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# Automated Kitchen Management and Provisions Monitoring System Using IoT Technology

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***Abstract***

*The primary purpose of this paper is to provide a user-friendly android application of kitchen monitoring for cooking by using the Internet of Things. Applications are available for fetching the recipes, but this project helps to reduce our mind calculation in choosing the cuisines. This application extracts the kitchens which stored in the Web Service. A sensor node is used for sensing the weight of the grocery container and uploads it to the Web Service. By using this update, the user can choose the cuisine and recipes with the available products and cook. This application can be used from anywhere at any time by making the recipe decisions easier. If a particular grocery is found empty, then its weight is notified as 0, that is, that specific grocery has to be refilled in its container. The main aim of this research is to provide a user-friendly android application that is useful for monitoring the food provisions in the kitchen and also provide different variety of cuisines and recipes based on the availability of ingredients.*

*Keywords: Smart Kitchen Monitoring, Internet of Things, Sensors, Web Service*

## I. Introduction

The kitchen is a significant spot of the home, and cooking is one of the everyday exercises. The typical trouble in a kitchen during cooking is seeing some food supplies as unavailable. The developing prominence of computerized frameworks shows the interest of the family unit gadgets to be shrewd and mechanized to help our everyday exercises [1]. Day by day kitchen exercises remember stocking kitchen cupboard for connection to distinguished dietary regiments, likes, and needs, tastes, etc. Smart Kitchen is an imaginative application that utilizes the Internet of Things (IoT). The term IoT defined to scenarios where organize network and computing ability reach out to objects, sensors, and regular things not ordinarily thought about PCs, permitting these devices to produce trade and expend information with negligible human intervention. We use IOT in this project for

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keeping track of the grocery and their quantity that resides in the kitchen, by using the mobile application and give a recipe for the available groceries [2].

RFID utilizes EMF to recognize and follow tags connected to objects naturally. The tags contain electronically put away data. Passive tags gather energy from a close-by RFID reader's examining radio waves. RFID tags utilized in numerous businesses; for instance, an RFID tag joined to a container which contains the grocery items used to track its name. RFID Reader used for reading the RFID tags, and this information sent to the Web Service [3]. The RFID Reader used is of high frequency that ranges up to 5cm. We use the FSR sensor for calculating the weight of the grocery containers. FSRs are sensors that permit you to recognize physical importance, pressing, and pressure. They are simple to use and low cost. These weights, along with its identification, are along sent to the Web Service. The recipes are provided based on the available grocery and its importance, which received to the application via Web Service. This application can be used from anywhere at any time by making the recipe decisions easier. It provides recipes that can be cooked for four members. If a particular grocery is found empty, then its weight is notified as 0, that is, that specific grocery has to be refilled in its container. [4-6] have review and designed developed a spike detector for fully Integrated Neuro modulation SoC with low energy processor and FIR filter architecture with pipelining shared component method.

## 2. Background Methodology

The advancement of a "Brilliant Kitchen Cabinet(BKC)," which distinguishes the grocery things in the kitchen store. The KC is increased with sensors to gauge the heaviness of a situation, which refreshed to a database at whatever point grocery things are set or taken out for cooking. The containers in the kitchen cupboard labeled with an RFID tag for recognizing and following the location.The framework likewise creates a computerized shopping list when a thing arrives at the characterized limit level, which depends on the prerequisite and utilization pattern of family members. [7]

An intelligent kitchen with pervasive computing technology gives nutritional data to family cooks to assist them with settling on educated choices about healthy, aware cooking in their social and routine settings. The iterative plan process yields intriguing difficulties with regards to inserting advancements for a home action, for example, food [8]. The Smart Kitchen, an instrumented domain to consequently catch, offer, and endeavor semantically commented on cooking encounters. We will portray our equipment and programming foundation, and present a first model application, the Semantic Cookbook [9].

