IOT Based Pantry Management System

Dr. Prasanna Kumar
Electronics and Instrumentation
R.V.College of Engineering
Bengaluru,India Country

Rima Raj
Electronics and Instrumentation
R.V.College of Engineering
Bengaluru,India Country

Riya Saini
Electronics and Instrumentation
R.V.College of Engineering
Bengaluru,India Country

Snigdha Mishra
Electronics and Instrumentation
R.V.College of Engineering
Bengaluru,India Country

. Surabhi Rakhecha
Electronics and Instrumentation
R.V.College of Engineering
Bengaluru,India Country

***Abstract*— To design and develop an IOT based grocery management system for the pantry. This paper deals with a sensitive sensor and develop an analog front end to detect weight of groceries and to integrate multiple load sensors for measurement of various quantities as well as to find a method to identify various containers that are present in the pantry and then finally send the information acquired by the sensors on cloud to design a system to update the shopping list.**

Keywords—grocery, IOT, load, management, sensor

I. INTRODUCTION

Now a days, Internet of Things has become a top trending technology which is motivating the advancement in Science and Technology, incorporating every field dynamically. This has given rise to an ideology that permits the innovation where devices are often interconnected and may share their great deal of data . Kitchen environment monitoring is one among the foremost important measures to be closely monitored in real-time for the comfort of the people. the traditional kitchen are often more interactive using sensors, user friendly interface and IOT to make smart application. With advancement in technology and present lifestyle of the people, it becomes very difficult to manage the stock of kitchen items just before shopping.

Inappropriate consumption pattern and lack of proper planning results in visit to store several times every week for purchasing grocery stuffs. Sooner or later, it becomes a busy task to maintain track of the supply of food items, replenishment and to take care of sufficient stock to support guest visits.

The complete functionalities could be realized by integrating the real world inventory of the kitchen with a user interface that can be accessed from anywhere. Hence by employing this approach the user will always have a record and track of the groceries present in the kitchen, and by knowing that, the user can purchase stuff from anywhere and at any time without having to travel back and check if the item is over. The kitchen has not been much exploited with the fast growing technological impact (especially in India), hence by implementing this technique during a present day scenario, it may help by integrating life and technology.

To overcome the gap in conventional kitchen, the project demonstrates the concept of Internet of Things (IOT) within the space , to make the system reactive towards grocery stocking that's integrated with associate interactive applications by utilizing sensors, which leads to successful utilization of the time and money.
This concept results in following features like:
A smart pantry to manage kitchen groceries. Automatic Shopping list generation. A sensitized smart drawer can be made which is capable of monitoring the number and quantity of various groceries in kitchen and notify the status to the customer mobile application with appropriate authentication.
.

II. DESIGN METHODOLOGY

The proposed model is a real time sensitized container which, measures the quantity of the different groceries, the data from which is sent to the micro-controller, which then processes this data from the sensors into the required format. Finally the processed data is sent to the NodeMcu which then uploads it to the cloud. The hardware architecture is mainly comprised of the load cell weighing sensor used to measure the quantity of a item in the kitchen. RFID reader is used to identify a particular grocery item. The networking part consists of a Gateway created using NodeMcu. With the help of an in-built Wi-fi module, this Gateway can be connected to the Internet. The data that is going to be sent to the cloud is segregated and stored in a defined manner according to the user program. The application layer consists of the Android application.

