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IoT BASED SMART REFRIGERATORSYSTEM

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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 paper 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.**

***Index Terms*—Refrigerator, IoT (Internet of things), ARM Controller, Android, Load sensor.**

I.INTRODUCTION

Refrigerator is the most frequently used domiciliary/kitchen electrical appliance all over the world for food storage. Principally this appliance is used for various tenacities 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 date, weight, quantity etc. Significance of this work will be removable of food spoilage, reduce illness and make healthier lifestyle of modern age human being. Smartapplications 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 paper 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 load cell sensor, which is used for checking the weight of 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 broughtadepressive 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 refrigeratorwith better health habits.

II. LITERATURE SURVEY

The system can be implemented close by on a user device or implemented across a client device and server environment. 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. For example, the packaging can include a barcode. The system can communicate with a barcode scanner and camera e.g. that is close-fitting in the physical storage device, to scan the barcode and receive the information encoded through the barcode. And also it can be used packaging of the food product can include an RFID tag [1].The Smart Refrigerator module is able to remotely notify the user about the low contents inside the refrigerator. It also facilitates purchase of the scarce food itemsfrom an online vendor. The link to the online vendor is incorporated inside the notification that is sent to the user via SMS (Short Message Service) and email. This module allows the user to specify a placed order and the other users to acknowledge the placed order

[2].Intelligent refrigerator finds out the stock of the product Present in it and robotically place order for the nearest. Online shop via internet, If the stock is below the threshold level and at the same time the System will robotically send message, to inform the owner about the situation of the stock in refrigerator, and done with SMS. This system falls human interference. With advancement in sensors, the proposed system will be made stronger in sensing status of the all types of food items and also helps to send message at different phases of items stock [3].The paper proposes idea of using load cell signals for detection of movement in bed. A system for inconspicuous detection of movement in bed that uses load cells fitted at the corners of a bed. The system focuses on identifying when a movement happens based on the forces sensed by the load cells. The approach estimates the energy in each load cell signal over short segments to detain the differences caused by movement. We analyzed the performance of the proposed methodology on data consisting of controlled movements and showed that methodology reliably detects movements [4]. To use load cell sensor making a smart system which is inform all activities to the user inside the refrigerator. In this paper, we develop I Fridge, 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. We develop a smart application for food preparation by sensing the user's day-to-day eating habits [5].

III.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 it 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. The whole system is governed by the STM32F103x8 cortex M3 ARM microcontroller where load cell act as an input of microcontroller and Wi-Fi transmits the all information to the android phone by usingIoT. The items weight is below the set threshold value to alert notification is send to the user's mobile to refill the food items before the get over.

