IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 13, Issue 5, May 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.317

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305059|

Smart Refrigirator for Commercial Purpose

Dr. MJ Chandrashekar, Akhilesh D, Jyotiraditya G, Yathin K, Nishanth V

Head of Department, Department of EEE, SJB Institute of Technology, Bangalore, Karnataka, India.

U.G. Student, Department of EEE, SJB Institute of Technology, Bangalore, Karnataka, India.

U.G. Student, Department of EEE, SJB Institute of Technology, Bangalore, Karnataka, India.

U.G. Student, Department of EEE, SJB Institute of Technology, Bangalore, Karnataka, India.

U.G. Student, Department of EEE, SJB Institute of Technology, Bangalore, Karnataka, India.

ABSTRACT: Smart appliances with multimedia capabilities are becoming increasingly integrated into our daily lives. This category includes devices such as washing machines, televisions, and refrigerators. In today's modern era, people are accustomed to interacting with this technology, often referred to as the Internet of Things (IoT). As we observe our surroundings, we notice the impact of advanced technology in various aspects, including cell phones, kitchen appliances, and more.

Leveraging the rapid advancements in computing technology and the widespread use of the Internet, smart homes have become a prominent area for intelligent appliances. The kitchen, in particular, is a key location where these smart devices are frequently utilized. However, existing systems often employ high technology that adds complexity and cost, requiring users to purchase entirely new, expensive refrigerators.

To address this issue, the Smart Refrigerator module has been designed to transform any standard refrigerator into a smart one in a cost-effective manner by utilizing various sensors.

KEYWORDS: smart refrigerator for commercial purpose, raspberry pi, IR sensors, gas sensor, temperature sensor, Wi-Fi module, h-bridge, dc motor, oled display, relay panel.

I. INTRODUCTION

Refrigerators are the most frequently used kitchen appliances worldwide, primarily for food storage, including vegetables and fruits. The Smart Refrigeration module is designed to convert any existing standard refrigerator into a smart, cost-effective appliance using sensors.

Smart appliances with multimedia capabilities, such as washing machines, televisions, and refrigerators, have become integral to our daily lives. In today's modern era, we are accustomed to interacting with this technology, often referred to as the Internet of Things (IOT).

Observing our surroundings, we can see the impact of advanced technology on various aspects of life, including cell phones and kitchen appliances.

The rapid advancement of computing technology and the widespread use of the Internet have made smart homes a prominent area for intelligent appliances. The Smart Refrigerator can monitor the status of food items, such as weight and quantity, helping to reduce food spoilage, illness, and promoting a healthier lifestyle. This smart appliance is capable of sensing and monitoring its contents, offering numerous beneficial features. It can be controlled remotely, notifying the user about low-stock items via a Wi-Fi module connected to a mobile Android application.

The Smart Refrigerator also facilitates the purchase of scarce items with a one-touch button on the mobile app, sending an SMS to a predefined nearby grocery vendor. Its core functionality is to maintain a list of items that need to be replenished with minimal effort. For instance, users are notified when eggs run out. A load cell triggers a notification when the quantity of vegetables falls below a threshold weight, and IR proximity sensors monitor containers of milk or juice. Additional features include ice readiness indication, power saving, smell detection, and overweight alerts.

However, the technology may be too complex for a simple household user with little understanding of the mechanisms behind the smart refrigerator. Additionally, poor internet connectivity in many areas results in low internet speeds or

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305059|

limited support. Moreover, the use of barcodes is not standardized, which complicates recording essential product information, including expiration dates.

II. LITERATURE SURVEY

Refrigerator is one such innovation which has helped people in many ways. It helps to keep the food fresh even if it is kept for more than a day. In such a modern technology, people expect the smart and improvement in technology. So a smart refrigerator using a LCD display, GSM module, sensors and many more must be designed to make it a smart refrigerator and lead in the improvement of technology [1]. Intelligent appliances with multimedia capability have been emerging into our daily life. Thanks to the fast advance of computing technology and the wide use of the Internet, smart home is one of the most prominent areas of intelligent appliances [2]. The system consists of a few sub-modules which are sensing module, control module and transmission module. Sensing module consists of gas, humidity and temperature sensor while control module consists of microcontroller and power supply unit and last but not least, transmission module consists of LCD module and Wi-Fi module [3]. The kitchen is regarded as the central unit of the traditional as well as modern homes. It is where people cook meals and where our families sit together to eat food. The refrigerator is the pivotal of all that, and hence it plays an important part in our regular lives. Wasted food due to spoilage is a critical resource issue. Food waste or food loss is food that is discarded or lost uneaten. Currently, in the world, according to the Food and Agriculture Organization of the United Nations (FAO), consumers waste about 1.3 billion tons of food annually and consumers in rich countries waste about 222 million tons of food products Once food products are purchased and set aside in a refrigerator, the users do not alert about their food items' expiration date and/or freshness unless they individually examine and track them [4].

