

IOT Based Smart Refrigerator System

Mini Project Report submitted in partial

fulfillment of

the requirement for the degree

of

T. E. (Information Technology)

Submitted By
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2019-20

CERTIFICATE OF APPROVAL

**For
Mini Project Report**

This is to Certify that

Sneha Mane

Anuja Dhanu

Have successfully carried our Mini Project entitled
“Smart Refrigerator System”
in partial fulfilment of degree course in
Information Technology
As laid down by University of Mumbai during the academic year
2019-2020

Under the Guidance of
“prof. Kanchan Dhuri”

Signature of Guide

Head of Department

Examiner 1

Examiner 2

Principal

Dr. S.A Patekar

ACKNOWLEDGEMENT

We thank God for giving us the ability or this undertaking. This acknowledgement is not something which has been written in a day but we have been longing, right from the time we were allotted our guide, to express our gratitude. This is just a channel for our expression.

First and foremost, we express our profound gratitude and sincere thanks to **Prof. Kanchan Dhuri** our respectable project guide, for her gigantic support and guidance. Without her counselling our project would not have seen the light of the day.

We extend our sincere thanks to **Dr. Girish Bhole** Head of the Department of Information Technology for offering valuable advice at every stage of this undertaking. We would like to thank all the staff members who willingly helped us. We are grateful to VIDYALANKAR INSTITUTE OF TECHNOLOGY for giving us this opportunity.

The days we have spent in the institute will always be remembered and also be reckoned as guiding in our career.

- 1. Sneha Mane**
- 2. Anuja Dhanu**

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Abstract

With the enhancement of technologies in various fields our lives are directed to the intelligent and smarter regime. We are following new technologies rather than old approaches. Thus the devices ought to be smart enough to recognize our needs. Domiciliary/kitchen is one of the most prominent zones of intelligent appliances, one of those devices is refrigerator. Since current life style is driving people spending less time on healthy food preparation at home, pleasurable and fit life style can be supported with a smart kitchenware such as a smart refrigerator.

This Project deals with the designing of a smart refrigerator which is able to sense the quantity as well as quality of the food items kept inside it. With smart sensing technology, this refrigerator will keep check on the expiry of food products and the spoilage of eatable items. It will be smart enough to notify the current status of food items through an android app on our mobile phone, and will also remind us about the items are going to spoilage before they actually get rotten. Thus it will save the money and food wastage as well as help us to live a healthier lifestyle.

1. Introduction

Refrigerator is the most frequently used Kitchen electrical appliance all over the world for food storage. Principally this appliance is used for various reasons like storing vegetables, fruits etc. Smart refrigeration module is designed to transfigure any existing refrigerator into a smart cost effective machine using sensors.

Smart refrigerator compares the status of the food for e.g. expiry of food product, quantity of vegetables, etc. Significance of this work will be removable of food spoilage, reduce illness and make healthier lifestyle of modern age human being. Smart applications with hypermedia capability are being used in today's life, all the major credit goes to digitalization of technology and wide usage of internet. In this modern era, human being is used to deal with technology or we can say it as internet of things (IoT). 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 Project we propose smart refrigerator which leads to healthier lifestyle. Smart refrigerator is designed for managing food items stored in it and advising it user what type of food store inside the refrigerator. Here we discover the presence of the object by using Camera which is used for checking products of the container where objects are placed. It is always challenging to develop smart appliances while we appreciate about a smart home. A smart refrigerator is the main motivation while we talk about our research. We have seen many advancements while developing smart refrigerator in industry and research. The industry tries to change the generalized refrigerator function, i.e. to store food items in a suitable environment these computer-operated capabilities allow the development of applications for many devices one of them is smart refrigerators.

In this project, we propose to develop smart refrigerator which is an intelligent embedded system and allows the user to manage and accurately locate food items stored inside it. Similar class of food items are placed at different-different blocks. It is a fact that the fast-paced development and today's modern living has brought a depressive change on people'

lifestyle towards less physical activities and efforts and an uneven poor diet. Careless eating habits can cause illness issues in late life if we do not start eating nutritional food seriously. For instance, problems resulting from unhealthy eating habits and lifestyles are becoming a big health threat in the most of the developed nations. In this index we believe that applications which targets on better health are important. Our work will be to present an application development which will mainly focus towards the smart refrigerator with better health habits.

2. Aim & Objectives

The aim of the project is to analyze the Refrigerator Problems faced by the women in the house. Also, Sometimes the food gets rotten as it kept for longer time in the fridge.

