Project U23: My Pantry Pal

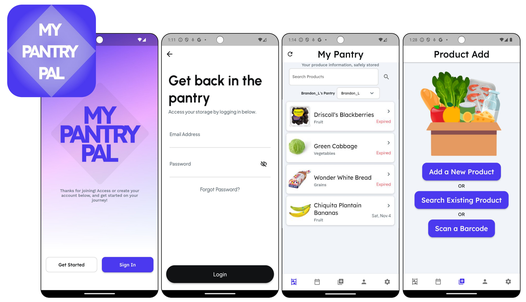
Project Advisor: Ahmed Banafa

Computer Engineering Department

Low, Brandon Andrew (BS Computer Engineering)
Mendiola, Caryann (BS Computer Engineering)
Tran, Andrew Hoa (BS Computer Engineering)
Yang, Guang (BS Software Engineering)

Introduction

For the past few decades, perishables have been stamped with expiration dates. These labels have acted as the indicator of when an item is at its peak or beyond its shelf life. Expiration dates can be informative but are often forgotten and in some cases, entirely ignored. There is a need for a system that will increase awareness of expired products to prevent accidental ingestion of unsafe products or unnecessary food waste.



My Pantry Pal is an expiration date tracking tool for consumables and is available on the Google Play Store. Our mobile app allows users to input their perishable item information and set notifications of incoming expiration dates. Information on optimal storage conditions is available for users to maximize the longevity of their products. Users can conveniently scan barcodes and invite friends to help manage their inventories. The outcome of this project prevents unnecessary food waste and protects users from ingesting expired products.

Methodology

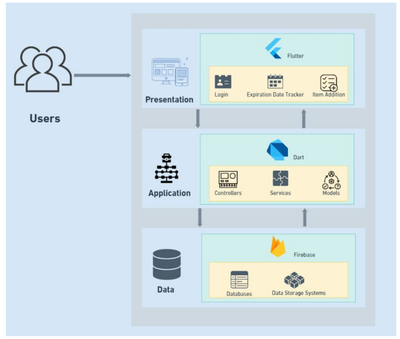
Application Architecture & Technology Stack

"My Pantry Pal", an innovative safety app designed to minimize waste and ensure the freshness of your food. Our app features a robust three-tier architecture that delivers a user-friendly experience, backed by cutting-edge technology.

Presentation Layer: Powered by Flutter, our intuitive interface features a straightforward login process, a dynamic expiration date tracker, and a simplified item addition system that includes manual entry and camera scanning for ease of use.

Application Layer: At the heart of our app is the Dart-based application layer, where the core functionalities come to life. Here, controllers orchestrate the workflow, services like barcode scanning and storage recommendations operate efficiently, and models handle the business logic, ensuring your pantry is smartly managed.

Methodology

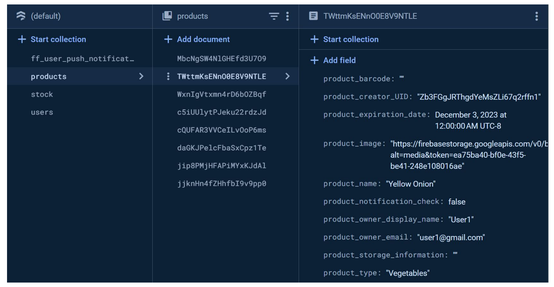


Data Layer: Reliability is key, which is why we've integrated Firebase for our data storage solutions. This layer ensures secure user authentication and robust database management, allowing for real-time updates and persistent data integrity.

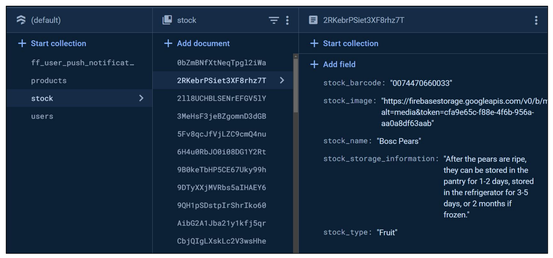
Implementation of Application

In My Pantry Pal, Expiration Tracking is the most important function. In order to manage the data more accurately and efficiently, we use two different types of documents for data storage, “products” and “stock”.

The Products document acts as a proprietary repository to focus on storing information about items added by the current user, and synchronizes and bundles this information into the stock document.



The Stock document is a focused storage of product information and uses item’s information as a template so that users can quickly add products.



Two document storage strategies ensure that data is in the right place and is easily tracked by expiration dates, and the bundling of information between documents can be adapted to accommodate the growing volume of users and product data.

