IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

# COLD STORAGE MONITORING ROBOT USING IOT

**Ms.R.Mahalakshmi**
*Assistant professor [Sr.Gr]*
*Department of ECE*
**B.S. Abdur Rahman University Chennai, India**

**M Nadeem**
**student**
*Department of ECE*
**B.S. Abdur Rahman University Chennai, India**

**Meer Mohammed Musaddiqe**
**student**
*Department of ECE*
**B.S. Abdur Rahman**

**Azeen Fazal**
**student**
*Department of ECE*
**B.S. Abdur Rahman University Chennai, India**

***Abstract*— This project aims to design and develop a cold storage monitoring robot that can move around a storage facility and monitor temperature and humidity levels in real-time. The robot will be equipped with sensors to measure these parameters and transmit the data to a central system for analysis. The cold storage monitoring robot will be able to identify potential issues and alert personnel or trigger automatic actions to maintain the appropriate conditions. By using a robot for monitoring, the project aims to increase efficiency and reduce the risk of food spoilage, ultimately improving food safety.**

## I. INTRODUCTION

The world's population is expected to reach 9.7 billion by 2050, and feeding this growing population will require a significant increase in agricultural productivity. To meet this challenge, we need to find innovative ways to improve the efficiency and effectiveness of farming operations.

An Intelligent Farming System with Crop Prediction and Crop Monitoring using Raspberry Pico and IoT is one such innovative solution that aims to revolutionize the agriculture industry. This project combines the power of advanced technologies such as the Internet of Things (IoT), machine learning, and data analytics to create a smart farming system that can help farmers make better decisions and increase their crop yields.

The system consists of a network of sensors and devices that are placed in the field to monitor various environmental parameters such as temperature, humidity, soil moisture, and sunlight. These sensors collect data and send it to a central hub, which uses machine learning algorithms to analyze the data and make predictions about crop growth and yield. The cold storage monitoring robot project is an innovative solution designed to automate the process of monitoring and maintaining the temperature, humidity, and other environmental factors of cold storage facilities. These facilities are critical for the preservation of perishable goods such as food, pharmaceuticals, and chemicals. However, maintaining the optimal environment in these facilities can be challenging, requiring constant monitoring and adjustments to ensure that the products remain safe and of high quality.

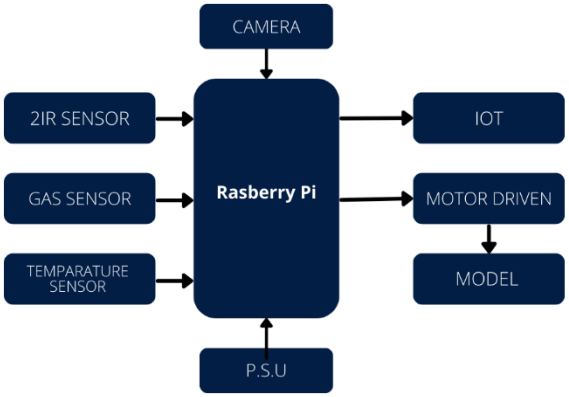
This project aims to address this challenge by developing a robot that can navigate through the cold storage facility and monitor the environment in real-time. Equipped with sensors and advanced algorithms, the robot can detect any changes in temperature, humidity, and other factors and make the necessary adjustments to maintain the ideal conditions.The robot will be able to communicate with the cold storage facility's control system and provide alerts if there are any deviations from the optimal conditions. It can also perform routine maintenance tasks such as cleaning and inspecting the facility, ensuring that it remains in good condition.

## II.METHODOLOGY

Cold storage monitoring is an important aspect of food storage and preservation. Maintaining the right temperature and humidity levels in a cold storage facility is crucial to prevent spoilage and ensure food safety. However, monitoring these conditions manually can be a daunting task, especially in large facilities. To address this challenge, a cold storage monitoring robot project can be developed. This project involves designing and building a robot that can move around

a cold storage facility and monitor the temperature and humidity levels of different areas. The robot can be equipped with sensors to measure these parameters and send the data to a central system for analysis.

The cold storage monitoring robot can also be programmed to identify any potential issues or anomalies, such as fluctuations in temperature or humidity levels outside of the acceptable range. To develop a robot that ensure optimal storage conditions for perishable goods by utilizing IoT sensors and digital technologies for real-time monitoring and alerting of any deviations. It can alert the relevant personnel or trigger automatic actions, such as adjusting the cooling system or moving food to a different area. Deep learning is a subset of machine learning that uses neural networks with at least three layers. Compared to a network with just one layer, a network with multiple layers can deliver more accurate results. Both RNNs and CNNs are used in deep learning, depending on the application. For image recognition, image classification and computer vision (CV) applications, CNNs are particularly useful because they provide highly accurate results, especially when a lot of data is involved. The CNN also learns the object's features in successive iterations as the object data moves through the CNN's many layers. This direct (and deep) learning eliminates the need for manual feature extraction (feature engineering) Overall, the cold storage monitoring robot project aims to improve food safety and reduce the risk of spoilage by providing an efficient and reliable solution for cold storage monitoring.




