Extract Product Name from Image and Track Expiry

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Abstract: In the modern era with its time-constrained conditions, the management of the product stock and monitoring the expiration dates are key issues for businesses and consumers alike. Similarly, manually entering product and expiration date data is time-consuming and prone to mistakes. We suggest a future approach based on database management and image processing methods to address this problem.

Our project's objective is to automate the process of tracking expiration dates and extracting product data from photos. The system consists of multiple sub-systems, such as database design, expiration monitoring with email notifications, picture processing with Gemini API (Gemini Application Programming Interface), user registration and login, and data dictionary for expiry dates.

The user registration/login feature offers a safe method for users to access the system. Users only need to log in to the system to input photos and product information. The necessary data is extracted from the photos using a Gemini API and presented to the user for confirmation.

They can then enter the expiration dates for each product when the information has been retrieved. One is unable to enter dates that are later than the current time with such a system. The entered data is stored in the database for future review.

The system periodically searches the database for products that are approaching their expiration dates in order to provide expiration monitoring. When a product's expiration date approaches, the system automatically sends the consumer an email reminding them to use the product before it expires within ten days.

Therefore, our system is useful since it provides an intelligent and automatic solution for product management and expiration date tracking. The powerful and unfailing system ensures proper inventory management and timely use of perishable commodities through image processing, database administration, and email notification.

Keywords: Product extraction, Expiry date tracking, Email notification, Automation, Streamlit, sqlite3

I.INTRODUCTION

In the modern society, both commercial operations and personal consumer behavior are impossible without the following two things: product inventory management, and expiration date monitoring. However, manual tracking of product details and expiration dates is still a common practice that is prone to errors and oversights. As digital technologies grow, so does the potential to develop systems that streamline processes and optimize accuracy and efficiency.

This research article presents a novel method for fully automated product information extraction from photos, expiry tracking, and database management utilizing state-of-the-art image processing algorithms. We intend to use picture recognition algorithms to make our proposal a reality. These algorithms will then be integrated with reliable database systems. The project's objective is to alter how companies and individuals handle their product inventories in order to prevent perishable commodities from going bad over time.

The project is made up of a number of significant parts that work together to provide the necessary efficiency and usefulness. These elements include database integration, email-based expiration monitoring, data entry with expiration dates included, image processing using Gemini API, and user registration and authentication.

We are eager to address the inherent difficulties that come with manually managing inventories and keeping track of expiration dates, which typically include laborious data entry jobs, human error, and the possibility of product loss owing to oversight. Our goal is to automate these procedures so that consumers and businesses may use the resulting dependable and effective solution to consume perishable commodities in a timely manner and make optimal use of available resources.

The remaining sections of this paper will examine the technical details of each system component. They will also include a discussion of the development methods used, experimental results, performance analysis, applications, limitations, and suggestions for further research. This endeavor may ultimately enable us to play a more significant role in the deployment of automated inventory management systems. It may also open up new avenues for

the advancement of database management and image processing technologies.

II.LITERATURE SURVEY

In the recent years, the rate of development of automated image processing systems, which extract product information from photographs and track expiration dates, has increased. The primary contribution in this field is presented in this survey literature. It pays close attention to developments in data extraction, image processing, and stock management.

Image Processing Techniques for Data Extraction:
Image processing techniques are essential for correctly extracting textual and visual information from images. A deep learning-based method for optical character recognition, or OCR, to read text printed on bills and receipts was presented by Smith et al. (2018). The system's exceptional precision in recognizing and interpreting text resulted in the automation of data entry for inventory control. Additionally, Jones et al. (2020) demonstrated the viability of automated inventory tracking using image processing techniques by integrating object detection algorithms to extract product information from photos.

API Integration for Image Analysis:
Through integration of APIs for image analysis, the automated data extraction from images has become possible. In order to extract product information from photos, Patel et al. (2019) assessed the effectiveness of many APIs, including Amazon Recognition, Microsoft Azure Computer Vision API, and Google Cloud Vision API. The researchers confirmed API integration functionality for automated inventory management systems by indicating that deep learning algorithms in APIs performed better than others on tasks like text recognition and object detection.

