SMART STOCK TRACKER

Minor Project-II

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CERTIFICATE

This is to certify that the Project Synopsis entitled, "**SMART CCTV**" submitted by "**Bhavya Gauri(19CSU066), Harsh Yadav(19CSU) and Hridyesh(19CSU)"** to **K.R Mangalam University, Gurugram, India,** is a record of bonafide project work carried out by them under my supervision and guidance and is worthy of consideration for the partial fulfilment of the degree of **Bachelor of Technology** in **Computer Science and Engineering** of the University.

Type of Project (Tick One Option)

Industry/Research/University Problem

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ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs) often face challenges in managing inventory due to limited resources, manual processes, and lack of access to advanced solutions. This project introduces a Smart Stock Management System specifically designed for MSMEs, using QR code technology to automate inventory tracking and improve accuracy. The system allows users to register products and automatically generate unique QR codes for each item. By scanning these codes during stock-in or stock-out events, inventory levels are updated in real time, reducing human error and saving time. Key features include low-stock alerts, categorized product listings, and an intuitive dashboard that provides real-time analytics and reports. The system is lightweight, cost-effective, and scalable, making it ideal for small businesses. With this solution, MSMEs can simplify their stock management, reduce losses due to stockouts or overstocking, and enhance operational efficiency—contributing to a smooth and digitally enabled business process.

Chapter 1: Introduction

Micro, Small, and Medium Enterprises (MSMEs) form the backbone of many economies, especially in developing countries like India. Despite their importance, MSMEs often face challenges in managing their operations effectively, especially when it comes to inventory management. Many of these businesses still rely on manual methods such as paper records or basic spreadsheets to track stock. These traditional approaches are not only time-consuming but also prone to human errors, such as miscounts or forgotten entries, which can lead to serious issues like stockouts, overstocking, or financial losses.

Furthermore, most advanced inventory management systems available in the market are expensive and require technical expertise, making them unsuitable for small businesses with limited resources. There is a clear need for a simple, affordable, and efficient solution that allows MSMEs to manage their inventory more effectively without heavy investment or complex training.

The motivation behind this project is to bridge this technology gap by developing a Smart Stock Management System that uses QR code technology to automate and simplify stock tracking. With features like real-time updates, low-stock alerts, and detailed analytics, the system empowers MSMEs to reduce errors, save time, and make better business decisions, ultimately leading to improved productivity and growth.

Chapter 2: LITERATURE REVIEW

Enterprise Resource Planning (ERP) systems are widely used in large organizations to manage inventory, sales, and supply chains. These systems are powerful but often

too expensive and complex for small businesses, especially Micro, Small, and Medium Enterprises (MSMEs). Most ERP solutions require substantial investment in hardware, software licenses, and professional training, which creates a significant barrier for MSMEs to adopt digital inventory management.

Recent research and case studies have shown that QR code-based systems can serve as a cost-effective alternative for managing inventory, especially in warehouse and retail settings. QR codes allow for quick product identification, stock movement tracking, and real-time updates, all of which improve accuracy and reduce human error. While QR code integration has been applied successfully in large-scale logistics and supply chain operations, its application in MSMEs remains limited.

GAP ANALYSIS

Inventory management solutions have advanced significantly in recent years, with large companies using ERP systems, IoT-based sensors, and AI-powered tools for tracking and analysis. However, these technologies are largely out of reach for Micro, Small, and Medium Enterprises (MSMEs) due to their high cost, complexity, and maintenance requirements. Most MSMEs continue to rely on manual methods like paper records or spreadsheets, which are prone to errors, time-consuming, and inefficient for growing operations.

Although QR code technology has been successfully used in warehouse management and logistics by larger businesses, its use in MSMEs is still minimal. Existing digital tools are either too basic, offering limited features, or too advanced and costly for small businesses to implement.

This creates a significant gap between the available technology and the needs of MSMEs. There is a clear lack of affordable, easy-to-use, and scalable inventory management systems tailored specifically for small businesses.

