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AI-Based Consumer Mobile Application for Searching Imported Food Safety Information

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***Abstract*— As global food trade grows ensuring the safety of imported food is crucial for consumers. This paper presents an AI powered mobile application that provides real-time safety information on imported food products. Using deep learning based image recognition and machine learning based voice recognition the application allows consumers to easily identify products and access safety details. The system's architecture supports real-time processing of image and voice data linking to a database of food safety information. Experimental results show the application effectively helps users make informed and safer food choices. This AI based solution aims to enhance consumer protection in the global food market.**

Keywords—AI, Deep learning, Machine learning, Android, Food Safety

I. INTRODUCTION

As global food trade increases ensuring the safety of imported food has become a major concern for consumers. Food safety [1] standards and regulations regarding contaminants, pesticide residues and foodborne pathogens can vary from country to country making it difficult for consumers to verify the safety of imported foods. In particular, consumers who aim to make informed purchasing decisions are increasingly in need of reliable and easily accessible information on the safety of imported foods. Currently food safety information is mainly provided through traditional channels such as government websites news reports and certification labels. However, these methods are often fragmented making them difficult to navigate and not user-friendly which leads to inconvenience or even avoidance by consumers. Additionally, consumers often lack real-time access to safety alerts or recall notifications which can be critical for products prone to contamination. To address these issues this paper presents a user-friendly AI based solution. The proposed solution is a mobile application designed to provide real-time safety information on imported food products allowing consumers to easily identify food safety issues and receive warnings. The application uses pre-trained models based on imported food data applying deep learning based image recognition and voice recognition technologies enabling users to easily identify food products and access relevant information. In order to enhance the system's real-time processing capabilities a suitable system architecture has been designed supporting consumers in making safer and more informed food choices. This study proposes a technology that uses AI to recognize food in two ways retrieves relevant information from a database based on the results and allows consumers to easily access food safety information. Through this, the technology aims to strengthen consumer protection in the food market and provide an effective solution to global food safety challenges.

II. METHOD

A. Overall Structure

The structure of the proposed application [2] to help consumers obtain easy and accurate information is illustrated in figure 1 below. First, the gateway server acts as an intermediary that classifies data according to the recognition method and transmits it to the appropriate processing server. Second, the image processing server utilizes a pre-trained deep learning-based image processing model to analyze and process images in real time. Third, the voice processing server is responsible for processing voice data in real time and responding based on a machine learning based text analysis model. Fourth, the database server stores and manages predefined information regarding imported foods safety-related information, recall reasons and more. Through this server structure when consumers use the application to send image or voice data each piece of data is analyzed in real time by the corresponding processing server and the results are provided. This system aims to deliver fast and accurate food safety information to consumers in real time.

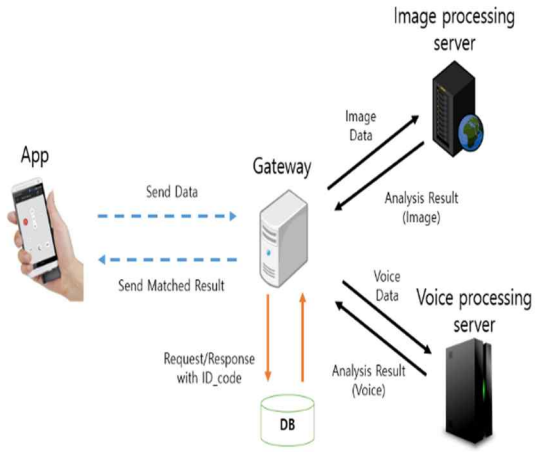

Fig. 1. Application Processing Flowchart.

B. Image Processing Server

The deep learning based image recognition server was developed using the YOLOv7 [3] object detection algorithm as its backbone. The most critical factors for the food processing server are processing speed and accuracy. Therefore, YOLOv7 which offers high accuracy and fast processing speeds was chosen for implementation. To enable real-time processing the logic was designed and developed in the form of a web based processing server. Below figure 2 shows the results of testing data received from a smartphone.

Fig. 2. Image Processing Server Test Results.

C. *Voice Processing Server*

The machine learning based voice recognition server was developed using the OneVsRestClassifier [4] algorithm. To analyze voice data it employs STT(Speech-to-Text) technology utilizing the Google Speech API to convert speech into text. After converting the text the product name and question words are separated and the product name is verified by comparing its similarity to pre-stored food product names. Any data corrections due to STT errors are also performed. Next, relevant words indicating the question intent are input into a pre-trained model to classify the question intent and the database is queried to check the 'product name' and whether it is a 'suitable product'. Below figure 3 shows the results of correcting errors in product names and indicates the suitability of the queried product.

