AisleDriver

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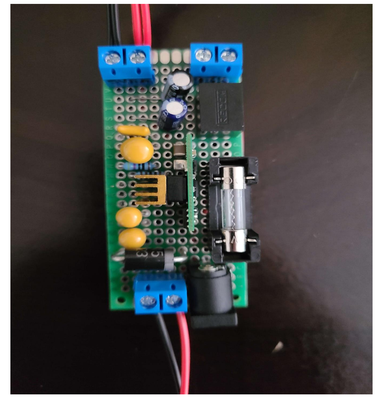
Abstract

- We embarked on this project with the aim to design and implement a user-friendly warehouse management tool that was not only effective and reliable, but cost-friendly as well. Manual Inventory audits are time consuming, menial, and stressful, leading them to be done infrequently and tersely. Couple this with disturbances like theft, breakage, expiration, improperly withdrawn items, and so forth, and warehouses can be out by hundreds of thousands of dollars. Efficient inventory management is crucial for businesses to streamline operations, optimize inventory control, and enhance overall productivity. With this in mind, AislePilot aims to provide a solution that is able to address all these issues all the while being reasonably cost.

Introduction

- In today's dynamic business landscape, efficient inventory management is essential for competitiveness and mitigation of risk. Our product is a cutting-edge warehouse management tool designed to streamline operations and enhance productivity. Leveraging advanced technologies such as LiDar scanning, machine learning, and autonomous navigation, our solution offers real-time inventory tracking, and insightful analytics mixed with innovative technology.
- The objective of our system is to transport a sensor payload – a LiDar and camera – to a specific location on a shelf face, in order to capture images and LiDar distance measurements to detect a package, and then move the sensor payload to a new location on the shelf to either take additional readings in the event that a package is detected or to take additional readings in an effort to detect a package. The system then calculates the quantity and product-type of the packages.

Components



Power Supply

1. Power Supply 12V-5V, 5A and 12V-3.3V 1.0A
2. 12V Battery 17.2Ah
3. Power Distribution Board.

Main Compute Hardware

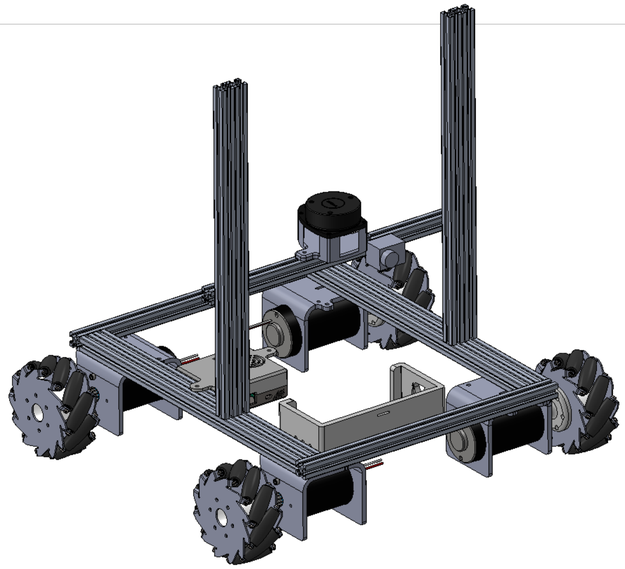
1. Raspberry Pi 4
2. 4K Camera
3. 2D RPLidar
4. 6-axis IMU

Mobility System

1. 4x Mecanum Wheels + 4x 12V DC Motors
2. ESP32

Discussion

- In the absence of direct results, our discussion focuses on the anticipated benefits of implementing our warehouse management tool. Using the advanced technology found in the LiDar, machine learning, and autonomous navigation, we expect substantial improvements in inventory accuracy. Automated features should streamline tasks, potentially leading to increased productivity and enhanced decision-making through real-time analytics. While empirical evidence is lacking, our discussion highlights the potential values our product offers in optimizing warehouse operations, emphasizing the need for future research to validate these expectations.



Conclusions

- Our project highlights the potential of advanced technology to revolutionize warehouse management practices. While specific results were not presented, our product's functionalities suggest promising avenues for improving efficiency, accuracy, and decision-making within warehouses. Moving forward, further research is needed to validate these outcomes. Nevertheless, our project lays the groundwork for future advancements in warehouse management technology emphasizing the importance of innovation in meeting industry demands.

Methods and Materials

- **1.) Development of Warehouse Management Tool**
- **Technology Selection:** Technologies including Python, Django, HTML/CSS, Javascript and LiDar.
- **Functional Requirements Gathering:** Requirements were gathered through interviews and industry research to identify key functionalities.
- **System Design and Architecture:** The software architecture establishes the "front-end" and "back-end".
- **2.) Implementation and Deployment**
- **Frontend Development:** The user-interface, written using Python Django to establish a secure and maintainable website.
- **Backend Development:** Written in Python providing the API packages working in the background that automate the sensors and capture relevant information of the inventory.
- **3.) Testing and Validation**
- **Unit Testing:** Automated unit tests were conducted to ensure component reliability and correctness.
- **Integration Testing:** Tests were performed to validate interactions between different modules and components.

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