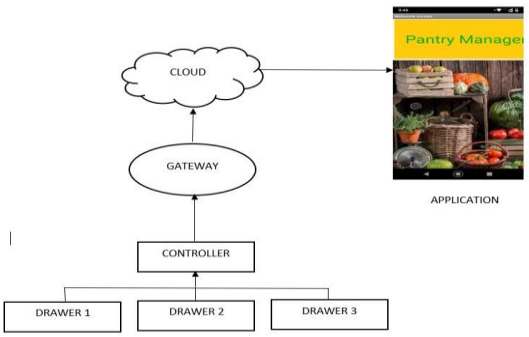

Fig2.1: The block diagram

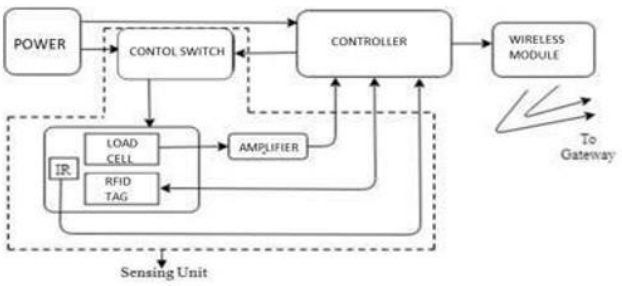

Fig2.2: The sensing unit

The Flowchart for operation of grocery management system is shown in figure 2.3. These will be valid when the system is in the steady state like proper power supply, WiFi connectivity. Updating quantities of different ingredients in the containers will be done, whenever the item

(container) is taken out of the drawer for use and placed back in the drawer.

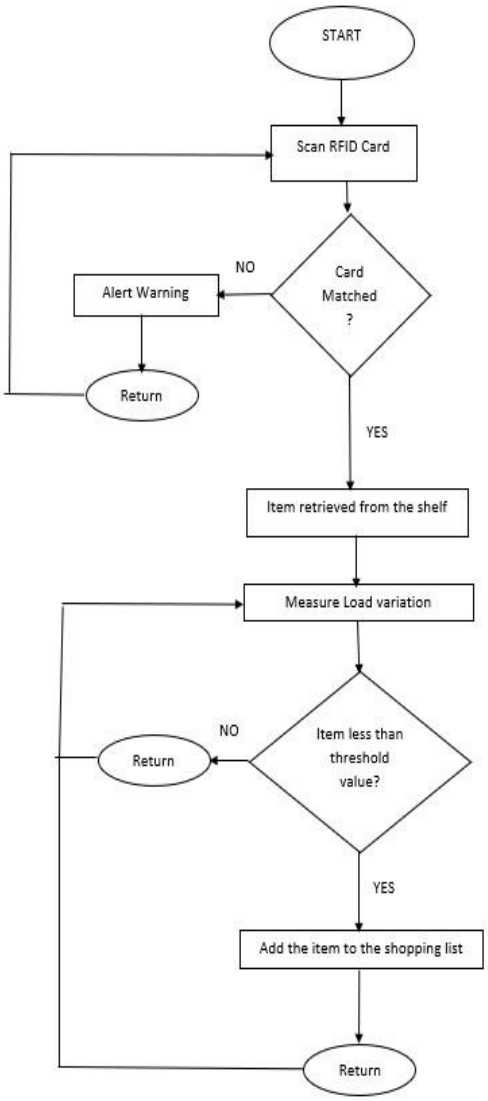

Fig 2.3 : Flowchart

III. SENSOR INTEGRATION AND NETWORKING

Our goal is to achieve a system wherein multiple load sensors could be added to the already existing weighing system. The future addition of the loa`d cells should not disturb the existing sensitised network for the drawer.Each sensor would be connected to the sink such that it could push data into it. We can have a main controller that will provide a gateway and upload the data to the cloud.

Typically, a sensor network contains hundreds and thousands of sensor nodes.

Fig 3.1 shows series of networks to monitor physical or environmental conditins and to cooperatively pass the data through the network to a main location or sink where the data can be observed or analyzed. A sink or base station acts like an interface between users and the network.

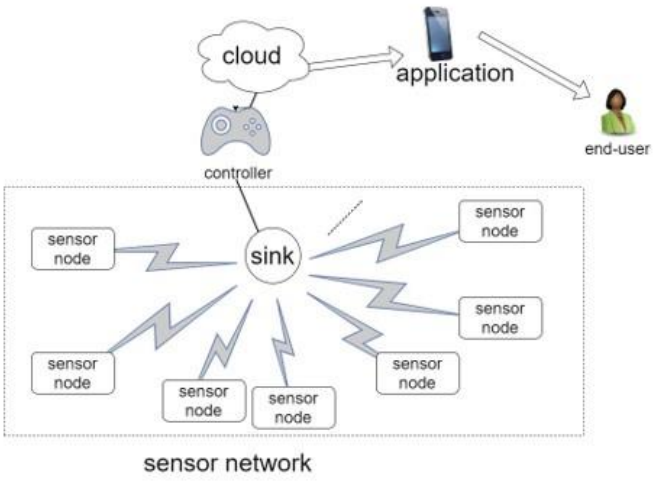

Fig3.1: Sensor Integration

.

