Proposing a New Structure for Web Mining and Personalizing Web Pages

Hamid Alinejad-Rokny * [a, b]

[a] CVR, Faculty of Medicine, The University of New South Wales, Sydney, NSW, Australia
[b] School of Computer Science and Engineering, The University of New South Wales, Sydney, NSW, Australia
Emails: H.Alinejad@ieee.org and Hamid.AlinejadRokny@UoN.edu.au

Mostafa Keikhay Farzaneh [c], Amir Goran Orimi [d], Mir Mohsen Pedram [e], Hojjat Ahangari Kiasari [f]
[c] Department of Industrial Engineering, Zahedan Branch, Islamic Azad University, Zahedan, Iran
[d] University of Mazandaran, Iran
[e] Department of Computer Engineering, Faculty of Engineering, Kharazmi University, Karaj, Tehran, Iran
[f] University of Hertfordshire, UK

Abstract—During users visiting a Web Server Access, data is stored. This information can be used broadly. Using this information we can obtain users' preferences and use them to personalize Web pages. Web mining is a new discussion that has been proposed to manage the web pages. In fact Web mining is the application of data mining techniques to discover patterns of user interests is the Data Web. In this article we provide a structure for web mining.

Index Terms—Web Mining, Personalization of Web pages, Recommendation systems, Comprehensive site.

I. INTRODUCTION

Today, the Web's global environment is the largest source of human information [4]. Currently, more than 124 million domains registered in cyberspace [5]. And every day the amount of domains increases. Despite the exponential growth speed, reading and understanding the information content remains constant [6]. Thus, we need automated tools and methods that can help to increase the speed, and allow users to access information on their favorite [1, 2, and 7]. One of these methods is called Web Mining.

In many resources Web exploration is defined as "the usage of data mining techniques for extracting information from the Web" [8 and 9]. One of Web exploration sub fields is web mining. Web mining is the application of data mining techniques to discover patterns of user interests from the Web Data [8 and 10]

One of the Web mining applications is the context of "Personalization of Web pages". For example, by comparing user's navigation patterns extracted from the log files the behavior of the user is predicted in real time [11]. One of the applications of this technique to real systems is recommendation systems. These systems are a specific type of information filtering systems, which recommend various items. (Such as movies, music, books, web pages, etc.) [12].

Nowadays the recommendation system is an important part of the user associated with web applications. E-commerce recommendation system is now proven that it can be effective in increasing profits and attract customers. [1, 2, 3 and 13]. In this article we propose a Web site structure (an online store), which is able to comply with the user and is customized for every user.

II. RELATED WORKS

In the field of web pages personalization, there are many algorithms and structures. Below are some examples of works.

Fabian Abel et al in Article [14] have provided a recommendation system based on a special Forums rule. SHEN Hui-Zhang presented a model of personalized web pages for web mining with hidden Markov model and dynamic clustering in Article [4]. In Article [15] Daniel Mican implemented a recommendation system called the WRS. Although the system has strengths as finding rules about less used pages and minor dependency between recommendation time and the number of saved records, but the important thing that should be noted is the lack of proper recommendations to users, especially when the information is not enough.

In Article [16] Minghao Lu, introduced structure that can evaluate the activities of the user (dynamic information), and also can scan profiles of the web site or Web site content. Thus its accuracy is higher than other structures, but this structures disadvantage is that it is slow. In this structure too much time spent that it depends on processing algorithm is used for Web Mining.

Qingtian Han and others in [17] has been set general view of a web mining algorithm for e-commerce website,

this algorithm is simple and can be implemented in a conventional website. It is also a strong point and a weak point for it.

Our proposed structure is highly flexible. Simplified version of the structure can be used in small Store, and on the other hand, this structure can be implemented in big shops that have many users and products

The only difference is the algorithms used for grouping elements and some details.

III. BASIC CONCEPTS

A. Types of Personalization Web Pages

There are three general ways to personalize web pages of architecture and algorithms view [19]:
1. Rule based personalization systems on the
2. Content based personalization systems
3. Complex personalization systems

In the rule based personalization systems, site administrators define rules, according to these rules users classify and their web will personalize [20]. The main drawback of this system is the constant information. This means that users must specify their interests and be entered into a bunch of rules. This may cause false information [21].

In content based personalization systems, for each user one user identifier ID exist that contains a description of the goods or items that the user already has expressed interest [19]. In fact, the system uses the ID and the similarity of the goods with user's interest, and

other commodities of interest to the user can be predicted. Some limitation of this system is that it has bad performance when enough data don't exist [22]. In complex Personalization systems, there is an attempt to solve some problems in the previous two systems.

This system focuses the same users and their choice will be examined and According to the choices and the user's interest in a certain score is assigned to each product [23]. KNN classifier is used for finding same users. For more information about this algorithm see [24].

