Dissertation on

Monitoring and Controlling the Crops in Warehouse using IOT

Submitted in partial fulfilment of the requirements for the award of degree of

Bachelor of Technology
in
Computer Science & Engineering

UE17CS490A – Capstone Project Phase - 1

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August - December 2020

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CERTIFICATE

This is to certify that the dissertation entitled

Monitoring and Controlling the Crops in Warehouse using IOT

is a bonafide work carried out by

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In partial fulfilment for the completion of seventh semester Capstone Project Phase - 1 (UE17CS490A) in the Program of Study - Bachelor of Technology in Computer Science and Engineering under rules and regulations of PES University, Bengaluru during the period Aug. 2020 – Dec. 2020. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report. The dissertation has been approved as it satisfies the 7th semester academic requirements in respect of project work.

Signature Prof. Rachana B S Assistant Professor	Signature Dr. Shylaja S S Chairperson	Signature Dr. B K Keshavan Dean of Faculty

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Name of the Examiners	**Signature with Date**
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DECLARATION

We hereby declare that the Capstone Project Phase - 1 entitled **Monitoring and Controlling the Crops in Warehouse using IOT** has been carried out by us under the guidance of Prof. Rachana B S and submitted in partial fulfilment of the course requirements for the award of degree of **Bachelor of Technology** in **Computer Science and Engineering** of **PES University, Bengaluru** during the academic semester August – December 2020. The matter embodied in this report has not been submitted to any other university or institution for the award of any degree.

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ACKNOWLEDGEMENT

We would like to express my gratitude to Prof. Rachana B S, Department of Computer Science and Engineering, PES University, for his continuous guidance, assistance, and encouragement throughout the development of this UE17CS490A - Capstone Project Phase – 1.

We take this opportunity to thank Dr. Shylaja S S, Chairperson, Department of Computer Science and Engineering, PES University, for all the knowledge and support I have received from the department. I would like to thank Dr. B.K. Keshavan, Dean of Faculty, PES University for his help.

We are deeply grateful to Dr. M. R. Doreswamy, Chancellor, PES University, Prof. Jawahar Doreswamy, Pro-Chancellor – PES University, Dr. Suryaprasad J, Vice-Chancellor, PES University for providing to me various opportunities and enlightenment every step of the way. Finally, this project could not have been completed without the continual support and encouragement I have received from my family and friends.

ABSTRACT

Physics objects associated with the web through sensors, hardware, programming, actuators that are implanted in or joined things give us better power over our surroundings, interface us to frameworks we utilize in our day by day life. In numerous nations' grains are the fundamental wellspring of food. Expanded interest will be inescapable on the grounds that food grains make up somewhere in the range of 67 and 80% of the world's food flexibly. Consequently, putting away yields without letting it to ruin is significant. During the yield stockpiling, temperature, mugginess, carbon monoxide factors that can influence the quality and amount of the put away yields.

Thus, we are proposing a keen yield stockpiling of executives utilizing IOT that will give a productive approach to control and screen the put away yields in stockrooms. Proposed structure screens stockroom boundaries, for example, temperature, carbon monoxide, stickiness, smoke by utilizing different sensors and raspberry pi. Thing speak is utilized as a cloud that helps in the visualisation of data.

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INTRODUCTION

India is where the horticultural areas assume a significant part in the economy. Consistently ranchers face various issues because of the capacity prerequisites, absence of legitimate checking of the food put away. Distribution centre in the agribusiness area is considered as the more significant area for the most part for guaranteeing food safety. In prior days, there were antiquated techniques for stockpiling the yields which required a ton of the manual methodology incidentally which is tedious and wasteful. Food and grains begin to ruin when they are yielding. Furthermore, just a little amount of the food and grains are stored in storage centres. An enormous piece of the harvests is left without legitimate storerooms. because of the variances in the market gracefully both from one season to straightaway and from one year to next, the misfortunes that the nation faces each year because of ill-advised capacity is about Rs.50,000 crores in money related terms.

A stockroom gives assurance of food from setback and mischief as a result of warmth, dampness, residue, and air. The basic point must be to keep up the yield in incredible condition for as far as might be feasible. Capacity of yields is one of the components of warehousing where insurance of yields and risk bearing is an essential factor. Besides, it hinders any mishaps like robbery or hardship. As observed by the Food and Agriculture Organization that the higher the temperature, the lower should be the clamminess of the grain to guarantee extraordinary security of the harvests. As a result of high temperature, food loses its weight continuously and in the end is withered, spoiled.

The primary target of this work is to develop a monitoring and controlling of yields in warehouses using IOT which will give live information of temperature, dampness and different boundaries and furthermore to control these boundaries distantly over the web. Means on the off chance that an unforeseen circumstance is made, at that point administrator can control the circumstance using a webpage. Another intention is to automate this cycle where everything like stockpiling temperature, moistness is consequently kept up without human communication.