III. METHODOLOGY

Implementing the Smart Grocery Management System with Enhanced Efficiency and User-Friendly Features involves a systematic approach to achieve the project's diverse objectives. It begins with a thorough requirement analysis, where user expectations and preferences are identified through surveys and interviews. The next phase involves designing a comprehensive system architecture that integrates automatic tracking mechanisms, expiration date monitoring, and a sophisticated refrigerator model with a smart door-closure system.

Sensors are strategically integrated to enable automatic grocery tracking and real-time updates on product expiration dates. Simultaneously, a robust database system is established to manage and secure the collected information. Communication protocols are implemented to ensure seamless interaction between the smart refrigerator and a user interface accessible on various devices.

Rigorous testing and validation procedures are conducted to ensure sensor accuracy, data synchronization, and optimal user interface responsiveness. Continuous optimization and refinement, based on user feedback and performance analysis, lead to the development of a reliable and efficient system. The deployment phase includes creating comprehensive documentation, such as user manuals and technical guides, followed by the system's deployment.

To help users maximize the system's benefits, training materials and support resources are provided, along with a dedicated customer support system to address inquiries, concerns, and technical issues.

This methodological framework aims to deliver a seamlessly integrated, user-friendly solution that redefines grocery management for modern households, emphasizing efficiency, sustainability, and enhanced user experience.

For manufacturers, this system enables easy tracking of products from the assembly line through the transportation route to the store shelf, providing valuable insights into assembly and transportation costs as well as product visibility in stores.
For consumers, it provides timely access to information that has traditionally been difficult or impossible to obtain, enhancing their grocery shopping and management experience. The fig (a) shown below is the block diagram of the smart refrigerator.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305059|

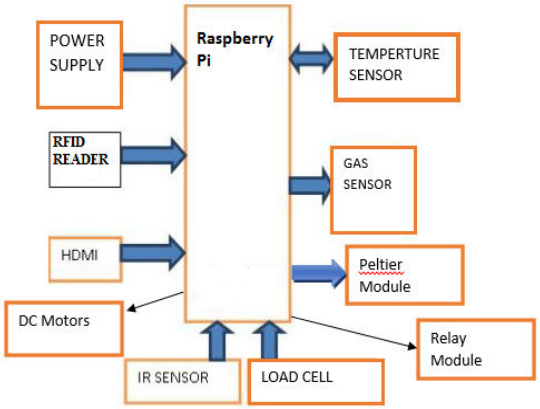
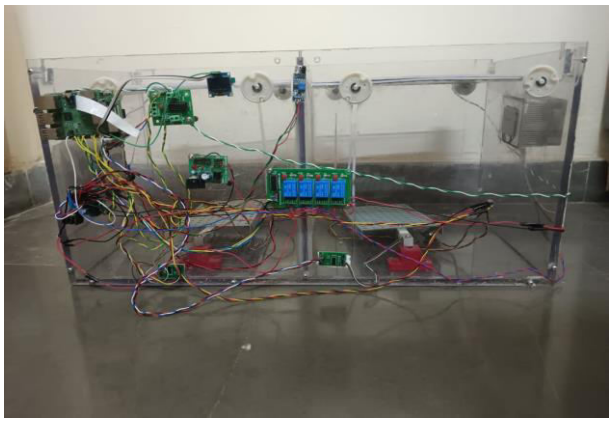


Fig.(a) : Block Diagram

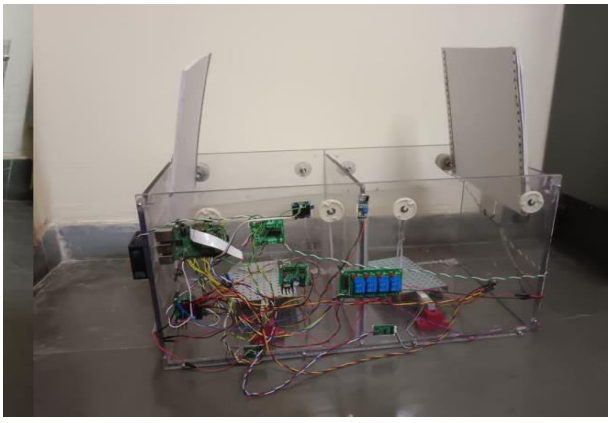
IV. EXPERIMENTAL RESULTS

The implementation of the Smart Grocery Management System with Enhanced Efficiency and User-Friendly Features has yielded significant and positive results. Through the integration of automatic tracking mechanisms and an advanced refrigerator model with a smart door-closure system, the system has successfully transformed the way households manage their grocery inventory. Users now benefit from real-time updates on their groceries, allowing for seamless organization and preventing unnecessary waste by closely monitoring expiration dates.

