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A Study on Self-medication for Health Promotion of the Silver Generation

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Abstract

With the development of medical care in the 21st century and the rapid development of the 4th industry, electronic devices and household goods taking into account the physical and mental aging of the silver generation have been developed, and apps related to health and health are generally developed and operated. The apps currently used by the silver generation are a form that provides information on diseases by focusing on prevention rather than treatment, such as safety management apps for the elderly living alone and methods for preventing diseases. There are not many apps that provide information on foods that have a direct effect and nutrients in that food, and research on apps that can obtain information about individual foods is insufficient. In this paper, we propose an app that analyzes food factors and provides self-medication for health promotion of the silver generation. This app allows the silver generation to conveniently and easily obtain information such as nutrients, calories, and efficacy of food they need. In addition, this app collects/categorizes healthy food information through a textom solution-based crawling agent, and stores highly relevant words in a data resource. In addition, wide deep learning was applied to enable self-medication recommendations for food. When this technique is applied, the most appropriate healthy food is suggested to people with similar eating patterns and tastes in the same age group, and users can receive recommendations on customized healthy foods that they need before eating. This made it possible to obtain convenient healthy food information through a customized interface for the elderly through a smartphone.

Keywords: Silver generation, Social media, Health app, Health promotion, Self medication

1. Introduction

With the development of the fourth industry, the use of smartphones by various age groups is increasing. Since the smartphone performs the desired function through a simple application, it is easy to operate and is an optimal information device for the elderly who have difficulty learning new things [1]. Medical and health management applications that provide various health information have emerged as the medical paradigm changes from treatment-oriented to prevention-oriented. However, research on an app that can provide information about food for health promotion to the elderly using a smart phone is insufficient. In this paper, we propose an application that enables the analysis of food factors and self-medication applications to improve the health of the generation. As the use of smartphones for the elderly increases due to aging and advanced medical technology, and the number of elderly people increases, the need for smartphone

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adaptation of the elderly is suggested and health promotion food information is being collected. After presenting the impact and importance of healthy food consumption on the elderly, we want to build a digital system that allows the elderly to obtain health food information more conveniently by grafting it on a smartphone. By applying wide deep learning technique, it is possible to recommend personalized healthy food by individuals. This supports indirect information on what kind of healthy food is needed for the elderly, and further provides a platform to directly purchase the food in the form of an application. In addition, the elderly who are concerned about their health can satisfy their desire as consumers to obtain information about healthy food. And it can solve the lack of information on the purchase process and food sources. The composition of this thesis is Chapter 1, an introduction, and has research background, problems, and service functions. Chapter 2 consists of related research, Chapter 3 proposes a system, Chapter 4 shows application interface, and finally Chapter 5 consists of conclusions.

2. Related Work

With recent advances in medical technology and changes in the environment, as the aging rate changes, the average life expectancy in 1970 was 61.9 years, but now it has increased to 82.7 in 2020. WHO has defined health. "It is not only a condition of an illness or a disability, but also maintaining a state of well-being that is satisfactory physically, mentally and socially. Health care for each senior is necessary for a healthy old age. Silver consumers are those who cannot easily perform their individual roles[2]. Exercise and regular eating habits are essential elements of health care for the elderly. Eating habits refer to an individual's lifestyle and personal health. Looking at the factors related to the eating habits of the silver generation, the health status of the silver generation is directly affected not only by physical, social, economic, and psychological factors, but also by eating habits and food intake [3]. Due to these various factors, the elderly's food intake, preference, diversity and pattern decreased, leading to various health problems such as undernutrition and nutritional imbalance [4]. Recently, as the age of low birthrate and aging has ignited, the food industry is putting a lot of effort into targeting silver food. As the proportion of the elderly to the population increases, there is a demand for a policy that allows the silver generation to access healthy food in various ways. For this, treatment at a professional medical institution and continuous exercise are important, but above all, management through diet is required. In the past, it was difficult to use the computer Internet, but through the spread of smartphones, information was easily and conveniently provided to the silver generation, enhancing the information acquisition power of the silver generation. Domestic and foreign silver generation related applications currently being developed are being developed and provided in the form of solving discomfort in body functions or providing health related information. However, there is a need for health-related applications that can bridge the mental gap between physical aging across generations and obtaining healthy food information. This paper proposes an application that allows generations to conveniently obtain information on foods that are directly related to health.

