Design of Smart Kitchen Information System Using Internet of Things Technology

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Abstract: Development of smart kitchen cupboards is an effort towards kitchen automation using ubiquitous computing technologies. The Internet of Things is making possible a new wave of smart kitchen gadgets using a suitable sensor. The purpose of this research is to make prototype of smart kitchen system using Internet of Things technology. The system is designed using 2 types of force sensitive resistor sensors which was programmed by NODEMCU. The designed smart kitchen concept was successfully tested on the prototype model which show that the system can work according to the desired specifications. The tested results gives the information that the purposed system is highly influenced by the Wi-Fi network which is used

Index Terms **- Smart Kitchen, Internet of Things (IoT), NODEMCU, Wi-Fi, Force Sensitive Resistor (FSR).**

1. INTRODUCTION

The kitchen is one of the important places in a house. A kitchen is a room or part of a room which is used for cooking and food predation in any commercial establishment [1]. The gradual improvement in kitchen infrastructure improves the lifestyle of the human being. In this sense, the development of the smart kitchen could play an important role in the improvement of human being lifestyle [2],[3]. The smart kitchen is a type of modern kitchen that uses smart devices (sensor) and this smart device can connect the internet system to improve the cooking experience. The Internet of things (IOTs) is a network of physical objects or things embedded with electronic, software, sensors and connectivity to enable objects to exchange data with manufacturer, operators and connected devices. This technology may help in designing the smart kitchen concept [4],[5].

The Smart Kitchen Cupboards is one which can identify the grocery items in the kitchen store. The kitchen cupboards are augment with the sensors to measure the weight of an item which is updated to a database whenever grocery items placed for cooking [6]. The system is also generating the automated shopping list when an item reaches to the defined threshold level, which is based on the requirement and consumption pattern of family members. The main aim of this paper, is to design a IOT based smart kitchen model which can improve the cooking experience [7],[8].

2. METHODOLOGY - DESIGN OF SMART KITCHEN USING IOT TECHNOLOGY

The implementation of the internet of things technology to sense groceries in the kitchen which can placed it in a order by automatically is the best way of utilising the technology. The person who uses this kind of system may get updates of the orders placed through the mobile application. This system in conjunction with mobile application and the website created by stores or the Internet of things cloud services that are specially being designed for such kind of purpose, can be hired. The quantities of groceries in the jars will be sensed by various sensors and when the quantities reach below the threshold value then system will place order to smart stores on behalf of you and with confirmation of order, Super market can deliver your order at your home when you reach home from office. The decreasing levels in the jars will be sensed by force sensitive resistor and orders will be placed the controlling devices of the whole system are Node MCU (microcontroller) with Wi-Fi that is connected to local router and it connect the system to Blynk cloud. The block diagram of the smart kitchen cupboard is presented in Figure 1.

The two force sensitive resistors (FSR) was used in this study which are analog in nature. The NODE microcontroller unit has only one analog pin A0. Thus, to read two analog value from two analog sensors a small circuit was used in this work. It named as an "Analog Mux" which is an analog multiplexer. The output pin of the sensors will be connected to the input pins of the Analog Mux and the supply pin of the sensors are driven by the digital pins of the Node MCU in regular time interval. Supply to sensor is being controlled through programming. At a time only one force sensitive resistor is active and another sensor will be

inactive. When first sensor is active then the reading will be taken from first sensor only and processed by the NodeMCU. After fixed interval, the second sensor will become active and the reading will be taken from second sensor only.
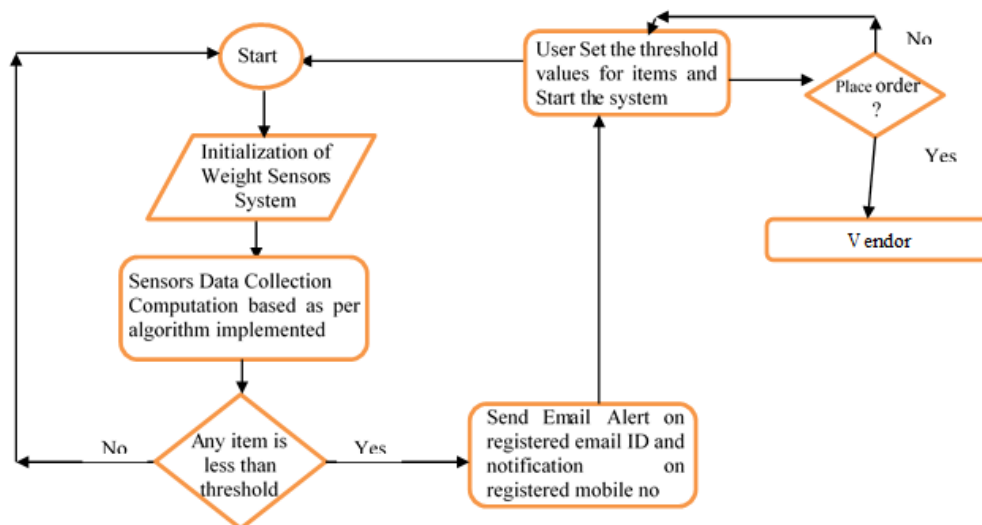