Our project addresses this gap by offering a Smart Stock Management System that integrates QR codes for real-time tracking, stock alerts, and detailed analytics—all through a simple, user-friendly interface. It bridges the divide between manual tracking and complex ERP systems, making digital inventory management accessible to MSMEs without significant investment.

PROBLEM STATEMENT

Micro, Small, and Medium Enterprises (MSMEs) are vital contributors to the economy but often face operational challenges due to limited resources. One of the major issues they encounter is inefficient inventory management. Most MSMEs still rely on manual stock tracking methods such as paper logs or spreadsheets, which are highly prone to errors, time-consuming, and difficult to scale as the business grows. These manual processes often result in issues like stockouts, overstocking, mismanagement, and financial losses.

While Enterprise Resource Planning (ERP) systems can solve these issues, they are expensive, complex, and not tailored to the scale and needs of MSMEs. Furthermore, many existing inventory software solutions require technical expertise and maintenance, making them impractical for smaller businesses with limited IT support.

There is a need for an affordable, easy-to-use inventory management solution that automates stock tracking, reduces manual errors, and improves operational efficiency. Our proposed solution—a Smart Stock Management System using QR Code Integration—aims to address this problem. It allows real-time inventory updates via QR code scanning, generates low-stock alerts, and provides analytical reports, all through a simple dashboard. This system is designed specifically to empower MSMEs with a practical, scalable, and efficient inventory management tool.

OBJECTIVES

The main objective of this project is to develop a Smart Stock Management System tailored specifically for MSMEs, enabling them to manage inventory more efficiently using QR code technology. The system is designed to be

simple, affordable, and scalable, allowing small businesses to automate their inventory process without needing complex or expensive tools.

Key objectives include:

- **Automate Inventory Updates:** Enable automatic addition or deduction of stock using QR code scanning.
- **Unique QR Code Generation:** Generate a unique QR code for each product at the time of entry.
- **Real-Time Stock Tracking:** Provide instant updates on stock levels when a product is scanned.
- **Low Stock Alerts:** Notify users when any product quantity drops below a predefined threshold.
- **Product Categorization and Search:** Allow users to categorize products and search inventory efficiently.
- **Detailed Reports and Analytics:** Generate daily, weekly, and monthly inventory reports for better decision-making.
- **User-Friendly Interface:** Provide a simple, easy-to-use dashboard accessible on mobile and desktop platforms.
- **Cost-Effective Solution:** Deliver all key features without requiring expensive software or hardware.

This system is designed to help MSMEs reduce manual effort, avoid errors, and improve overall inventory visibility and control.

CHAPTER 3: METHODOLOGY (NO PAGE LIMIT)

The Smart Stock Management System is developed with a modular approach to automate inventory management for MSMEs using QR code technology. The process begins with product registration, where the user inputs item details such as name, category, and quantity. The system then generates a unique QR code for each product using Python's qrcode library. These QR codes are printed and attached to respective items.

Whenever stock is added or removed—during purchase, sale, or usage—the QR code is scanned using a webcam or mobile device. The scanning is handled through OpenCV, and the stock count is updated in real-time within a database (SQLite or MySQL).

A user-friendly dashboard built using Tkinter (desktop) or Flask (web) displays stock information, alerts users when quantities fall below threshold levels, and provides search and categorization features. The system also generates analytical reports using Pandas and Matplotlib to support decision-making.

This lightweight architecture ensures low cost, easy deployment, and minimal technical barriers. The system is compatible with common operating systems and runs on basic hardware, making it ideal for small businesses looking to digitize their stock tracking processes without complex setups.

1. Details of tools, software, and equipment utilized.

PLATFORM USED:

To build the Smart Stock Management System for MSMEs, we selected tools and platforms that are lightweight, cost-effective, and easy to deploy. The goal was to ensure accessibility for small business users with limited technical infrastructure.

