IASTAM TECHNICAL CHALLENGE PARTICIPATION

TEMPLEWATCH'S SPEACIFICATION BOOK

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INTRODUCTION

While automation improves things, without automation, retailers are faced with increasing concerns in three major areas: security, monitoring, and supply chain management. Stores are more considered to be vulnerable without automation; most of their surveillance is manual, making them the easy target of any security threat in the forms of theft, fraud, and inefficiency at work. Other supply chain issues include inefficient inventory control due to ineffective automation tools that are outdated or otherwise inadequate.

The system enhances retail inventory accuracy and supply chain management by simulating and analyzing operational scenarios, incorporating IoT devices for real-time data collection and early risk identification. This report provides a detailed explanation of the project and the technologies used.

PROJECT'S SCOPE

More and more concerns are faced by retailers due to the absence of automation in three different main areas: security, monitoring and supply chain management. Stores are more vulnerable due to a lack of automation. Indeed, most of their surveillance is manual, which is turning them into easy targets for security threats such as theft, fraud, and inefficiency at work. Similarly, other supply chain problems include poor inventory control, stockouts, and delayed replenishment due to old or inadequate automation tools.

These inefficiencies affect a store's ability to meet customer demand and maintain smooth operations. By embracing more automation for security and supply chain processes, risks can be reduced, while inventory management can be optimized, customer satisfaction improved, and operational efficiency enhanced.

The objectives of the project are:

- Ease of management: by automating processes and providing real-time data. This reduces human error, enhances decision-making, and allows managers to respond to issues faster.

- Monitoring and security: in order to provide real-time supervision and analysis. Automated alerts may help detect potential risks early which ensures a safer and more secure retail environment.

- Predictive capabilities for sales: predict sales trends by analyzing historical data and real-time inputs. This helps retails be align with customer demand while ensuring a good management of the stock.

- Clear visualization: A user-friendly interface that helps retail visualize data.

PROPOSED SOLUTION

Initially, two methods are used to collect the data. the camera feed in the first, and the YZC-161B with a HX-711 load amplifier sheet data in the second.
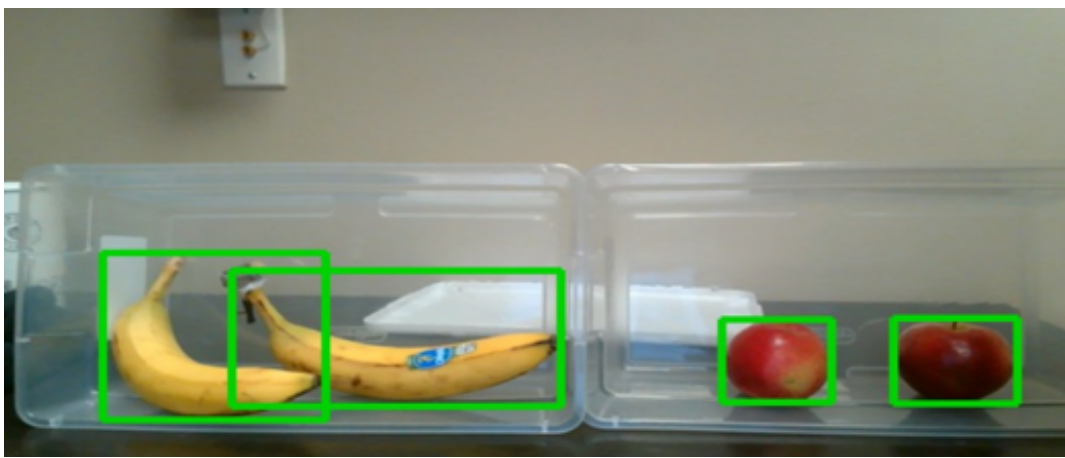

Figure 1: Feed from cameras

Figure 2: YZC-161B

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The process of data flow involves importing the frames from OpenCV, storing them in an S3 bucket, and sending them to a recognition instance in order to extract product lines from the photos and identify objects based on pixel content. The structured data is then stored. After that, an Athena query is used to analyze the data as raw structured data. Lastly, by integrating the query results into the digital twin, everything is viewed out of the digital twin copy. All this is done noting that the data from the sensors are fed into the structured data before being put into the digital twin.

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METHODOLOGY

In everyday circumstances, the project is easy to implement. All that is needed to use a few simple, low-cost tools. It doesn't require a lot of complexities, intricate installations, or wiring. All that will be needed to implement the solution is the installation of cameras, which are already common in most retail establishments, and inexpensive sheets that can be placed on the shelves holding the merchandise. Although they are not required, the sheets help to further secure the products.

In addition to being advantageous to the store, these small installations will be crucial to the program that will be utilized in this situation.

PROTOTYPE

This Unity C# script simulates product detection on a shelf based on weight by randomly generating a weight value every 5 seconds. The script checks if the simulated weight exceeds a set threshold of 50.0f, and based on this, it controls the visibility of a GameObject representing the product. If the weight is above the threshold, the product is shown (indicating it's on the shelf); otherwise, the product is hidden (indicating the shelf is empty). The script logs the simulated weight and repeats the process using Unity's InvokeRepeating method.
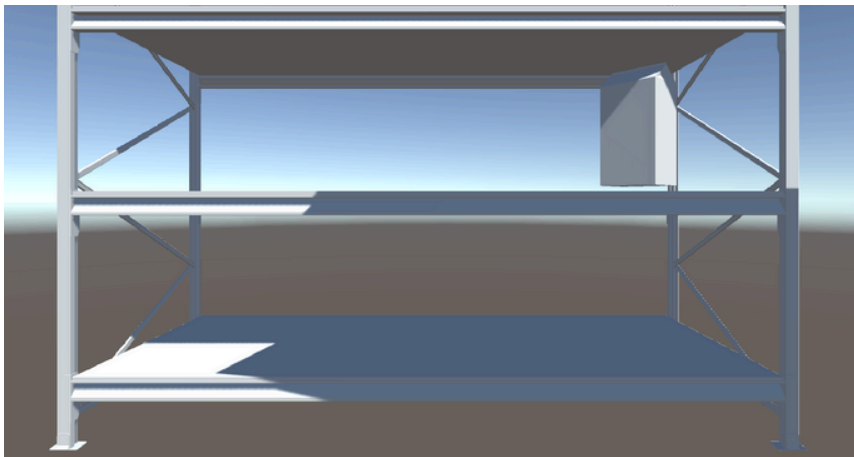
Simulated Weight: 96.96999

Simulated Weight: 38.51491

CONCLUSION

In summary, our project shows how incorporating modern technologies like AI, IoT, machine learning, and building information modeling may revolutionize the retail industry. We solve important issues with sales forecasting, inventory management, and security by creating an innovative system that combines an easy-to-use monitoring software, smart shelves with integrated sensors, and real-time data analytics through digital twins. In addition to improving operational effectiveness, this all-encompassing strategy gives retailers the ability to make well-informed decisions that correspond with consumer demand. Our technology opens the door for smarter, more responsive retail environments that boost business success and consumer satisfaction as the retail landscape changes.

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