

Enhancing Performance In Smart Refrigerator Using IOT

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Abstract-

The Internet of Things (IoT) refers to the set of devices and systems that interconnect real world sensors and actuators to the Internet. This includes many different systems, including smart objects, smart monitoring devices, home automation systems, smartphones (which are increasingly being used to measure the world around them) and many more. This paper designed with A smart refrigerator allows a user to know which items are inside the refrigerator without opening it, like name of the product and before what date and time it should be used by simply checking the display list on user's Email. what kinds of vegetables are being stored inside it and keep a track of the stock expiry of vegetables and it will notify the current status of food items. The refrigerator is able to send its content list to user's email. The items are going to spoil before the product status is updated the user's. The correct temperatures in the fresh foods and freezer sections maintain the various product of foods control set to point (adjusting the temperature controls).

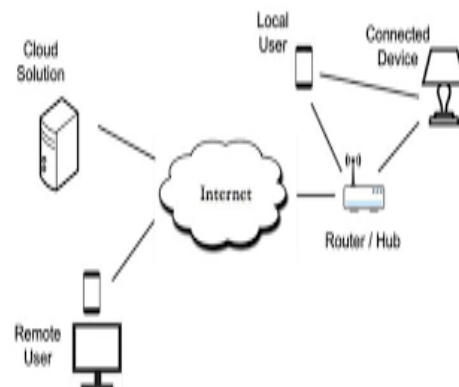
Index terms: Smart refrigerator, Internet of Things (IoT), arduino uno, Temperature sensor, load cell sensor, gas sensor, Ir sensor.

I. INTRODUCTION

The Internet of things (IoT) refers to the set of devices and systems that interconnect real world sensors to the internet. This Both the Research and the Industry has focused on the development of the Smart Home Environment. Developing the Smart Appliances is hence directly proportional to Developing the Smart Home environment. It is a critical factor in the realization of smart home environment. The Kitchen is one of the most important place in the Smart home as it consists of many appliances which provides an better services to household. The main focus of our project is on the smart refrigerator. Refrigerator is the most frequently used kitchen electrical appliance all over the world for food storage. Principally this appliance is used for various tenacities like storing vegetables, fruits etc. Smart refrigerator compares the status of the food

for e.g. expiry, weight, quantity etc. Significance of this work will be removable of food spoilage, reduce illness and make healthier lifestyle of modern age human being. As we look around ourselves we see modernization with superior technology, for example cell phones, kitchen, appliances and many more. Smart appliances include washing machine, television, refrigerator etc. Here we study about smart refrigerator, because people are very busy in modern life style. They do not really have time to look after their basic healthy habits and diet; since we are capable to deal with the technology we can design a smart refrigerator system which can help us to maintain a healthier lifestyle without putting any extra effort and time. In this paper we propose smart refrigerator which leads to healthier lifestyle.

BLOCK DIAGRAM



II. LITERATURE SURVEY

A. Shwetha J1 and S N Prasad2

This paper we propose an architecture to have IoT benefits on regular embedded systems like common shopper machines, we will utilize the sensors to screen the status of the things in therefrigerator . The status of operation will be informed to the user with the help of IoT technique.

B. Shouming Qiao, Hongzhen Zhu

This paper deals with RFID combined with Internet and information processing, intelligent refrigerator for food management is developed, the wireless communication module can also be used to connect intelligent terminal and the refrigerator, the situation inside the refrigerator is checked.

C. Lei Xie Bo Sheng

iFridge is able to automatically collect the food information, perceive the user's activities and locate the specified foods. It is a tedious task to search and locate a specific food from a massive number of foods arbitrarily placed in a fridge.

D. Hsin-Han Wu, Yung-Ting Chuang

This paper approaches a low-cost smart Refrigerator built with Raspberry Pi, GUI prompt data synchronization among multiple devices, and real-time actual images then the image capturing will lag the output performance due to the foggy inside the refrigerator.

E. Haidawati Nasir, Wan Basyar

Smart kitchen evolution, the smart refrigerator system is developed. The system consists of three main parts which are sensing module, control module and transmission module. Notify the user about the condition and quantity of the food via an SMS. Expiration date may lead to significant food spoilage.