Programming Language:

- **Python**
  Python was chosen for its simplicity, versatility, and rich ecosystem of libraries. It supports rapid development and integration with GUI frameworks and data processing tools.

Libraries and Packages:

- **qrcode** – Used to generate unique QR codes for each product.
- **OpenCV** – Enables QR code scanning using webcam or external camera.
- **Pandas** – Used for handling and analyzing inventory data.
- **Matplotlib/Seaborn** – For creating analytical graphs and reports.

- **Tkinter / Flask** – Used to build the desktop or web-based user interface/dashboard.

Database:

- **SQLite** or **MySQL** – Lightweight relational databases used to store product details, stock levels, and transaction history.

Devices and Equipment:

- A standard **PC or Laptop**
- **Webcam** or **Mobile QR Scanner**
- Optional: Android device for mobile-based QR scanning

Operating System Compatibility:

- The system is compatible with **Windows**, **Linux**, and **MacOS**.

These tools were selected to ensure ease of use, minimal hardware requirements, and low deployment cost.

2. ENVIRONMENTAL SETUP

To ensure smooth development and operation of the Smart Stock Management System, the following software and hardware environments were used:

Software Requirements:

- **Operating System:** Compatible with Windows, Linux, and MacOS.

- **Programming Language:** Python 3
- **Python Libraries:**
  - `OpenCV` – For QR code scanning
  - `qrcode` – To generate QR codes
  - `numpy, skimage` – Image processing support
  - `tkinter / Flask` – GUI development
  - `pandas, matplotlib` – Data analysis and report generation

Hardware Requirements:

- A working **PC or Laptop**
- **Webcam** or **Mobile QR scanner** for code scanning
- Optional **LED/Flashlight** for low-light environments

Tested Platforms:

- Windows 7/10
- Linux Mint/Ubuntu

This lightweight setup ensures affordability and accessibility, making it ideal for MSMEs with minimal infrastructure.

HARDWARE REQUIREMENTS

In terms of hardware requirements there is not much required at all but still below requirements are must:

1. Working PC or Laptop
2. Webcam with drivers installed
3. Flashlight/ LED if using this at night.

PLATFORMS ALREADY TESTED ON:

It is tested on Windows 7, Windows 10 and windows 11.

<u>Chapter 4: Implementation</u>

The Smart Stock Management System was implemented using a modular and scalable architecture. The core modules include product registration, QR code generation and scanning, real-time stock updates, and an interactive dashboard.

1. **Product Registration & QR Generation:**
   a. Users input product details (name, category, quantity) into the system.
   b. A unique QR code is generated using the Python `qrcode` library for each product.
   c. These codes are printed and attached to physical products for identification.

2. **QR Scanning & Inventory Update:**
   a. OpenCV is used to capture and decode QR codes via webcam or mobile device.
   b. On scanning, the system automatically identifies the product and updates the stock—either adding or deducting units based on the transaction type.

3. **Database Management:**
   a. All data (products, stock levels, history) is stored in a lightweight database such as SQLite or MySQL.
   b. The database ensures persistence and supports queries for reporting and search.