CHAPTER-2

PROBLEM STATEMENT

Nowadays ranchers are going up against enormous hardships due to some amassing essentials which are not being fulfilled and in light of nonattendance of induction to sensible refrigeration structures. From now on we have devised an undertaking where all the harvests are being checked ceaselessly with the help of sensors. Fundamentally this undertaking utilizes raspberry pi which goes probably as a microcontroller similarly as a specialist and prefers heat, moistness, smoke and a light sensor. All of these sensors can be easily controlled through a web application. This endeavor makes us screen constantly and grants the customer to control the movements at whatever point required.

CHAPTER-3

LITERATURE SURVEY

In this part, we present the current information on the territory and survey significant discoveries that help shape, advise and change our study.

- **3.1**
  - **Title:** Smart Warehouse Monitoring Using IOT,2019

    Authors:K.Mohanraj,S.Vijayalakshmi,N.Balaji,R.Chithra kannan,R.Karthikeyan,2019, IJEAT
  - **Abstract:** This project is to catch heat, dampness, quake and fire related data utilizing sensors and send cautions utilizing IOT innovation. The issue looked by the Central Warehouse Corporation is limit loss of food grains on account of environmental changes Storage loss of capacity loss of food grains are being noticed and controlled through quality check chips away at including typical and discontinuous compound treatment, recording of mugginess dampness and other key limits, customary review, proper documentation age examination, sanitization, condition of being of storeroom. By executing the new present day apparatuses for storeroom association structure incorporates different plans of motivations and wants from various financial specialists. Diverse storeroom systems during execution fail to meet their methods. By then the endeavor risk is given after execution. Due to ill-advised arranging the execution fizzled. So we need to complete a versatile and progressing course of action to execute a storeroom structure.

- **Methodology :**

  - The different sensors used are heat and dampness sensor and piezo vibration sensor and IR sensor.
  - The information collected from the sensors is sent to the Raspberry Pi microcontroller.
  - The collected information can be displayed in an LCD display.
  - The Raspberry pi has an interior Wi-Fi module through which the IoT is associated. It has a SD space which stores a restricted scope of each sensor.
  - Now the yield stored in warehouse information collected by the sensors is updated periodically through the controller.
  - The controller checks at standard traverses when the scope out performs it gives an alert. We can screen this by associating with HDMI.

- **Future Work:**

  - The feature of this technique is that it has further developed innovation with massive highlights which is fused in the framework itself.
  - The outline regarding the smart warehouse system and fire sensor and web camera to pass the information to Raspberry Pi microcontroller via LCD display as SMS/E-Mail.
  - Therefore, in future it can be automated for warehouses using IoT. In future the automatic system can be used for irrigation purposes.

3.2

- **Title:** IOT Based Smart Real Time Agriculture Warehouse Monitoring And Control System Using Raspberry Pi,2019,IJRECE

  Authors: Dr.R.M. Rewatkar , Mr. Akash V. Gulhane , Ms. Ashwini S. Mungale, Ms. Nikita M. Dhengare , Ms. Pooja P. Thakare , Ms.Prajakta D. Sabane

- **Abstract:** In Warehouse, ranchers are keeping their horticulture items to build the lifetime of the capacity materials. Ranchers should know if their capacity items have been harmed or not. Consequently our venture plans to make agribusiness shrewd ongoing checking and controlling framework with the assistance of PC, PC and most recent advances.

- **Methodology :**
  - Web-application module is utilized to keep data about the adjustments in the atmosphere
  - Raspberry Pi is essentially a gadget planned which goes about as a microcontroller just as a worker
  - Humidity Sensor otherwise called hygrometer faculties and reports both dampness and air temperature.
  - Relays are essentially switches which work both precisely and electrically with an electromagnet. It works when there is a low-power sign and this data is helpful to control the circuit.
  - Smoke sensors are utilized to recognize smoke dependent on the voltage levels. More smoke demonstrates more noteworthy voltage.
  - Essential guideline of a LDR is photograph conductivity. It is an optical marvel wherein the materials conductivity is expanded when light is consumed by the material.

- **Future Work:**
  - We can use a web camera to capture images or video.It will help to see the actual condition of the product.
  - Currently, the system is monitoring only four parameters and controlling two parameters.

- **3.3**

- **Title:** Iot Instrumented Food and Grain Warehouse Traceability System for Farmers, 2020,IEEE Xplore.

  Author: Susmita Banerjee, Anil Kumar Saini, Himanshu Nigam, Vijay

- **Abstract :** Food stockpiling assumes a significant job with regards to food safety that is influenced by food misfortune and food wastage. The proposed framework should permit an IoT empowered observing framework to convey in distant regions where the openness is extremely least for ranchers with food storerooms to decrease food misfortunes and increment sanitation.

