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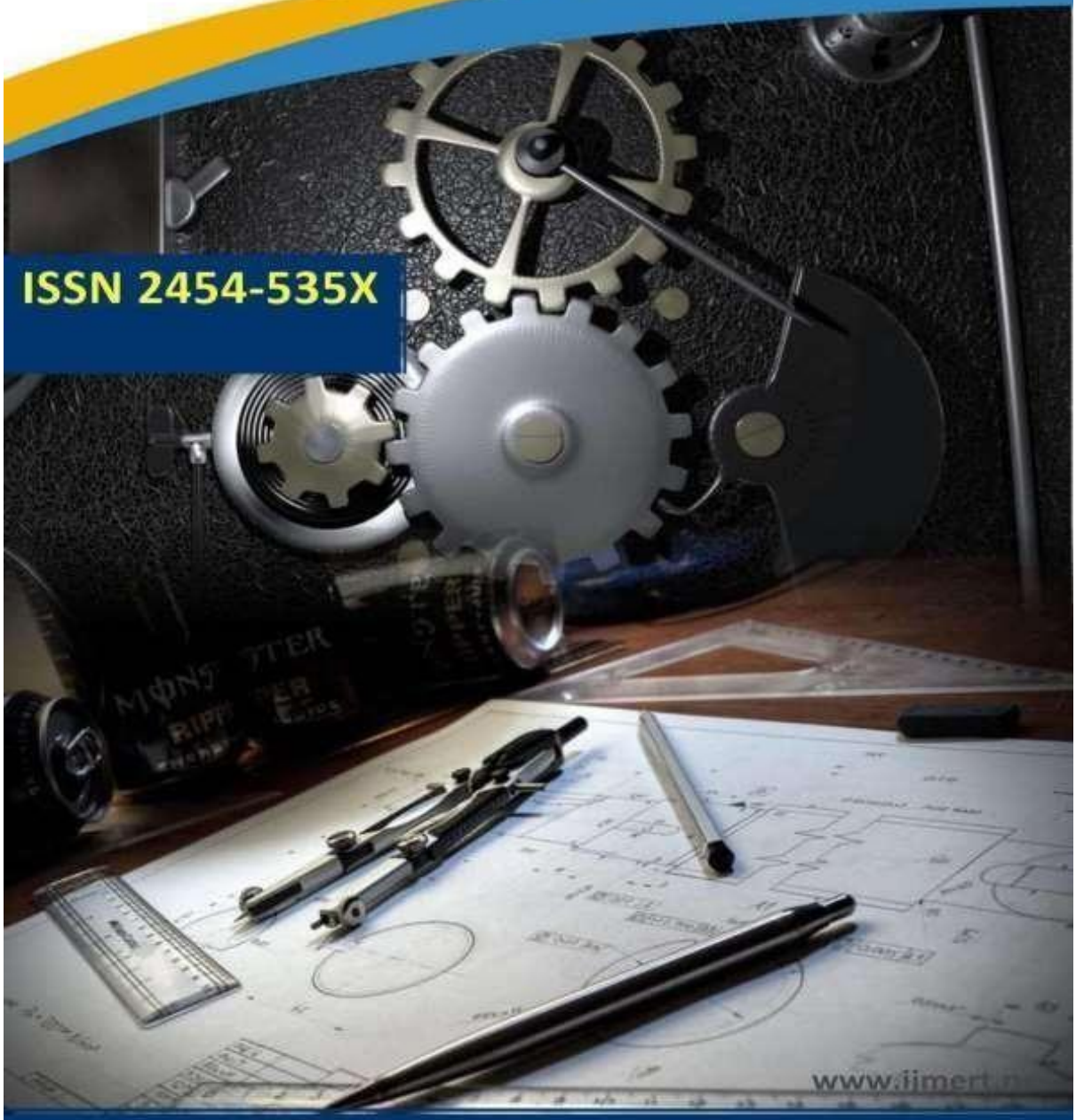

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THE IMPLEMENTATION OF IOT & SMS BASED SMART REFRIGERATOR

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ABSTRACT

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. Moreover, for food products which are not labelled with an explicit expiration date may lead to significant food spoilage and additional expenditure for the users. However, with the latest trend technology of the Internet of Things (IoT), this problem can be resolved. Combining the idea of Internet of Things and smart kitchen evolution, the smart refrigerator system is developed. The system consists of three main parts which are sensing module, control module and transmission module. Sensing module consists of DHT11 and odour sensor while control module consists of Arduino UNO and power supply unit and last but not least, the transmission module consists of LCD module and Wi-Fi module. These modules work together to determine contents status inside the refrigerator and notify the user about the condition and quantity of the food via an SMS.

