Home Groceries Management System Using IOT

T. Manikandan*, D. Tamil Selvan, R. Vaidhyanathan, B. Vigneshvaran and

V. Nandalal

Abstract--- In this fast world, remembering the groceries in kitchen is really a tough job for the people who are involved in the jobs away from home. To get rid of these things, smart kitchen shelf system will keep track of the availability of the grocery items in the kitchens at home. This work is aimed to detect the groceries that is to be refilled and intimates the user with an alert through webpage. In this work we used load cell to collect the information about the weight of the grocery items/products, with the help of analog-to-digital converter and NodeMCU modules. The designed system is connected with the internet via WiFi, which will intimate the family head/user whenever the weight of the products goes below the threshold level.

Keywords--- Grocery, Load Cell, Node MCU, A/D Converter, IoT.

I. INTRODUCTION

Smart kitchen shelf is the shelf in the kitchen which can communicate automatically to the family head and grocery shop/super market via internet when kitchen groceries containers are below the minimum level [1]. The invention of the concept of Internet of Things (IoT) has made everything smart in this world [2,3,4,5]. IoT makes people's lives easier and gives them insight into the patterns that govern the user's lives by collecting and analyzing data aggregated from multiple sources throughout the internet. It is already used in environmental management, infrastructure management, health care systems, transportation, home automation, and much more to make society function more smoothly [6,7,8,9]. The application of IoT can make the kitchen shelf a smarter one than ever. Smart kitchen shelf using IoT will make the everyday grocery shopping as simple as possible. The smart kitchen system concentrates on simplifying the process of buying and making food by intimating users when items run out and replenish the item in the user's kitchen automatically.

The smart kitchen management system using IoT technology developed by Chopade and Nighot (2019) used to monitor the grocery items in home and supermarket [9,10]. In their prototype the camera is used to detect the product/grocery item and weight sensors are used to check the availability of the product. If the weight of a particular product goes below some threshold, user will be intimated. Smart pantry described by Ahir et al. (2019) used load cells to track the weight of the grocery item/product in the storeroom [11]. If the product's weight goes below the threshold, that product will be automatically added to the shopping list. Their developed system provides valuable information about the consumption of grocery items and ease storekeeper to expect and replenish their grocery items on time. Javed et al. (2016) described development of an IoT enabled household which utilized camera to detect the product by scanning their bar codes and weight sensors [12]. If the product's weight goes below the threshold the user is intimated about the shortage. Chen et al. (2010) developed a smart kitchen for nutrition-

T. Manikandan*, Professor, Department of ECE, Rajalakshmi Engineering College, Chennai. E-mail: manikandan.t@rajalakshmi.edu.in
D. Tamil Selvan, Final Year UG Students, Department of ECE, Rajalakshmi Engineering College, Chennai.
R. Vaidhyanathan, Final Year UG Students, Department of ECE, Rajalakshmi Engineering College, Chennai.
B. Vigneshvaran, Final Year UG Students, Department of ECE, Rajalakshmi Engineering College, Chennai.
V. Nandalal, Professor, Department of ECE, Sri Krishna College of Engineering and Technology, Coimbatore.

aware cooking system, which intellects cooking activities and delivers nutritional information to the user [13]. Their developed system enabled healthy cooking by nutrition foods which are necessary for good health. Still there is a scope to improve the existing systems for smart kitchen management system. To overcome the drawbacks of existing smart kitchen systems, in this work we used the load cell sensor to continuously track the weight of the grocery item/product and gives the data to the A/D converter. The A/D converter will acquire and process the data. The output of A/D converter is fed to the node MCU which checks for the level of the grocery items. The weight of each grocery item is displayed in the webpage automatically by Wi-Fi module which is in built with node MCU. If any grocery item in the kitchen found to less than the minimum (threshold) predefined weight it intimate the user with an alert.

II. PROPOSED SYSTEM

The block diagram of home grocery management system using IoT is given in figure 1. It consists of load cell sensor, A/D converter, Node MCU, power supply and webpage display. The load cell sensor is used to track the weight of the each grocery item. Once the weight goes to the below the predefined minimum (threshold) weight, the device will intimate the user about the grocery item status. The A/D converter connected with internet through NodeMCU module, which collects the data from the sensor and alert the user. When the NodeMCU is connected to the webpage via internet through Wi-Fi module.
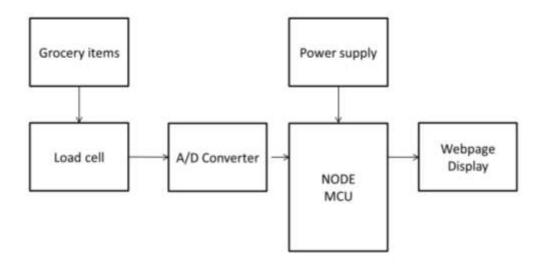