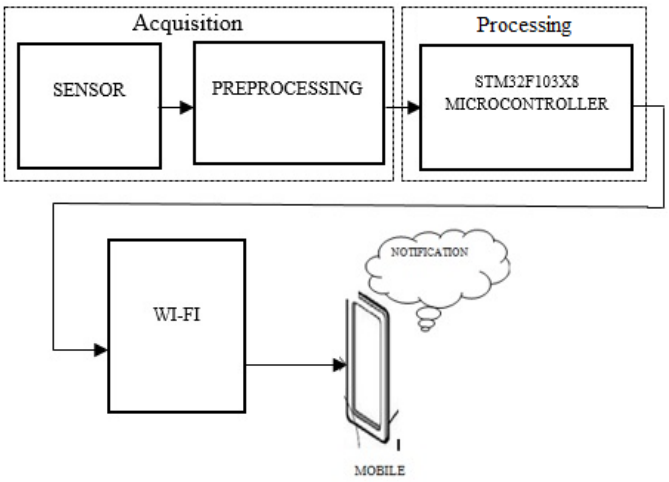

Fig 1 Block diagram

IV. Process flow

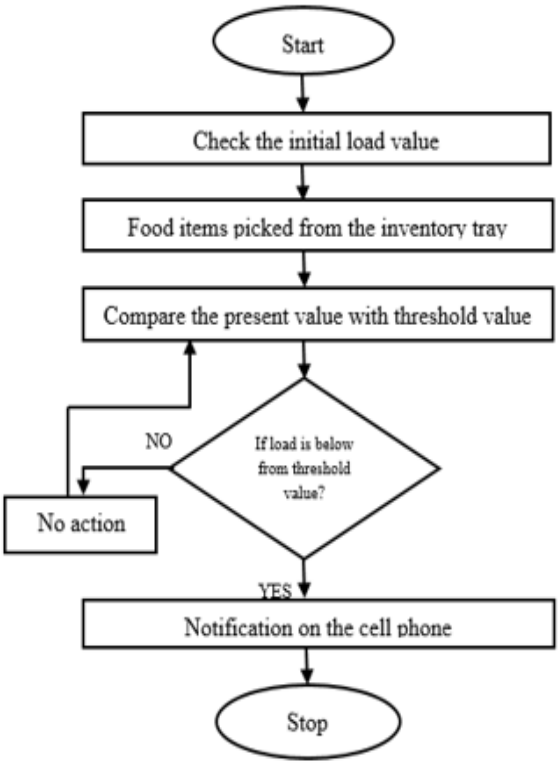

Fig 2 Process flow diagram

The steps followed for designing the system are:

1- Check the initial value of the food item which is kept inside the refrigerator
2- Food items picked from the inventory tray
3- Compare the status of food items (present value with threshold value)
4- If load value is below from threshold value then send the notification to the user on the mobile phone.

The system comprises of many sections where the sensors are placed Load cell sensors are placed alongside with a counter which can be used to sense the number of vegetables inside the refrigerator which is being done with the help of load cell sensors which has a threshold of 200gm approximately.

Whenever the food items kept in the refrigerator goes below the present value than it generates an alert which is being transmitted in the form of message to the user.After following the above steps we are now able to get real time information, quality(in terms of expiry), and quantity of food items which are stored inside the refrigerator.

V. Wi-Fi MODULE

There are many Wi-Fi technology such as

1- Bluetooth IEEE802.15.1
2- ZigBee IEEE 802.15.4
3- WiMAX IEEE802.16

Here we are using ESP8266 because of

1- Easy to development
2- Low cost
3- Small size
4- Wide range

Wi-Fi device, wireless internet access can be added to any other microcontroller-based design concluded by UART interface that is inbuilt in ESP8266 to make easy transmission.

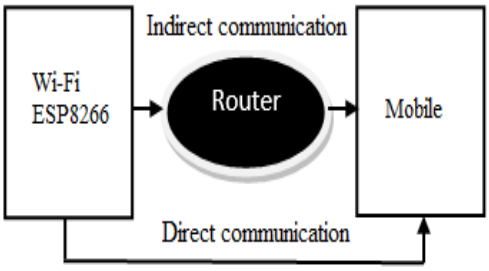

Fig 3 at home application

VI. FUNCTIONAL DISCRIPTION OF REFRIGERATOR

Fig 4 Functional description of fridge

Functional description of smart refrigerator are following below.

1- Perishable food items (particular vegetable or fruits) kept in block first. If vegetable is below from threshold value (200grm) then send the notification on the android app and also press the switch button then start the timer. After some time it will send the notification on the app showing expiry of food items.
2- Another type of food like dairy products and confectionary products kept in block second and third, the functioning is similar as first block.

