

Development a Recommendation Library System Based On Android Application

Kunyanuth Kularbphetong, Kunnika Tenprakhon, Pattarapan Roonrakwit

Abstract—In this paper, we present a recommendation library application on Android system. The objective of this system is to support and advice user to use library resources based on mobile application. We describe the design approaches and functional components of this system. The system was developed based on under association rules, Apriori algorithm. In this project, it was divided the result by the research purposes into 2 parts: developing the Mobile application for online library service and testing and evaluating the system. Questionnaires were used to measure user satisfaction with system usability by specialists and users. The results were satisfactory both specialists and users.

Keywords—Online library, Apriori algorithm, android application, black box.

I. INTRODUCTION

CURRENTLY, library is a significant source of knowledge for educational institutions. Library serves much of resources, like book, journal, CD and online database, to support knowledge learning. Information technology has been currently applied to service users in library. It is worthwhile to take advantages of technology to support so as to improve library services. Therefore, to provide precise resources to the users shows the library's efficiency in passing knowledge to users. When compared the book-loan behavior of each library, it shown that one user can borrow many books at the same time. This can affect the accuracy in keeping track of books for future use; therefore, the library might not have enough resources for the users' need. Hence, it is very important to analyze library users' behavior in order to improve and manage library management.

With rapidly changes in information technology of smart mobile devices, it is possible to take benefit of these devices to design an application to support library's user. Moreover, smart phone devices become more widely used as an opportunity to serve and advice users to use library's resources and data mining is an important technique to create knowledge from transactional database by using statistic procedure and machine learning and training set to get the exact information for future management [1], [2]. Data Mining can analyze relevant information results and produce different perspectives to understand more about the users' behavior so as to handle

Kunyanuth Kularbphetong is with Computer Science Program, Suan Sunandha Rajabhet University, Bangkok, Thailand (phone: 662-150-1169; e-mail: kunyanuth.ku@ssru.ac.th)

Kunnika Tenprakhon is with Computer Science Program, Suan Sunandha Rajabhet University, Bangkok, Thailand (e-mail: kunnika.te@ssru.ac.th)

Pattarapan Roonrakwit is with Faculty of Information and Communication Technology, Silpakorn University, Bangkok, Thailand. (e-mail: ajpui20@hotmail.com).

library resources.

This research aims to develop a recommendation library system based on Android Application which will be useful to directly support both the student and users. Moreover, it can figure out what factors encourage users to use the library's resources, what categories are related to their interest, and how we predict the future needs.

The remainder of this paper is organized as follows. Section II presents the experimental setup of this work. Section III presents the results evaluated by specialists and users. Finally, in Section IV conclude the paper with future work

II. THE EXPERIMENTAL SETUP

In this section, we present how to set up and develop this system. Data used in research is collected the user's behaviour log from Suan Sunandha Rajabhat University Library, in the semesters of 2011 and 2012. The number of user's behavior loaning data was 3,826 and Fig. 1 shows the data preparation process.

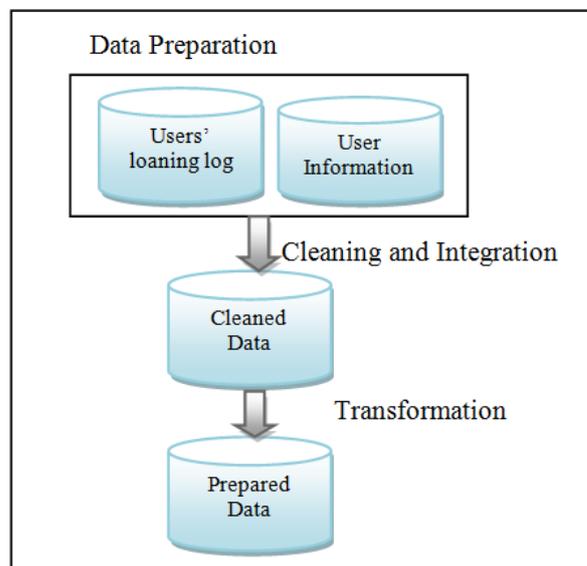


Fig. 1 The data preparation process

The association rule mining algorithm was applied after preparation process in order to discover valuable patterns. Data was analyzed by WEKA. WEKA, the Waikato Environment for Knowledge Analysis, is a collection of machine learning algorithm to analyze data set for data mining tasks [3]. Apriori algorithm [4], [5] has been used for this research and evaluated with a minimum support of 0.2 and a

minimum confidence of 0.9. Table I shows examples from the results of Apriori algorithm.

