

A recommendation system based on object of the interest

Sung-Woo Byun *, So-Min Lee *, Seok-Pil Lee *, Kwang-Yong Kim **, Cho Kee-Seong **

* Dept. Computer Science, Sangmyung University, Seoul, Korea

** Dept. Intelligent Convergence Media Research Department, Electronics and Telecommunications Research Institute (ETRI), Daejeon, Korea

123234566@naver.com, somin4412@nate.com, esprit@smu.ac.kr, kwangyk@etri.re.kr, chokis@etri.re.kr

Abstract— Needs of contents recommendation technologies are increasing as the number of the media content on TV and Internet is increased. For the precise recommendation, researches on collaborative filtering recommendation system are increasing. But these researches have problems in scalability and cold-start. To solve these problems, this paper proposes the recommendation system based on user's content consumption according to watching time pattern and objects of interest. For this, we extract objects of interest from 259 media contents and 157 users and then calculate preference scores. To evaluate the performance of the proposed system comparison tests are done with the results of the existing collaborative filtering systems.

Keywords— Collaborative filtering; Recommendation system; Consumption patterns; Objects of interest; Personalized media;

I. INTRODUCTION

Needs of contents recommendation technologies are increasing as the number of the media content on TV and Internet is increased. To reflect demands of users, a variety of customized broadcasting services have been researched. A typical service is personalized broadcasting service and it allows the users to watch the program or the desired part of programs they want at any time. Also it can provide the scenes with objects that the users are most interested in through utilization of multiple camera angles. For more precise recommendations in the personalized broadcasting service, collaborative filtering systems have been researched [1]. But these researches have problems in scalability and cold-start. To solve these problems, this paper proposes the recommendation system based on user's content consumption according to watching time pattern and objects of interest. For these, we analyze the objects while the users are watching contents, and extract the user-interested objects. Then we design and implement a recommendation service system with capability of recommendation of the contents with user-interested objects. The rest of this paper is organized as follows. Section 2 presents the overall structure and method of our recommendation system. Section 3 and 4 explain the experimental data set and the results, respectively. Section 5 presents summaries and conclusions.

II. PROPOSED METHOD

A. Object-based media service metadata schema

The object-based media service metadata schema was used to recommends contents with the object which users are interested in. The object-based media service metadata is a technology structure that can search and extract information about all of the objects while users are watching TV. The following figure 1 is a Credits Item structure, which stores information about that objects.

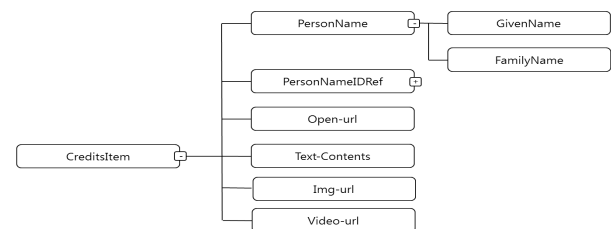


Figure 1. CreditsItem Type which stores information about the object

Object name, object id, and additional knowledge information were added to the original 'TV-Anytime Credits Item Type' [2]. For the Program Information Table, which contains the information about the scenes, and the Segment Information Table, which composed of the segment information about the beginning and ending frames of an object in the scenes, the structure that has been suggested in previous research was used [3].

B. Preference score calculation using watching time pattern

Equation that calculates user's preference score is shown in (1). The time that the user has spent on a program was divided by the total time of program, and then reflected to the user's preference score.

$$PF_{score} = \frac{V_e - V_s}{PG} \quad (1)$$

C. Proposed recommendation system with user-interested object

First, contents are grouped by genre. And then segment information is extracted from the whole contents. When users are watching the contents, preference score of user-interested objects is calculated. Finally, the recommendation system shows the top-Nth contents to user using user's preference score.

D. Evaluation Indicators

Various evaluation methods have been proposed for evaluation to recommendation system performance. In this research, we use the precision rate and the recall rate method that are the basic measures used in evaluating search strategies. The precision rate is the ratio of the number of contents which user consumes to the total number of recommended contents. The precision rate is shown in (2).

$$\text{Precision Rate} = \frac{|T \cap R|}{|R|} \quad (2)$$

The recall rate is the ratio of the number of recommended contents to the total number of contents which user consumes the recall rate is shown in (3).

$$\text{Recall Rate} = \frac{|T \cap R|}{|T|} \quad (3)$$

From this, R is the number of contents recommended by system. T is the number of contents which user consumes.