Figure 1: Block diagram of a home grocery management system using IoT

The internal circuit diagram of smart kitchen shelf is given in figure 2. Each grocery item is kept on the load cell sensor which senses the weight of the respective grocery item and sends the initial weight i.e., analog signal to the HX711 dual channel precision A/D converter, which to converts the analog signal to an equivalent digital data. This digital data is given as an input to the NodeMCU. The NodeMCU sends the data to the webpage in order to display the each grocery item status to the user. If the weight goes below the threshold level an alert is sent to the user.
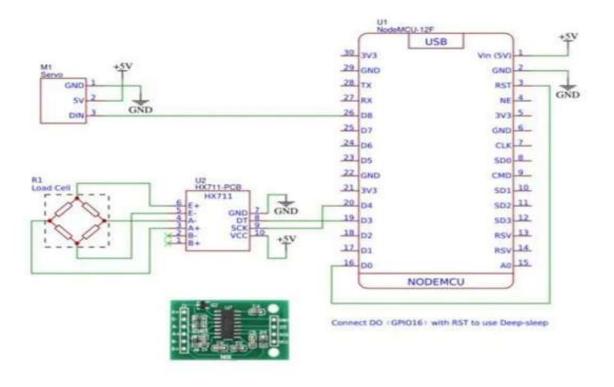
Figure 2: Internal circuit diagram of a smart kitchen shelf

The components of smart kitchen shelf are briefed below:

i. Load cell

Load cell is a transducer which converts energy in one form to the other form i.e it converts force (compression, tension, torque or pressure) into an equivalent electrical signal. As the pressure applied on the load cell increases, the generated electrical signal from the load cell also increases and vice-versa. The load cells are made up of piezo electric material and produces electric signal when the force is applied on it. The load cell used in this work is given in figure 3.

Figure 3: Load cell

ii. NodeMCU

The nodeMCU combines the nodes of the sensor cells with micro controller unit (MCU). It is a lost cost device and supports internet of things platform. The nodeMCU collects the information about the grocery items from the smart kitchen shelf and intimates to the user as well as grocery stores. NodeMCU used in this work is shown in figure 4.

Figure 4: NodeMCU

iii. Analog-to-digital converter

Analog-to-digital converter (HX711) is a 24 bit converter which can be directly connected with load cell. The input to the A/D converter is an electrical signal obtained from the load cell in response to the weight of a grocery items. The output of the A/D converter is a digital data according to the corresponding electrical signal produced by the load cell. The A/D convertor output is inputted to the nodeMCU,
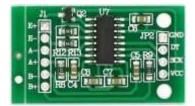

Figure 5: HX711 A/D converter

iv. Webpage display

A web page is a specific collection of information provided by the NodeMCU and is used to display the weight of every grocery items to the user through webpage. Typically a webpage consist of many link and mainly is used to display data to the end user. In our case it is used to display grocery items weights and alert the user if necessary.

III. RESULTS AND DISCUSSION

The implemented hardware of smart kitchen shelf is shown in figure 6.

Figure 6: Hardware implementation of smart kitchen shelf

The implemented smart kitchen shelf has four load cells and capable of measuring and sending the weights of four grocery items simultaneously. Depending upon the number of grocery items in the kitchen shelf, the number of load cells can be increased. The smart kitchen shelf measures the readiness of various grocery items and alert the user whenever the grocery item goes below the predefined threshold level. Webpage will provide the weight of the grocery item which will be updated every second automatically and when the weight goes below the threshold level an alert is given in the website to the user. So that the user can buy to refill the grocery item. The website also provides suggestion of the grocery item to be refilled from online grocery websites by comparing it with different brands with different prices. Thus, the user can purchase their grocery items with best price in market. The webpage display is shown in figure 7.
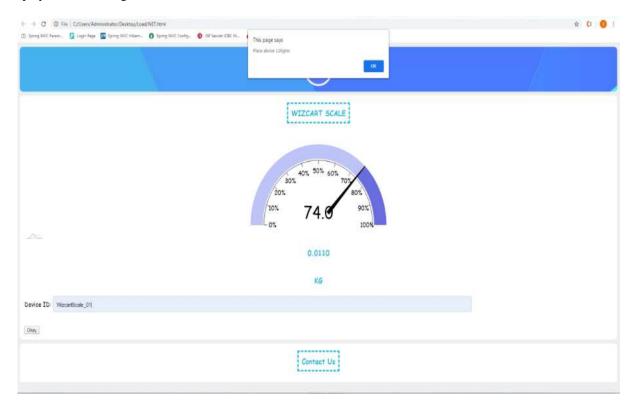

Figure 7: Webpage display

IV. CONCLUSION

The smart kitchen shelves are needed for today's scenario. The developed system is an initiative towards smart homes in near future. The developed smart kitchen shelf was effectively checks the status of grocery items and intimates the user through webpage if the grocery items weight goes below the minimum predefined levels. Thus, the developed smart kitchen shelves can support the smart home initiatives.

In future, the smart kitchen selves may linked directly with supermarkets/grocery stores and integrated with drone delivery system to deliver the grocery items from the super markets/grocery stores if grocery items are found be below the minimum predefined levels by user's approval.

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