Recommender System for Thai Food Cooking on Smartphone

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***Abstract*—The purpose of this research were to develop the recommender system for Thai food cooking on smartphone and evaluate user's satisfaction on the recommender system for Thai food cooking on smartphone. This application has been developed to give users about Thai food cooking information. The application function is offline mode and can be displayed in two languages: Thai language and English language. This paper presents the design and implementation by using Android Software Development Kit. The results show that the users can search cooking method from category, cooking method, food name and ingredient. The application can show the detail of food as such as food name, picture of the food, ingredient and cooking method. The proposed application is better support for users that the users are used android mobile.**

Keywords—Recommender System; Thai food; Smartphone;

I. INTRODUCTION

Nowadays, smartphones have become very popular for a large number of users. The users can install add-on for ability of your phone, the format of install depends on platform and the operating system [1]. The android operating system was popular platform on Smartphone. The developers around the world can develop software. The developers always create an application for user's android mobile. So most users use android mobile at the moment [2].

Thai food was important cultural heritage of the nation because Thailand is located in a region with a significant diversity of resources in the world. The Thai culture makes Thai food diverse, unique and specific. As a result, Thai food is consistently voted as one of the top ten foods in the world [3]. The government was support the policy of continuous stimulating the Thai food industry. Especially, the Thai food exports to abroad. The name of policy of the Government promote was "Thai Cuisine to the World". The main aims are the following: 1) To be one of the five world food exporters within 2-3 years with the highest creditability in safety, health and sanitation. 2) To promote more export of raw materials and additional ingredients for Thai recipes and they can define basic taste of Thai food in order to the best quality. Under the concept "Thai cuisine wherever cooked, it must have the same Thai flavor". [4]

This paper proposes the recommender system for Thai food cooking on smartphone. The recommender system function is offline mode and can be displayed in two languages: Thai language and English language. The design and implementation by using Android Software Development Kit. The application has been developed using Android Studio 1.3 [5] with Java programming language [6] and SQLite database [7] for storing the Thai food cooking data. The rest of this paper is organized as follows: Section II describes related work. Section III explains the system overview. The implementation and testing are presented in Section IV. Section V demonstrates the result of recommender system for Thai food cooking on smartphone. Section VI indicates the conclusion.

II. RELATED WORK

Recommendation system is a modern technology that is used to introduce information that is expected by the user to be interesting or user-specific and suitable for conducting electronic commerce business (e-Commerce). The paper [8] is proposed recommendation system by using Content-Based Filtering. The example of recommendation system [9] is introduced the tourism information and retrieve information by putting the complex conditions. The information management system has been introduced to be an alternative for making decisions it easier and faster. The keyword technique is a part of recommendation system. The keywords are words that show the content of a work and helps to search the work, do this by pulling words or ideas that appear in the title. The title should contain keywords covering all content. Based on a research study [10] and [11], the extracting keywords from electronics word of mouth in webboard communication is proposed. A novel method can extract electronics word such as keywords from threads in E-WOM. The proposed method divides the original text from the web site into several threads using a general text tiling algorithm. Then weights of each word in each thread are calculated using the modified for Thread-TFIDF (MT-TFIDF) which is our main contribution.

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The experimental results show that the keywords sorted by MT-TFIDF are in better order than the original TFIDF.

Teh Lee Cheng et al. [12] presented the content-based filtering algorithm for mobile recipe application. The main objective of this proposed application is to suggest a user preferred recipe using content-based filtering algorithm. Content-based filtering algorithm (CBFA) will be applied to identify the recipes that have high possibility for user to like. This algorithm will be able to recommend recipes based on user interaction. The algorithm will consider a few attributes to identify the similarity between the recipe pages viewed by the user. The reason to choose this algorithm is because it does not have the cold-start problem and it solely depends on the active user to identify their preferences. An Android based mobile recipe application is built to test this algorithm. The results from the experiment conducted show that the proposed algorithm is effective for recommending preferred recipes to user.

Shubham Takalkar et al. [13] presented the android application for local food ordering system. This research work aims to automate the food ordering process in near vicinity and also improve the dining experience of customers. In this report we discuss about the design & implementation of automated food ordering system with real time customer feedback for vendors. This system, implements wireless data access to servers. The android application on user's mobile will have all the menu details. The order details from customer's mobile are wirelessly updated in central database and subsequently sent to kitchen and cashier respectively. The vendor can manage the menu modifications easily. The wireless application on mobile devices provide a means of convenience, improving efficiency and accuracy for vendors by saving the time.