## 3. Proposed System

In the existing system, we are confused about what variety of food can be prepared for a day. We are also in the situation of considering the availabilities of the grocery in our kitchen. To make these things more comfortable or to reduce manual calculation, we are going to create a compelling and suitable application, which is user-friendly for cooking. Here we provide containers with RFID tags inserted in it. It will display the product name that is available in the kitchen. With the help of the FSR sensor, the weight of the products is received, and this data is updated to Web Service. This Web Service provides all the recipes which the available grocery items. Once the data are updated to the Web Service, it will be open until the next update. If we select a recipe, then the method for preparing it will be shown.

**ADVANTAGES**

- Time taken for deciding the recipe and checking the item availability reduced.
- Tension-free cooking.
- Automated list of a different item that can be cooked.
- Quick display of availability of ingredients.
- This application can be accessed from any place.
- The items list securely maintained for each user.
- It occupies very little space and can operate very efficiently.

### 3.1 Hardware RFID

Radio Frequency Identification (RFID) innovation can track the running objects through a system of radio-empowered scanning devices over separation of a few meters is called RFID tag, as shown in Fig 1.

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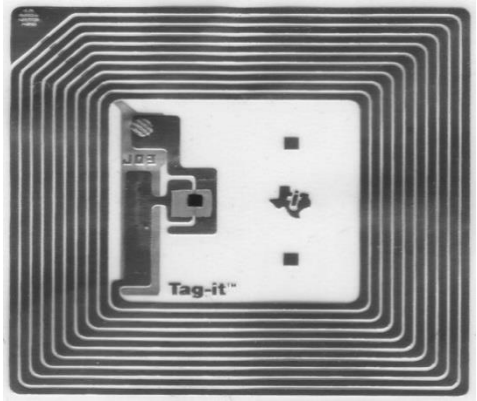


**Fig.1 Structure of Tag**

### 3.2 UML and Use case Diagram

In 1997 Object Management Group created UML. Its a standard language for indicating, picturing, and recording of programming frameworks. It consists of three UML modeling, like the Structural model, Behavioural model, and Architecture model, are to catch.Dynamic behavior which has interior or outer variables for making the communication. In Fig 2, we characterize the Case diagram for our project. A use case is a set of situations that portraying a connection between a user and a framework system. This diagram shows the relationship between the actors and uses cases: the two principal parts, a user, or another framework that will cooperate with the structure model. A use case is an outside perspective on the structure that speaks to some activity the client may act to finish an errand.

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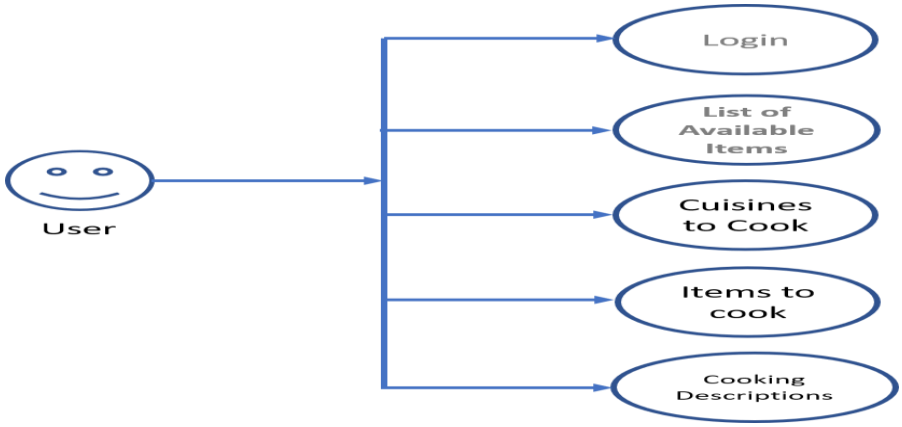


**Fig.2 Use case diagram**

### 3.3 Software Architecture-SA

SA is design naturally indicates the high-level structures of a software framework. It tends to be characterized as the arrangement of structures expected to reason about the software product framework, which contains the software product components, the relations among them, and the properties of the two elements and connections. The term SA likewise indicates the arrangement of practices used to choose, characterize, or design software architecture. At last, the term regularly shows the documentation of a framework's product design.