The sensors integrated into the system have demonstrated high accuracy in tracking groceries within the refrigerator and providing timely alerts about approaching expiration dates. The smart door-closure system has proven effective in maintaining optimal storage conditions.



(B) Door close status



(C) Door open status

Automatic door opening and closing- the above figure (B), (C) are the status of automatic door opening and closing By integrating two inputs that is IR Sensor input and Face recognition input given through pi camera the automatic door closing is enabled. The face is being trained through a face reading program that reads the face dimension and stores the data into the data base of raspberry pi. This stored data is then compared with scanned face data from pi camera if the image has 85% match then the system recognizes the use has named else the message is being relayed to the user that an unknown person has been detected .The second part is to sense whether the person is still in the vicinity of the refrigerator to optimize the power usage an IR Sensor has been installed to sense whether a person is present or not. These inputs are given to the H Bridge which used for controlling the motor which have been attached to door for open and closing purpose.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305059|

1. Activation of peltier for cooling- The peltier module is being operated by the inputs given by the temperature and humidity sensor the reading are relayed to the raspberry Pi the raspberry Pi send high signal to the relay the relay is the turned on when the temperature is above 15°c if the temp is below 10°c the the relay switches of the peltier module the usage of 4channel 5v relay has been used two channels for peltier 2 channels for fan for cooling purpose.

2. Rotten smell detector - The gas sensor has been used to detect gases evolved when the vegetable have been rotten the input has been given to raspberry Pi this input is the given to the operator and the is also displayed in the OLED display since there is two compartments the display displays in which specific module this detection is being taking place.

3. Weighing monitor - for weighing purpose the load cell of 6kg capacity has been used and a tray is mounted on one side upon tension the weight is sent to the operator and also displayed on the oled display . Since the signal from load cell is not adequate to to be relayed to the raspberry Pi. Usage of HX711 signal amplifier has been used this amplifies the signal this information is relayed to the raspberry Pi the raspberry Pi sends the processed information to operator and also to oled screen.

4. Smart info - We can observe all the read data and info is being upadated to the operator and each and every stage via telegram the bot created in telegram is linked to the rapsberry pi program hyperlink there therefore smart info is being given to the operator making his operation and maintenance easy.

V. CONCLUSION

In conclusion, the development of this advanced smart refrigerator for commercial applications marks a significant leap forward in addressing multifaceted challenges within perishable goods management. By seamlessly integrating cutting-edge technologies, including automatic tracking, real-time expiry date monitoring, and energy optimization through machine learning, this project not only enhances the operational efficiency of businesses but also champions sustainability goals. The robust system addresses the pervasive issue of food waste, contributing to economic savings and promoting environmentally responsible practices.

The inclusion of a door closure monitoring mechanism and remote accessibility ensures a user-centric design, emphasizing convenience and proactive management. As businesses globally grapple with the demands of the modern era, this smart refrigerator emerges as a pioneering solution, poised to revolutionize commercial refrigeration practices. Its potential to streamline inventory management, reduce energy consumption, and provide real-time insights positions it as a cornerstone in the evolution of refrigeration technology.

Furthermore, the project responds to the urgency of our times, aligning with global sustainability initiatives. By minimizing food waste and optimizing energy utilization, it not only meets the immediate needs of businesses but also contributes to a more responsible and eco-conscious approach to perishable goods management. In essence, this smart refrigerator represents a forward-looking solution that embodies efficiency, sustainability, and technological innovation, paving the way for a future where commercial refrigeration is not just a necessity but a catalyst for positive change.

Additionally, the adaptability of this smart refrigerator to various commercial settings, such as restaurants, supermarkets, and food distribution centers, underscores its versatility and scalability. The modular design and compatibility with existing infrastructures make it an accessible and impactful solution for a diverse range of businesses, further solidifying its potential to transform the landscape of commercial refrigeration on a global scale.