- **Methodology :**

  The main component of this system is ESP-32. They have used various sensors such as PIR sensor,Vibration Switch,Gas sensor DHT11 sensor and Fire sensor. The framework comprises a sensor hub, microcontroller hub, web worker. Microcontroller accumulates sensor values from the sensor hub and sends it to the GSM module, later it communicates to the web worker. GSM is an advanced cell innovation utilized for sending voice and information. It acts as a correspondence interface among microcontrollers and web workers. Sensors are responsible for recognition of different inconsistencies in a stockroom or cold-stockpiling conditions. Certain food items, for example, food grains need appropriate lighting to look after quality, such area LDR are put. Humidity sensor detects high dampness in a distribution centre climate. Furthermore, send the value into the microcontroller. Temperature sensor detects high temperature in a stockroom and sends these qualities into the microcontroller. Smoke alarm distinguishes smoke if in the event that fire occurs in the stockroom and sends

these qualities into the microcontroller. Load cells are utilized to check weight of food items, it occurs if there should be an occurrence of rodent warming and corruption of food items.

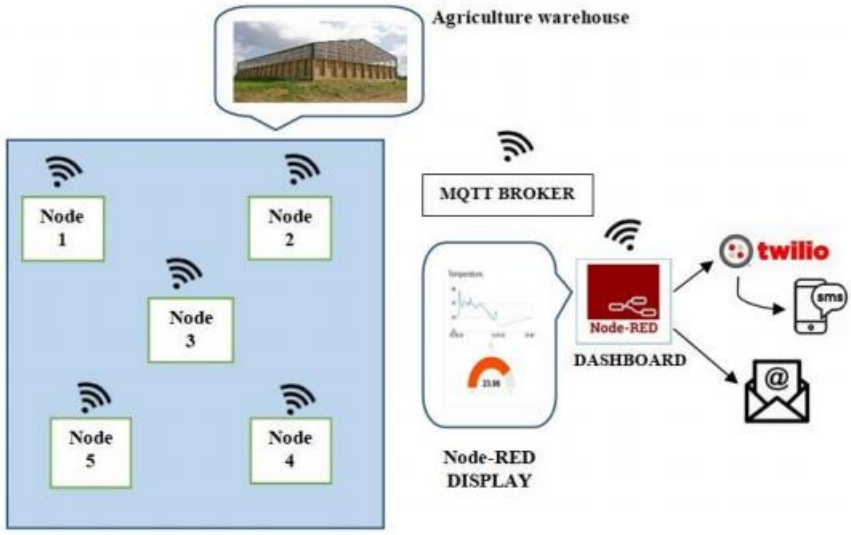

Fig-1:Overall System Architecture.

- **Future Work:**
  - As IoT has entered the horticulture field, this advancement will be successfully open to ranchers.
  - Later on we can use different sensors with high affectability, high flexibility, and high unwavering quality which will be made and which can be valuable to secure the grains and vegetables.

3.4

- **Title:** Iot Based Food Monitoring System in Warehouses,2020,IRJET

  Author: Shivani Bhandari , Pooja Gangola , Shivani Verma , Surekha K Si
- **Abstract:** India is the country where the agricultural sectors play a major role in the economy. Every year farmers face numerous problems due to the storage requirements, lack

of proper monitoring of the food stored. Warehouses are used for storage purposes. Only a small part of the food grains are stored in the state run warehouses. A large part of the crops is left without proper storage facilities.So the IoT based system for monitoring of food grains not only aims at implementing a multi-parametric system which helps in preventing the loss against various factors like moisture, aging and decaying but also consumes less time and cost effectively.This paper presents a food monitoring system in warehouses using raspberry pi and various sensors that continuously monitor the various factors which may affect the food quality. The ThingSpeak is used as a cloud that helps in the visualization of data.

- **Methodology :**

In this paper they have used different sensors like heat sensor, dampness sensor, Light sensor, MQ3 sensor and give different types of notifications to the warehouse manager about the conditions so that the manager can take action. The actions taken by the manager will help them increase the survival of food little longer and proper use of resources will be done, which will make the environment friendly also. Data from different parameters can be seen on computers and SmartPhones. And they have used Raspberry Pi which is Wi-Fi enabled and also thingspeak to store the data in the cloud.

- **Future Work:**

There are 3 methods to notify the directors, with the assistance of LEDs visual caution, with the assistance of Blynk versatile application that can follow live feed too and the diverse alarm sound with assistance of small buzzer .An organization where each segment will have the option to think exclusively, will recover information from cloud to likewise improve their choices each time with the assistance of information mining algorithms.We can associate this entire framework to Soracon Lagoon dashboard to get further inside and out examination with the of GSM module and IoT SIM card on our own computers.Alarm structure can be used to alert the supervisors if there emerge an event of any unusual exercises, this can achieved by using sensors around the field and presenting a live perception in order to perceive remarkable conduct by image processing .

3.5

- **Title:** Intelligent Grain Storage Management System Based on IOT

  Author: Ajay Doltade,Ankita Kadam,Sayali Honmore,Sanjeev Wagh

  Abstract: India is the tremendous nation attached to horticulture most generally where in india a large portion of individuals practically 70% individuals lives relies upon agribusiness. Where capacity of food grains is the most significant part and plays an essential role.Indian economy though while putting away grains the temperature, dampness etc.,their focus is more significant and where these components additionally could influence the nature of food grains.