INTRODUCTION

The Implementation of IoT & SMS Based Smart Refrigerator project introduces a transformative approach to conventional refrigeration technology. By integrating IoT sensors and SMS-based communication, this project aims to enhance the functionality and convenience

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of household refrigerators. Through the utilization of temperature, humidity, and weight sensors, the smart refrigerator ensures precise monitoring and control of food storage conditions. Users can remotely access and manage the refrigerator's operations via a dedicated mobile application or SMS commands, offering unprecedented convenience. Automated alerts notify users of any deviations from optimal conditions, promoting food safety and minimizing wastage.

The project emphasizes energy efficiency through intelligent algorithms, optimizing cooling cycles to reduce electricity consumption. By bridging the gap between traditional appliances and modern technology, the smart refrigerator exemplifies the potential of IoT in everyday life. Accessibility is ensured through Wi-Fi or Ethernet connectivity, enabling seamless integration into smart home ecosystems. Real-time data from IoT sensors enables proactive maintenance and troubleshooting, enhancing reliability. The project addresses key challenges in traditional refrigeration, such as manual monitoring and limited control. Through remote monitoring and management capabilities, users can optimize food storage and reduce their environmental footprint.

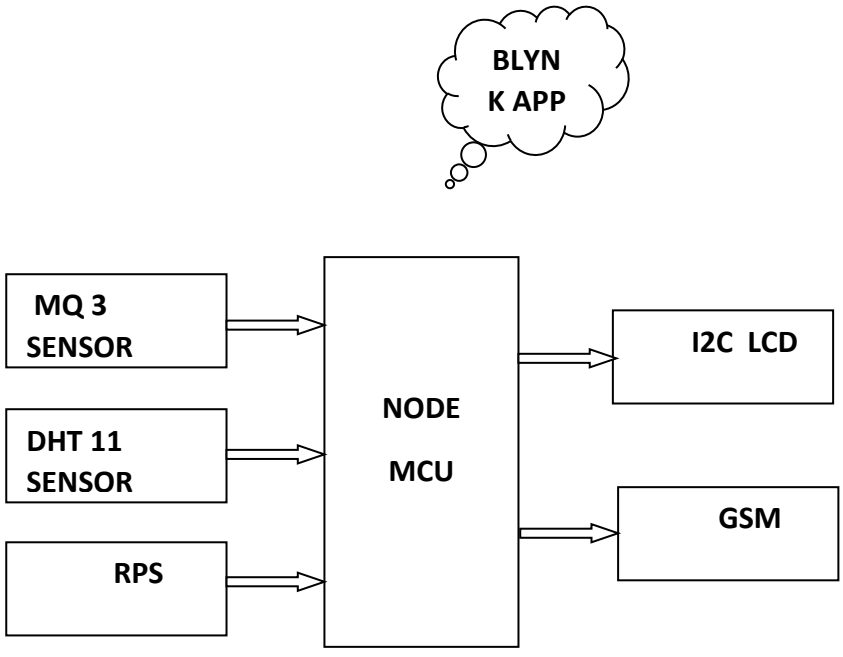

Figure.1 Block diagram

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LITERATURE SURVEY

1.INTERNET refrigerator also known as Smart refrigerator is a refrigerator which has been programmed to sense what kinds of products are being stored inside it and keep a track of the stock through barcode or RFID scanning. This kind of refrigerator is often equipped to automatically determine when a food item needs to be replenished. It also provides users with extra information about their products, their nutritional facts and consumption history. An internet refrigerator can download recipes based on its content; communicate with a microwave oven to prepare the cooking power and time for the given mix of ingredients.

2.Remote Monitoring and Control:

Review literature on how IoT-enabled smart refrigerators enable remote monitoring and control of temperature and other parameters.

Explore studies that discuss the deployment of sensors for real-time monitoring of temperature variations and the use of actuators to adjust cooling settings remotely.

3.Inventory Management and Food Safety:

Examine research papers and articles that explore how IoT-based smart refrigerators facilitate inventory management and ensure food safety.

Look for studies that discuss features such as RFID tagging, barcode scanning, and expiration date tracking to help users manage their food inventory and reduce waste.

PROPOSED SYSTEM

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. These modules work together to determine contents status inside the refrigerator and notify the user about the products via an SMS or an email. Figure 1 shows the block diagram of the smart refrigerator.

