

Next Generation Smart Refrigerator Based on IoT

Amit Sharma

Department of Electronics and Communication Engineering
Faculty of Engineering, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India

ABSTRACT: *In a home the kitchen plays a major role in keeping the family alive and together, as the kitchen acts as the location where meals are cooked and also the meeting point where family members gather to eat. The fridge is of great importance among all the appliances or equipment used in a kitchen. This is because the refrigerator houses or holds food products that are needed in the home intact. For a period of time, conventional refrigerators have performed great tasks in preserving food products, but there is a need for more innovative ways to preserve and handle food products. The Internet of Things (IoT) came with technological developments, where different devices are linked together with the internet, like home appliances. The Internet Refrigerator, which is a traditional IoT, has also been designed to make life more convenient and comfortable by handling the kitchen more efficiently.*

KEYWORDS: *Kitchen, Refrigerator, IoT, Food, Health, Next generation devices, Smart equipments.*

INTRODUCTION

Designing smart equipment is critical to the realization of a smart home. Kitchen is an important place inside the home which consists of many advanced appliances which provide advanced services for a household. A smart refrigerator is the main focus of this research paper. This paper discusses efforts in developing a smart refrigerator to provide better services. The industry from time to time changes the traditional refrigerator function, i.e., to store food items in a cool environment, to combine fridge with TV, Mobile, computer & even connection to the Internet. These capabilities enable the development of applications for devices such as smart fridges. In this paper the main aim is to develop a smart refrigerator which focuses on better nutrition and health [1].

All devices are connected to the internet, which forms the internet of things, with tremendous technological changes. The sensors are used to capture the data and send it over the internet to a host where it is supposed to be processed. Improvements in technology have simplified our everyday lives. It has been made smarter by the innovations introduced using IoT in electrical appliances at home. Smart refrigerators are one of those technologies which are used to store the things for cooking. Refrigerators are used to prevent food from being wasted and to keep it healthy. It eliminates sickness and makes our lifestyle in the modern world healthier. In order to make the fridge smarter, the proposed IOT based device uses Raspberry pi as the central server.

In order to achieve a smart house, the production of smart appliances is critical. The kitchen is a popular location in the home with many smart appliances. To provide a family with better facilities. The focal point of our research is a smart fridge. In industry and science, we have seen several attempts at creating smart fridges. The industry is trying to change the conventional function of the refrigerator, i.e. storing food products in a cool atmosphere, incorporating the refrigerator with TV, radio and computer capabilities, and even connecting to the Internet. These computer-like capabilities make it possible for devices such as smart fridges to create applications [2].

A smart refrigerator is connected to the internet through the Internet of Things, where it can do far more than just keep food cold. The Smart refrigerator proposed in this paper provides the consumer with SMS

notifying the scarcity of food in the refrigerator and has the potential to order online shortages of food products such as milk, butter, etc. or messages from the nearest grocery store. In order to scale back food spoilage, it jointly detects temperature, humidity and shows them. If ice cubes are ready to send a warning buzz when ready to use, the smart refrigerator can also be useful in notifying. The smart fridge also has the ability to say by giving a notification via mobile or web application if the door is held open. Some modules also have features that let you know the products in the refrigerator recipes.

It is a well-known fact that fast-paced growth and modern living have been achieved. The result was a change in the lifestyle of individuals towards less exercise and an unhealthy diet. If we do not take consuming nutritious food seriously, poor eating habits will cause diet-related illness in late life. In developing nations, for example, obesity resulting from unhealthy eating patterns and behaviors is becoming a major health danger [3]. People believe that applications that concentrate on better nutrition and health are important in this context. This paper introduces an application that encourages healthier food and health behaviors directed towards the smart fridge. The fridge being a prominent appliance in the kitchen plays an important role in food and nutrition of a household and in our opinion is ideally suited for such an application [4].

LITERATURE REVIEW

In the present period, automation is the most important aspect of our lives. Home-accommodated automation helps us to monitor IoT devices such as lights, entryways, fans, AC, fridges, etc. A refrigerator is the most commonly used electrical appliance in the kitchen for preserving and keeping food fresh all over the world. Using a smart refrigerator module consisting of sensors such as load cell, gas sensor, camera module, etc., a basic refrigerator can be upgraded to a smart, cost-effective system. The smart refrigerator analyses food nutrition status for e.g. weight, quantity, consistency and freshness, etc.