III. EXPERIMENT DATA

TABLE 1. CONTENTS INFORMATION OF GENRE

Genre	Number of contents
News	30
Documentary	31
Entertainment	64
Drama	42
Music	54
Animation	30

As shown in Table I, the experimental data is collected from a total of 259 contents subdivided into seven branches by genre like 34 for news, 31 for documentary, 64 for entertainment, 42 for drama, 54 for music, and 30 for animation Figure 1.

IV. EXPERIMENT RESULT

Table II shows the result evaluating performance of the proposed recommendation system. We compared proposed recommendation method with user based collaborative filtering [4], clustering + user based collaborative filtering [5] using precision rate and recall rate while increasing recommended content.

TABLE 2. PERFORMANCE EVALUATION

Top-Nth		Proposed recommendation result	User based collaborative filtering	Clustering + User based collaborative filtering
4	Precision	54.36508	13.095	32.539
	Recall	25.95139	7.8	16.613
6	Precision	48.67725	16.402	30.423
	Recall	30.34672	12.513	20.97
8	Precision	44.44444	16.468	27.182
	Recall	33.39001	15.312	24.14
10	Precision	42.69841	14.444	25.238
	Recall	37.22976	16.483	26.831

Average of precision rate of proposed recommendation method was 47.546295. It was better than average of precision rate of user based collaborative filtering (15.1022) and clustering + user based collaborative filtering (28.8455). Average of recall rate of proposed recommendation method was 31.72947. It was better than average of precision rate of user based collaborative filtering (12.977) and clustering + user based collaborative filtering (22.1385).

V. CONCLUSIONS

For the precise recommendation, researches on collaborative filtering recommendation system are increasing. But these researches have problems in scalability and cold-start. To solve these problems, this paper proposes the recommendation system based on user's content consumption according to watching time pattern and objects of interest. For this, we extract objects of interest from 259 media contents and 157 users and then calculate preference scores. To evaluate the performance of the proposed system comparison tests are done with the results of the existing collaborative filtering systems.

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Sung-Woo Byun received B.S degree in department of digital media technology from Sangmyung University, Seoul, Korea. He is currently a PhD student in department of computer science, Sangmyung University. His main research interests include signal processing, artificial intelligence, personalized media processing.



So-Min Lee received B.S degree in department of media software from Sangmyung University, Seoul, Korea. She is currently a M.S student in department of computer science, Sangmyung University. Her main research interests include signal processing, artificial intelligence, recommendation system



Seok-Pil Lee received BS and MS degrees in electrical engineering from Yonsei University, Seoul, Korea, in 1990 and 1992, respectively. In 1997, he earned a PhD degree in electrical engineering also at Yonsei University. From 1997 to 2002, he worked as a senior research staff at Daewoo Electronics, Seoul, Korea. From 2002 to 2012, he worked as a head of digital media research center of Korea Electronics Technology Institute. He worked also as a research staff at Georgia

Tech., Atlanta, USA from 2010 to 2011. He is currently a professor at the dept. of media software, Sangmyung University. His research interests include artificial intelligence, audio digital processing and multimedia searching.



Kwang-Yong Kim received the B.S. degree in 1991, M.S. degree in 1993, Ph.D. degree in 1998, all from Chungnam National University, Daejeon, Korea, Computer Engineering Department. Currently he has been working at ETRI (Electronics and Telecommunications Research Institute) as a research staff since 2000. His research interests include human detection and tracking, convergence broadcasting service, and the application of fuzzy logic and

artificial neural networks.



Kee-Seong Cho received the B.S. degree in 1982, M.S. degree in 1984, all from Kyungpook National University, Daegu, Korea, Electrical Engineering Department. He is currently Director at dept. of Media Cloud Research Section, Broadcasting & Telecommunications Media Laboratory, ETRI (Electronics and Telecommunications Research Institute). He has been working at ETRI as a research staff since 1984. His research interests include cloud

computing and network, image recognition, and convergence service, cloud computing and network, convergence broadcasting service, and mobility.