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MQ3 gas sensor is used to detect gasses produces by fruits or vegetables or any other organic contents stored in the refrigerator. There is a possibility that variety of foods are kept in the refrigerator at different time. Therefore, the latest food kept in the refrigerator is the latest to become rotten or expired. However, due to the mixture of gasses produced by the earliest food kept in the refrigerator, it also may affect the latest to become rotten faster than it supposed to be. In order to prevent this problem and maintain the quality and freshness of the contents inside the refrigerator, the gas sensor is used.

In addition to MQ3 sensor, DHT11 temperature and humidity sensor is used to monitor the temperature and humidity of the refrigerator. The reason is, temperature plays an important role to maintain the freshness of the food.

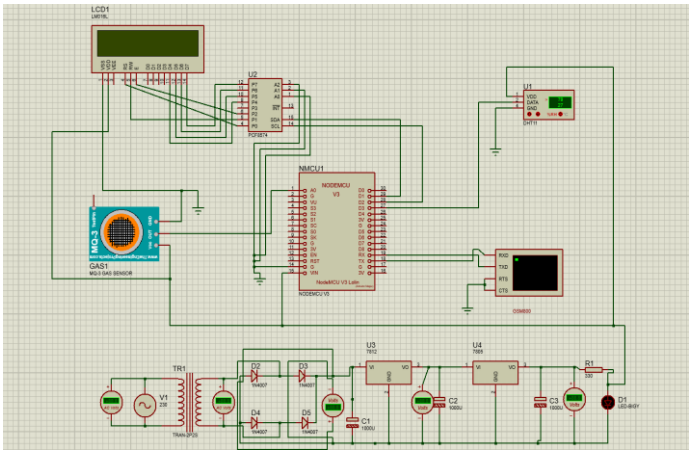

Figure.2 Schematic Diagram

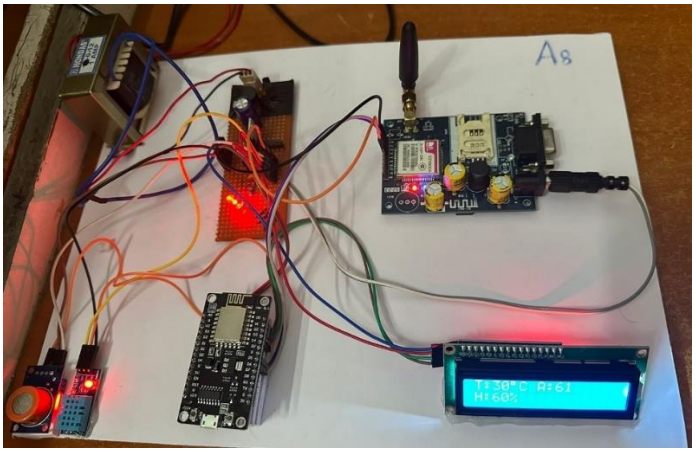

Figure.3 Project setup

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RESULTS

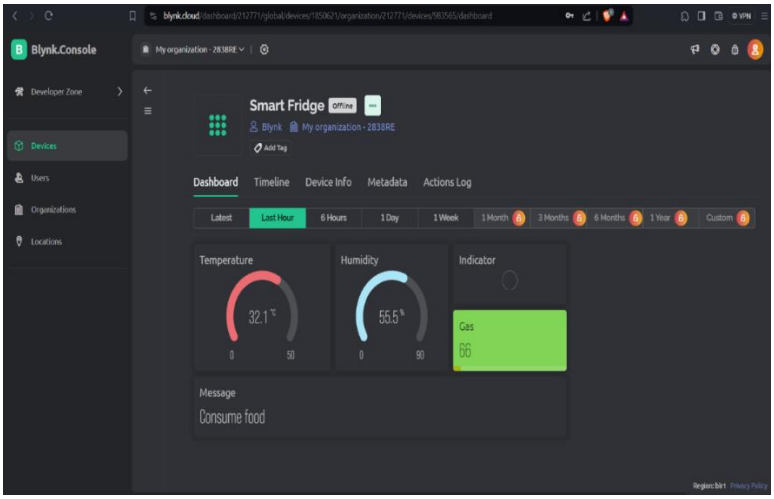

Figure.4 Blynk output

Figure.5 Welcome display on LCD

Figure.6 Displaying temp & MQ2

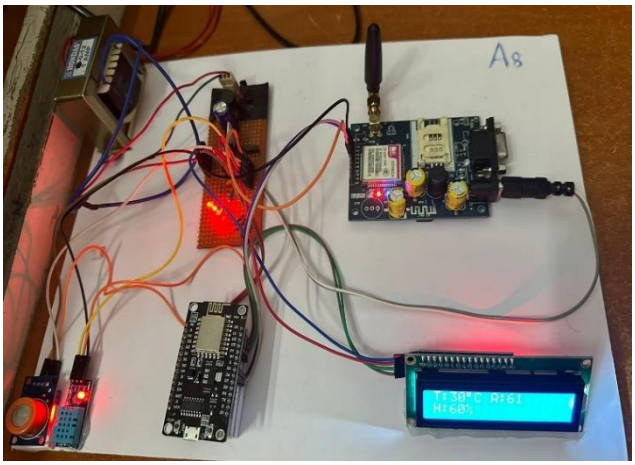

Figure.7 Working kit

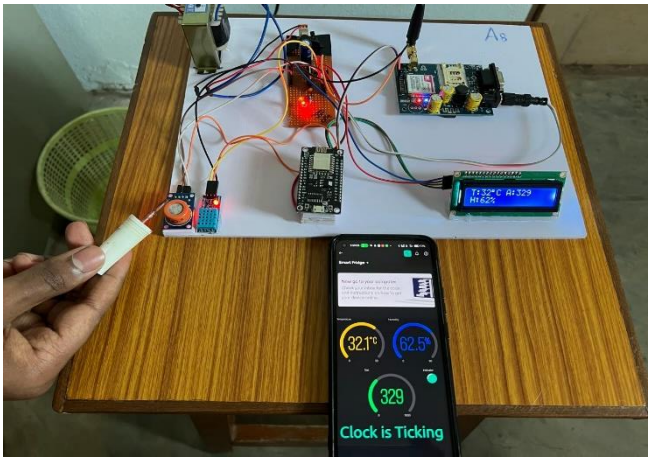

Figure.6 Testing

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APPLICATIONS

Residential Use: Users can remotely monitor and control their refrigerator, check inventory, and receive alerts about temperature fluctuations

Commercial Settings: Facilitates real-time monitoring of perishable goods, enabling store managers to ensure product freshness, reduce spoilage, and improve customer satisfaction.

Health care facilities: Provides a reliable solution for storing vaccines, medications, and other temperature-sensitive medical supplies, with remote monitoring capabilities for staff to ensure compliance with storage requirements.

Research Laboratories: Offers a controlled environment for storing biological samples, reagents, and laboratory materials, with real-time monitoring and alerting functionalities to safeguard valuable research assets.

ADVANTAGES

Remote monitoring: User can remotely monitor and control the refrigerator temperature and inventory atatus from anywhere using their mobile phones.

Real-time Alerts and Notifications: The system sends real-time alerts and notifications via SMS in case of temperature deviations, low inventory, or power outages, enabling timely intervention to prevent food spoilage.