Y. van Pinxteren et al. [14] presented a user-centered approach to define a content-based recipe similarity measure. This thesis will focus on the identification, application and evaluation of methods to assist people to vary their food intake by suggesting recipes. These recipe suggestions could be variations to familiar recipes, which would lead to a more varied food intake without changing eating patterns. To search for such a variation, we present a method to calculate the similarity between recipes. First, we investigated which recipe characteristics identify this similarity. Next, we showed how these characteristics can be extracted from a recipe text and how we used them in a similarity measure. Further, we compared our similarity measure to the commonly used tf-idf method. The results showed that our measure strongly outperforms the tf-idf method. Finally, our similarity measure was used for recommending recipes to people at home. The recommendations were highly appreciated, while several improvements could still be implemented relatively easy. We will discuss some ways on how to do this.

Toon De Pessemier et al. [15] presented the food recommender for patients in a care facility. In this research, a food recommendation strategy for patients in a care facility is proposed. Since many of these patients can not express their personal preferences, a recommender system can assist the caregivers in the selection of the menu items that match the patients'preferences. Recommendations are generated based on three information sources: explicit ratings for menu items, implicit feedback based on the patient's eating behavior and the amount of food that was eaten, and inferred preferences for the ingredients of the menu items. In addition, monitoring the amount of food that was eaten by each patient can provide insights into the optimal amount of each menu item that has to be served to each patient. Furthermore, monitoring food consumption allows to detect irregularities in the eating behavior of the patient, which can be a symptom of illness.

Michael Yosep Ricky [16] presented the mobile food ordering application using Android OS Platform. The purpose of this research is making an ordering food application based on Android with New Order, Order History, Restaurant Profile, Order Status, Tracking Order, and Setting Profile Features. The research method used in this research is water model of System Development Life Cycle (SDLC) method with following phases: requirement definition, analyzing and determining the features needed in developing application and making the detail definition of each features, system and software design, designing the flow of developing application by using storyboard design, user experience design, Unified Modeling Language (UML) design, and database structure design, implementation an unit testing, making database and translating the result of designs to programming language code then doing unit testing, integration and system testing, integrating unit program to one unit system then doing system testing, operation and maintenance, operating the result of system testing and if any changes and reparations needed then the previous phases could be back. The result of this research is an ordering food application based on Android for customer and courier user, and a website for restaurant and admin user. The conclusion of this research is to help customer in making order easily, to give detail information needed by customer, to help restaurant in receiving order, and to help courier while doing delivery.

III. THE SYSTEM OVERVIEW

The section introduces analysis and design of recommender system for Thai food cooking on smartphone. The user can select the searching method by category of food or keyword and the screen will be display searching results that match the user's needs.

A. Data Analysis

To analyzing food data the step can be divided into the following:

- Studies and Collection: The food data will collection from food books "Classic Thai Stir Fry Dishes" [17] and food websites "thaifoodcookbook.net" [18].
- Division of Data: By office of the national culture commission may classify Thai food into two categories. The first category is meat dishes and the secondary is dessert dishes. In the part of meat dishes can divided into six cooking methods: Curry and Soup, Fried Stir, Thai Salad, Fried and Roast, Sauce and Appetizer [19]. In the part of dessert dishes can divided by ripening into ten cooking methods: Steaming, Boiling, Stir, Baking,

Fried, Toast, Sugar Syrup, Coating Sugar, Coconut cream and Syrup [20].

- Data analyzing the test items: Data verifies by specialist of Thai food, each test was calculated to find reliability by using the index of item-objective congruence (IOC). IOC is used in item analysis in order to find the congruence between the test items and the specified objectives [21].

B. System Analysis

The flow chart of the application is shown in Figure 1. When user starts the application, the application will enter to main page. In the main page, user can change the language between Thai language and English language by touching flag icon in top-left corner of the screen. The main page can be divided into two searching include searching by category of food and searching by keyword. After select searching, the application will work in the different results according to the selected searching.