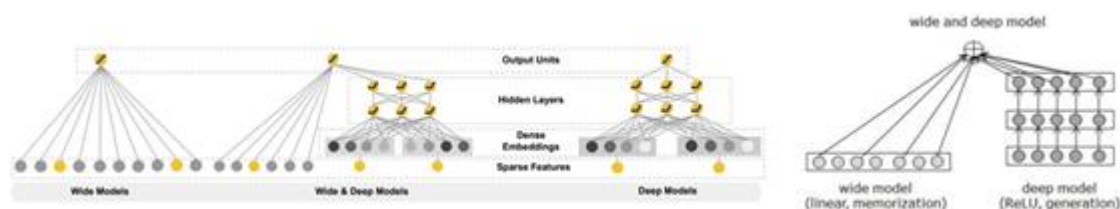


Fig. 2 Wide and Deep Learning Model

With Google's wide-and-deep learning model, the wide model allows categorical data to be computed with linear regression. In addition, the nonlinear characteristics of the categorical type add nonlinear characteristics to the wide model by additionally considering the cross product between the categorical data [5, 6]. However, in this study, in order to perform the calculation of food keywords reflecting the elderly health information and healthy food information, the cross product is excluded. I will make a wide model by referring to 2>. Second, continuous data can be learned with deep learning's deep neural network (DNN) [7]. In the deep model, ReLU [8] and the dropout technique [9] are applied to prevent overfitting as an activation function. In the wide model,

a part of the categorical data is made into an embedding vector with a high dimension to perform calculation. Therefore, the deep model can extract general characteristics of continuous data. Finally, the wide and deep learning model is a hybrid model that combines the wide model and the deep model. The activation function uses a well-known sigmoid function, and the backpropagation algorithm It is structured to optimize weight values.

3. Proposal System

This paper proposes an application that allows the elderly to easily and conveniently acquire information by providing information on healthy food necessary for the elderly when providing their own diet and health information. We propose a customized application that expands the age range of consumers so that they can obtain and use information tailored to them. [Figure 1] uses the content-based wide deep learning technique as the proposed system configuration. The system consists of five layers. The application layer consists of user/mobile, web/app, and the system layer consists of web/app agent and phone gap plug-in. The data resource hierarchy is composed of user's eating habits, user's preferred food, healthy food related books, and information from the Korean Nutrition Society. The data resource layer provides data to wide deep learning techniques and web/app agents, and the transmitted data is stored in database resources. A description of the components of each layer is as follows.

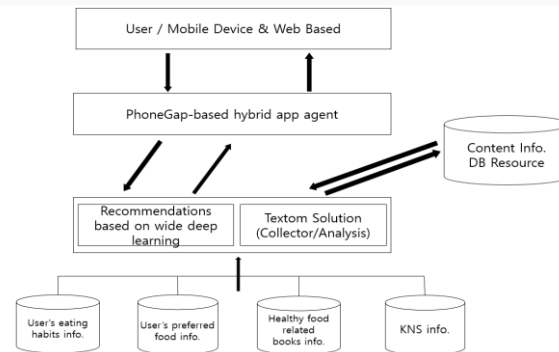


Figure 1. Development system of Wide Deep learning

■ User/Mobile, Web/App: This layer refers to the user of the application as the output process of this system. Web/app acts as a medium for users to use the application.

■ Phonegap plugin-based hybrid app agent: This agent is a package of code written to use the native function in a hybrid app written in Cordova. In general, the native functions that can be used in the web view are provided with a JavaScript interface. Therefore, the recommendation system in this paper applies this technique to provide services to users in the form of an app. The following is the detailed design and operation process.