People see improvements to superior technology, such as cell phones, home appliances and much more, as people look around them. Smart appliances include a washing machine, a TV, a fridge, etc. The smart refrigerator system is addressed here because individuals are very stuck in the present lifestyle. They don't really have time to take care of their simple healthy habits and diet; in the early morning, the man leaves home and returns around night, there is no time for a person to take care of themselves.

Although the industry has made efforts to create a smart refrigerator, the new or emerging technology is not yet cost-effective or energy-efficient. For a simple household consumer who has no understanding of how the whole system behind the smart refrigerator functions, the technology is too complicated or complex. Internet access is still weak at most locations and there is minimal connectivity to the network, i.e. either low internet speeds or low support. The barcode does not document the essentials of the product containing the expiry date in a uniform way. There is inadequate protection for the smart home environment or the networked home to safeguard the data outflow from the house. The privacy of the user and the house can be compromised by attackers.

Spoilage of waste food is one of the biggest constraints we are facing in the world. As soon as the food is purchased it is stored for a long term in the refrigerator thus making its depowering its freshness. There are times when one forgets the items are already present in the refrigerator and end up buying the items again from the grocery store thus supporting food wastage. The Smart Refrigerator system is primarily used to turn the current refrigerator into a cost-effective smart appliance. The smart refrigerator system is capable of detecting and tracking its contents. The intelligent refrigerator device will alert the user remotely via SMS and email of the scarce goods. The system monitoring unit has a software module in its memory, which is still in the monitoring mode and scans its input. To maximize the consumption and value of energy while maintaining the level of comfort specified. When users adjust their behaviour as a

result of unexpected events, the system may notice incorrect predictions by analyzing sensor information in real time and consequently switch system actions. The parameters could avoid the introduction of energy saving home automation systems into the mass market [5].

Technology's development is inevitable, each invention has been established to have a positive impact on human life. One of the most developed technologies today is the Internet of Things (IoT) where the things can be found, tracked, monitored and managed automatically. A hyper-connected world has been brought forward by the exponential growth of information technology (IT) in which objects are connected to mobile devices and the Internet, interacting with each other. To facilitate human needs, several IoT-based appliances have been developed, such as the smart refrigerator.

CONCLUSION & DISCUSSION

The transformation of existing refrigerator to advanced & intelligent refrigerator is done using Arduino UNO & web server and the module detects the shortage of food items and notifies the user and uploads the information to web service along with information of refrigerator temperature and humidity. This system is cost-effective and provides the user SMS notifying the shortage of food quantity present in the fridge & has the ability to order and notify shortage of food items online like egg, milk, butter & many more items or messages the nearby general store for the order to refill the items of quantity. Additionally it senses the nutrient value of items stored in the fridge, temperature, humidity & also displays expiry date of food stored in it.

REFERENCES

- [1] R. C. Hou, X. Wang, and X. Y. Wang, "A food management system based on IOT for smart refrigerator," *Appl. Mech. Mater.*, vol. 427–429, no. November, pp. 2936–2939, 2013, doi: 10.4028/www.scientific.net/AMM.427-429.2936.
- [2] A. D. Floarea and V. Sgârciu, "Smart refrigerator : A next generation refrigerator connected to the IoT," *Proc. 8th Int. Conf. Electron. Comput. Artif. Intell. ECAI 2016*, 2017, doi: 10.1109/ECAI.2016.7861170.
- [3] S. Luo, J. S. Jin, and J. Li, "A smart fridge with an ability to enhance health and enable better nutrition," *Int. J. Multimed. Ubiquitous Eng.*, vol. 4, no. 2, pp. 69–80, 2009.
- [4] M. P. Mahajan, R. R. Nikam, V. P. Patil, and R. D. Dond, "Smart Refrigerator Using IOT," *Int. J. Latest Eng. Res. Appl.*, pp. 86–91, 2017.
- [5] F. Osisanwo, S. Kuyoro, and O. Awodele, "Internet Refrigerator –A typical Internet of Things (IoT)," 2015, doi: 10.15242/iie.e0315051.