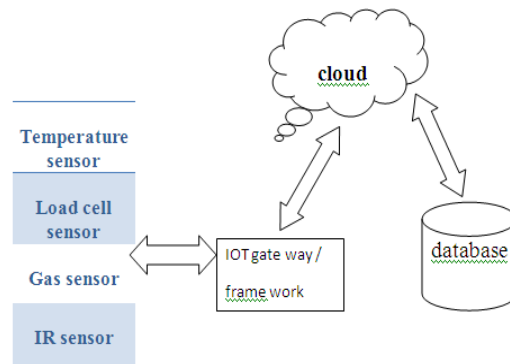
III. PROBLEM STATEMENT AND SYSTEM DEFINITION

System checks the packaging of the food items through the scanning of packaged food items. The system can communicate with sensors or scanners, to determine the embedded information. The Smart Refrigerator module is able to remotely notify the user about the low contents inside the refrigerator. Explicit expiration date may lead to significant food spoilage. Sensing module consists of temperature, IR sensor, load cell and odour sensor. Control module consists of Arduino UNO and power supply unit and last but not least, the transmission module consists of LCD module and Zigbee module. These modules work together to determine contents status inside the refrigerator and notify the user about the condition and quantity of the food via an email.

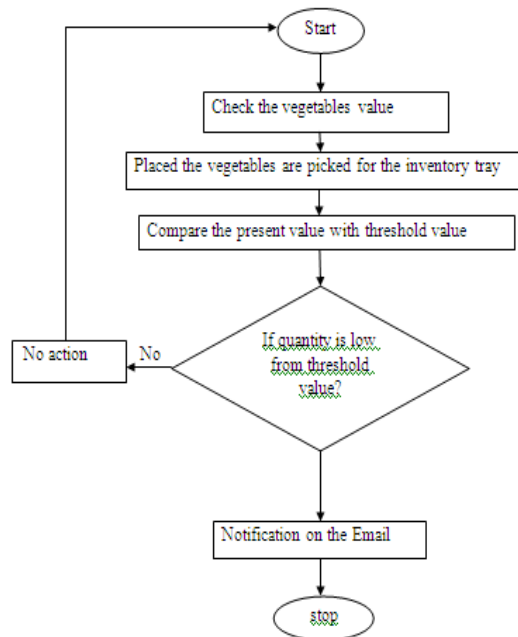
IV. SYSTEM ARCHITECTURE

An IoT system consists of sensors/devices which "talk" to the cloud through some kind of connectivity. Once the data gets to the cloud, software processes it and then might decide to perform an action, such as sending an alert or automatically

adjusting the sensors/devices without the need for the user.



FLOW CHART



V. EXISTING SYSTEM

The smart refrigerator system is capable of sensing as well as monitoring its contents. The smart refrigerator system is able to remotely notify the user about the scarce products via SMS. An intelligent system which permits the user to efficiently manage and correctly locate the foods stored inside the fridge. By using the RFID technology, I-Fridge is able to robotically collect the food information, observe the user's activities and localize the specified foods.

Disadvantage:

- Cleaning of this device should be done very carefully
- Different blocks are maintained to keep particular type of food.
- System won't work properly in case of food block and food type is exchanged

VI. PROPOSED SYSTEM

The proposed design aims to implement a smart refrigerator system, which is easy to use and economical for the user. It is capable of notifying its owner about the activities going on inside it via wireless system on the email. The designing of the smart refrigerator which is able to sense the quantity and quality of the food items kept inside the refrigerator.

Advantage:

- The message comes with the information about product which is low in quantity.
- Threshold level and at the same time the System will automatically send message.
- Checks the quantity and quality of the food items

VII. MODULES DESCRIPTION

- Sensor Data Collection
- Micro controller
- Threshold Level Check
- Message Notification

A. Sensor Data Collection:

- Sensing module consists of temperature, load cell, IR and gas sensor
- MQ gas sensor is used to detect gasses produced by fruits or vegetables or any other organic contents stored in the refrigerator.
- There is a possibility that variety of foods are kept in the refrigerator at different time.
- Therefore, the latest food kept in the refrigerator is the latest to become rotten or expired.

B. Micro Controller

- Control module consists of microcontroller and power supply unit and
- Arduino UNO controller for the smart system acts as a microcontroller that processes and connects all the sensors

- The most important thing is, it connects all of them through wired connection so that user can monitor all the values using Zigbee and receive via PC.