* Synchronous plugin execution mechanism

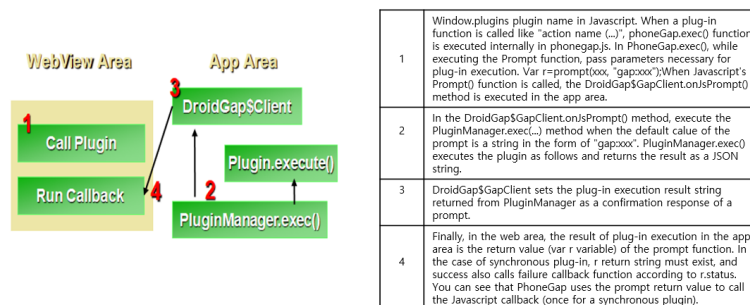


Figure 2. Synchronous plugin execution mechanism

* Asynchronous plugin execution mechanism

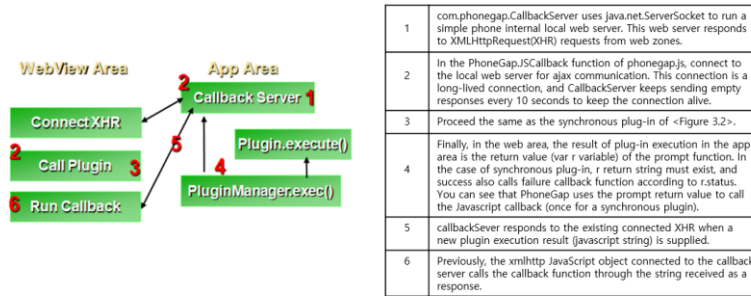


Figure 3. Asynchronous plugin execution mechanism

■ Healthy food recommendation technique based on wide deep learning

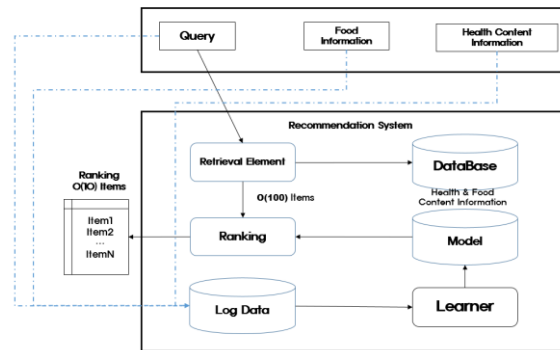


Figure 4. Recommendations based on wide deep learning

An overview of the method of recommending healthy food information is shown in Fig. Same as 4>. When a user accesses the recommended app, a questionnaire based on food & health keywords is generated by including various variables related to information related to the user (food information + health information). This recommended app allows the user to click or purchase specific actions. Returns a list that can be performed. User actions are recorded in the log as training data for the learner along with the query and exposure. Since there are more than 1 million apps in the database, it is difficult to thoroughly score the entire app for every query within the required service latency (mostly O (10) milliseconds). Therefore, the first step after receiving the query is search. The search system uses a variety of signals (typically a combination of machine learning models and human-defined rules) to return a short list of food & health related items that best match the query. After reducing the range of candidates, the ranking system ranks scores for every item. Scores are usually $P(y | x)$ i.e. user variables (e.g. country, language, demographic), context variables (e.g. device, time of day, day of the week) and impressions (e.g. elapsed time since app launch, app stats). This is the probability of each label y of user actions given a variable x including history). This paper will focus on the ranking model using wide and deep learning.