  The conventional techniques just cutoff to a portion of the testing climate condition approaches,where different variables must be distinguished or checked independently.The strategy for observing the grain stockpiling progressively is planned by utilizing some IOT devices.The result of this paper has numerous attributes, for example, discovery and simple anticipation helps in improving the nature of the food grain put away and lessens the wastage of grains put away in the stockroom.

- **Methodology :**

  The Node MCU ESP8266 is the microcontroller which goes about as the focal control part.DHT11,MQ135,MQ2and PIR are the sensors utilized for detecting and accepting the data.Buzzer is utilized for the alarming the managers.Blynk application is utilized for warning conveyed by blynk cloud.

- **Future Work:**

  Need to monitor the temperature and humidity regularly.

Drawbacks:

- Internet connection is very important in case a poor network system fails to control and monitor the system on time.
- Providing security to the warehouse is also more important
- Data security is another drawback
- Requires 24/7 power supply failure in regular supply of power will damage the grains

Conclusion:

- Other than setting up a food support framework, it proposes a minimal effort arrangement dependent on IoT.
- This framework advances the updating of the stockroom, the system framework maintaining a strategic distance from food squander and pointless financial misfortune.
- By execution and usage of the current innovation the stock administration for the cutting edge storage facility, the system is proposed with IOT empowered sensor innovation.

CHAPTER-4

SYSTEM SPECIFICATION AND PROJECT REQUIREMENTS

4.1 Introduction

Internet of Things (IoT) is a concept that permits actual articles with computational and sensory support with each other and access services across the Internet. The IoT idea was introduced to connect devices through the Internet and facilitate access to information for clients. The wide range of potential applications of IoT also includes agriculture, where extensive use of IoT is expected in the future. The point of this work is to introduce the IoT idea as a reason for monitoring and controlling the yield in food storage houses.

4.1.1 Project Scope

- **Aim :**Our Aim is to provide Ranchers yield with good storerooms to reduce food misfortunes and increment food safety. Reducing food misfortune which will consequently build high amounts of food availability.

- **Benefits :** The vital advantage of this cycle is that it permits the Stakeholders to comprehend the present status of the undertaking, the means taken, and financial plan, schedule,remote monitoring,reduced employees and increase in food availability

- **Usage:**Producers, Dealers, Traders, Distributors for good storage facility.

4.2 Product Perspective

- With the development of business and the continuous necessities of the food item assortment, old style storehouse the board models won't meet that, because of its heavy capacity and low proficiency. To moderate the physical work and to make the work simpler, a smart warehouse is implemented which is empowered with a few sensors and advanced technologies.

4.2.1 User Classes :

- FOOD MONITORING: To create an ideal environment for food by monitoring the state of food regularly and generates an alert if any problem is recognizable.

4.2.2 Operating Environment

Hardware Requirements
Raspberry PI
Temperature & Humidity Sensor
PIR Sensor
Fire Sensor
Gas Sensor

System Requirements
Intel I7 Processors
16GB RAM

Languages
Python

Operating System
Windows/Linux

4.2.3.General Constraints, Assumptions:

Constraints
Revenue and Affordability
Power Supply
Communication Range
Harsh Device Environment
Quality and Availability of Data
Quality of Wireless Link

Assumptions
Gracefully merchandise into the commercial center by having the option to store products when flexibly surpasses request and afterward delivering them when request surpasses.
Keeping up reliable stock levels causes costs to remain stable, making it simpler for organizations to estimate creation, benefit and misfortune.

4.2.4 Risks

1. THE SECURITY FACTOR
2. TECHNICAL FAILURE AND FALSE ALARMS
3. CHANCES OF RASPBERRY PI GETTING DAMAGED
4. DATA SECURITY AND PRIVACY
5. NOT IN TIME ALERTS

4.3 Functional Requirements:

The progressive necessities indicate the capacities and units of the proposed framework. They characterize the conduct of the framework identifying with need:

1. Measuring the Temperature.
2. Measure Humidity.
3. Estimate the light intensity
4. Connecting Devices.
5. Permit clients to alter the ideal qualities for the sensor.
6. React to sensor readings and send alarms to the client.

