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Development of packaged food classification and information propagation app using deep learning

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Abstract. Many foods are packaged in various wrapper and distributed to people. In order to live a healthy life by eating food in a balanced manner and improving eating habits, it is necessary to identify the nutrients and ingredients of the food and intake it in a planned manner. Although ingredients are legally marked on the back of food packaging, it is sometimes difficult to grasp information in imported foods, and even the marked information is not delivered to people due to their unique package design. In this paper, we intend to improve these problems by proposing a technique that uses deep learning algorithm to recognize packaged food and deliver food information to people via smartphone applicaton. Because the performance of smartphones used by people is various, implementing deep learning internally causes a problem of performance difference between users, which does not guarantee good detection results. To this end, a separate system was established based on server and client model. First, a server system is build up for clasifying packaged food using deep learning. Sencond, an andorid appplication is implemented to capture food image data by the user. When the application(client) transmits the captured image data of food to the remotely located server, the server matches the recognized result with a predefined food information from database. Then it delivers detailed food information to users. In addition, a gateway server is also designed for multiple user accesses with their data queries. The performance result has been demonstrated that accurate food information is delivered to the client. Future research will increase the number of foods to improve performance with deep learning network design, and further study is planned for design of enhanced detection methods.

Keywords: deep learning, packaged food, classification, server processing.

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1. Introduction

As IT technology develops, it permeates many parts of life and gives convenience to life. Among them, smartphones have become an essential technology that everyone uses and is being used in various fields. In addition, with the development of hardware in this way, software technology has also developed. As the latest technology, deep learning technology that uses prior data to learn from computers and derive results is emerging. It has become possible to play a role in handling not only life but also tasks on behalf of humans, and has become an essential technology for automation technology. Therefore, advanced hardware and software technologies can apply in the food sector. Currently, imported food is available in various places such as large discount stores, convenience stores, and nearby stores. The physical characteristics of consumers who encounter these imported foods have differences with various characteristics. For example, there will be consumers who are allergic to certain ingredients, and in severe cases, life-threatening situations will occur. The problem is that consumers do not easily recognize ingredient information on imported food that uses language in many countries. To solve these problem situations, this paper developed Development of packaged food classification and information propagation applying deep learning to make it easier for consumers to access imported food information.

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A. System Architecture for Experiments

The technology mentioned in this paper was implemented in the form of an Android app[3] that is easily accessible to consumers, and gateway, DB servers, and AI server were built maintaining the integrity of the specifications. As shown in FIG. 1, there is a smartphone application capable of transmitting an input image and receiving a detection result for an object recognition improvement test. AI server[1] detect images using

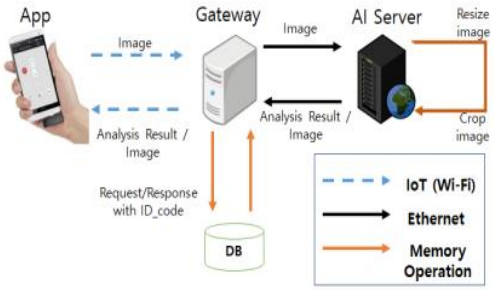

Fig 1. System configuration for experiments.

preprocessing technology, and gateway servers[1] transmit information to smartphone applications for convenience.

The received information matches the DB table built on the gateway server with the result derived from the deep learning server and displays the detected result information on the Android app[3]. The backbone of the established AI server was built with VGG16, and food-related image data were directly photographed and collected.

B. AI Server

As mentioned above, the deep learning server backbone used VGG16. The data set has a total of 4,800 images and is classified into 800 images per product. The parameters were epoch 5, batch-size 64, and adam. The image taken in the app in real time is received in json format through the gateway server and the result value is detected after decoding. The result of the image that passed through the network is returned to the gateway server, and the return value is matched with the DB server[2] built on the gateway server, and the relevant information is compressed again in json format and delivered to the app.

C. Experiment

For the experiment, one Android phone, a test product, a gateway server, and a PC that will serve as an AI server were installed and proceeded. The detailed specifications on the programs used in the experiment are shown in Table 1.

Table 1. Programs information

	Application	**Gateway**	**AI**
Langue	Kotlin	Kotlin	Python 3.8
Tool	Android Studio	IntelliJ	Python IDLE
OS	Android	Window 11	Ubuntu 18.04
Equipment	Smart Phone	Desktop	Desktop

The test product was carried out with 100g of Haribo Golden Beren, Fitted Green Olives, Fitted Black Olives. The result screen is shown in Fig 2 below.

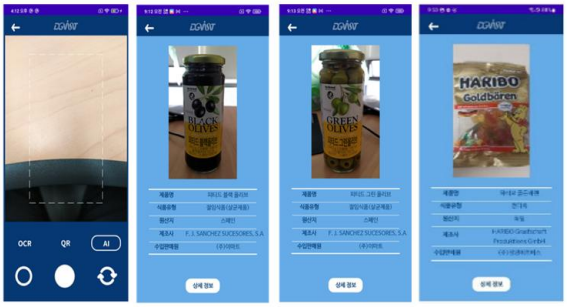

Fig. 2 Experiment Result

The far left side is implemented so that a camera screen composed of a preview and a product to be detected can be photographed. The three test products mentioned were learned and ported to the AI server, and related data were exchanged in Json format. As a result of the test, each product was detected and matched with a DB storing related information, and the results were shown as shown in Fig 2.

D. Conclusiont

The main contribution of this study is to implement deep learning algorithm to recognize food's package and provide information about target food to clients based on the results. It was used as a few packaged foods, but in the future, we will increase the class by adding food, and conduct research so that food information can be delivered in various ways as well as image recognition. It is hoped that this technology will make it safer and easier for anyone to recognize information about food.

Acknowledgment

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