■ Textom Crawling: Textom is a big data analysis solution using text mining technology that can collect and refine data in a web environment and even process matrix data generation. It supports the collection, purification and analysis of user's favorite foods, healthy food-related books, and information data of the Korean Nutrition Society, and supports various collection channels including Naver, Daum, Google, Baidu, Twitter, Facebook and other specific sites. It provides 1-way and 2-way purification/analysis methods that can process not only collected data but also retained data. Analysis results can be applied to various statistical analysis programs such as SPSS, UCINet, NodeXL, NetMiner, Pajek, and Gephi. It was developed to

overcome the difficulty of collecting data in surveys, and it has strengths in data mining because it collects large amounts of data from various channels such as portal sites and social media and analyzes the network through a computerized purification process.

- Data Resource : A data resource is a device that stores data collected through a textom solution technique.
- Healthy food information : Healthy food information serves to provide information as a source source. User eating habits, user preferred foods, books related to healthy food, and information on the Korean Nutrition Society collect data on the source and composition necessary for application development through the textom crawling agent. Store the collected data in a data storage. Stored data is analyzed through a wide deep learning technique and combined with web/app agents and phone gap plug-ins to provide healthy food information derived from users and mobiles.

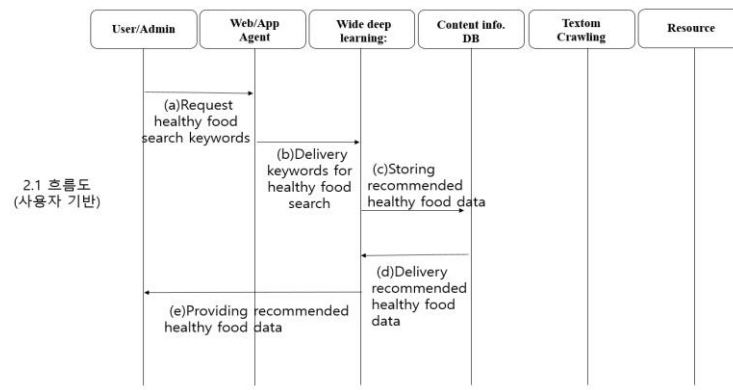


Figure 5. Proposal system sequence A

Figure 5.A shows the process of requesting information and information about the process that will be carried out with the application. Health food information (a), the user and the manager request health food information from the web/app agent. In (b), the web/app agent delivers the keyword of health information food to the wide deep learning recommendation technique(c). stores healthy food information data in a database through a wide deep learning technique(d). delivers healthy food data from the database using a wide deep learning technique(e) provides healthy food data to users and managers

Figure 5. Proposal system sequence B

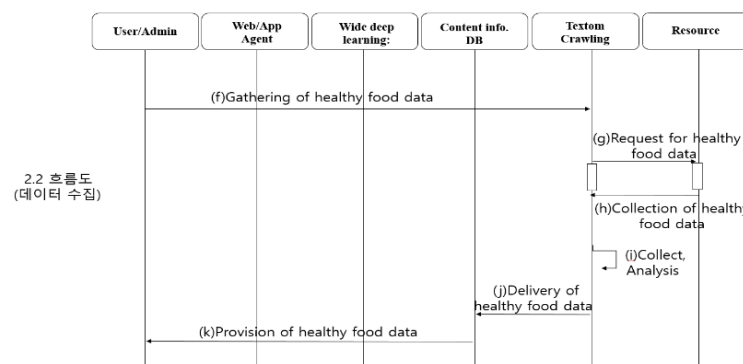


Figure 5.B shows the process of collecting data by collecting, analyzing and storing data as requested. Users and managers collect healthy food information and deliver it to the textom crawling agent (f). The textom crawling agent requests healthy food data from the data storage (g). The collection of healthy food data from the data storage is transferred to the textom crawling agent (h). The textom crawl agent collects and analyzes data (i), and the textom crawl agent delivers healthy food data to the database (j). The database provides healthy food data to users and managers (k).