To prevent the destruction we use the gas sensor to check the freshness of food item and also use the Camera for visualization of all activities inside the refrigerator and display it to the user in real time and to monitor the replacement of food items kept inside it. The user can add the item before keeping it in Refrigerator and add a time counter to tell the expiry of that particular product or food kept inside a vessel.

The refrigerator would then be able to cross reference and act on reducing the ingredients used in future meal suggestions and helping to minimize food waste.

2. Problem statement

Design a system which commences the check on the expiry of food products and the spoilage of eatable items. And, also sense the quantity as well as quantity of the food items kept inside it by setting a timer on it.

4. 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 mobile phone. The android app developed here is used as a GUI for the user where they will be able to see the condition of the food items kept inside the refrigerator.

4.1 Block Diagram:-

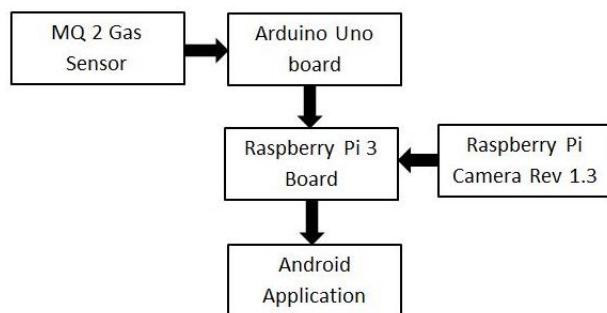


Fig 1.1: Block Diagram

4.2 Flow Chart:

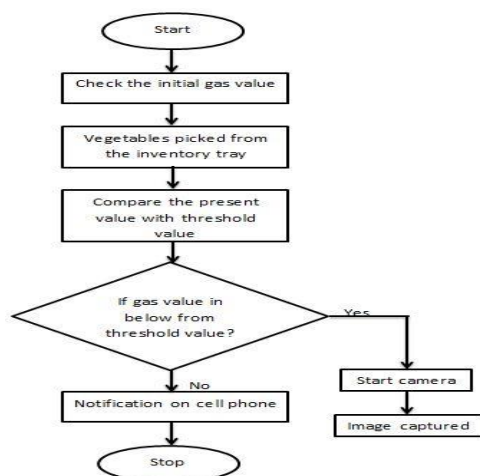


Fig 1.2: Flow Chart

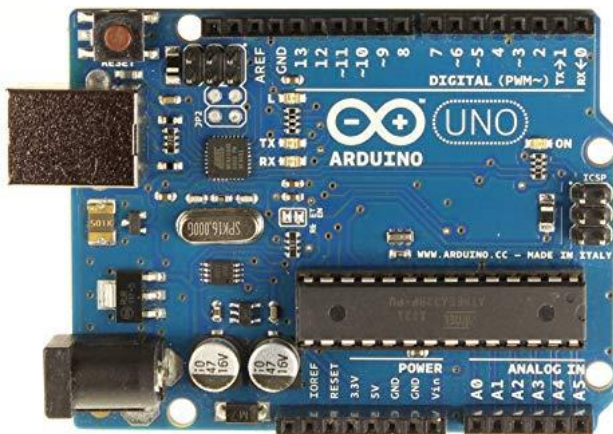
The steps followed for designing the system are:

- 1- Check the initial gas value of the vegetable item which is kept inside the refrigerator
- 2- Food items picked from the inventory tray
- 3- Compare the status of vegetable items (present value with threshold value)
- 4- If gas value is below from threshold value then start the camera and captured the image. And if it is not below then send the notification on the cell phone.

5. Components

5.1 Hardware:

Arduino Uno Board:



It is used to get the analog value which is more accurate than digital value which gives output as 0 or 1 from MQ2 Gas Sensor and send the data to Raspberry pi 3 Board.

Raspberry Pi 3 Board:



Raspberry Pi 3 Board is used to connect Raspberry Pi camera Rev 1.3 and it is used to take the gas sensor value from arduino board and send it on the android application. The gas sensor cannot be connected to the Raspberry Pi board because all the pins of Raspberry Pi board are digital and we need analog output.



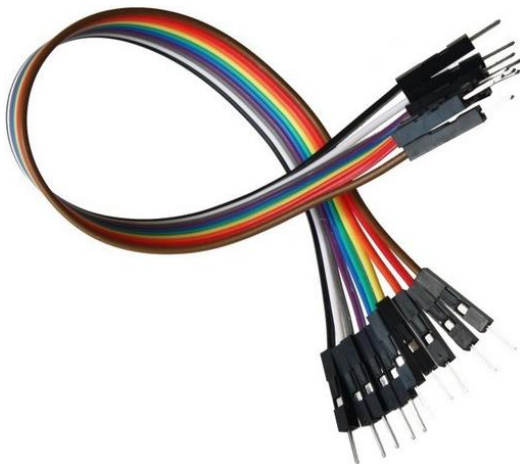
MQ2 Gas Sensor:

MQ2 Gas Sensor is used to sense the Methane gas which is emitted by the rotten vegetables the gas sensor is connected to arduino uno board.