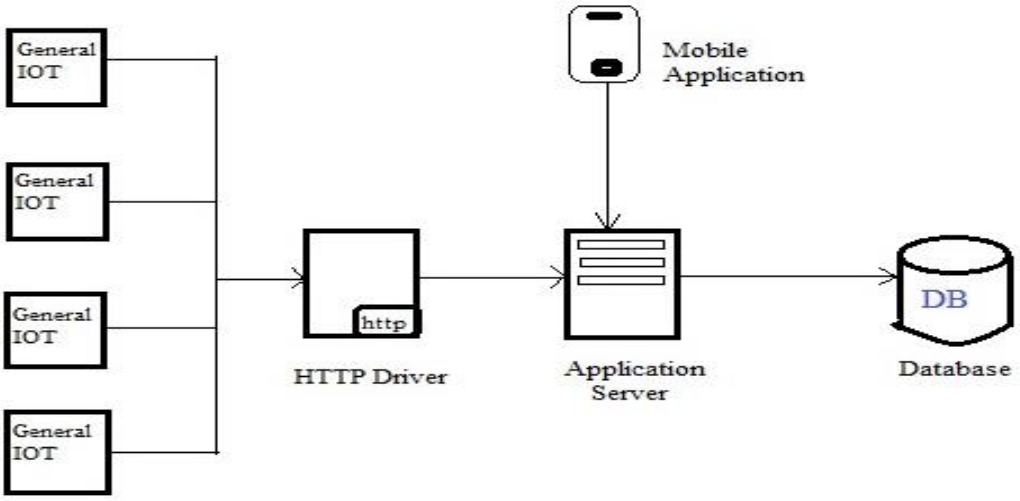


**Fig.2 Architecture Diagram**

### 3.4. Activity Diagram

The activity diagram is commonly utilized for business processes demonstrating for displaying the rationale caught by a single use case or usage situation, or for modeling the specific justification of a business rule. Even though UML activity diagrams might show the internal logic of a complex operation, it would be much better to just rewrite the process with the goal that it is straightforward enough that you don't require an activity diagram as shown in Fig

4. From numerous points of view, UML activity diagrams are the objects-oriented equivalent of flow charts and data flow diagrams (DFDs) from structured development.

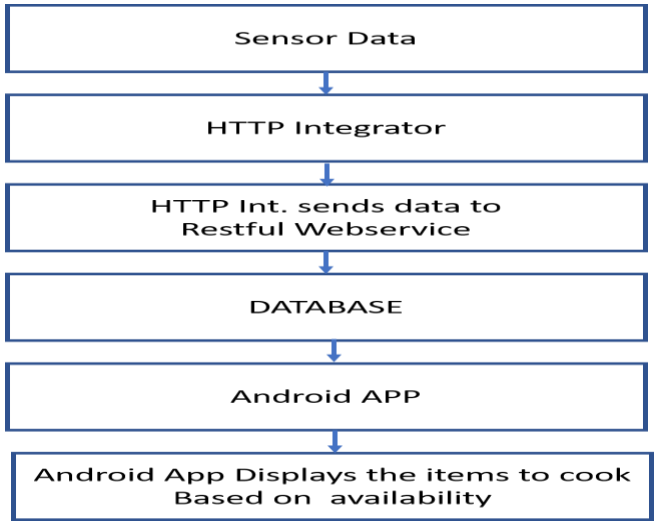


**Fig.4 Activity Diagram**

### 3.5 Data Flow Diagram-DFD

The DFD is a realistic apparatus utilized for expressing system requirements in a graphical structure is shown in Fig 5. The DFD, otherwise called the "bubble chart," has the motivation behind explaining framework prerequisites and distinguishing significant changes to become a program in system design. In this manner.The DFD comprise of the arrangement of series of bubbles joined by lines. The bubbles symbolize data transformations, and the edges correspond to data flows in the system. A DFD depicts what that data stream in instead of how they are processed. So it doesn't rely upon hardware, software, data structure or file organization

### 3.6. Class Diagram

The class diagram is the primary block of object-oriented modeling. It is utilized both for general conceptual modeling of the systematics of the function and for entire modeling translating the models into programming code. Class charts can likewise be used by data modeling. A class has three segments shown in Fig.6.