VII. ANDROID APPLICATION

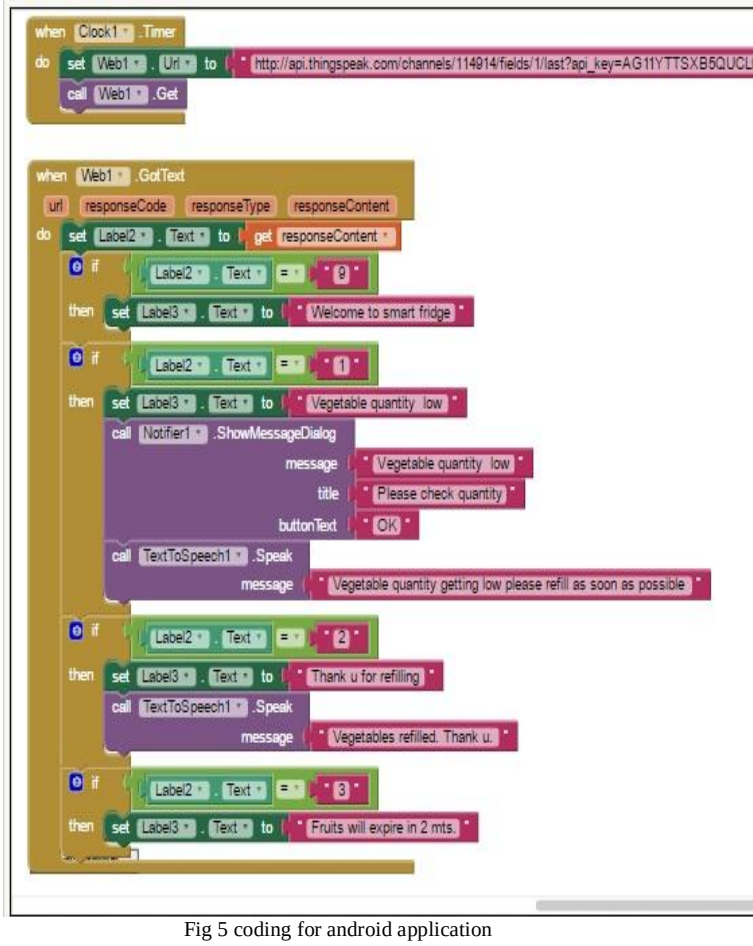

Fig 5 coding for android application

With the help of fig 5 we design android app using [http://api.thingspeak.com/channels/114914/fields/1/last?api_key=AG11YTTSXB5QUCL9] URL.

Here four conditions are followed.

1- Initially controller send 9 to the server then display the notification “Welcome to smart fridge” on the app at normal condition.
2- When controller send 1 to the server then display the notification “Vegetable quantity low” on the app.
3- When controller send 2 to the server then display the notification “Thank u for refilling” on the app.
4- After press the switch button for expiry of food items controller send 3 to the server

then display the notification “fruits will expire in 2 min” on the app.

