Thermoelectric Refrigerator Stock Management System

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Abstract— Rapid improvements in technology tend to use smarter devices in day to day life, one such device is refrigerator. Now a days, everywhere we are experiencing IOT(Internet Of Things) systems , which are mainly converting physical world into an internet world. Refrigerator is an important part in our daily lives. Refrigerator is essentialas it stores the food item for a long time. In this paper, we propose an architecture for stock management system in mini refrigerator, based on thermoelectric cooling. More over mini refrigerators are also available in market for portable use of it. There is a need for more efficient way to monitor the amount of food materials left for forth coming days and in case of shop, it is necessary to avail the required quantity to improve the level of stock management.

Keywords: embedded systems, internet world, refrigerator, Thermoelectric, sensor, IFTTT, Raspberry Pi, Stock, inventory, food items

I. INTRODUCTION

The present invention are related to a mobile communication system and, in particular, to a method of stock management of items inside a refrigerator, which allows a person to monitor the items with a mobile terminal even from outside the residence in real time through a mobile communication network.

One aspect of the proposed work is to provide a method for stock management of items preserved in a refrigerator that is capable of monitoring the information on the items in real time so as to use the information for making a purchase decision.

Another objective of the work is to provide a method for stock management of the refrigerator, which provides the user with the real time information on the items in the refrigerator using a mobile terminal communicating with the refrigerator through a wireless communication network with the help of web service such as IFTTT. In this work, we are utilizing the sensors to keep the status of the thing in the refrigerator by creating an equipment model of the refrigerator based on the concept of thermoelectric refrigeration.

II. RELATED WORK

Shruthi, P, R. Nagashree, Likitha R. V.[1] have suggested LDR sensor for the checking the presence of food items in the system, they used RF transmitter and receiver to check the expiry date of the products inside the refrigerator. At whatever point substance inside the refrigerator goes below the predetermined limit or on the way to get rotten that is there are chances that the item is very nearly become useless, a trigger is produced which is being transmitted as a message to the user.

Emily Moin [2] has proposed the grocery management system for refrigerator the system detects status of items like expiry dates, weight, and freshness whatever the measure the nourishment items. Here the system compares the status of the items with the other predetermined criterion, e.g. Regardless whether the item within the period of expiry date, regardless whether the item is underneath the limit amount, e.g. by weight, volume, etc.

Jessica Tran [3] has proposed a system, "Automated Demand Response Refrigerator Project". In which they gave a dashboard to view a sensor data and control the refrigerator remotely.

III. PROPOSED METHODOLOGY

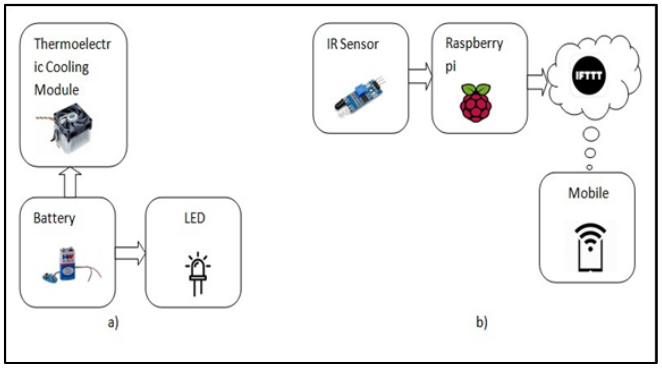


Fig. 1: Proposed System
Fig. 1.a) Block Diagram for Refrigeration System Fig. 1.b) Block Diagram for Stock Management System

As shown in the Fig.1.a), the refrigeration system consists of thermoelectric cooling module, 9V battery, and a LED. Here, the Thermoelectric cooling module and the LED is operated by the switch present outside of the refrigerator for the convenience of operating both the systems as separate in different manner. A refrigeration system is based on the Peltier effect.

Fig.1.b), The stock Management System consists of an IR Sensor, Raspberry Pi Zero W, a power supply, etc. The IR Sensor is interfaced Raspberry Pi board.

A. IR Sensor

The infrared sensor is used as an object detector. The principle of an IR sensor working as an object detection sensor can be explained using the following Fig. 2.

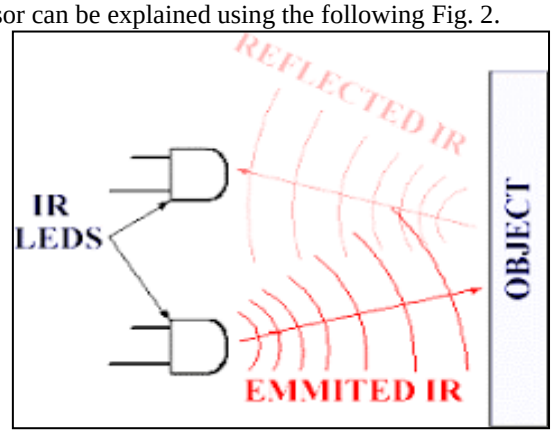


Fig. 2: principle working of an IR Sensor

B. Raspberry Pi Zero W

The Raspberry Pi Zero W extends the Pi Zero Family. The ultra small and ultra slim Raspberry Pi Zero W (wireless) is the smallest form factor
Raspberry Pi on the market now incorporating WiFi and Bluetooth connectivity on board. It is 40% faster than the original Raspberry Pi.