- Top part -The name of the class.
- Center part - The qualities of the level.
- Base par t- Activities the level can take or embrace.

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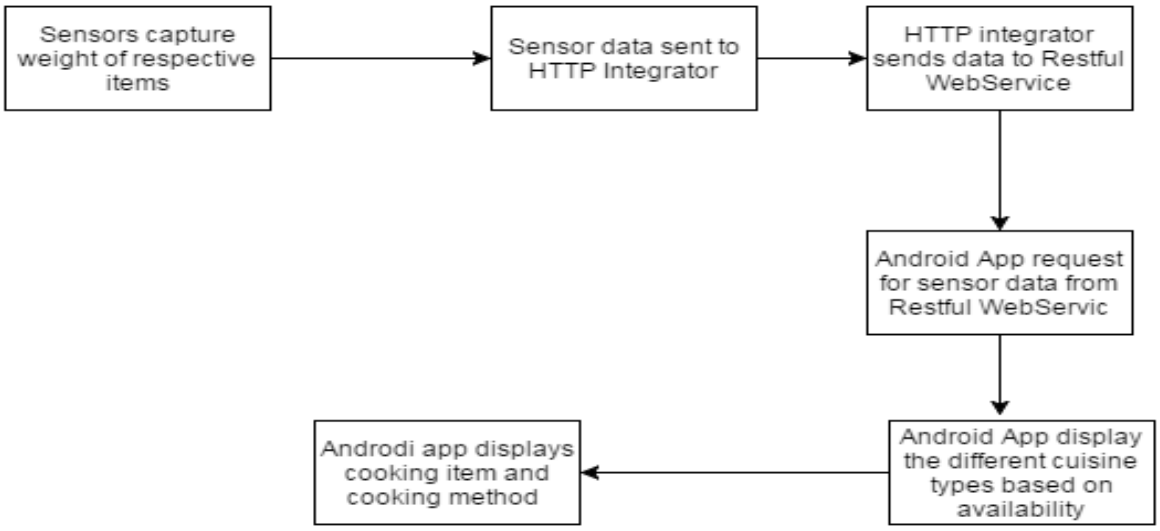