4. **User Interface & Dashboard:**
   a. A desktop GUI is built using Tkinter, and a web version is implemented using Flask.
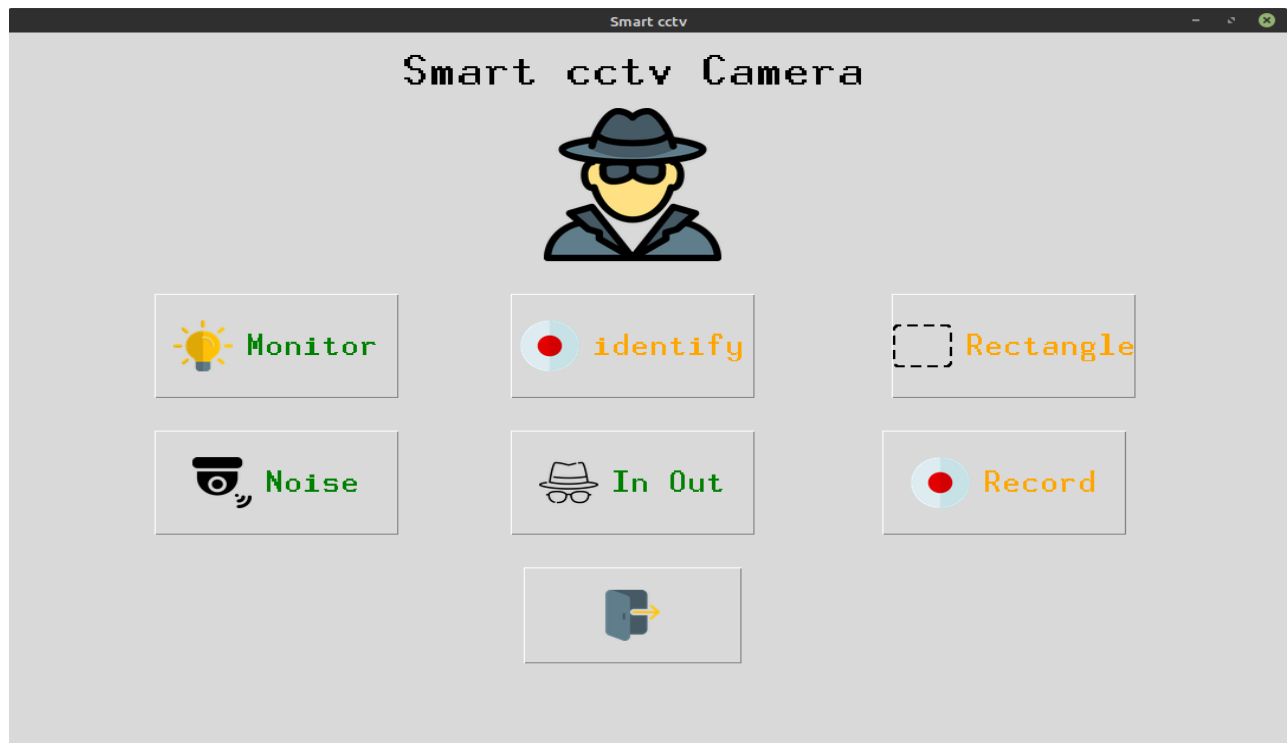   b. The dashboard provides real-time stock levels, low-stock alerts, categorized views, and search functionality.

5. **Analytics & Reports:**
   a. The system uses `pandas` and `matplotlib` to generate daily and monthly reports.
   b. Users can visualize trends, stock movements, and generate downloadable summaries for decision-making.
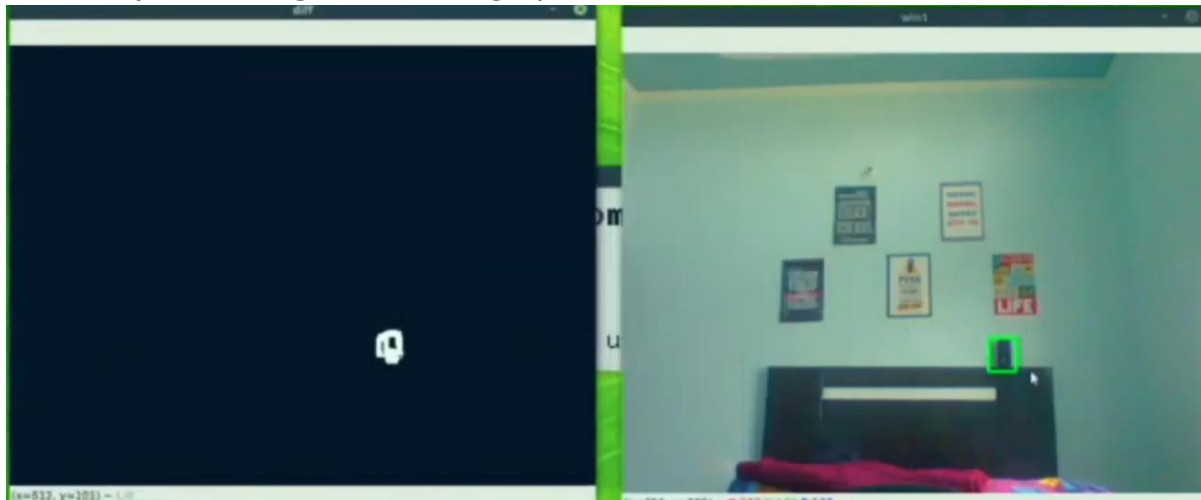
Chapter 5

