Smart Kitchen Containers as a Part of Smart Home Appliances Using IOT and Android

Anup Aravind Lakkanagavi[1], Amulya H N[1], Apoorva N[1], Bhargav[1], Aryan Singh[1], Naveen N C[2]

[1]UG Students, [2]Professor and Head
[1,2]Department of Computer Science, JSS Academy of Technical Education, Bangalore, Karnataka, India
Email: amulyanarayan.159@gmail.com
DOI: http://doi.org/10.5281/zenodo.3259500

Abstract
The kitchen is a special room in our home being the center of our family's day-to-day living. Modernizing the kitchen becomes a necessity when you have a tight schedule which demands saving as much time as you can. Smart kitchen containers help people with it by keeping a track of food items and reordering it whenever needed, all by itself. The prototype is developed mainly using raspberry pi and infrasonic sound sensors. Sensors tracks the quantity of the commodity in the containers on a regular basis and it sends the signal to the server along with the quantity data. The data is compared with minimum value. If received data value is less, the server places an order of that food item online. These containers can be used in homes as well as commercial restaurants to modernize their kitchens.

Keywords: *Android, home, kitchen, smart containers*

INTRODUCTION

Ever wondered how technology can help us transform our ordinary kitchen containers into smart ones? Our research paper is mainly based on the above stated question. One of the most apt use cases in a kitchen is the constant storage and replenishment of groceries. Now imagine, if the most common accessory in any kitchen, i.e., a container could keep track of what, when and where you buy your commodity and also keep a check on the amount you spend while doing so. In addition, the commodity that you require is delivered to your doorstep as and when it gets empty without your intervention. This is what our paper aims to deliver.

With our daily schedules getting more and more hectic, we tend to postpone our grocery shopping thus affecting our access to fresh ingredients and healthy eating.

Our kitchen containers are the solution to this problem. The sensors and chips that we intend to use in the containers are completely safe to use and does not cause any sort of harm to the food I the container. They keep track of your groceries, notify you when it's getting empty and automatically order them online (with a preset quantity).

These chips are designed in such a way that they can be mount onto the back of the lid of any container, thus buying new ones to make them smart is not necessary. We mainly make use of an Ultrasonic sensor which basically measures the height, thus calculating the height at which the grains are present from the top of the container, helping us notify the users when the height falls below a particular level.

All this is stored in a database and can be accessed at any point of time using a mobile application.

There are mainly three processes involved:
Measurement of height of level of commodity present in the container
The level of the commodity present in the container is continuously monitored and

the height is measured after every fixed interval of time. If the level is falls below a preset level the user is notified.

Notification and Online Ordering

The user is notified if the commodity is almost empty. It is left to the user's discretion whether he/she wants to automate the process of ordering the goods online with a preset value, else the user will be notified through mail and a link to the order online is provided for the user to place an order.

Mobile application

The user has to download our application so that he/she can access all the data, i.e.,when, what and for how much a commodity was bought, the current amount of a particular commodity, approximate time a commodity will last, etc.

Thus, our idea is to mainly provide a simple, affordable and safe solution to make any normal container into a smart one, with the only a container and a smartphone as a requirement, so that it can be used by all class of people.

LITERATURE REVIEW

The basic idea behind designing smart kitchen containers came in order to reduce the workload of a person. There are many storage compartments in factories which raises an alarm if the item in it goes below a certain level, those systems made us think about implementing the same technology in small and big containers in home kitchens as well as restaurants. Henceforth, we came up with idea of smart kitchen containers.

METHODOLOGY

The whole concept of smart kitchen containers started by wondering if a person could buy groceries or cereals without human intervention. After the completion of literature review all the physical parts needed were carefully evaluated. We evaluate all the problems faced by the prototype for the betterment of the same.
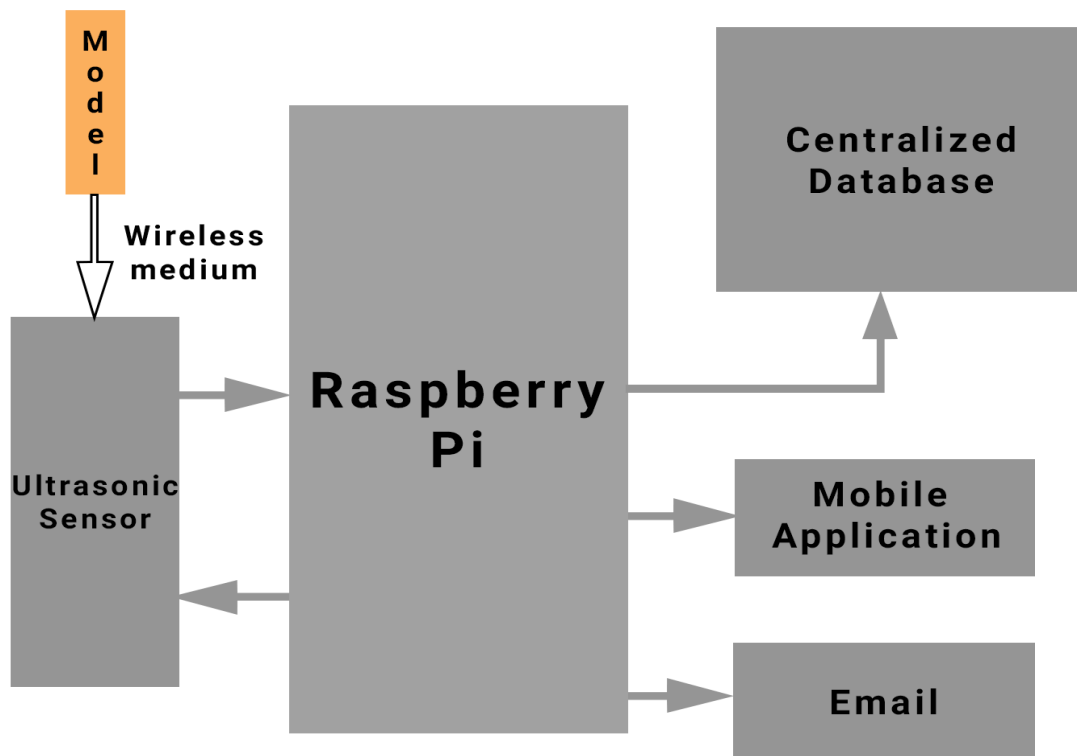