REFERENCES

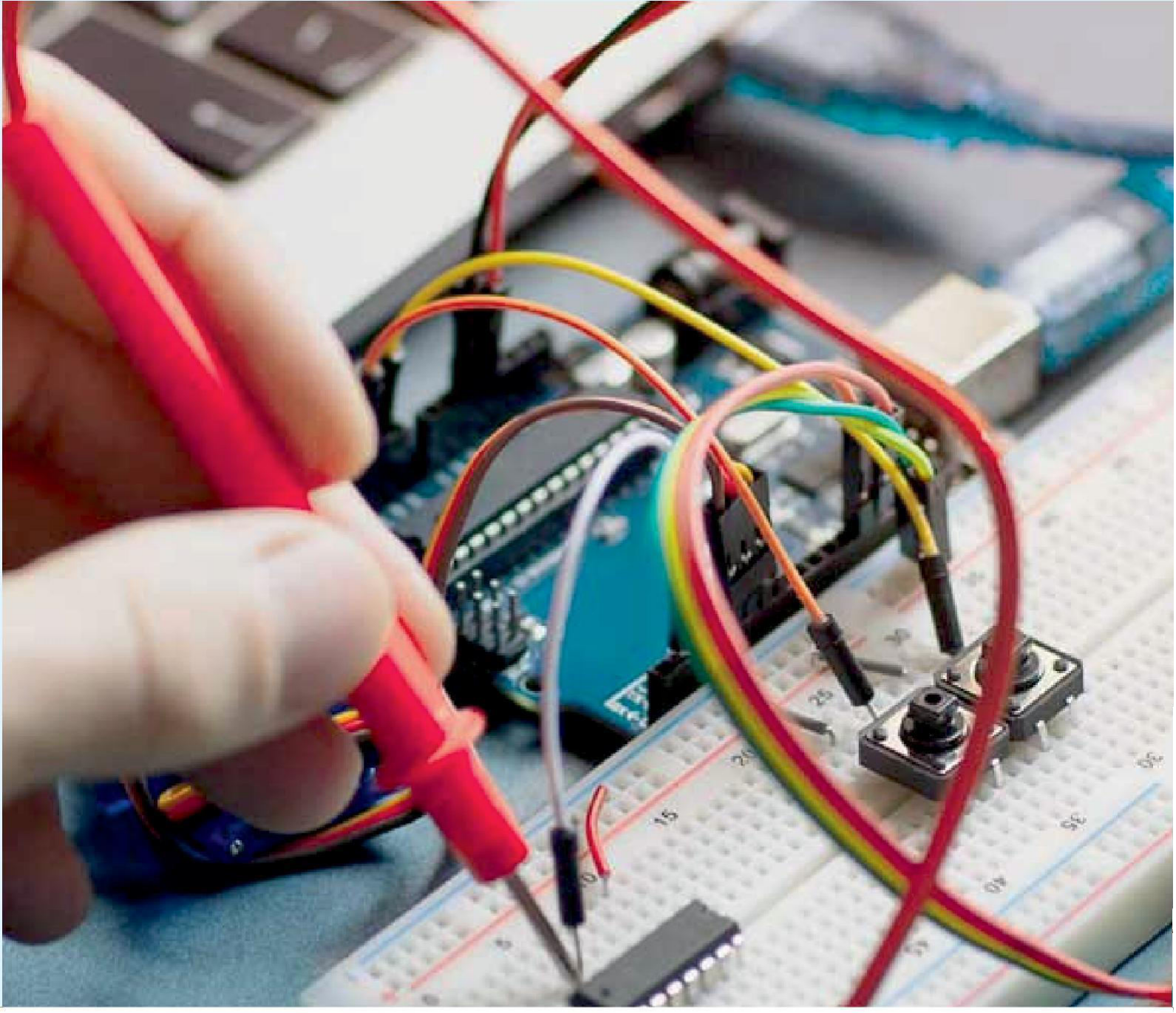
1. Prapulla S. B., Dr. Shobha G., Journal of Multidisciplinary Engineering Science and Technology (MEST) ISSN: 3159-0040 Vol. 2
2. International Journal of Multimedia and Ubiquitous Engineering Vol. 4, No. 2, 'A Smart Fridge with an Ability to Enhance Health and Enable BetterNutrition' by Suhuai Luo, Jesse S. Jin, and Jiaming Li.
3. Somayya Madakam, R. Ramaswamy, Siddharth Tripathi, Journal of Computer and Communications, 2015, 3, 164-173, 'Internet of Things (IoT): A Literature Review' Published Online May 2015 in SciRes.

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.317|| A Monthly Peer Reviewed & Referred Journal |

||Volume 13, Issue 5, May 2024||

|DOI:10.15662/IJAREEIE.2024.1305059|

4. International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 5, . 'IoT-based Smart Refrigerator System' by Deepti Singh, Preeti Jain.



INNO SPACE
SJIF Scientific Journal Impact Factor

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

9940 572 462 6381 907 438 ijareeie@gmail.com

Scan to save the contact details