**Fig.5. Data Flow Diagram**

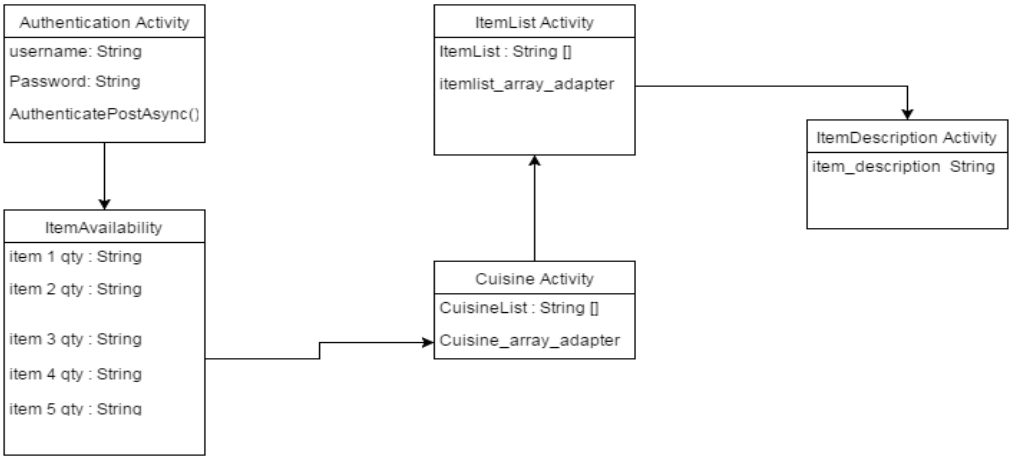


**Fig.6 Class Diagram**

### 3.7. Modules Description

Smart kitchen android application work in association with weight sensors and RFID for individual items. RFID will be displayed to identify the object, and the item will be placed in the weight sensor. Item and the individual weight will be sent to the Internet. Web Service on the internet will capture the data and store it in the database. Later the android app will call Web Service to get data and display in the android application. The modules consist of Internet of Things (Sensors connected to the Internet), Restful Web Service, Authentication, Items Retrieval, Cuisines List, Items List, Items Description, PIC16F877A Microcontroller module, and RFID Reader module

### 3.7.1. Internet of Things & Restful Web service

Sensors connected to the internet constitute of Internet of Things. Here are weight sensors and RFID data that are connected to the internet and transfer the data to restful Web Service. Restful Web Service gets data in HTTP get method and returns data in JSON format. IoT uses this Web Service to store data. This Web Service stores the information feed in the database. Later, when the Android application is requesting details, the Web Service retrieves data from the database and displays it in the Android app. The authentication module performs the authentication for smart kitchen applications. It gets the username and password as input and performs the authentication. If the username and password are correct, it will retrieve data from restful Web Service. After successful login, items weight will be retrieved from Web Service and displayed in the android application. Weights shown will not be editable fields. Item weight will be displayed in grams. After clicking the submit button in Items Availability list, cuisines that can be cooked based on the available inventory will be presented in List format. This will be the dynamical list, and the list size will vary based on the availability of items. When respective cuisine clicked, details to be cooked under the cuisines category based on the availability of the groceries will be displayed. This will also be displayed in a list format, and this, too, is a dynamic list. When the item clicked, the item description is displayed based on the subject.

## 4. Result and Discussions

A new user is created and added to the database. This User Name and Password help to monitor the Grocery items which belong to that user, and it is secured.


**Figure 7. Items Retrieval**

The data from the database received in the application through the internet. Also, we have provided some data to be entered manually, which is available in the kitchen. If there is an item with very little quantity or if it is empty, then it is noted, and that item has to be filled in the container is shown in Fig 7.

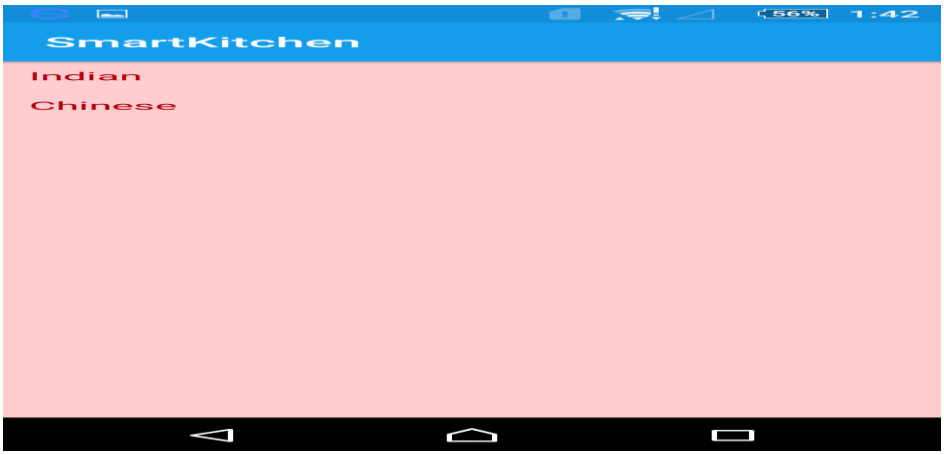


**Figure 8. Cuisine List**

The application will automatically display the cuisines for the available ingredients in the kitchen. The user has to choose between the available cuisines is shown in Fig 8.