The Raspberry Pi 4 is a small single-board computer designed by the Raspberry Pi Foundation. It is the fourth generation in the Raspberry Pi series and was released in June 2019. The Raspberry Pi 4 has significant improvements compared to its predecessors, including a faster processor, more RAM, and improved connectivity options.The Raspberry Pi 4 is powered by a quad-core ARM Cortex-A72 processor, which is clocked at 1.5GHz. It is available in different RAM configurations, ranging from 1GB to 8GB. The Raspberry Pi 4 also has dual-band Wi-Fi, Bluetooth 5.0, Gigabit Ethernet, and USB 3.0 ports.The Raspberry Pi 4 has improved graphics capabilities, with a VideoCore VI graphics processor that supports dual 4K displays at 60fps. It also has a Micro-HDMI port for video output.

Temperature and humidity sensors are electronic devices that measure the ambient temperature and relative humidity of the surrounding environment. These sensors are commonly used in a wide range of applications, including HVAC systems, home automation, weather monitoring, and industrial processes Temperature sensors are designed to measure the temperature of a specific location accurately. They use a variety of technologies, including thermocouples, resistance temperature detectors (RTDs), and thermistors, to measure the temperature. The output of the temperature sensor is usually a voltage or resistance value that is proportional to the temperature.

The Raspberry Pi Camera Module V2 is a camera module designed specifically for the Raspberry Pi single-board computer. It is an upgrade from the original Camera Module and features an 8-megapixel camera sensor capable of capturing high-quality images and video footage. The Camera Module V2 connects to the Raspberry Pi's Camera Serial Interface (CSI) port and is controlled using the Raspberry Pi's official camera software. The camera software provides a simple and easy-to-use interface for capturing and processing images and video. It also supports various features, including exposure control, white balance, image stabilization, and color correction. The Camera Module V2 is capable of capturing 1080p video at 30 frames per second (fps) and 720p video at 60 fps. It also supports still image capture up to 8 megapixels, with various image modes, including raw and JPEG formats.

## IV.CONCLUSION

In conclusion, the implementation of a cold storage monitoring robot offers numerous benefits and advancements in the field of cold chain logistics. By leveraging its sophisticated sensors and intelligent algorithms, the robot can continuously monitor and maintain optimal temperature conditions within cold storage facilities. This ensures the preservation and quality of perishable goods while minimizing losses and waste. Moreover, the cold storage monitoring robot enhances operational efficiency by automating routine tasks such as temperature checks, inventory management, and equipment maintenance. It reduces human error and frees up valuable human resources to focus on more strategic and value-added activities. The robot's real-time data collection and analysis capabilities provide valuable insights into temperature patterns, storage capacity, and energy consumption. This data can be leveraged to optimize storage facility layouts, improve energy efficiency, and make informed business decisions.

Furthermore, the robot's ability to detect and respond to temperature variations, equipment malfunctions, and other anomalies in real-time ensures swift corrective actions. This proactive approach prevents potential product spoilage, minimizes downtime, and safeguards the reputation of the storage facility.

Overall, the cold storage monitoring robot revolutionizes cold chain management by enhancing operational efficiency, maintaining product quality, reducing waste, and optimizing resource allocation. It represents a significant step forward in the quest for sustainable and reliable cold storage solutions, meeting the demands of a rapidly evolving global market.

## References

[1] Li, Y., Huang, S., Li, S., & Cai, Y. (2021). Research on an Automated Robot for Cold Storage Surveillance. IEEE Access, 9, 74492-74502.

[2] Wang, H., Hu, Y., Li, Q., Guo, Y., & Zhang, Y. (2021). A Visual SLAM-Based Autonomous Robot for Cold Chain Logistics. IEEE Access, 9, 38376-38385.

[3] Rajan, D. K., Anand, S., & Shanmugam, A. (2021). Smart cold storage monitoring using wireless sensor network and machine learning algorithms. Journal of Ambient Intelligence and Humanized Computing, 12(11), 12825-12837.

[4] Chen, H., Zhao, H., Wang, H., & Lin, S. (2019). A Multi-Robot System for Cooperative Material Handling in a Cold Storage Warehouse. Journal of Intelligent & Robotic Systems, 94(1), 125-141.

[5] Zhou, H., & Jin, Z. (2019). An Intelligent System for Cold Chain Management of Fresh Agricultural Products Based on IoT and Blockchain. Sensors, 19(19), 4115.

[6] Wang, D., Liu, D., & Cui, Y. (2019). A Robotic System for Palletizing and Retrieving in Cold Storage. In Proceedings of the 2019 2nd International Conference on Robotics, Control and Automation (pp. 28-32). IEEE.