TABLE I
RESULTS OF THIS PROCESS

Rule	Meaning
1	"67% of library users who borrowed books from literature, history and geography categories would also borrow books from sociology category."
2	"67% of library users who borrowed books from miscellaneous and linguistic categories would also borrow books from sociology category."
3	"63% of library users who borrowed books in linguistic and literature categories would also borrow books from sociology category."
4	"58% of library users who borrowed books from sociology and literature categories would also borrow books from linguistic category."

To implement this project, we studied and collected data from user's requirements. The information was used as a source of information for management web and mobile applications and database management and internet network technology were applied to make the system fast and efficiently work.

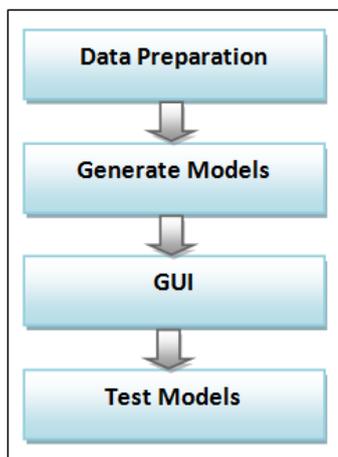


Fig. 2 The process of the user's behavior model

Fig. 2 shows the process of this research to generate the user's behavior model by using data mining techniques and develops a recommendation system based on the model.

From analysis and design phase, we applied UML (Unified Modeling Language) as a tool for this step and Fig. 3 presents use case diagram of this system.

To test and evaluation a mobile application system, Black box Testing and Questionnaires with specialists and users were applied. Black box testing was tested based on the performances of the system and collected errors of the system. Questionnaires were tested for user's satisfaction. To evaluate the quality assessment system, Mean (x) and standard deviation (SD) were used to assess the qualities of the project.

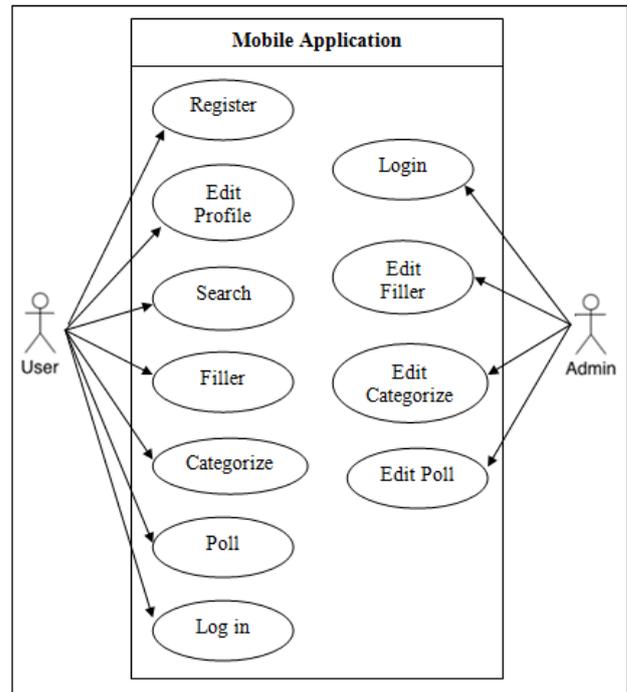


Fig. 3 Use case of the components of the system

III. RESULTS

In this project, it was divided the result by the research purposes into 2 parts: developing the mobile based application for supporting library users and testing and evaluating the system.

A. Developing the Mobile Application Based Android System

Figs. 4 to 6 show the results of mobile application.