B. Sources of Used Information

Information on the Server side

The first source for personalizing user's web pages is Access Logs on the server. When users visit a Web Server access data are stored in a file named Access Logs [25]. An example of this file is shown in Figure 1. As you can see this file stores any request to the server with the IP address of the requesting user, restored data and its date [26]. However there are three flaws in this information. First, per opening each page of a website ten lines of information in this file may be stored.

Second, the IP number might be used by several people, also some ISP, allocate different IP, for each user request in a session.

And third, it is possible some requests respond from the browser cache or proxy server these requests are not stored in the access logs file [18].

```
127.0.0.1 – [29/oct/2010 : 10:29:37 +0330] "Get /xampp/ HTTP/1.1" 302 - "-" "Opera/9.50 (Windows NT 5.1; U; en)"
127.0.0.1 – [29/oct/2010 : 10:29:37 +0330] "Get /xampp/ HTTP/1.1" 200 6545 "http:// locahost/xampp/splash.php"
127.0.0.1 – [29/oct/2010 : 10:29:37 +0330] "Get /xampp/ HTTP/1.1" 200 6338 "http:// locahost/xampp/splash.php"
127.0.0.1 – [29/oct/2010 : 10:29:41 +0330] "Get /xampp/ HTTP/1.1" 200 4357 "http:// locahost/xampp/splash.php"
127.0.0.1 – [29/oct/2010 : 10:29:41 +0330] "Get /xampp/ HTTP/1.1" 302 - "-" "http:// locahost/xampp/Opera/9.50 (Windows NT 5.1;)"
127.0.0.1 – [29/oct/2010 : 10:29:41 +0330] "Get /xampp/ HTTP/1.1" 302 - "-" ""http:// locahost/xampp/splash.php"
127.0.0.1 – [29/oct/2010 : 10:29:41 +0330] "Get /xampp/ HTTP/1.1" 200 4383 "http:// locahost/xampp/splash.php"
127.0.0.1 – [29/oct/2010 : 10:29:41 +0330] "Get /xampp/ HTTP/1.1" 200 1165 "http:// locahost/xampp/splash.php"
127.0.0.1 – [29/oct/2010 : 10:29:42 +0330] "Get /xampp/ HTTP/1.1" 302 - "-" "http:// locahost/xampp/splash.php"
127.0.0.1 – [29/oct/2010 : 10:29:42 +0330] "Get /xampp/ HTTP/1.1" 200 1254 "http:// locahost/xampp/splash.php"
```

Figure 1. A sample of access log file

Other types of server-side information are information that can be obtained during user registration. This information will be stored on a server, then it can be used to personalize the content and structure of the website [21].

Information on proxy side

A proxy server is a server that plays role of intermediary between the user (or organization) and the Internet. This will increase the security of organization. A proxy has ability to add security controls and cache services [27]. The proxy servers like common file servers Sent requests is stored in Access Logs [28], thus it can be

used as the source of this information to personalize web pages.

Client side information

One of the information that is stored on the client computer and its browser is cookie. This cookie is a text that can be used for verifying the server settings storage, Contents of card, current session ID in server or other data that can be saved [29]. On the client side (with the user's knowledge) applications can be installed that evaluate user performance and send data to the server to be used to personalize web pages.

Or capabilities of Java Applet can be used in to run a server application on the client computer (using Java Virtual Machine) [30].

Steps of web pages personalization

In the most of references of web personalization three steps listed, which is described below [21, 31 and 32] since much time is needed for the first two steps they are done offline [15].

Preparation data (data gathering)

At this step, data is collected and some refining is done on it. For example, broken Data in Access Logs files are deleted [32].

Exploring data

At this step data mining techniques (such as clustering, classification, and return [33] are used to explore the relationships between pages, users, and also pattern on the using Web [21].

Decision making

This step uses the results obtained in the previous step, and personalizes the pages according to user's requirements and interests. This phase is performed online, i.e. when the user visits the website this step will be implemented and the results are shown to the user [31].