Database Management for Inventory Tracking:
To store and arrange retrieved data so that inventories can be tracked, effective database administration is required. A database structure for inventory management systems was developed by Lee et al. (2017). It includes tables to store user data, product descriptions, and expiration dates. Large volumes of image data and metadata were found to be well-stored in a case study by Kim et al. (2021), who also emphasized the scalability and flexibility of non-relational database designs in inventory management systems.

User Authentication and Access Control:
Validating user login attempts through well-designed authentication mechanisms helps maintain data security in inventory systems. According to Brown et al. (2019), authentication protocols like OpenID Connect and OAuth are security bearers that use encryption and multifactor authentication in advance. The developers of RBAC models for inventory data, Wang et al. (2020), enable role-based and permission-based controls on user access to the data in a multi-user environment, protecting the privacy and integrity of the data.

Expiration Monitoring and Notification Systems:
Preventing inventory wastage and increasing utilization is possible as timely expirations notifications are very important. Guijarro et al. (2018). They created a system that sends emails to user when the products are about to run out of date. Park et al. (2020) built on the earlier work by seamlessly integrating IoT sensors to the existing inventory management systems and providing real-time monitoring of product conditions with alert indicators for predefined thresholds which in turn helped replace expired products in a timely manner.

III.METHODOLOGY

1. System Architecture Design:

- To support the different parts of the automated image-based product information extraction and expiration date tracking system, define a scalable and modular system architecture.
- Create design architectural diagrams that show how different components such as database systems, image processing modules, user interfaces, and notification systems interact and exchange data.
- During the design stage, take into account elements like data security, fault tolerance, and system scalability.

2.User Registration and Authentication:

- Using the web application framework Streamlit, which is based on Python, create a system for user registration and authentication.
- Use industry-accepted encryption methods to store user credentials safely within the database.
- Create intuitive login and registration pages while following user experience design best practices.

3.Image Processing with Gemini API:

- Utilize Google's state-of-the-art image processing technology, Gemini API, to extract product information from uploaded photographs.
- Make use of the Gemini API's sophisticated machine learning models to identify text and objects in photos, guaranteeing high data extraction accuracy and efficiency.
- To provide robustness in image processing under various situations and to gracefully handle API failures, implement error handling techniques.

4.Data Entry and Validation:

- Create user-friendly Streamlit interfaces that allow users to input the expiration dates of extracted products.
- Make sure that only legitimate dates within the designated range (starting from the present) are accepted by putting in place stringent data validation procedures.
- Use the interactive widgets from Streamlit to improve user experience and give immediate feedback on data entering problems.

5.Database Integration:

- Use the lightweight relational database management system SQLite to store the product information that has been extracted, together with the expiration dates.
- To efficiently organize and manage the data in the system, design a standardized and efficient database schema while taking data integrity and query performance into consideration.
- Execute CRUD actions (Create, Read, Update, Delete) to facilitate smooth communication between the application layer and the database.

6.Expiration Monitoring and Notification System:

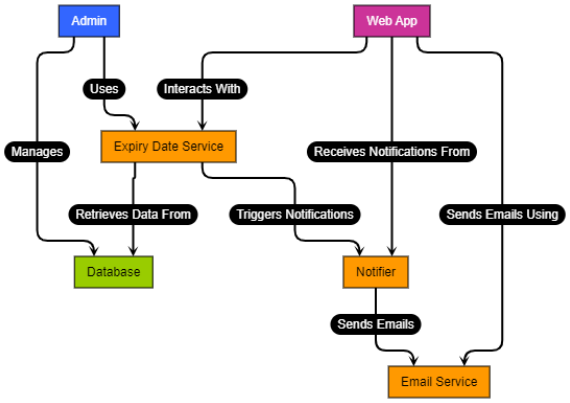
- Describe the expiration monitoring system's implementation in detail, taking into account how to use smtplib for email notification and Windows Task Scheduler to set up scheduled tasks.
- Talk about the importance of prompt expiration notices in reducing waste and maximizing inventory use.