Figure1: Flow Chart of Working Methodology

The force sensitive resistor is a strain sensor which can read any values when a weighted body with force apply on it. The sensor will not give any value when no strain is experienced by the it. Therefore, in this paper in order to make the sensor active i.e., sense the weight a default force of 140 to 170 grams in the form of weight is applied on the sensor. The default force is same as an iron plate which has a sharp object in the middle. That sharp object plate was placed on the sensor to create the strain by it. The circuitry of smart kitchen cupboard using IOT technology is shown in Figure 1. To process the program, feature a cloud type structure was created in this wok, which are shown in Figure 2.
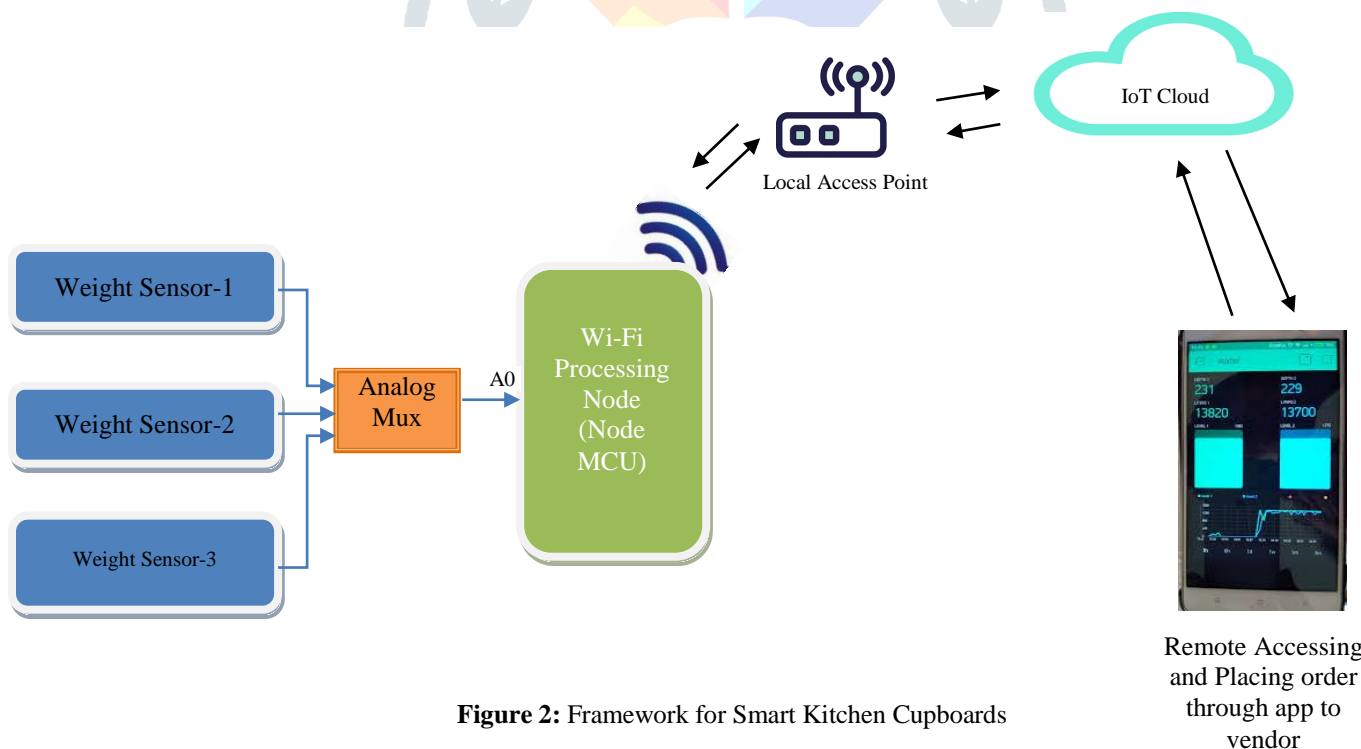