4.4 External Interface Requirements:

4.4.1 User Interfaces :

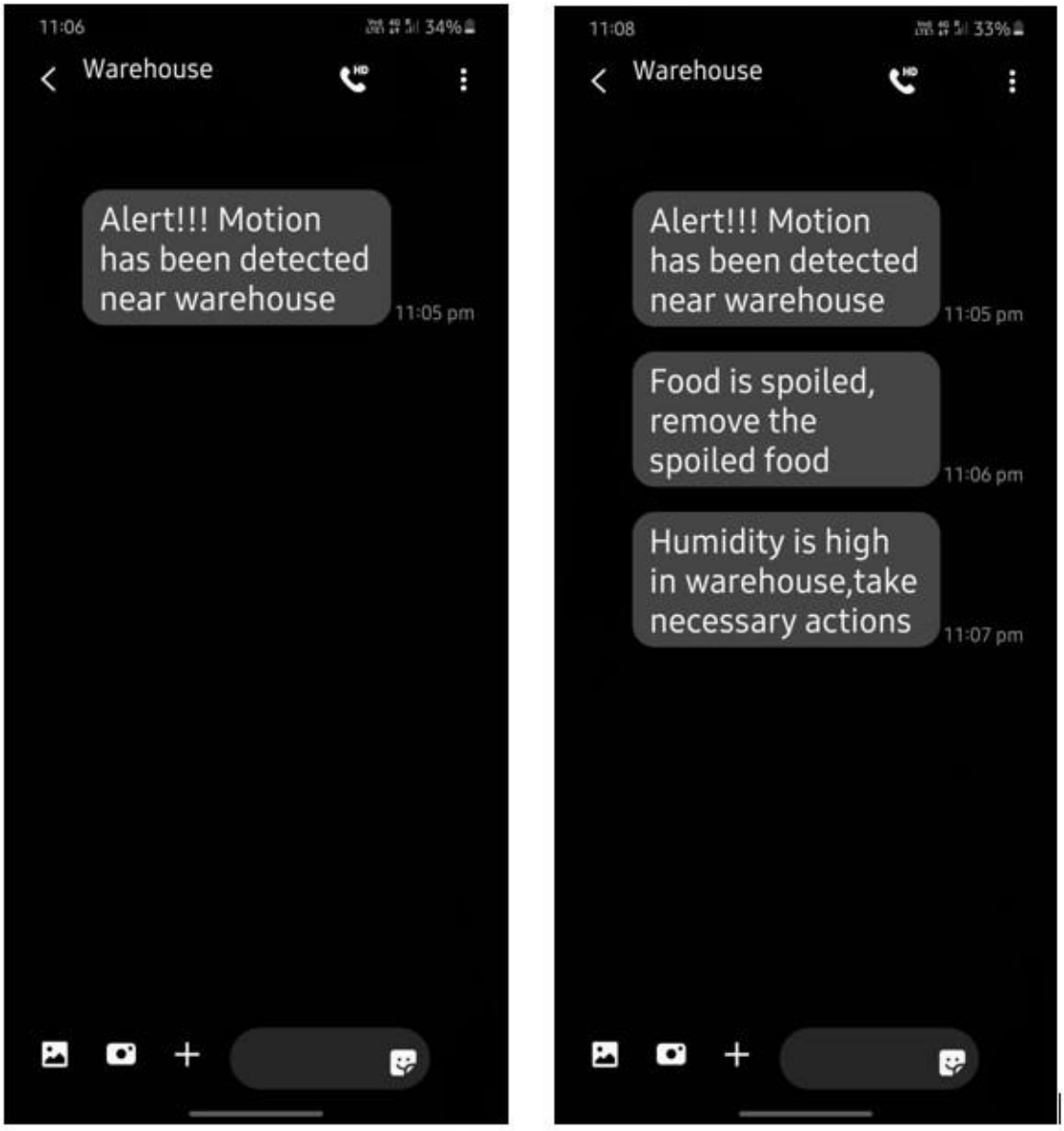

Fig-2:Example Alerts Sent to the User

The system sends an Alert message when any motion , fire is detected near the warehouse and it will also send alert messages when parameters like temperature , humidity goes below or above the requirements and also send alerts when food is spoiled inside the warehouse.

4.5 Non-Functional Requirements :

The Non-Functional Requirements of the proposed work survey the accompanying:

- Accessibility: The proposed framework worked successfully all the time.
- Dependability: The framework has long life and the readings are precise.
- Maintainability: The proposed framework can be updated at ease by simply coordinating extra segments with upgraded highlights.
- Usability: The proposed framework is effortless to understand.
- Capacity: A farmer can plan how much yield to store in the warehouse.
- Security: The proposed system requires this feature to increase users' trust.

CHAPTER-5

System Design

This segment describes design tasks and contemplations, gives a significant level outline of the system architecture, and describes the information configuration related to the framework, just as the human-machine interface and operational situations.

5.1 High Level System Design:

5.1.1 Design Description:

- **Physical Implementation:**Execution of Sensors, Actuators and Micro Controllers Implementation of Network Equipment
- **Sensing:** Collection of Data (environment) through Sensors.
- **Data Communication:** Communication between the focal and remote sensor hubs. Sensor Data is gathered into Cloud Storage.
- **Visualisation:** visualisation, processing and manipulation of data.

1. Circuit Design:

- **Wireless Sensor Nodes**: Observing and Recording the states of being of the climate and putting together the gathered information at a central location.
- **Central Node**: consists of Raspberry Pi, GSM Module, Exhaust fan.