C. Threshold Level Check

- The notification is sent to the user once the value of the sensor exceeds the normal range.
- The normal range is the threshold value that can be set by the user.
- Once it exceeds the normal range, data application is triggered by the system to execute the next steps.
- Alert about the condition of their food stored in the refrigerator as well as to monitor the condition of their food through the channel connected with the system.

D. Message Notification:

- Transmission of message notification module consists of LCD module and Zigbee module.
- These modules work together to determine contents status inside the refrigerator and notify the user about the products via an email through PC.

VIII. FUNCTIONAL DESCRIPTION

- Perishable food items (particular vegetable or fruits) kept in block first. If vegetable is below from threshold value (200gm) then send the notification showing expiry of food items on the user's mail
- Also another type of food like dairy products and confectionary products kept in block second and third, the functioning is similar as first block.



A. Working on load cell:



1) Vegetable Detection:

The load cell is mounted below vegetable tray in the refrigerator that continuously measures the weight of vegetables in the tray. Since the weight of vegetable tray goes below threshold weight (set by user approximately 500gm), it senses the less presence of vegetables. Low signal will be generated corresponds to it which will be sent to the user on the mail.

2) Over Weight Detection:

The load cell is also used to measure the overall weight of fridge and compares this weight with the maximum possible capacity to carry the material inside fridge set by the manufacturer at which the cooling process of the refrigerator works properly. When the overall weight crosses the threshold level, buzzer will turn ON indicating overweight.

B. Working on the gas sensor (smell detection):



Rotten vegetables produce a mixture of gasses. Gas sensors are fixed inside the fridge to detect the odor of rotten vegetables. If gasses detected by the gas sensor, the message will be displayed on user's mobile, indicating to clean the fridge.

C. Push buttons on main door and freezer door:(IR sensor)



While the closing of main door or freezer door of the fridge, by mistake it may remain open by the user. When any of the doors is opened the push button release its contact and triggers the timer. If timer exceeds the threshold time of 5 minutes, the buzzer turns ON.

D. working on the temperature sensor:



Typical temperature in the freezer is -5 to -10-degree Celsius. At this temperature, the water in ice tray takes nearly 30 minutes to prepare complete ice. IR sensor is fixed in a compartment of ice tray that detects when the ice tray is placed in the freezer and starts the timer. After 30 minutes the timer stops and displays the message 'ice ready' on users mail.

Snap shots:



User can get the mail into the refrigerator .view the vegetables on the tray. notify the expire vegetable details and refill the content.

<input type="checkbox"/>	raspiduino4201	(no subject) - Smart Container Alert... Container is Empty
<input type="checkbox"/>	raspiduino4201	(no subject) - Smart Container Alert... Container Full
<input type="checkbox"/>	raspiduino4201	(no subject) - Smart Container Alert... Container is Empty
<input type="checkbox"/>	raspiduino4201	(no subject) - Smart Container Alert... Container Full
<input type="checkbox"/>	raspiduino4201	(no subject) - Smart Container Alert... Container is Empty
<input type="checkbox"/>	raspiduino4201	(no subject) - Smart Container Alert... Container Full

IX. CONCLUSION

The Smart Refrigerator module can remotely notify the user about the low contents of vegetables inside the refrigerator. Calculate the weight and check freshness from the vegetables. This module provides other advantageous like power saving, smell detection, ice-ready indication and others features. The proposed smart refrigerator is designed to healthier life style. It is designed for managing vegetables stored in refrigerator. And also through the smart refrigerator people can save money with less effort. We are confident that such type smart refrigerator will be important in future smart homes. The concept of smart refrigerator is far more reaching than notifying the user about the contents of the refrigerator. Smart refrigerator is cost effective, economical and user friendly.

X. FUTURE ENHANCEMENT

- It should give importance on maintaining a healthier lifestyle by providing thenutritional value of the contents.
- The future smart fridge will use barcode scanner that willscan theexpiry date products while keeping in the fridge.
- This gives alert to the user when any product in the fridge is expired. Ultrasound-scanning technology built into the door will allow the fridge to 'swipe and capture' the food on a plate before and after mealtime, meaning it can assess what type and amount of food are wasted.
- Cameras can be placed in the refrigerator that the user can able to see the contents available in the fridge on user's mobile application from a remote area.

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