

Smart Kitchen containers – Research Project

I am sure most of us have been in a situation where you are busy working and your mom suddenly calls you to buy stuff from the market, and she might even need it urgently. This is a very irritating situation of both my mom who needs a commodity as well as me who has to stop whatever I am doing in order to get what she wants. That's when I realized 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.

I wondered how technology can help us transform our ordinary kitchen containers into smart ones? That's when I told my friends about the project's main idea and they were more than happy to participate. Our research project 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.

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 in 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 mounted 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.

Each container has an ultrasonic sensor near its lid and it keeps track of the distance between the lid and the grocery level. This height is passed on to the Raspberry pi module which is programmed to check the distance frequently (every 10 minutes) and to automatically order that particular grocery online if the height is greater than threshold as it indicates that the grocery is running out of

stock. An e-mail notification is also sent to the user before ordering an item online. User interface is developed to check the quantity of all groceries from anywhere and at any time. This application of IOT is a part of Home Automation.

We were so curious about our research that we actually built a solution as a part of a national level hackathon, where we stood one among the top 4 finalists.

We also published a research paper in the same topic in Mat Journals. Research paper link: <http://matjournals.in/index.php/JoAAT/article/view/3987>

More details about the project:

Requirements:

Components:

- Raspberry pi
- Ultrasonic sensor
- Resistors
- Led lights
- Bread board
- Wires
- Containers

Software:

- Python (for working of backend – Raspberry pi)
- PHP (to connect front end and backend)
- SMTP Library (email notification)
- phpMyAdmin (database)
- HTML, CSS, JavaScript (front end)

The main advantage of our project is that it is cost effective as well as a durable solution to eliminate human intervention and automate a manual process. The total cost of the project was around Rs.3,500 which can be further reduced if customized circuit boards are used. Thus, it makes our solution affordable to common man, targeting a wide range of population. It can be used in a small scale household as well as restaurants or large hotels.

My contribution to this research project was:

- Coming up with the idea/ aim of the project (finding a problem faced in everyday life)
- Front end development (HTML, CSS, JavaScript) – created front end for the project to display data sent from raspberry pi. It also acted as a small website that a user can make use of to keep track of commodities, preset threshold values, preset online order requirements.
- I also made use of SMTP Libraries to send email notification to user whenever the threshold is reached.

Challenges faced:

- Strong internet connectivity at all times
- Scalability
- Sensors not water resistant
- Can't use in a container where the commodity is stored up to the brim as it may tamper with the sensors.