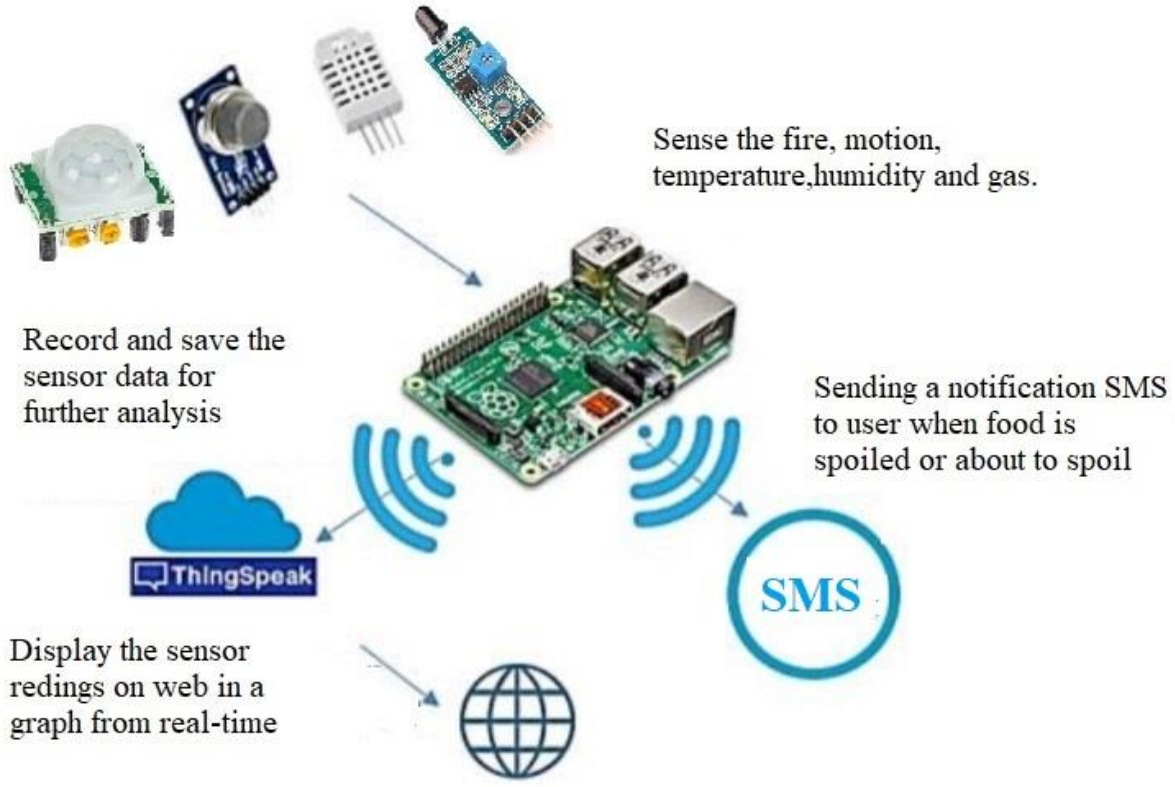

Fig-3: High Level System Design

Remote sensor networks enable us to assemble data from detecting gadgets (sensors) and send it to the core servers. Data accumulated through the sensors gives information about different biological conditions to screen the complete framework appropriately. Observing the natural conditions or yield profitability isn't the ideal factor for the analysis yet there are various factors which impact the yield's stored in warehouse, for example, movement of an undesirable object or food.Likewise, IoT ensures capable arranging of confined assets which ensures the best utilization of IoT to improve productivity.

