

## **SMART VENDING MACHINE INVENTORY MANAGEMENT SYSTEM**

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**ABSTRACT** - The current state of vending machines poses inventory management issues as well as a lack of remote access to real-time information. Smart Vending Machine Inventory Management System is presented to address these difficulties, utilising technology such as Arduino, infrared sensors, WIFI, and GPS modules. Testing and evaluation demonstrate the accuracy, functionality, usability, and network performance of the system. The findings support the system's effectiveness, dependability, and user satisfaction. In the future, research could incorporate maintenance and problem detection systems, as well as apply data analytics capabilities for increased operational efficiency and revenue optimisation.

**Keyword:** Arduino, IoT, Infrared sensor, ESP8266 and Blynk

### **1. INTRODUCTION**

Vending machines are self-service devices that dispense various goods without human assistance (Sibanda et al., 2020). They offer advantages such as reduced labor costs, flexibility in operation, and time-saving convenience. According to Ratnasri & Sharmilan (2021), the global market for vending machine is predicted it will reach US\$146.6 Billion in 2027. vending machine can be categorized as IoT-based or non-IoT-based. However, there are issues with current vending machines, such as stock management, a lack of sales data, and restricted remote access (Wiyanti & Alim, 2020). These problems result in more labour being needed, less effective stocking, and lost time. The Smart Vending Machine Inventory Management System has been proposed as a solution to these issues. The system aim is to provide easy access to the vending machine stocks, location and condition so that the manager of the vending machine could manage it easier.

### **2. METHODOLOGY**

The development process of the Smart Vending Machine Inventory Management System follows a structured methodology. It includes initiation, planning, development, evaluation, analysis, and documentation phases. The system incorporates hardware such as Arduino, infrared sensors, wireless and GPS modules. Evaluation involves functionality testing, notification testing, usability testing, and network performance testing. The analysis phase analyzes the results and provides recommendations. The documentation phase compiles the findings. This methodology ensures a systematic approach to the project's design, development, and documentation.

### **3. RESULT AND DISCUSSION**

The functionality test of the infrared sensor showed accurate detection of obstacles within a 5 cm range, highlighting its effectiveness and limitations. The notifications test successfully triggered notifications according to the set conditions, indicating the proper functioning of the system. The usability test, conducted with 20 participants, yielded positive results, demonstrating the efficiency and user-friendliness of the system. The network performance test was deemed successful as the system performed well across different locations, with minimal impact on transfer rate and latency due to its lightweight data transfer. Overall, these tests confirm the effectiveness, reliability, and user satisfaction of the Smart Vending Machine Inventory Management System.

### **4. NOVELTY OF RESEARCH**

The novelty of this research project is the development of a Smart Vending Machine Inventory Management System that overcomes the drawbacks of the existing vending machine systems. The system offers real-time monitoring, remote access, and effective inventory management by integrating IoT technologies including infrared sensors, GPS modules, and wireless connectivity. The vending machine gains cutting-edge capability thanks to the implementation of an infrared sensor for exact product detection and deduction from the inventory as well as the integration of GPS modules for accurate location tracking. With the help of this project, vending machine business will

be able to better manage their inventories, cut costs, and increase their overall productivity and profitability.

## 5. CONCLUSION

By utilizing IoT technology, the Smart Vending Machine Inventory Management System project was able to successfully address the issues that the current vending machine sector was facing. Through a prototype system, it offered real-time data on sales, inventory, and location tracking. The project boosted efficiency, decreased expenses, and eliminated the requirement for human presence. Vending machine management was made simple by the integration of GPS and wireless modules, and the Blynk application functioned as a hub for data gathering and analysis. The project met its goals, resolving issues in the sector and opening the door for upcoming advances.

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