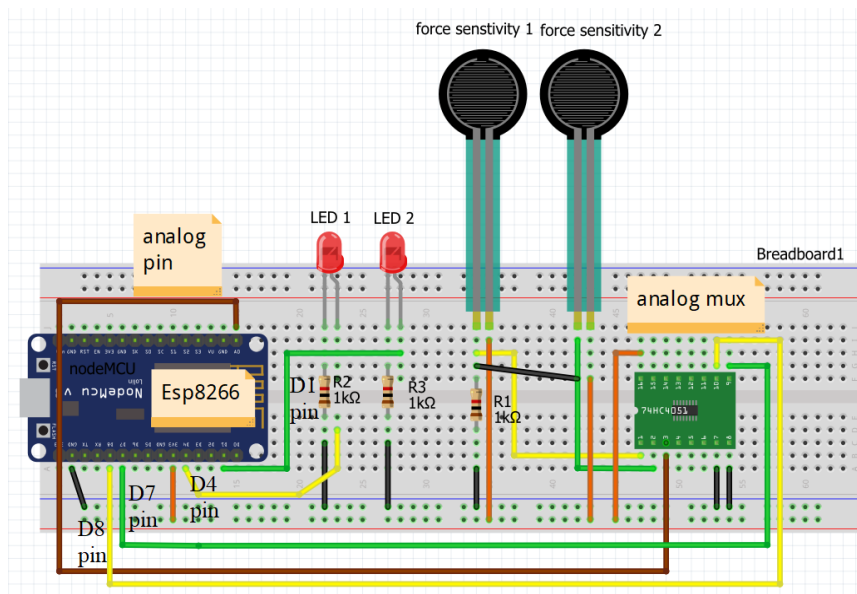**Figure 2:** Framework for Smart Kitchen Cupboards

Figure 3. Circuit of Smart Kitchen Cupboards using IoT

The Microcontroller gets the data from both the sensors at stipulated intervals. After dumping the code into microcontroller, if the power supply provided on it, first it connects to Wi-Fi by using the credentials which are given in program as username and password of Wi-Fi. Afterward, it connects to Blynk cloud using Authentication token given in program. Blynk is a mobile application which is an open source app to operate things through Wi-Fi. To check whether the microcontroller connect to Blynk or not we open the Blynk app. Then it shows it is online if it connects to cloud otherwise it shows offline. To monitor vegetables, fruits or any items quantity from Blynk app we should send the output data to cloud. To display these values in Blynk we take two widgets named value display which are used to display any values through virtual pins V0 and V1.

3. RESULTS AND DISCUSSION

IoT Enabled Smart kitchen Cupboards can be useful for monitoring, tracing and manage the remote valves. In conventional systems a person is employed for such remote valves. The aim of this work is to focus on various applications of IoT in smart kitchen cupboards which reduces the human effort and overcome the drawbacks in the conventional system. This project is user accessible and it provide the facility that the user need not go to check the grocery items when they are empty. When no item is placed in baskets the LED'S will blink which indicates the item is empty. Similarly, whenever grocery item are present then the force sensitive resistor will sense the weight and displays the value how much the quantity is remaining. This both the above said discussion is presented in Figure 3. When the grocery items are filled LED's will not blink and the weight will be continuously display in Blynk application which can see by Figure 3.

(a): No Items

(b): Items in Baskets

Figure 4: Schematic diagram of (a) No item (b) Item place in baskets

So, the user can monitor his/her household items quantity from anywhere through Wi-Fi. In this project, email notification has been implemented, the status of the grocery item of the kitchen will be send to registered mail of super market vendors and user. There is some cloud which is connected to super market, in this user has to create an account with the vendor and has to attached the credit card to it. So that whenever, the order will be placed and it is confirmed by the user then amount will be detected by from user credit card and items will be delivered at user home.

4. CONCLUSIONS

Now a days the project of smart kitchen information system using internet of things technology is getting much attraction in both i.e., public and research. Development of smart kitchen cupboards is an effort towards kitchen automation using ubiquitous computing technologies. Based on the database information the various services offered by kitchen cupboards such as inventory management and automatic shopping list preparation are useful and helping us to manage the kitchen activities effectively. The main aim of this study is to design and test the smart kitchen concept which was made on the basis of IOT technology. The tested result gives an observation that all the sensor which are used in the system works well and respond timely. The collected data also displayed on the web and app for the further processing. Further, in the delivery of such information this system is strongly influenced by the quality of Wi-Fi network used.

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