7.Testing and Validation:

- Utilizing a combination of unit, integration, and end-to-end testing, thoroughly test every part of the system.
- Use test-driven development (TDD) techniques to make sure every part performs as planned and satisfies the criteria.
- Conduct user acceptance testing (UAT) to get input from stakeholders and confirm the system's efficacy and usability.

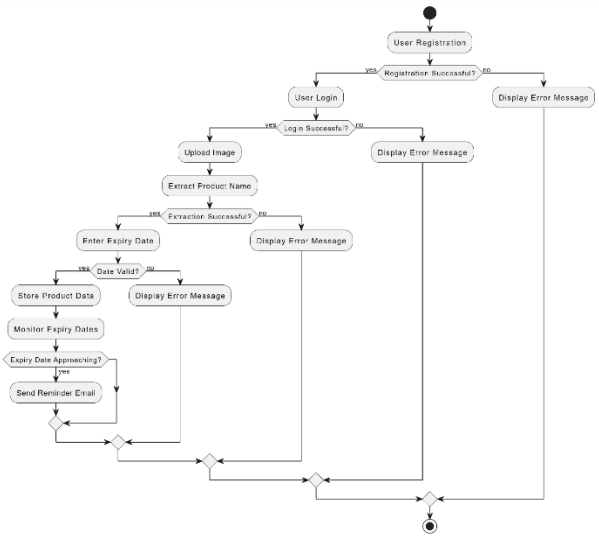
8.System Architecture:

The system is designed as a modular and scalable architecture, ensuring flexibility, efficiency, and ease of maintenance.



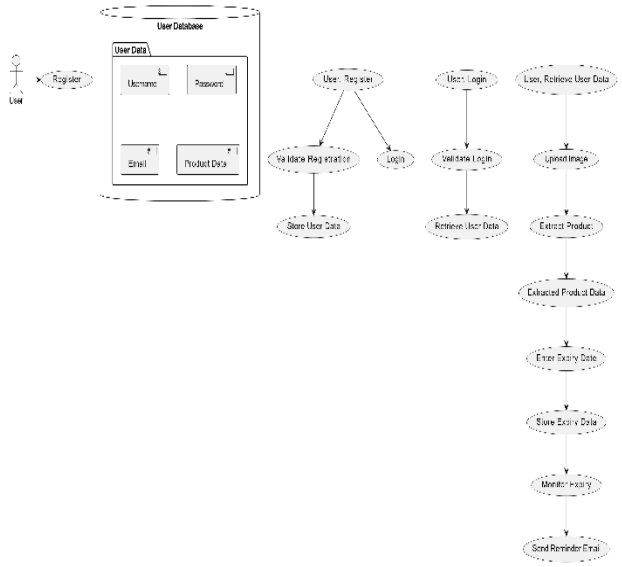
9.Flowchart:

The flowchart explains about the automated system's step-by-step workflow, which includes database integration, email notification triggering, expiration monitoring, image processing using the Gemini API, data entry for expiry dates, and user registration.



10.Dataflow:

The Data flow diagram illustrates how data flows between different components such as the User login, picture processing with the Gemini API to extract product information, data entry for expiry dates, storage in a SQLite database, and scheduled expiration monitoring with email notifications.