Raspberry Pi Camera:

Raspberry Pi Camera Rev 1.3 is used to capture image inside the refrigerator and send it to the android application to the user.



Jumper Wire:

The jumper Wires are used to connect gas sensor to the arduino uno board.

5.2 Software:

Arduino IDE: Software provided by ARDUINO to code using different languages and make the Arduino UNO work accordingly.

MIT App Inventor to create Android Application.

VLC Viewer for Raspberry Pi coding this is used so that anyone who has the valid credentials can change the requirement.

Firebase Database is used to store gas value.

Google Cloud Storage is used to store image.

6. Logic:

The MQ-2 gas sensor is connected to Arduino UNO board which is used for detection of smoke from rotten vegetables

The gas sensor is connected to port 'A0' of the Arduino UNO which reads the analog data from the sensor and if the data is high then the specified value of the smoke that is already specified to the Arduino UNO it sends HIGH data to the relay which is connected to Pi. The Raspberry-Pi Camera Rev-1.3 is connected to raspberry pi board which clicks an image after every 10 seconds which overlap the pervious image. The user need to add an item and name it while keeping it in the Refrigerator and set a timer on it to keep a reminder to use it before spoiling.

The image and the gas valued is taken from the raspberry board and is displayed on the android app which is created MIT App Inventor.

The gas value is stored in Firebase database and the image is stored on Google cloud storage.

7. Code:

```
from picamera import PiCamera
from time import sleep
from google.cloud import storage
from firebase import firebase
import os
import sys
import RPi.GPIO as GPIO
import serial
import time
import pyrebase

os.environ["GOOGLE_APPLICATION_CREDENTIALS"]="/home/pi/Desktop/project
/camera-44e5a-6884d04a79c5.json"
firebase = firebase.FirebaseApplication('https://camera-44e5a.firebaseio.com/')
client = storage.Client()
bucket = client.get_bucket('camera-44e5a.appspot.com')

config = {
    "apiKey": "AIzaSyBU9c2nqXEG2GQhPXC70zst57FGdWNFS-w",
    "authDomain": "camera-44e5a.firebaseio.com",
    "databaseURL": "https://camera-44e5a.firebaseio.com",
    "projectId": "camera-44e5a",
    "storageBucket": "camera-44e5a.appspot.com",
    "messagingSenderId": "293129361834",
    "appId": "1:293129361834:web:30a3a24cb13d17e580f3d3",
    "measurementId": "G-QR6TRZE49F"
};

firebase=pyrebase.initialize_app(config);
db =firebase.database()
auth = firebase.auth()
```

```

ser = serial.Serial('/dev/ttyACM0',9600)
imageBlob = bucket.blob("")
imagePath = "/home/pi/Desktop/project/image.jpg"
imageBlob = bucket.blob("image.jpg")
camera = PiCamera()
camera.resolution = (480, 480)
try:
    while True:
        gas=ser.readline()
        gas=int(gas.strip())
        data={"Gas":gas}
        db.child("Data").update(data)
        print("Smoke sensor value",gas)
        camera.capture('/home/pi/Desktop/project/image.jpg')
        imageBlob.upload_from_filename(imagePath)
        print("Image uploaded")
        sleep(3)
except KeyboardInterrupt:
    print("Stopped by User")
    GPIO.cleanup()
const int gasPin = A0;

void setup()

{

    Serial.begin(9600);
}

void loop()
{
    int gas =analogRead(gasPin);
    Serial.println(gas);
    delay(10);
}

```


8. Implementation

8.1 Working

1. Reading from the gas value will be sent to the Arduino UNO, which will be checked by the Arduino with a pre-defined value.
2. If the reading by the gas sensor is larger then the pre-defined value. Arduino UNO will send a HIGH signal to Pi.
3. Once a HIGH signal From Arduino UNO is detected by the Pi, it will send a notification to the user that the vegetable is rotten.
4. The Pi will click a picture after every 10 sec which will overlap the previous image so that the user can get the latest image with the gas value on the Android app.
5. When the user will keep a product in the Refrigerator he/she will have to add item in the Android application and also set a timer on it so the user can use product before getting spoiled.
6. The data which is taken from Arduino and the image which captured by the Pi will be sent to the user on an android application.