VIII. RESULT

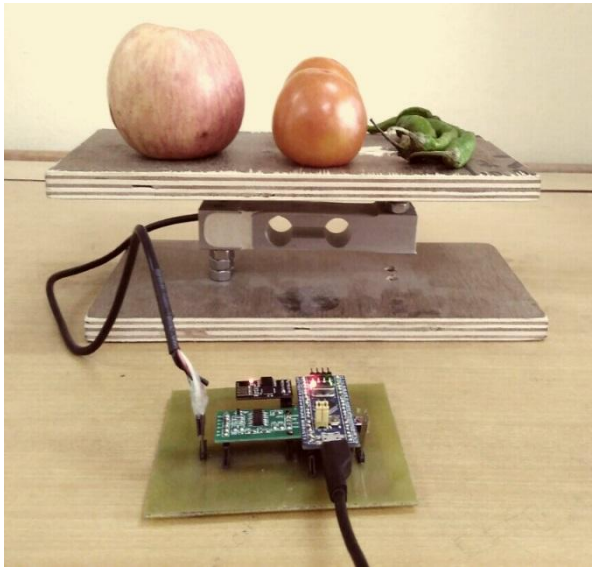

Fig 6 Hardware module of refrigerator

Fig 7 Notification for low quantity of food items

Fig 8 Notification for refilling items

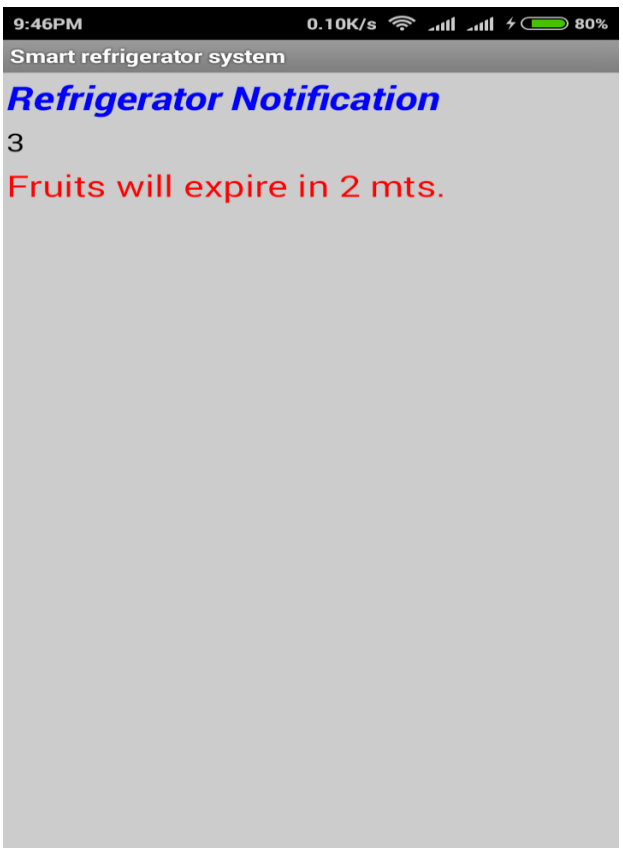

Fig 9 Notification for expiry of food items

IX.CONCLUSION

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.

X.FUTURE WORK

The concept of smart refrigerator is far more reaching than notifying the user about the contents of the refrigerator. It should give importance on maintaining a healthier lifestyle by providing the nutritional value of the contents. The future smart refrigeratorcan use the gas sensor to check the freshness of food item and also use the CCTV 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 refrigerator of the future would then be able to cross reference and act on reducing the ingredients used in future meal suggestions and helping to minimize food waste.

REFERENCES

[1] Emily Moin, “Smart Refrigerator for grocery management” Technical disclosure commons May 6, 2015

[2] Prapulla S B Dept. of CSE, RVCE, Bengaluru, India ,Dr.Shobha G Dept. of CSE, RVCE, Bengaluru, India, Dr.Thanuja T C VLSI Design and Embedded systems, VTU, Belgaum Journal of multidisciplinary engineering science and technology(JMEST).(Volume 2,Issue 7,July 2015

[3] G. SubramanyaNayak Department of E &C Engineering, Manipal Institute of Technology Manipal University Manipal -576104, Gangadhar Department of E & C Engineering Mangalore Institute of Technology & Engineering Moodabidri, Mangalore,Puttamadappa C Department of E &C Engineering SJB Institute of Technology Uttarahalli Road, Kengeri Bangalore -60“Intelligent Refrigerator with Monitoring Capability through Internet” IJCA Special Issue on “Wireless Information Networks & Business Information System” WINBIS,(2011)

[4] Adami, A.M.; Pavel, M.; Hayes, T.L.; Singer, C.M., "Detection of Movement in Bed Using Unobtrusive Load Cell Sensors," in Information Technology in Biomedicine, IEEE Transactions on , vol.14, no.2, pp.481-490, March 2010

[5] Lei Xie, Bo Sheng, Yafeng Yin, Sanglu Lu, Xiang Lu, I Refrigerator:“An Intelligent Refrigerator for Food Management based on RFID Technology” UbiComp’13, September 8–12, 2013, Zurich, Switzerland,