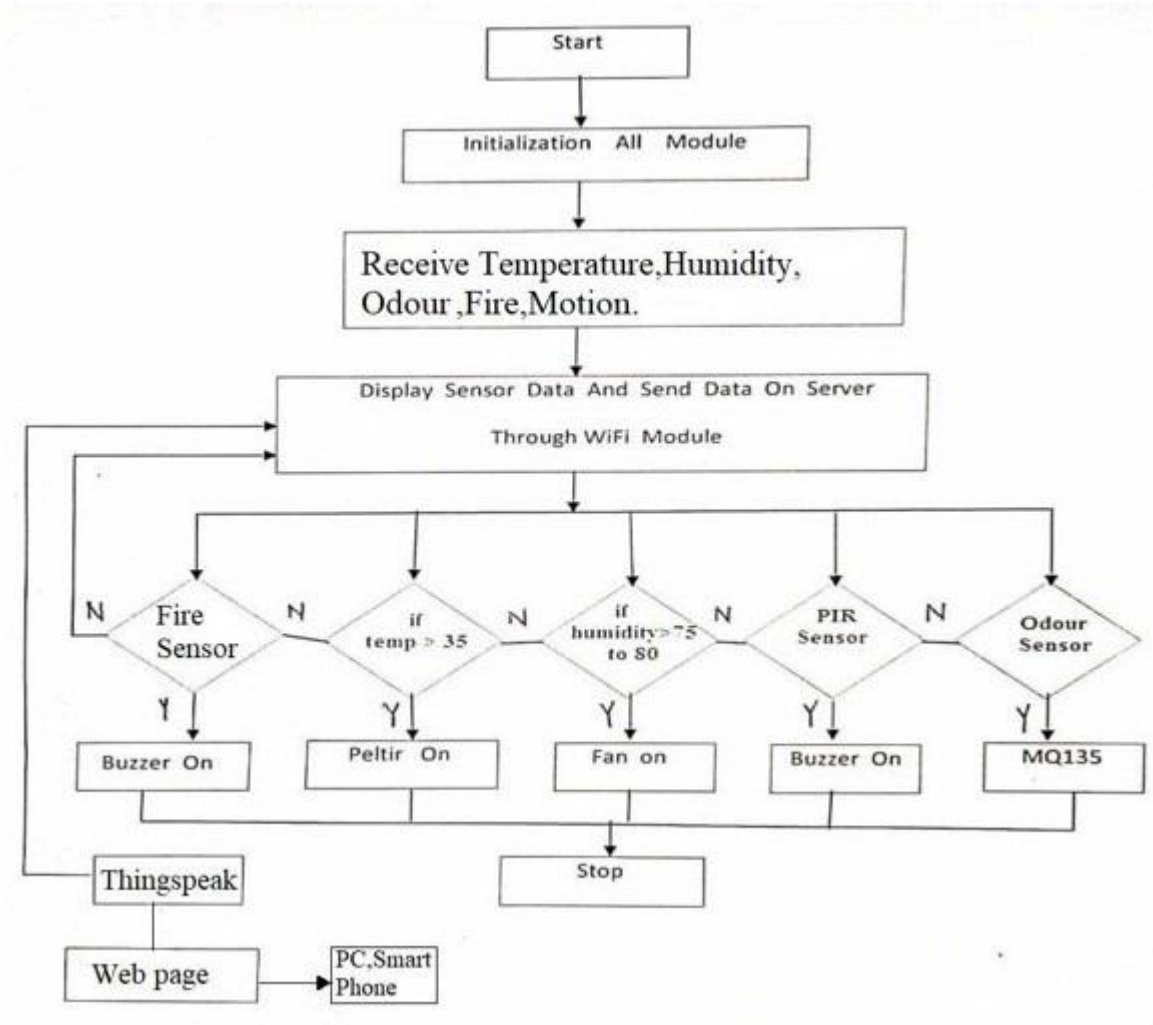

Fig-4:Flow Chart of Prototyping Framework

It finds any Temperature, humidity difference in the air and also food which is spoiled through the built application so that he can take care of the food stored in warehouse, Mainly the data is stored on the database through the cloud(Thing Speak) & through the GSM module the signal(message) is sent to client mobile regarding the indication of the temperature, humidity and food spoilage .

Food spoilage detection is done by sensing the gas in the air or using the pre-existing dataset.