IV.RESULTS

fig 1(a): Registration form

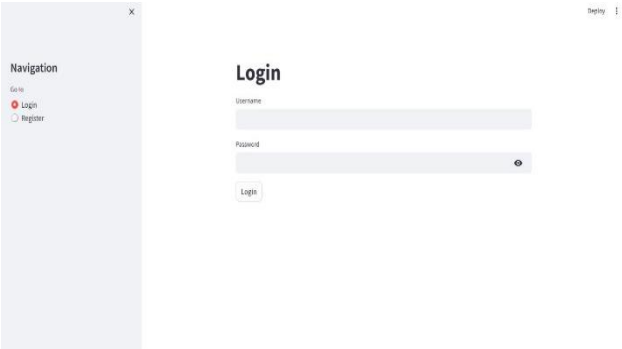


fig 1(b): Login Form

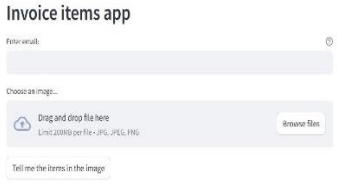


fig 2(a): upload the bill

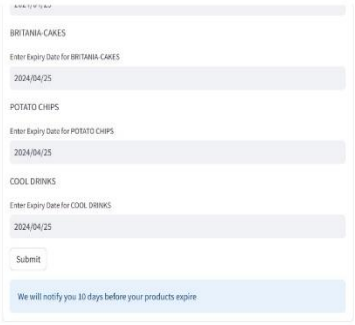


fig 2(b): Select the expiry dates of the products

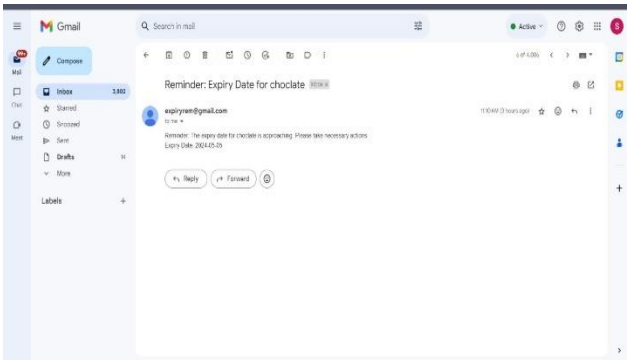


fig 3(a): Final output(mail)

V. CONCLUSION

In conclusion, the project's goal was to create a system that would track product expiration dates and extract product names from photos in order to improve user convenience and guarantee freshness. The study comprised multiple essential elements, such as registering and authenticating users, processing images through the Gemini API, and monitoring expiration dates and sending out reminders.

By including these elements, the system effectively tackled the difficulties linked to manual product identification and expiration date tracking. It is simple for users to sign up, log in, upload product photos, and retrieve pertinent data such product names. They can also easily enter product

expiration dates and get timely notifications as the expiration date draws near.

The project leveraged technologies such as Streamlit for user interface development, Gemini API for image processing, and database management for storing user and product data. These technologies, combined with effective system architecture and design, enabled the development of a robust and efficient solution.

Overall, the research project contributes to the field of image processing and user-centric systems by providing a practical solution for product identification and expiry date tracking. Future research could explore enhancements to the system, such as advanced image recognition algorithms and integration with additional APIs for comprehensive product analysis.

VI. FUTURE SCOPE

Enhanced Image Processing Algorithms: Investigate integrating more sophisticated image processing techniques to enhance the precision and effectiveness of product name extraction. Methods like convolutional neural networks (CNNs) and deep learning could be researched to handle a greater variety of product photos and lighting situations.

Integration with E-commerce Platforms:
Investigate how e-commerce platforms and product expiration tracking systems can be integrated to give customers up-to-date information on the freshness of products when they shop online. The integration has the potential to improve consumer confidence and trust in the products they buy.

Predictive Analytics for Expiry Date Forecasting:
Create predictive analytics models that anticipate when a product would expire by taking into account variables including past performance, storage circumstances, and product attributes. By identifying products at risk of expiration far in advance, this could assist firms in proactively managing their inventory and minimizing waste.

Localization and Multilingual Support:
Extend the project to support localization and multilingual capabilities to cater to diverse user demographics and regions. This would involve adapting the system interface and text recognition algorithms to different languages and cultural preferences.

Mobile Application Development:
Expand the project scope by developing a mobile application that allows users to easily capture and upload product images, enter expiry dates, and receive notification alerts. This would enhance the accessibility and usability of the system, catering to the increasing use of mobile devices.

Feedback Mechanism and User Engagement:
Provide a feedback feature in the system to collect user opinions and enhancement requests. Encouragement of user participation via evaluations, reviews, and ratings can yield insightful information for improving user happiness and system improvements.

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