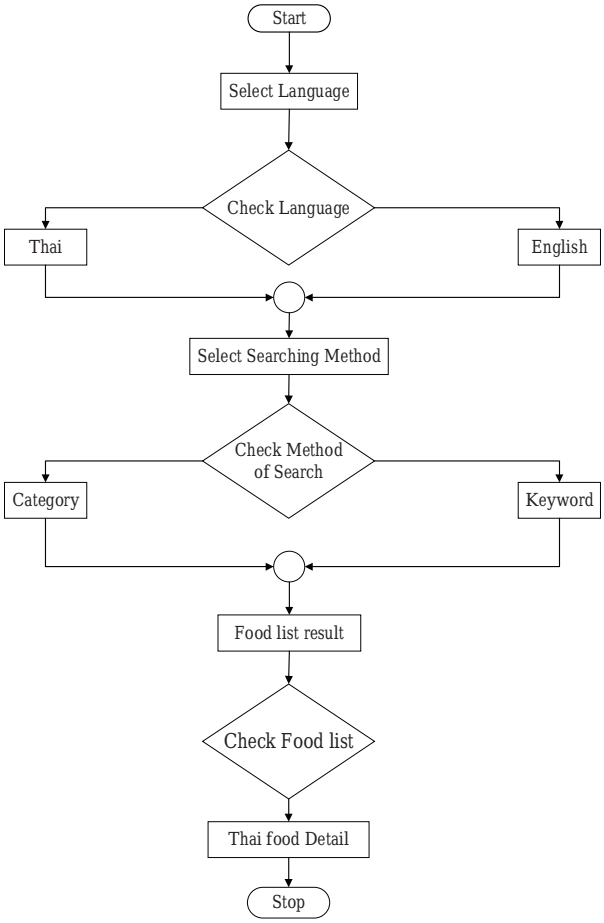

Fig.1. System Flowchart

- Category Searching: The Thai food category includes meat dishes, dessert dishes and all food as mentioned in the topic data analysis. When the users select the category, the screen will display a list Thai food name. Then, the user has to select the food name on the list and detail of the Thai food will display on the screen.
- Keyword Searching: The keyword can be searching by either food name or ingredient. In searching screen, when the user enter keyword and select category and select cooking method, the screen will be displays a list of the results that the user need.

C. Use Case Diagram

The use case diagram shows that users can select languages of the application, searching method which searching method include searching by category of the food and searching by the keyword and recommended dishes. Then, the application will work in the different results according to the menu. The use case diagram as shown in the Figure 2.

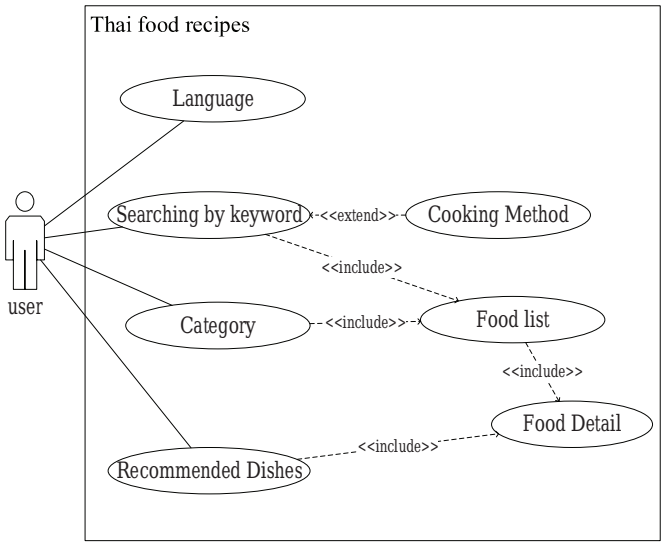

Fig.2. Use Case Diagram

IV. DESIGN APPLICATION

In this part, the design of user interface application are illustrated "Thai food recipes". There are two screens, main page screen and searching page screen as shown in Figure 3. The application has been developed using Android Studio with Java and the application can be used on Android mobile in the Android 4.0.3 or upper. This application using the SQLite database for storing data and the graphic user interface (GUI) is designed by using Adobe Photoshop.

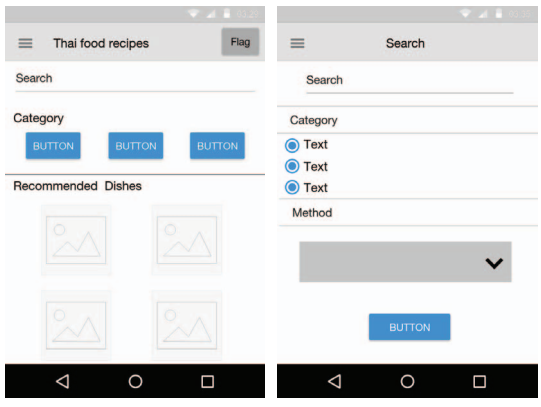

Fig.3. Design screen

V. DEMONSTRATION OF RECOMMENDER SYSTEM FOR THAI FOOD COOKING ON SMARTPHONE

This section demonstrates recommender system for Thai food cooking on Smartphone. The application program will enter to the main page when the users start the application.

