

# Home Automation: Smart Canister using Internet of Things

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**Abstract:** *This project deals with low cost and user friendly automation system for houses. Its a common scenario in every household where the wife needs to keep a constant check on the availability of groceries in the kitchen. As the stock decreases, the "Things to buy" list on top of the fridge keeps adding up! Hence, a weekly trip to Big Bazaar or Reliance Fresh has become a routine in most of the houses. What we also fail to keep a check on, is the nutritional value and consumption rate of the ingredient we buy and how it affects a family's healthy lifestyle. Using Internet of Things and Data Analytics techniques, this paper aims to automate this with the advent of "Smart Canister System".*

## 1. Introduction

Using Internet of Things, Smart Canister calculates the consumption of a particular ingredient kept in the container. This Smart Canister is linked to a smart phone via a Wi-Fi module and the data received is stored over a cloud connected database.

The accompanying android app can keep track of what you are eating, how much you're eating, notify you when you are running out of something, remind you if something is going stale and automatically add such items to your shopping cart.

## 2. Literature Review

These futuristic canisters are built with sensors that monitor what's been put inside of them, as well as the nutrients that particular food or liquid contains. The data then syncs with Smart Canister's app to provide nutritional information, freshness dates, and best of all, recipes based on the ingredients you have on hand. There were various smart systems have been proposed where the system works on touch and play mechanism using the concept of internet of things (IoT) [2] as the technology of IoT is more complex, it is difficult to implement and integrate the smart devices in the home. In Wi-Fi based home automation, the system uses a PC (with built in Wi-Fi card) based server that manages the connected home devices. Other papers that are presented includes smart homes controlled using systems involving internet's web server [1], message queuing telemetry transport (MQTT) protocol [3], raspberry pi and android application for interconnecting and handling the devices.

## 3. System Architecture

### a) Ultrasonic sensors

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible

to calculate the distance between the sonar sensors and objects

*Ultrasonic sensor concept diagram:*

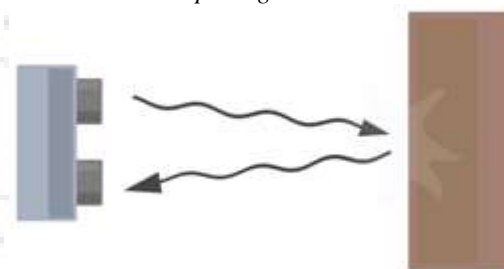


Diagram of the basic ultrasonic sensor operation:

Distance = (speed of sound x time taken) / 2

Since it is known that sound travels through air at about 344 m/s (1129 ft/s), you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave traveled 2 times the distance to the object before it was detected by the sensor; it includes the 'trip' from the sonar sensor to the object AND the 'trip' from the object to the Ultrasonic sensor (after the sound wave bounced off the object). To find the distance to the object, simply divide the round-trip distance in half.

### b) Node MCU

This paper requires a Node MCU which allows connecting things easily. An open-source firmware and development kit that helps you to prototype your IOT product within a few Lua script lines. Its Features includes Interactive, Programmable, Low cost, Simple, Smart, WI-FI enabled, Open source

### c) Arduino like hardware IO

Advanced API for hardware IO, which can dramatically reduce the redundant work for configuring and manipulating hardware. Code like arduino, but interactively in Lua script.

### d) Nodejs style network API

Event-driven API for network applications, which facilitates developers writing code running on a 5mm\*5mm sized MCU in Nodejs style. Greatly speed up your IOT application developing process.

**e) Lowest cost WiFi**

Less than \$2 WI-FI MCU ESP8266 integrated and easy to prototyping development kit. We provide the best platform for IOT application development at the lowest cost.

**f) Development kit**

The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. Power your development in the fastest way combining with NodeMcu Firmware.

**g) Firebase**

Firebase is a backend platform for building Web, Android and IOS applications. It offers real time database, different APIs, multiple authentication types and hosting platform. It has features such as Firebase Auth, Real time Database, Hosting, Firebase Notifications and firebase storage

**h) Android app**

These futuristic canisters are built with sensors that monitor what's been put inside of them, as well as the nutrients that particular food or liquid contains. The data then syncs with Smart Canister's app to provide nutritional information, freshness dates, and best of all, recipes based on the ingredients you have on hand. The invention isn't just for those looking to monitor their eating habits. The jars can communicate with your online grocery cart, indicating when you are running low on your favourite foods, thus preventing you from having a last-minute cooking emergency.

## 4. Implementation



**Figure 1:** Proposed system model

The proposed model bridges down the human action in the involvement in checking the groceries at a regular intervals of

time. Using of Data Analytics, a detailed pictorial analysis on the usage of individual ingredient is depicted on a daily, weekly, monthly and yearly basis. This analysis helps to decode the nutritional intake and food habits of the family. The app also displays the kind of diseases the family is prone to because of such a lifestyle. Hence, I present to you "Smart Canister System", a one stop personalized destination for a healthy lifestyle!

Smart technology has come to nutrition in the form of what is being called a Smart Canister in which the ingredients of a meal can be broken down into the specific amount of calories, carbohydrates, protein and fat. Bluetooth tech, with an accompanying mobile app, can suggest appropriate recipes. The result is a jar that, once you tell it what it contains, can keep track of how much you're eating, alert you when you are running out of something, remind you if something is going stale, and recommend recipes compatible with its contents. It connects to your smartphone or tablet via WiFi. Once you pour a bag of spaghetti into the Smart Canister, you can either scan its barcode or manually enter in its name. The accompanying app then retrieves the pasta's nutritional information, as well as historical information about how long it takes for the food to expire. If your item doesn't show up in the list, you can add in the details yourself. Once you add an your special pasta sauce, the app will remember it, and the cloud-connected database learns all the time.

As you start using the spaghetti, the jar begins to learn your habits, allowing you to take advantage of No Touch shopping. If Wednesday is pasta night, before you run out of spaghetti it will automatically add the item to your mobile shopping list. From there, you can buy it from Amazon or just consult it the next time you're at the grocery store.

**Advantages:**

- 1) It is cheaper and more cost efficient than the smart jar available in the supermarket.
- 2) The currently available smart jars use pressure sensors to monitor the ingredient and bluetooth for communication but in this smart canister ultrasonic sensor is used to get exact accurate level of ingredient contained in the smart canister and It uses Wifi for its connectivity and Firebase as its backend cloud so that you can access the app from anywhere and get real time updates on your ingredients.

**Limitations:**

- 1) If it is used in an imperfect way errors are bound to happen.

## 5. Current Development Status

A prototype has been made on this invention with sensor sending perfect readings to the cloud and the App also fetches it instantly. Almost all the features of the App have been designed and Implemented and currently the app is in beta testing phase.

## 6. Conclusion

The project is done in order to make day to day life easier by ordering the required groceries in cart on its own instead of manual checking of groceries. It also checks your nutrient consumption per day.

## References

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