Fig. 4 The main page of application



Fig. 5 The search page of application

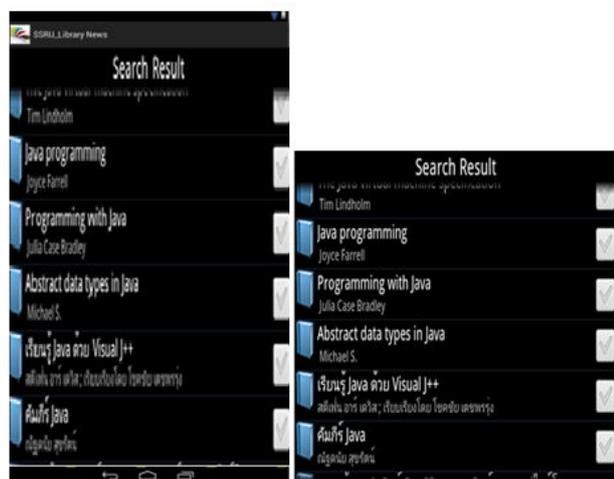


Fig. 6 The results page of application

B. Testing and Evaluating the Qualities of the System

When tested and evaluated the qualities of the system, black box testing and questionnaires by specialists and users were used to test this project. Black box testing was determined the error of the project as following: functional requirement test, function test, usability test, performance test and security test.

TABLE II
THE RESULTS OF BLACK BOX TESTING

	Specialists		Users	
	\bar{x}	SD	\bar{x}	SD
1.Function Requirement Test	4.13	0.74	4.2	0.71
2. Functional Test	4.2	0.68	4.07	0.74
3. Usability Test	4.27	0.8	4.23	0.77
4. Performance Test	3.93	0.88	4.1	0.88
5. Security Test	4.07	0.8	4.03	0.61

Functional requirement test was evaluated the ability of the system to serve the needs of the users and Functional test was used to evaluate the accuracy of the system. Usability test was

tested the suitability of the system. Performance test was assessed the processing speed of the system. Finally, security test was used to evaluate the security of the system Table II shows the results of black box testing.

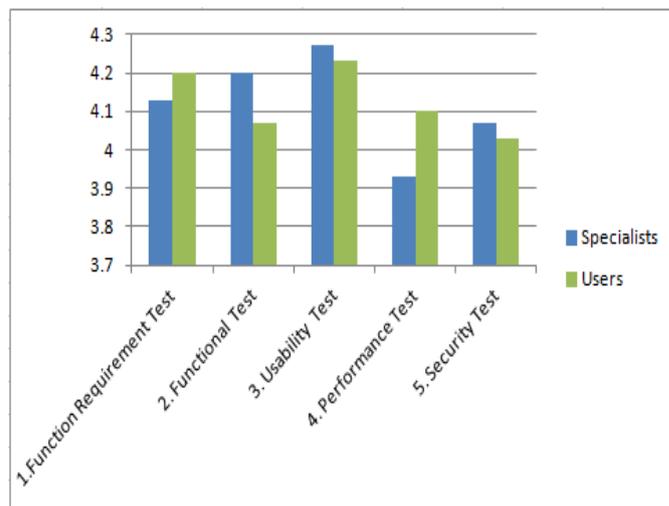


Fig. 7 The results of Black box testing

The results of data analysis by using Questionnaires to evaluate user satisfaction were found that specialists and users have satisfied the performances of the system as well.

IV. CONCLUSION AND FUTURE WORK

In this paper, we present the results of developing mobile based application to support library services and also this system can be beneficial to manage and enhance library resources. However, in term of the future experiments, we are looking forward to improve the system by using other technology and techniques to enhance this project and also apply the tool to handle this project.

ACKNOWLEDGMENT

The authors gratefully acknowledge the financial subsidy provided by Suan Sunandha Rajabhat University.

REFERENCES

- [1] U. M. Fayyad, G. Piatetsky-Shapiro, P. Smyth, and R. Uthuramy, "Advances in Knowledge Discovery and Data Mining", AAAI/MIT Press, 1996.
- [2] W. Frawley, G. Piatetsky-Shapiro, and C. Matheus, "Knowledge Discovery in Databases: An Overview". AI Magazine, Fall 1992, pp. 213-228.
- [3] <http://www.cs.waikato.ac.nz/ml/weka/>
- [4] Z. Qiankun, "Association Rule Mining: A Survey, Technical Report", CAIS, Nanyang Technological University, Singapore, 2003.
- [5] R. Agrawal, and R. Srikant, "Fast algorithms for mining association rules", In Proc. 20th Int. Conf. Very Large Data Bases, VLDB, pp. 487-499, 1994.