A. *Main page*

This activity is the main page, the main page allows the user to proceed to the functionalities of the application by select language between Thai language and English language, or select searching by keyword, the user can select by clicking on the search button, or select searching by category. When the user select by click on the category icon, then the user has to select the type of category icon. There are three type of category icons, all food list, meat dishes and dessert dishes. In addition, the user can select recommended dishes by click on the food pictures. The main page is shown in Figure 4.

- Number 1: Select language of the system.
- Number 2: Searching by keyword.
- Number 3: Searching by category.
- Number 4: Recommended dishes.

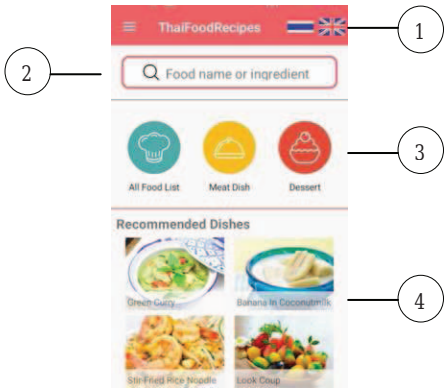

Fig.4. Main Page

B. *Searching by Keyword*

The searching screen as shown in Figure 5. The user can access the searching screen by clicking on the search button on the main page. The user can searching by food name or ingredient and can filter by category and cooking method. When the user selects all food, meat dishes or dessert dishes, the screen will display the list of cooking methods that the user selected. If the users select the meat dishes, the meat dish has six choices to select the cooking method: Curry and Soup, Fried Stir, Thai Salad, Fried and Roast, Sauce and Appetizer. If the user select the dessert dishes, the dessert dish has ten choices to select the cooking method: Steaming, Boiling, Stir, Baking, Fried, Toast, Sugar Syrup, Coating Sugar, Coconut cream and Syrup. Then users must clicking search button and the screen will display the list of the result.

In addition, the application has four techniques for searching. The technique will help to improve the performance of the results even more. The searching techniques are as follows.

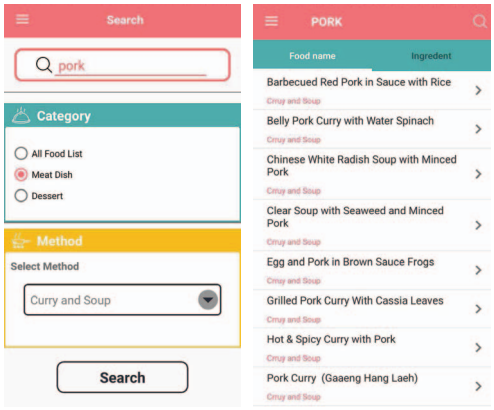

Fig. 5. Searching Screen

1) The searching by using the condition "AND" or " ": The user can enter "AND" or " " between search words and phrases to further define your search. In the example, if the user search by using the word "Pork and Curry" or "Pork Curry", the screen will be display a list of food name or ingredient that pork and curry as shown in Figure 6. This technique narrows the result of searching.

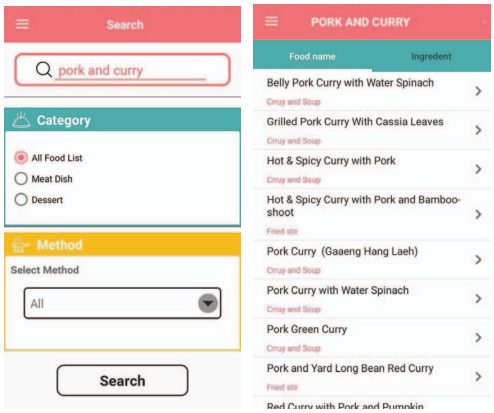

Fig. 6. The searching by using condition "AND"

2) The searching by using condition "OR" : The application uses the "OR" operator to search for one term or the other.

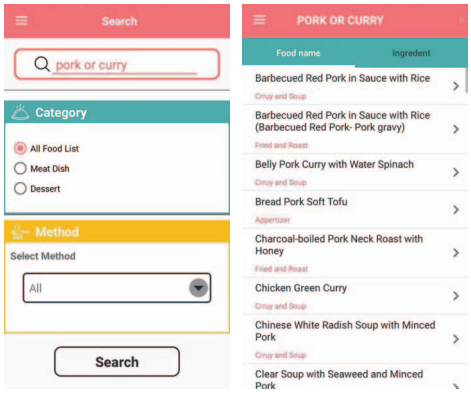

Fig. 7. The searching by using condition "OR"

The result can contain either word but does not have to include both. The user can enter "OR" between search words and phrases to further define your search. For the example, the user put the searching word "Pork or Curry", the screen will display a list of food name or ingredient that the food use pork or curry as shown in Figure 7.