Analysis and Results

To test our application, functionality tests were performed to test user interactions and navigation on the application. Both emulators and physical devices were used during testing. System functionality tests indicate that our application functioned as intended and includes features such as user login, tracking expiration dates, adding/ deleting items, barcode scanning, item organization, and expiration alerts.

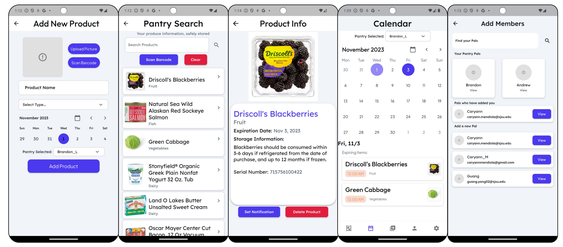
Requirement ID	Functions Tested	Expected Result	Actual Result	Result
SF1	The user shall be able to log into the system using their email and password.	The application allows the user to log in to their account after successful authentication of the user’s email and encrypted password.	As expected	Pass
SF2	The user shall be able to manually enter items and their information into their inventory.	The application stores the user’s manual input in the user’s inventory.	As expected	Pass
SF3	The user shall be able to enter items and their information using the barcode scanner function.	The application allows the user to scan the barcode of a product using the device camera to enter item information.	As expected	Pass
SF4	The user shall be able to delete items from their inventory.	The application removes the selected item from the user’s inventory if the user deletes it.	As expected	Pass
SF5	The application shall organize the inventory by expiration date and may alert the user on the date of expiration.	The application organizes expiring products in descending order and sends an app notification on the expiration date of an item if the notification setting is set.	As expected	Pass

Non-functional tests ensure the reliability and robustness of the application. Some features will need to be retested in the future as the application continues to store new items in the database. Other features were unable to be tested due to these optional features not being implemented at this time.

Requirement ID	Requirements Tested	Expected Result	Actual Result	Result
NF01	The application must be easy to use and understand.	A user who is not part of the development team can easily navigate through the application and understand how to use it.	As expected	Pass
NF02	The application must process each user input within 3 seconds.	The application responds to each user input and button click within 3 seconds.	The application responds within 1 second.	Pass
NF03	The application must load the user’s inventory within 3 seconds.	The application displays the user’s inventory upon sign-in and when the inventory is clicked from any page.	The application displays all inventory data within 1 second after the first time running the application.	Pass
NF04	The application must support iOS and Android devices.	The application can run seamlessly on both Android and iOS emulators and real devices.	As expected	Pass
NF05	The application must encrypt user login credentials and system data.	The application database stores the encrypted user login credentials and all product data.	As expected	Pass
NF06	The application must be scalable enough to support more than 200 items in an inventory at once.	The application runs smoothly with 200+ items in the inventory.	The application runs smoothly with ~50 items and must be retested as the database grows over time.	Pass
NF07	If the application allows payments, payment processing for automatic refills must be PCI DSS compliant.	The application follows the PCI DSS regulations if payments are processed through the app.	N/A, not tested	N/A

Other features were tested using the same functionality tests, including our essential features of calendar views and desired features of user collaboration pantries and item storage recommendations.

As all system functional requirements, essential features, desired features, and 6/7 non-functional requirements passed, our application is considered fully functional. The application fully works on iOS and Android Devices.



Summary/Conclusions

My Pantry Pal ensures that products are safely stored for as long as possible and urges users to dispose of products once they are no longer considered safe for consumption. Our project helps prevent unnecessary food waste and protects users from ingesting expired products by informing users of what they have in their pantries at all times.

My Pantry Pal is available on the Google Play Store.

Key References

[1] C. Byrd-Bredbenner, J. M. Abbot, and V. Quick, “Food Safety Knowledge and beliefs of middle school children: Implications for food safety educators,” Journal of Food Science Education, vol. 9, no. 1, pp. 19–30, 2010.

[2] R. Cao, L. Yan, S. Xiao, B. Hou, X. Zhou, W. Wang, T. Bai, K. Zhu, J. Cheng, and J. Zhang, “Effects of different low-temperature storage methods on the quality and processing characteristics of fresh beef,” Foods, vol. 12, no. 4, p. 782, 2023.

[3] Assistant Secretary for Public Affairs (ASPA), “Cold Food Storage Chart,” FoodSafety.gov, 06-May-2022. [Online]. Available: https://www.foodsafety.gov/food-safety-charts/cold-food-storage-charts. [Accessed: 21-Apr-2023].

Acknowledgements

We would like to thank our project advisor, Ahmed Banafa, for his continued support and guidance throughout our project development.