8.2 Circuit Diagram

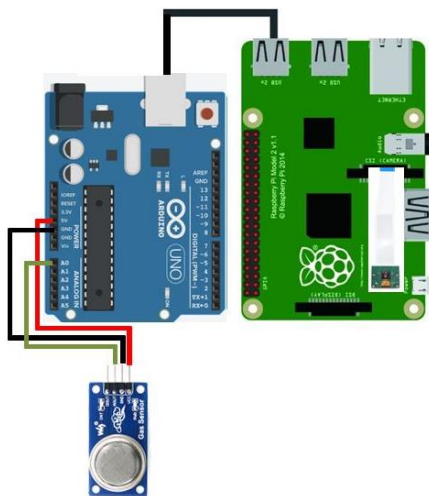


Fig 8.1: Circuit Diagram

9. Deployment of Testing:



Fig 9.1: Refrigerator Setup

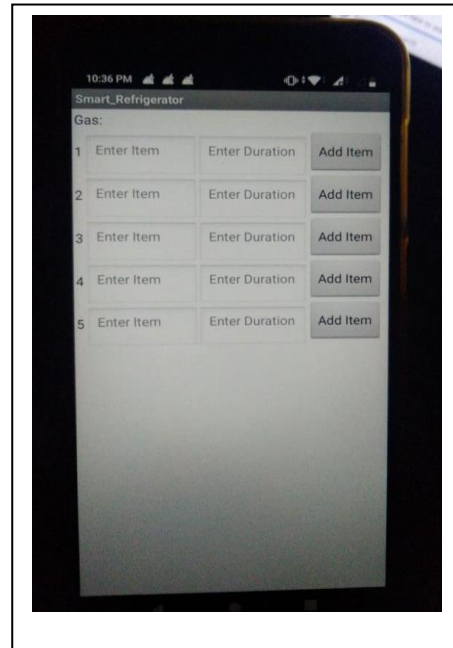


Fig 9.2: Add item and time duration setup

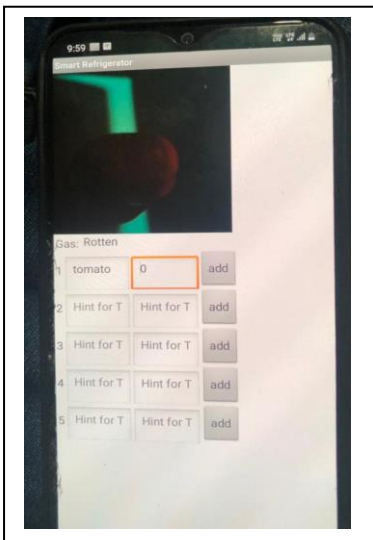


Fig 9.3: Image is captured and sent to user.

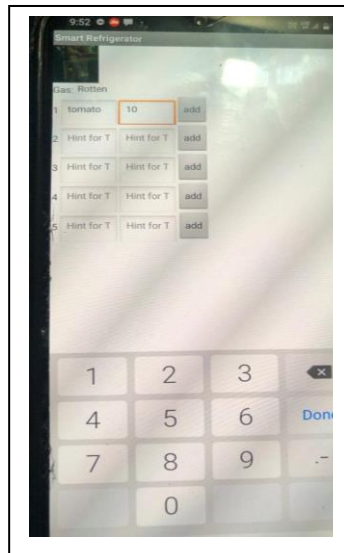


Fig 9.4: The item is added and time duration is started

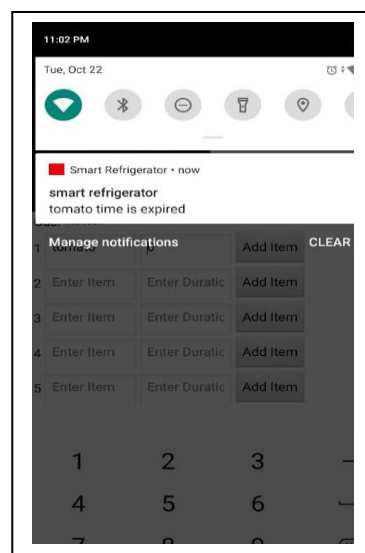


Fig 9.5: Notification is sent to the user after vegetable time is over.

10. Conclusion & Future Scope

We have introduced smart refrigerator application with intelligent multimedia capability. The proposed smart refrigerator can enable health. It is designed for managing items stored in it. More importantly, it can perform other functions such as dietary control, eating routine analysis etc. And also through the smart refrigerator people can save money with less effort. We are confident that such type smart refrigerator will be important component 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. Our future scope is to create a communication with the user directly when he/she keeps a product into the fridge so that the user will not have to add a product manually.

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