IV. IMPLEMENTATION

For the hardware implementation – node mcu, arduino kit, load cells, and other supports and communication cables were used. The software and cloud implementation is as follows:

Fig. 4.1:Basic framework

As we can see in the figure 3.1 - the node mcu acts as the sink and has collected all the data from the various sensor nodes, this is communicated to the firebase database – which is an open source cloud application, from here the data simply gets sent to the android and web application through the communication framework.

The next figure explains how the firebase interface works with a schematic diagram.

Fig. 4.2: Firebase Gateway and Communication

V. RESULTS AND EVALUATION

The prototype for our project was constructed using the hardware components as discussed above. The weighing module included load sensors that could measure weights till 5 kg. Each load cell corresponds to a single drawer. Each drawer is proposed to have three containers.

The results were viewed on a serial monitor. As shown below, figure 5.1 is a sample reading of the weighing scale.

Fig. 5.1: Readings of weighing scale

The final step of this project was to build a mobile application that is user friendly. The application contains the information about the quantities of the various ingredients left in the drawers. This application also contains a shopping list that the user can access from anywhere.

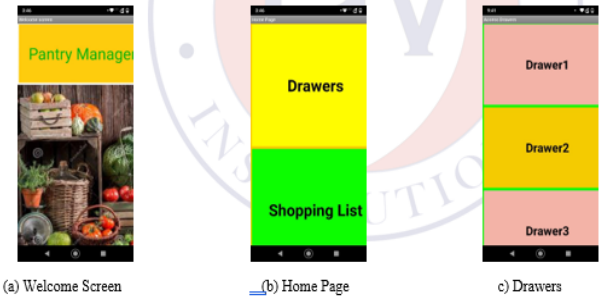

Fig. 5.2: Mobile Application Screenshots

VI. CONCLUSIONS

The final prototype could successfully measure the weight of various containers in a single drawer, as well as differentiate the containers. The data generated by the sensors could be uploaded to the cloud platform and then transmitted to the user's mobile application. The prototype can measure weights upto 5kg with satisfactory accuracy. The introduction of RFID sensor could enable storage of different types of grains in a single drawer, thus making the design more cost effective. By using IoT technology, the data could easily be transmitted to the user's mobile application. This helped in achieving the ultimate goal of designing a user friendly user interface that would enhance the user's shopping experience.

VII. FUTURE SCOPE

Making the hardware setup more aesthetically appealing. Making the hardware setup more compact so as to fit in small spaces. Modifying the model such that it can be used in hotel industries.Integrating the mobile application with websites like Big Basket and Amazon Pantry, such that, the shopping cart can automatically update the list.

VIII. REFERENCES

[1] RoSystem for Kitchen," International Conference on Materials, Applied Physics & Engineering (ICMAE) Jun 2018, Indore, Madhya Pradesh.

[2] D. M. Stefanescu, " Strain gauges and Wheatstone bridges- Basic instrumentation and new applications for electrical measurement of non-electrical quantities, Eights International and Multi-Conference on Systems, Signals & Devices, Sousse, 2011, pp.1-5.

[3] B. Maundy and S. J .G. Gift, "Strain Gauge Amplifier Circuits," in IEEE Transactions on Instrumentation and Measurement, vol. 62, no. 4,pp. 693-700, April 2013.

[4] S. Chattoraj, "Smart Home Automation based on different sensors and Arduino as the master controller", International Journal of Scientific and Research Publications, vol. 5, no. 10, 2015.

[5] Kaya, Mahir & Cetin-Kaya, Yasemin. (2017). "Complex Event Processing Using IOT Devices Based on Arduino" International Journal on Cloud Computing: Services and Architecture.

[6] M. Scherhäufl, M. Pichler and A. Stelzer, "Localization of passive UHF RFID tags based on inverse synthetic apertures," *2014 IEEE International Conference on RFID (IEEE RFID)*, Orlando, FL, 2014, pp. 82-88. doi: 10.1109/RFID.2014.6810716.

[7]opa J, M Govinda Raju, Vijay Kumar V H, Gowtham J, Sunil Kumar D M, Vinay Kumar H S, Yathish Kumar S. "IoT Based Smart Pantry Management