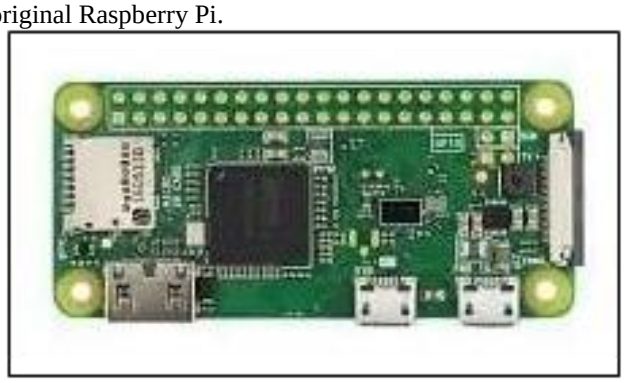
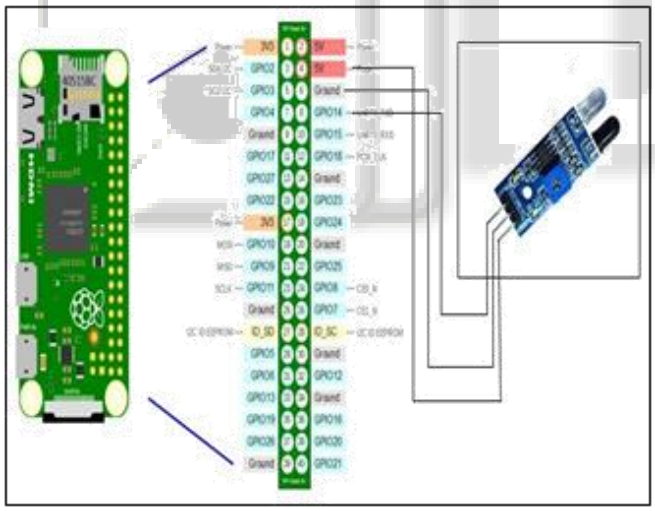


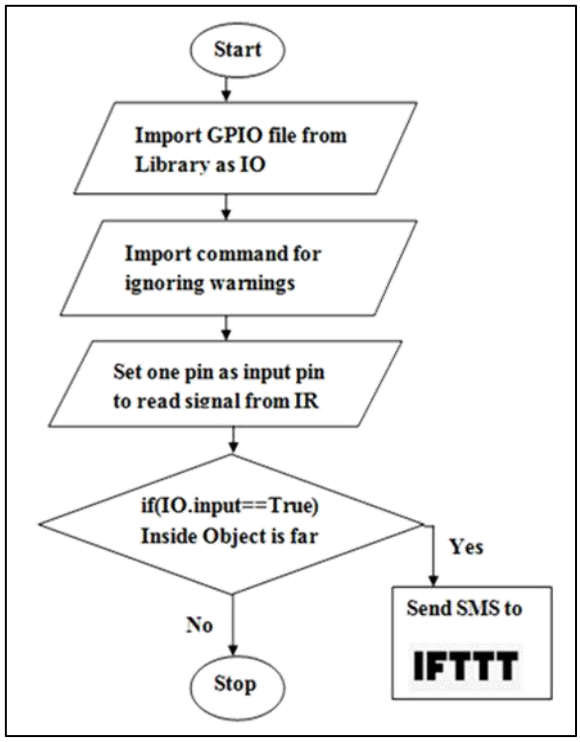
Fig. 3 Raspberry Pi board

C. IFTTT

If This Then That, also known as IFTTT is a freeware web based service that creats chains of simple conditional statements called applets. An applet is triggered by changes that occur within other web services. It helps to connect all of your different apps and services.

IV. CONNECTION DIAGRAM AND PROCESS FLOW





V. APPLICATION AREAS

Such an advanced stock, pantry management systems have wide applications in stores, shops, factories, etc where requirement of refrigeration is more and must. These kinds of systems help you to keep updated about the stock in refrigerator, where selling is in bulk quantity by sending proper notifications.

The application of thermoelectric Peltier cooling in medical field for vaccines storages for longer duration.
Thermoelectric Mini refrigerators are useful in travelling such that they are easy to carry anywhere.

VI. RESULT

When the system is switched ON thermoelectric cooling generates cool breeze inside refrigerator. The temperature inside the refrigerator falls about 100C below than the outside temperature. When the IR sensor, present inside the refrigerator, unable to detect the object(in the stock) coming in its range, it indicates that the stock kept in the mini refrigerator is going low or out of stock, then the Raspberry Pi sends following type of notification SMS on the IFTTT application in mobile.

Fig. 4: Message received on User's mobile

VII. CONCLUSION

Stock management can be a tedious process that slows down your work, business. A software tool with the right features can help. This system is a tool that allows you to monitor your stock of food items inside the refrigerator in real time in efficient manner. Also, the proposed model of thermoelectric mini refrigerator is simple, easy and efficient to carry anywhere, such that it will fulfill our need of cooling to keep item inside it fresh for some more time. It will give you insights into every aspect of our stock optimization in refrigerator.

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