User-friendly Interface: The web or mobile application provides a user-friendly interface for accessing refrigerator status, managing inventory, and receiving alerts, making it easy for users to interact with the system.

Improved Food Safety: Continuous monitoring of temperature ensures that perishable food items are stored at optimal conditions, reducing the risk of bacterial growth, foodborne illnesses, and spoilage.

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Energy Efficiency: Smart control features optimize energy consumption by regulating temperature settings based on usage patterns and environmental conditions, resulting in lower electricity bills and reduced environmental impact.

CONCLUSION

In conclusion, the "Implementation of IoT and SMS-based Smart Refrigerator System" project represents a significant advancement in modern refrigeration technology. By integrating Internet of Things (IoT) sensors and SMS communication, the system offers real-time monitoring of refrigerator temperature, inventory management, and remote control capabilities.

Throughout the project, meticulous attention was given to system design, component selection, and implementation steps to ensure functionality, reliability, and user-friendliness. The literature survey provided valuable insights into existing research, guiding the development process and contributing to the project's success.

The smart refrigerator system demonstrates the potential to enhance food safety, optimize energy efficiency, and improve user convenience in various settings including homes, restaurants, and supermarkets. With the inclusion of future enhancements such as predictive maintenance and voice control integration, the system is poised for further innovation and adoption in the IoT ecosystem.

FUTURE SCOPE

Fisheries Storage facilities:

Enhance the IoT-based refrigeration system to provide precise temperature monitoring and control within fisheries storage facilities.

Implement advanced sensors and actuators to maintain optimal storage conditions for various seafood products, ensuring freshness and prolonging shelf life.

Enhanced User Interface:

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Develop a more intuitive and interactive user interface by implementing voice-controlled commands for hands-free operation, enabling users to interact with the refrigerator system using natural language.

Predictive Maintenance:

Implement self-diagnostic capabilities within the system to automatically detect and troubleshoot common issues, minimizing downtime and service disruptions.

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