RESULTS AND DISCUSSIONS
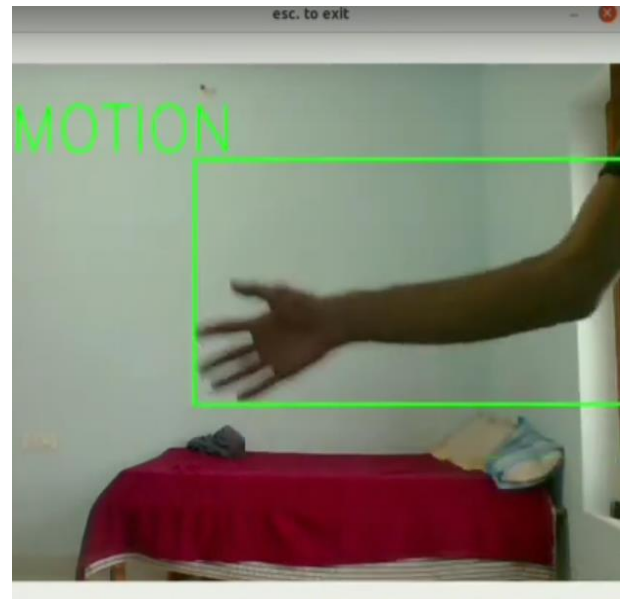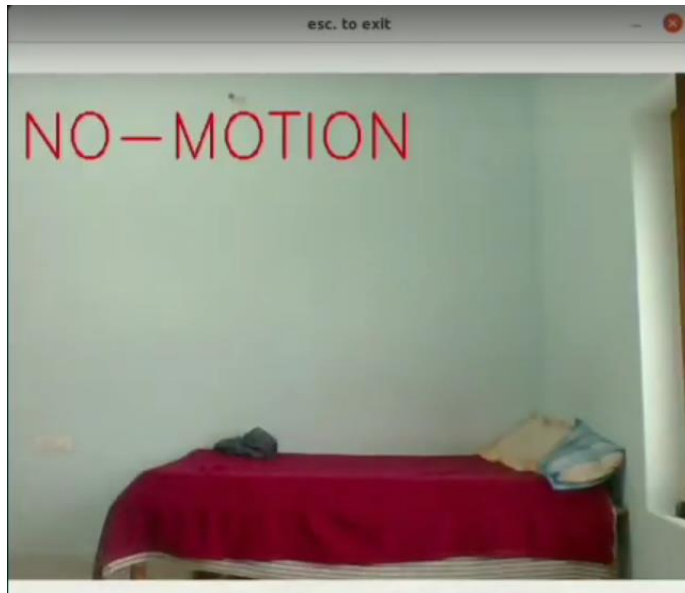

THE GUI:

MONITOR FEATURE:

Correctly detecting the missing speaker from the frame.
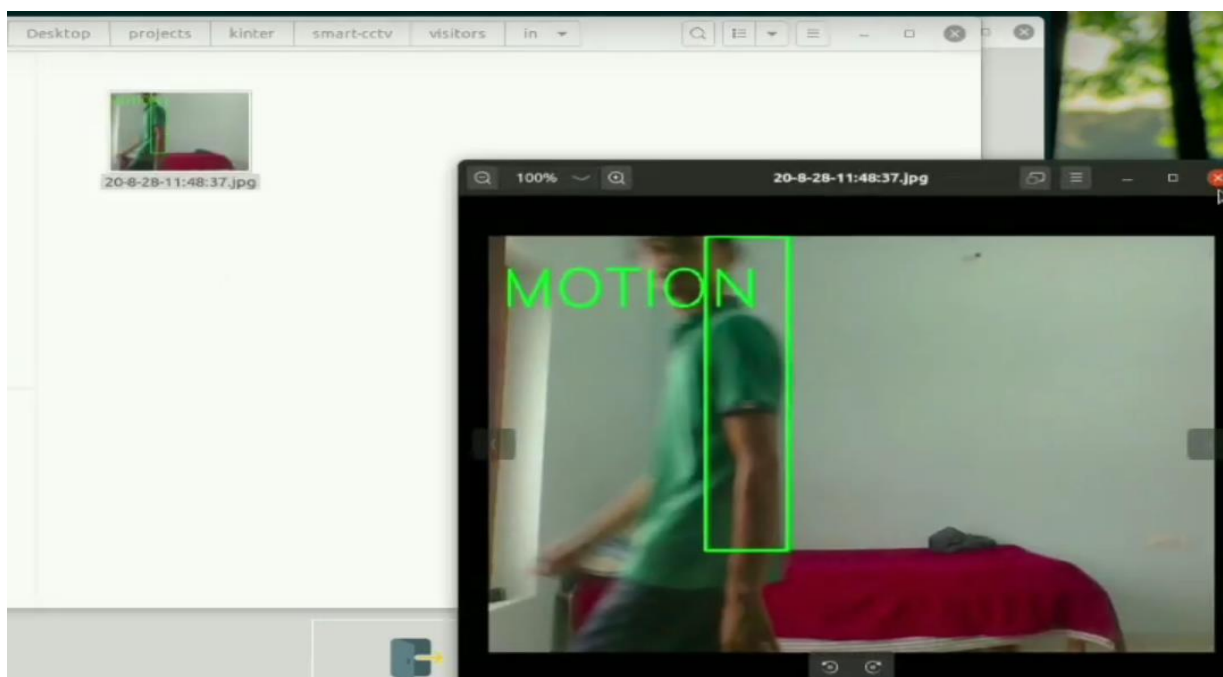

2.NOISE DETECTION FEATURE:

Detecting hand motion correctly.

3.IN-OUT MOVEMENT DETECTION:

Saves the image locally as – entered the room.

Chapter 6: CONCLUSION

The Smart Stock Management System for MSMEs successfully addresses the common challenges faced by small enterprises in inventory control. By integrating QR code technology with a lightweight, user-friendly interface, the system automates stock tracking, reduces manual errors, and enhances operational efficiency. The use of real-time data updates and low-cost tools ensures that even businesses with limited resources can adopt and benefit from the solution. Overall, the project demonstrates a practical and scalable approach to modernizing inventory management for grassroots enterprises.

FUTURE WORK

To further enhance the system's capabilities and usability, the following developments are planned:

- **Mobile App Development:** Create a dedicated mobile app for Android/iOS to support on-the-go inventory management.
- **Cloud Integration:** Move to a cloud-based database for multi-location access and real-time syncing across devices.

- **AI-Based Demand Forecasting:** Integrate machine learning algorithms to predict stock requirements based on sales history.
- **Multi-User Roles:** Introduce user authentication and role-based access control (admin, staff, supplier).
- **Supplier Notification System:** Automate alerts to vendors when stock falls below threshold levels for faster replenishment.
- **Integration with Accounting Tools:** Enable export to or sync with accounting software like Tally or Zoho Books for streamlined operations.

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