Figure 1: Block diagram.

According to the block diagram, we can say that we need a 12V battery to power up the model and activate the entire project. The Raspberry Pi will act as a controller and the Ultrasonic sensor is used to measure the contents of the box and the data is sent back to the Raspberry pi. The Raspberry Pi 3+ uses a Broadcom BCM2837B0 SoC with a 1.4 GHz 64-bit quad-coreARMCortex-A53 processor, with 512 KB shared L2 cache. Later it is stored in database and can be accessed for further use.

The Ultrasonic sensor HC-SR04sensor connects up to the Raspberry Pi. We use PhpMyAdmin to note down the output of the ultrasonic sensor and generate a query to send automatically generated mail to the end user. PhpMyAdmin is a free software tool written in PHP, intended to handle the administration of MySQL over the Web.

The Methodology includes
Height Measurement: The height is measured by ultrasonic sensor from the top of the lid to the top level of grocery or cereals.
Storing the Data: The data from the ultrasonic sensor is stored in PhpMy Admin.
Mobile App: We can check the quantity of the grocery or cereals in a mobile app where a user can track the current status of the materials and can also place an order in an E-Commerce site for the same.
Email Notification: We send an auto generated mail to the user when the materials are below critical level so that they can place order or the preferred website.

IMPLEMENTATION
Internet of things is one of the most significant technologies of twenty first century that connects everyday physical objects through the internet. Now days it's finding its major applications in the field of home automation.

In our project we make use of this technique to connect containers present in the kitchen through internet. The kitchen containers that are used to store groceries and other items are connected together with the help of ultrasonic sensors and they in turn send signals to raspberry pie. Raspberry pie processes these signals and whenever a certain condition is met it automatically orders that particular grocery online.

Ultrasonic sensors basically measure the distance between two objects. It is a small sensor that emits ultrasonic signals from one end and receives the wave reflected back from the other end. It makes use of the following formula to calculate the distance.

$$L = 1/2 \times T \times C$$

Here, L is the distance, T is the time required by ultrasonic signal to travel from sensor to an object and back from object to the sensor and C is the speed of ultrasonic signal.

These sensors are connected to grocery containers and they are placed near the lid of the container. They are directed towards the item present inside the container and thereby constantly measuring the distance between the lid and the item. It then sends the distance parameter to raspberry pie regularly for processing it further. Whenever the quantity of a grocery reaches a threshold level it indicates that particular grocery is running out of stock. This part is analyzed by the raspberry pie.

Figure 2: Raspberry pie.

Raspberry pie constantly processes the signals sent by the ultrasonic sensors and compares it with the threshold value. Whenever the calculated value is found lesser than the threshold value then it is automatically ordered online in any of the given e-commerce website and an email notification is sent to the mobile.

A database is managed to store information about the current status of items in the kitchen. Raspberry pie stores this information into the database and with the help of it one can easily check the current status of any item in the kitchen from anywhere and at any time using an URL provided.

In order to constantly keep track of all items in the kitchen, an ultrasonic check is done every 7 hours. As we make use of distance property for checking the quantity of food, this principle can be used to keep track a wide range of food items.

CONCLUSION
The product explained in this paper successfully solves the problem of inventory of the kitchen.

The product is helpful to a wide variety of consumers. It can be implemented in houses as well as large restaurants. it is very helpful in the sense that the customer need not worry about the goods running out as there is a facility that will automatically inform the customer when the particular good is critical and also places an order of the same with very little human intervention.

There is also the advantage out product can be implemented on any sort of substance which is stored. It can even be transparent or liquid as explained earlier in this paper. The device has no ill effects on any sort of food items on which it is used since ultrasound has no effects on food too.

REFERENCES
1. Hong, S., Kim, D., Ha, M., Bae, S., Park, S. J., Jung, W., Kim, J. E. (2010),"SNAIL: an IP-based wireless sensor network approach to the internet of things", *IEEE Wireless Communications,*Volume 17, Issue 6, pp. 321−331.
2. Kranz, M., Holleis, P., Schmidt, A. (2010),"Embedded interaction: Interacting with the internet of things", *IEEE Internet Computing,*Volume 14,

Issue 2, pp. 46−53.

3. Li, B., Yu, J. (2011),"Research and application on the smart home based on component technologies and Internet of Things", *Procedia Engineering,*Volume 15, pp. 2087−2092.

4. Gusmeroli S, Haller S, Harrison M, KalaboukasK, Tomasella M, Vermesan O, Vogt H, Wouters K,"Vision and challenges for realising the internet of things.