3) The searching by using condition "NOT" : The user can enter "NOT" between search words and phrases to further define your search. Example, "Pork not Curry", The screen displays a list of food name or ingredient that pork but does not have curry as shown in Figure 8.

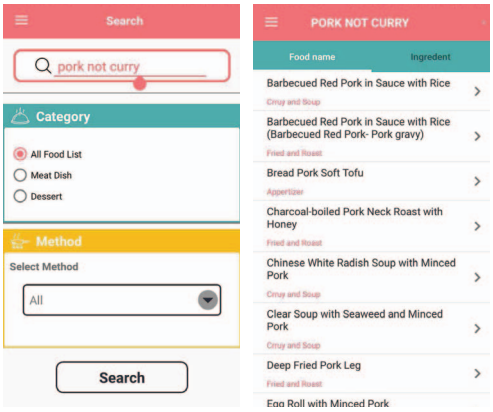

Fig. 8. The searching by using condition "NOT"

4) The searching by using techniques compare character : The user can enter uppercase or lowercase in the searching. The application compares the characters and it displays a list of result as shown in Figure 9.

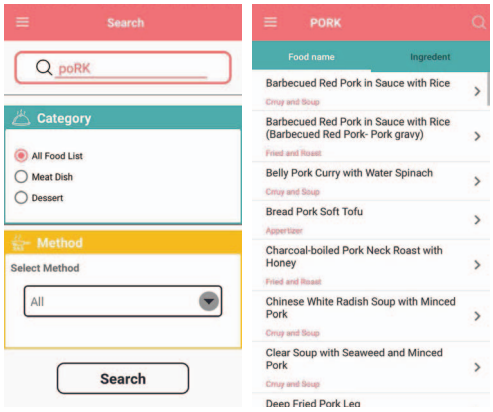

Fig. 9. The searching by using techniques compare character

C. *Searching by Category*

This activity is filled list of Thai food from searching by Thai food category which Thai food category includes meat dishes, dessert dishes and all food lists. Once, the user clicks on one of the Thai food, the next step will be link to the detail screen. This activity has two parts: food name and ingredient as shown in Figure 10.

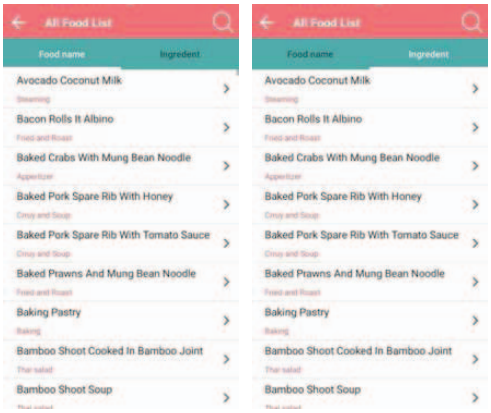

Fig.10. Food List Screen

D. *The Detail of Food Method*

The food method shows the detail information about Thai food which this method include food name, picture of food, ingredient and detail how to cooking the Thai food as shown in Figure 11.

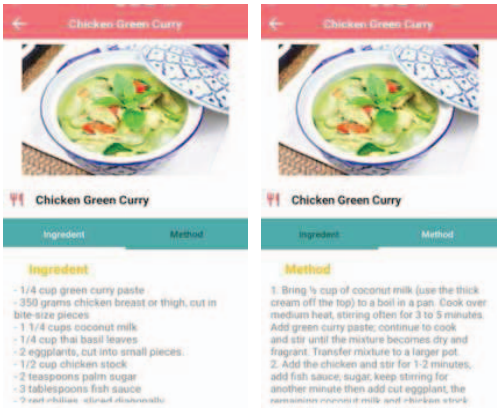

Fig.11. Food Detail Screen

VI. CONCLUSION

This paper presents the application of recommender system for Thai food cooking on smartphone. The application developed to searching for Thai food cooking information. The application can be displayed in two languages: Thai language and English language. This application has two searching functions: searching by using the category of food and searching by using the keyword. For the category of food, it can be divided into two categories: meat dishes and dessert dishes. For keyword, the user can be selected either food name or ingredient. The results show that the recommender system for Thai food cooking on Smartphone can searching the detail of Thai food method, ingredient of food and picture of food. The application can be downloaded by search that "Thai food recipes" on the play store.

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