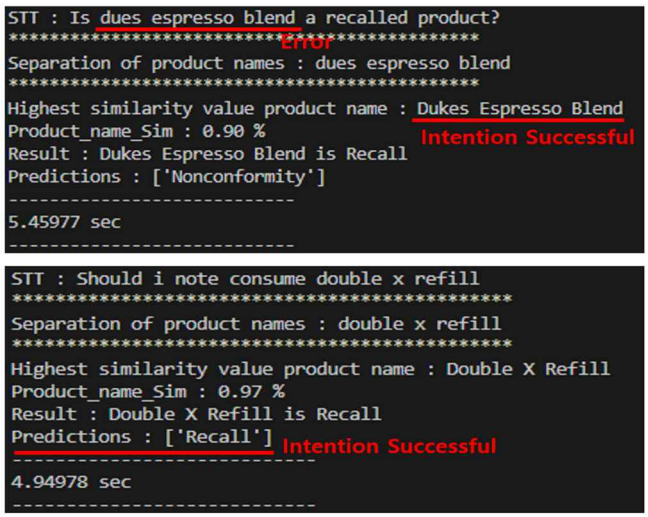

Fig. 3. Voice Processing Server Test Results.

III. EXPERIMENTS AND RESULTS

A test was conducted to see if consumers could easily access information on imported food products using an Android based application. Below figure 4 shows a scene from the image recognition test using the application. The suitability of the product was determined based on information arbitrarily set in the database. When the camera button is clicked on the main screen the screen on the right appears with a fixed guideline displayed in the preview. Consumers align the product within this guideline and take a picture which sends the image data to the image processing server. After going through the processing procedure a screen is displayed indicating that the product is safe. Additionally, by clicking on the product, consumers can view a screen that provides detailed information about the product.

Fig. 4. Application Image Recognition Test.

Below figure 5 show a scene from the voice recognition test using the application. When the microphone button is clicked on the main screen the screen transitions to the one on the right where a green microphone button prompts the user to input voice commands. The user presses the microphone button to provide voice input and if no voice is detected for a certain period the system automatically ends the input and sends the voice data to the voice processing server. After processing on the server a result screen is displayed indicating that the product is unsuitable. Additionally, in the voice recognition test it was confirmed that clicking on the product allows the user to view a screen with detailed information about the product.

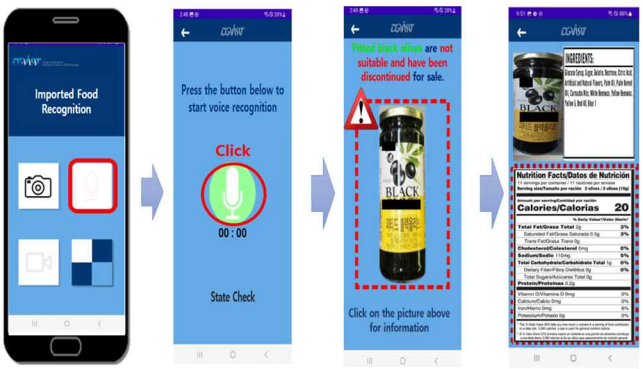

Fig. 5. Application Speech Recognition Test.

The application developed was tested for its recognition methods. For the image recognition test, 10 types of imported products were randomly selected from 100, and each was photographed 10 times from various angles. For the voice recognition test, all 100 products were tested by inputting voice commands combining suitability and sales suspension-related sentences. The results showed that the image recognition successfully identified all products except for those wrapped in plastic wrap. As for voice recognition, it accurately detected 100% of the input sentences.

IV. CONCLUSIONS

This resarch presented an AI powered mobile application designed to provide consumers with real-time safety information on imported food products. By incorporating deep learning based image recognition and machine learning based voice recognition the application offers a user friendly solution that allows consumers to easily identify food items

and access relevant safety data. The experimental results confirmed the effectiveness of the application in enabling users to quickly and accurately retrieve product details and assess food safety. The image and voice recognition functionalities both performed reliably enhancing user experience and simplifying the process of obtaining crucial safety information. Overall, this application addresses the limitations of traditional food safety information channels by offering a more accessible real-time and efficient solution. Future research will focus on further developing the system by expanding the database and improving recognition algorithms as well as adding additional features.

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REFERENCES

[1] Redmond, Elizabeth C., and Christopher J. Griffith. "Consumer food handling in the home: a review of food safety studies." *Journal of food protection* 66.1 (2003): 130-161.

[2] Kadam, A. J., et al. "Mobile Web Based Android Application for College Management System." *Int. J. Eng. Comput. Sci* 6.2 (2017): 20206-20209.

[3] Wang, Chien-Yao, Alexey Bochkovskiy, and Hong-Yuan Mark Liao. "YOLOv7: Trainable bag-of-freebies sets new state-of-the-art for real-time object detectors." *Proceedings of the IEEE/CVF conference on computer vision and pattern recognition*. 2023.

[4] Cho, Seung Gyu, et al. "Multi-abnormality attention diagnosis model using one-vs-rest classifier in a nuclear power plant." *Journal of Nuclear Engineering* 4.3 (2023): 467-483..