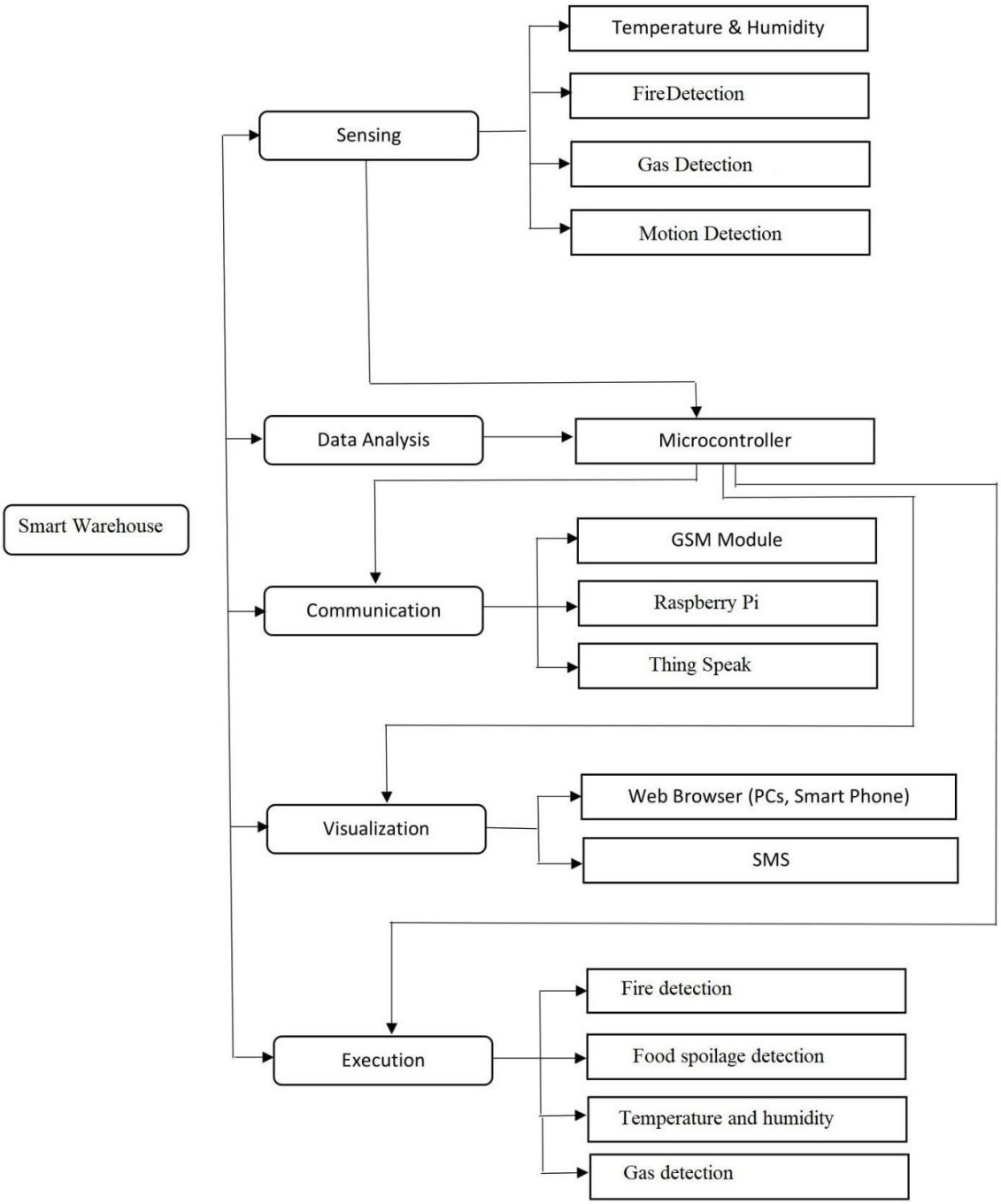

Fig-5: State Diagram

CHAPTER-6

Implementation and Pseudocode

Step-1: Downloaded Raspbian.

Step-2: Stored required packets in SD card.

Step-3: Inserted the SD card in raspberry pi.

Step-4: Connected raspberry pi with laptop.

Step-5: Getting an error while connecting raspberry pi with laptop.

Login Page:

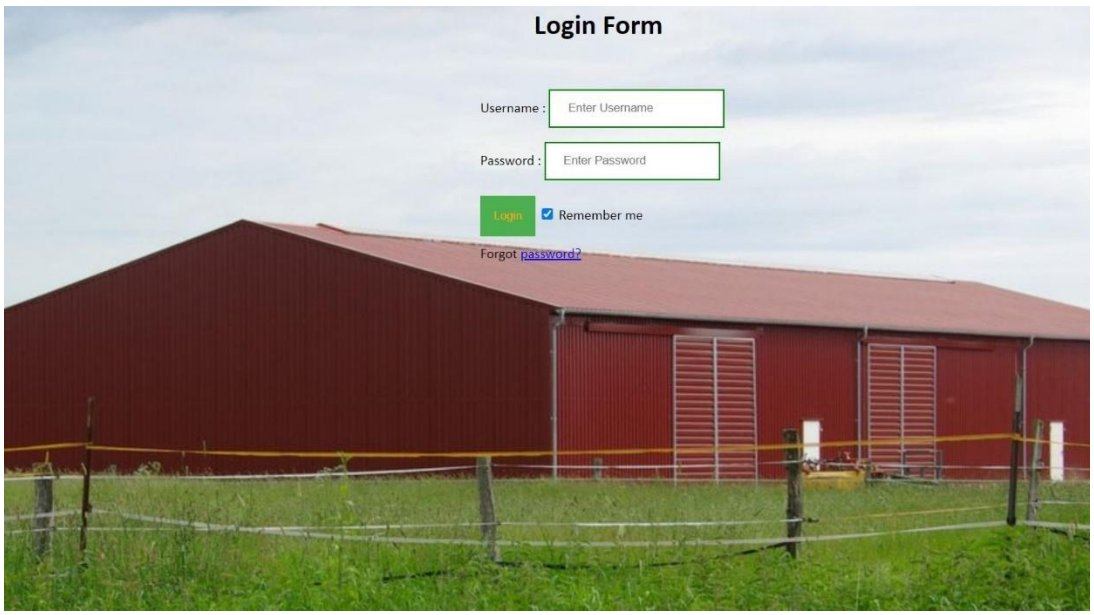

Fig-6:Login Page

Step-1: Downloaded Sublime Text

Step-2: Made a suitable website which takes the input as username,password,submit,forgot password,remember me.

Step-3: Execute the code in google chrome.

CHAPTER-7

Conclusion of Capstone Phase - 1

We have built our login page, completed a Literature survey and Partial Implementation of the System Is done.As a part of our project one of our teammates visited a grain storage warehouse .Our inference was that the warehouse was using the old traditional method.They were also using more man power and they told us that due to covid-19 pandemic there were lot of thefts in the warehouse.And one of our teammates visited vegetables and fruits storage warehouse.They were also using the old traditional method and they found that due to covid pandemic people who don't have enough money to buy food and started stealing the food materials from the warehouses and animals also started to take food items and also spoiled lot of food due these the dealers faced huge loss.

CHAPTER-8

PLAN OF WORK FOR CAPSTONE PROJECT PHASE - 2

Capstone Project Phase 2 deliverables are :

- Working with sensors.
- Complete-Implementation of the Project.
- Testing the Project.

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Appendix A:Definitions, Acronyms and Abbreviations

PIR : A passive infrared sensor

HTML : Hypertext Mark-up Language is the standard mark-up language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets and scripting languages such as JavaScript.

Food : Any nutritious substance that people or animals eat or drink or that plants absorb in order to maintain life and growth.