4. Application Interface

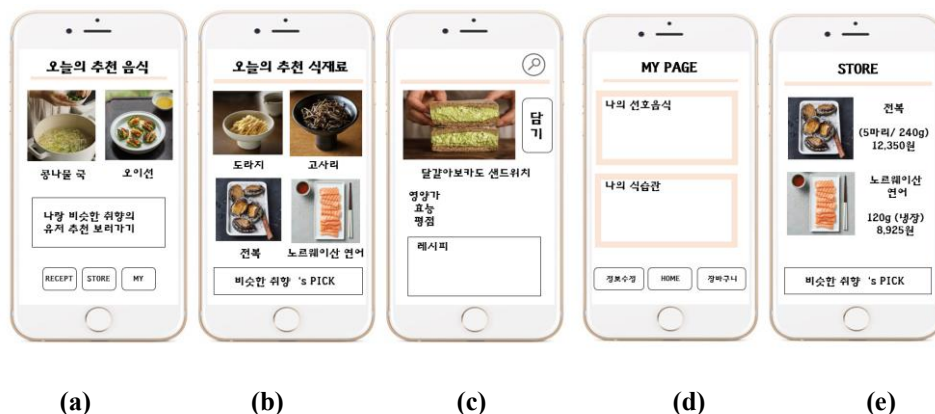


Figure 6. Application Interface

Figure 6 shows the application interface. (a) is an image information screen that maps information collected from textom crawling, stores highly relevant information, analyzes the user's favorite food and eating habits, and recommends today's recommended food to the user. Other users with similar eating habits and tastes may also be provided with information on recommended foods and food choices. Like (a), (b) provides information on today's ingredients as images. If you click the image, nutritional value, efficacy, rating, and recipe are presented as shown in (c), and you can put the food or ingredients in the shopping cart. You can also update the information by filling in the app with information on your preferred food and eating habits (d). Stores can shop for foods of interest.

5. Conclusion

In this paper, an app that enables food factor analysis and self-medication app for health promotion of the silver generation is proposed. Search the proposed system using the textom crawling technique through keywords corresponding to the query entered by the user. The search results were collected and refined in a web environment. This proposed system is based on a wide deep learning technique. The services provided by the system proposed in this paper are as follows. First, it is possible to provide information on healthy food to the silver generation who wants to obtain information through a smartphone. Second, it can be useful for the silver generation with various diseases and health conditions by recommending personalized diets and foods. Until now, health-related apps have been used for the safety and general disease prevention of the silver generation. Through the apps proposed in this paper, it is possible to directly help the health management of the silver generation by receiving recommendations for food ingredients and foods suitable for individual health conditions.

References

- [1] A study on the effects of the use of smart phone on the self-esteem of the elderly: focusing the mediating effects of the interpersonal relationship- Lee, Maung Sung, 2015
- [2] The Effects of the Physical and Emotional Activities on the Health, Self Perceived Health Status and the Depression of the Elderly- Lee, Mak Dal, 2012
- [3] Study about silver generation lifestyle type by HMR selection attribute and on purchasing behavior-Ok-Kyung Ahn, 2017
- [4] Study on the Characteristics of Consumption Propensities and Eating Behaviors on Dining out as Perceived by Silver Generation: Focused on the Silver Consumers in Seoul - Choi, Mi Sook, 2015
- [5] GUO, Huifeng, et al. Deepfm: An end-to-end wide & deep learning framework for CTR prediction. arXiv preprint arXiv:1804.04950, 2018.
- [6] Burel, Grégoire, Hassan Saif, and Harith Alani. "Semantic wide and deep learning for detecting crisis-

- information categories on social media." International Semantic Web Conference. Springer, Cham, 2017.
- [7] . Seide, Frank, Gang Li, and Dong Yu. "Conversational speech transcription using context-dependent deep neural networks." Twelfth annual conference of the international speech communication association. 2011.
- [8] AGARAP, Abien Fred. Deep learning using rectified linear units (relu). arXiv preprint arXiv:1803.08375, 2018.
- [9] Ba, Jimmy, and Brendan Frey. "Adaptive dropout for training deep neural networks." Advances in neural information processing systems. 2013.