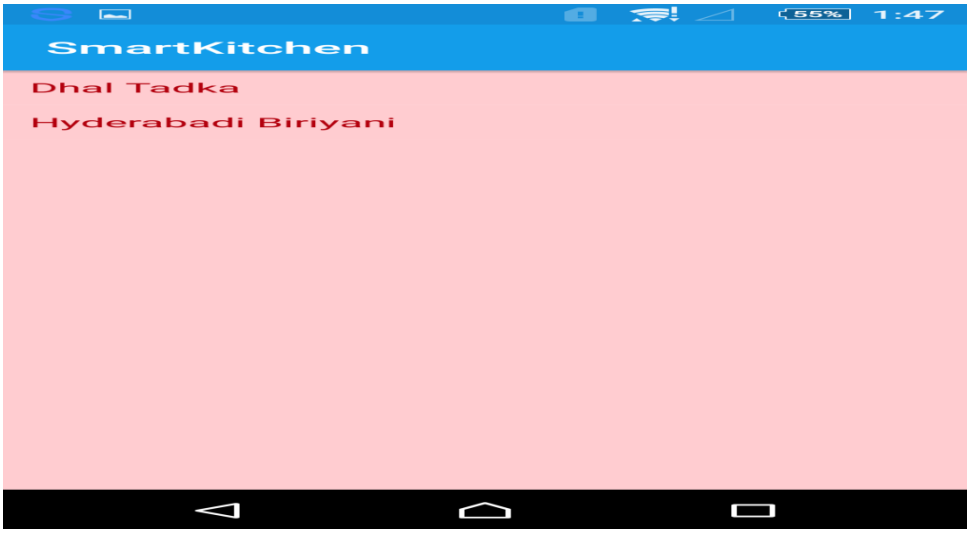


**Figure. 9 A4 Recipe List**

The Recipes that are available in the selected cuisine displayed in Fig 9. The user can choose between the available recipes and submit them for getting the chosen recipe description.The method and ingredients for the chosen recipe displayed on this screen, which helps the user in easy cooking shown in Fig 10.

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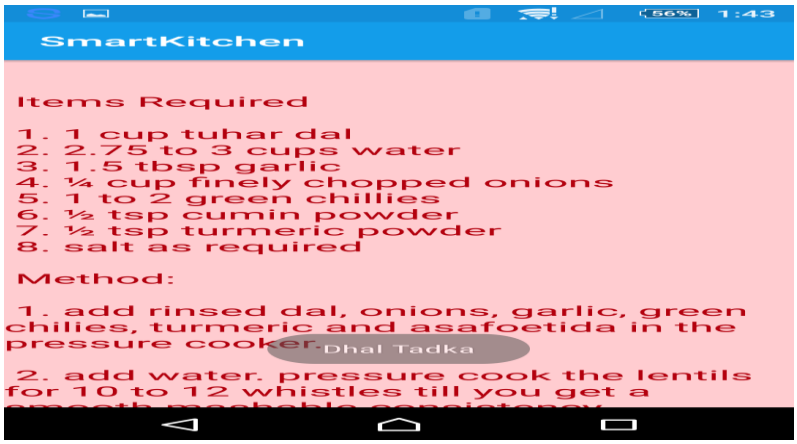


**Figure.10 Method for Cooking**

## 5. Conclusion

Hence this paper fulfills the objective considered, thereby displaying the weight of the items and calculating the groceries for choosing the cuisine and recipes are selected, and the application is useful for showing the method of cooking. The future enhancement scheme will automatically calculate the calories of the items that used for cooking to give nutritious recipes. The sensor container can be made available, which reduces the manually. We can display a notification if the items are empty or reduced to the user's mobile or email.

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