applying embedded technology and IOT wireless transceiver technology to the rapid deployment system of the incident detection of emergency food storage without complicated connections. It enhances the system flexibility, small size, low cost and good effective.

9. REFERENCES

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