 

**CSC2106 Internet of Things: Protocols and Networks [2023/24 T2]**

Literature Review (Individual):   
Literature Review of BLE/WiFi-based Inventory Tracking System for perishable goods and products

| **Name** | **Student ID** | **Team No.** |
| --- | --- | --- |
| Wong Kar Long Keagan | 2200517 / 2837260W | 29 |

**Contents**

[**1. Introduction** 2](#_heading=h.gjdgxs)

[**2. Problem Statement** 2](#_heading=h.30j0zll)

[**3. Literature Review** 3](#_heading=h.1fob9te)

[**4. Reference** 3](#_heading=h.3znysh7)

# **1. Introduction**

The Smart Tracker project focuses on developing a comprehensive Smart Warehouse Inventory Tracker for indoor environments. The system aims to provide precise location information, catering to applications such as indoor asset tracking in warehouses. Utilising communication protocols, such as Bluetooth Low Energy (BLE) and/or WiFi, and microcontroller units (MCUs) such as M5StickC Plus, Super Mini ESP32-C3, and Raspberry Pi Pico, the project aims to demonstrate real-time tracking capabilities.

# **2. Problem Statement**

The Smart Warehouse Inventory Tracker project aims to rectify the inherent limitations of contemporary IoT sensors, particularly concerning their efficacy in detecting objects in a vertical orientation within the intricate dimensions of a 3D indoor space. This deficiency becomes particularly pronounced and operationally challenging in vertical tracking scenarios, notably when applied to the precision monitoring of tools within a workshop environment. Recognising the urgency to overcome these limitations, the project introduces an innovative solution characterised by an augmentation of the sensor network, strategically increasing the number of nodes. This augmentation aims not only to bolster tracking accuracy but also to hone in on the nuanced demands of vertical tracking within the specific context of workshop tools.

Key Points:

* Vertical Tracking Limitation: The prevailing generation of IoT sensors grapples with challenges in effectively detecting objects oriented vertically within the intricate spatial landscape of a 3D indoor environment. This limitation poses a substantial impediment to achieving precise and reliable tracking outcomes.
* Enhanced Accuracy: The proposed solution unfolds as a meticulous strategy involving a discerning increase in the number of nodes within the sensor network. This deliberate augmentation is envisaged as a cornerstone for achieving a paradigm shift in tracking accuracy, transcending the constraints imposed by current sensor limitations.
* Workshop Tool Tracking: A focal point of this initiative is the tailored attention given to the tracking of tools within the dynamic setting of a workshop environment. Recognising the unique challenges presented by workshop scenarios, the solution aims to elevate the accuracy and reliability of tracking specifically for tools, thereby addressing a critical operational need.
* Scalability Consideration: The design philosophy underpinning the proposed solution is inherently forward-looking, with scalability positioned as a paramount consideration. Beyond immediate requirements, the solution is meticulously crafted to seamlessly expand and adapt to the evolving demands of future expansions, ensuring sustained relevance and operational efficiency.

# **3. Literature Review**

In today’s modern supply chain, effective inventory management systems for perishable goods are essential for maintaining quality and meeting customer demands. This literature review examines the strategies, challenges, and innovations provided by existing solutions. By examining existing research and industry practices, it aims to provide insights into optimizing inventory control and enhancing operational efficiency in the context of perishable goods.

Q Learning Algorithm

Nissen et al. investigated the application of the Q-learning algorithm in the domain of food products, aiming to develop an optimal policy for cost minimization. Q-learning iteratively learns to better policies through exploration and exploitation involving stakeholders allowing for an optimized algorithm in storing products.

Linear Quantile Regression & Tree Based Models

Meller, J., Taigel, F. and Pibernik,R. (2018) implemented the above model to predict order quantities whilst also considering traffic per day and climate conditions resulting in different inventory storage. They noticed that the Linear Quantile Regression performed better in optimizing the costs and predicting the demands.

Markov’s Chai Rules

Haijema, R. (2014) explored the process of optimizing the ordering process and disposal policies dependent upon the age of the stock, the variables used, shortage cost, base stock cost. The first ordering system policy determines the quantity of the order and replenishment point whilst taking in actual stock levels and demands. The above mentioned in addition to enforcing First in First Out (FIFO) rules ensures when products and goods should be handled over another and how they should be stored in order.

Apriori Algorithm

R. Agrawal and R. Srikant in (1994) applied the Apriori Algorithm to scan transaction data to determine item co-occurrences, revealing relationships among items. This enables efficient inventory management by predicting item associations and optimizing stock levels to minimize wastage and maximize profitability.

Implementation of the above methods optimizes whether to prioritize one product over the other based on demands which is critical in sustaining perishable goods in inventory management.

# **4. Reference**

[**https://ieeexplore-ieee-org.singaporetech.remotexs.co/document/9824831**](https://ieeexplore-ieee-org.singaporetech.remotexs.co/document/9824831)