IV. WEBSITE STRUCTURE

The proposed structure, is intended for an online store. This store is provided with various products. There are also banners on the pages for advertising and also it can send comments and recommendations to the system user by email. In this website, we have used a mixed personalization system and there is no need to Access Logs file, rather after user identification visited page's information is stored in the database. (Excessive requests to the database can be avoided with storing the data in a temporary interface.) This information is stored in the user's last five sessions. The overall structure of the website is shown in figure 2. This structure will be described in the next sections.
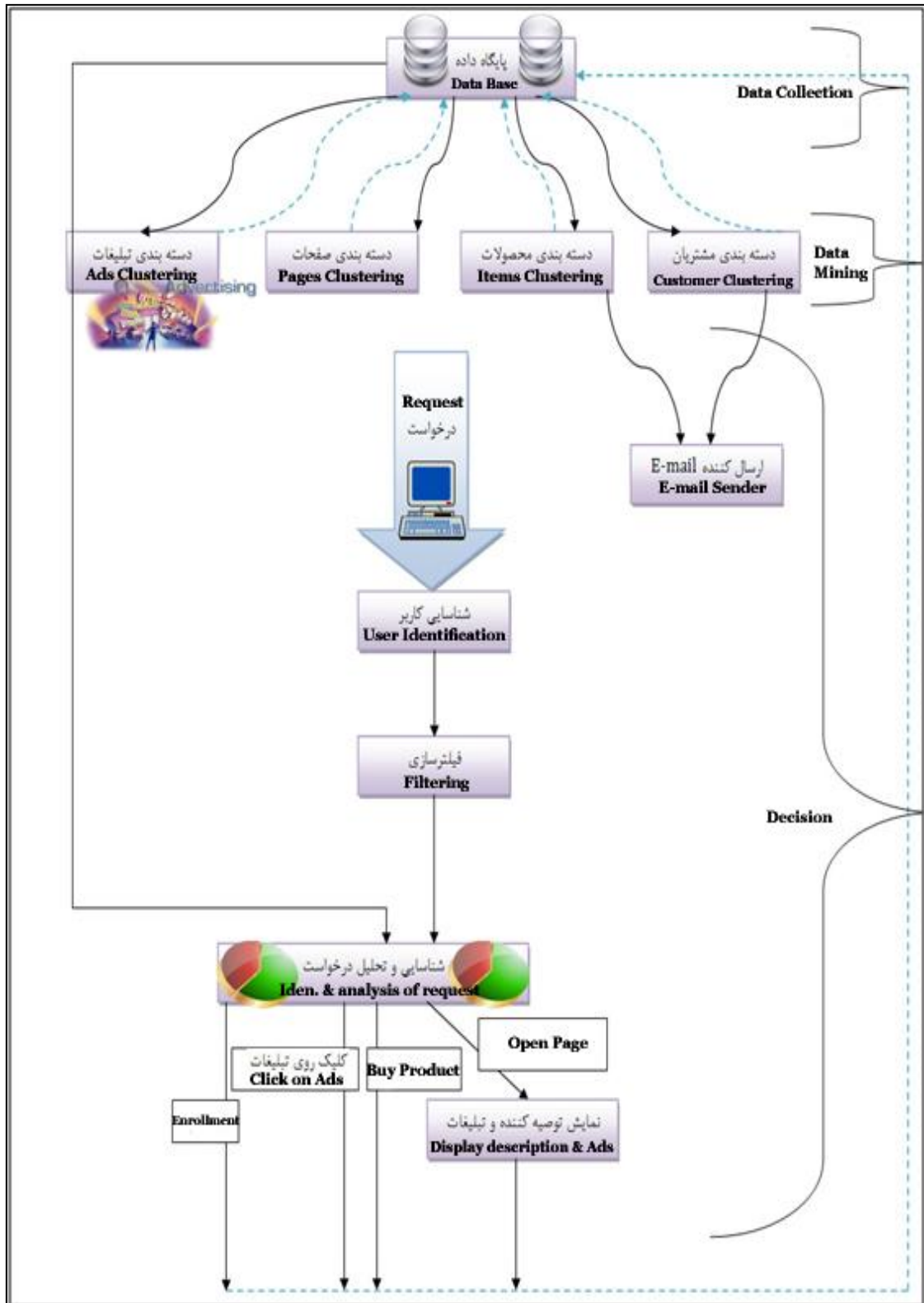
Figure 2. Structure of store

A. Client apply and Identification

For each request that website receive, first the customer must be identified. This website's customers can register on the website in order to make it easier to personalize web pages. However, customers who do not register are identified with the IP address. Of course, for some not registered customers the conventional and non-Personalized screen

is displayed, this includes the people that connected via proxy and don't have IP or they are machine. (Such as search engines or other reptiles). In the structure, the "filtering" is considered. to identify these people. For these people, a message is displayed on all pages and they will be invited to register. During registration the user may be asked, 'If you want to choose the best product which one you choose? "After selecting one of the products by the user it is stored in the database to be used later for personalization. Description of this process will be explained further. Also, during registration the user will be asked whether he/she want to receive E-Mail via the Web site or not. If he/she is interested, this is recorded in the database to introduce products purchased by

similar users to him/her by E-Mail. On entrance the client a session ID assigned to him so that his activity is recognized in a session. After registering customers are detected via cookies in browser and consequently the Customer's previous visits can be accessed via the database.

B. Database

In the database, all customers, products, advertisements, and pages information can be saved. This information is used to personalize pages. Tables stored in the database are shown in figure 3.

Costumer table

Costumer name or IP	Costumer settings	5 last sessions	Favorite product	Purchased products ID	Introduced products ID	last email date for Introduced products ID	Clicked Advertises ID	Costumer Category

Products table

Product name	Product ID	Product Description	Product Category

Advertisements table

Advertisement name	Advertisement ID	Advertisement Description	Advertisement Category

Pages table

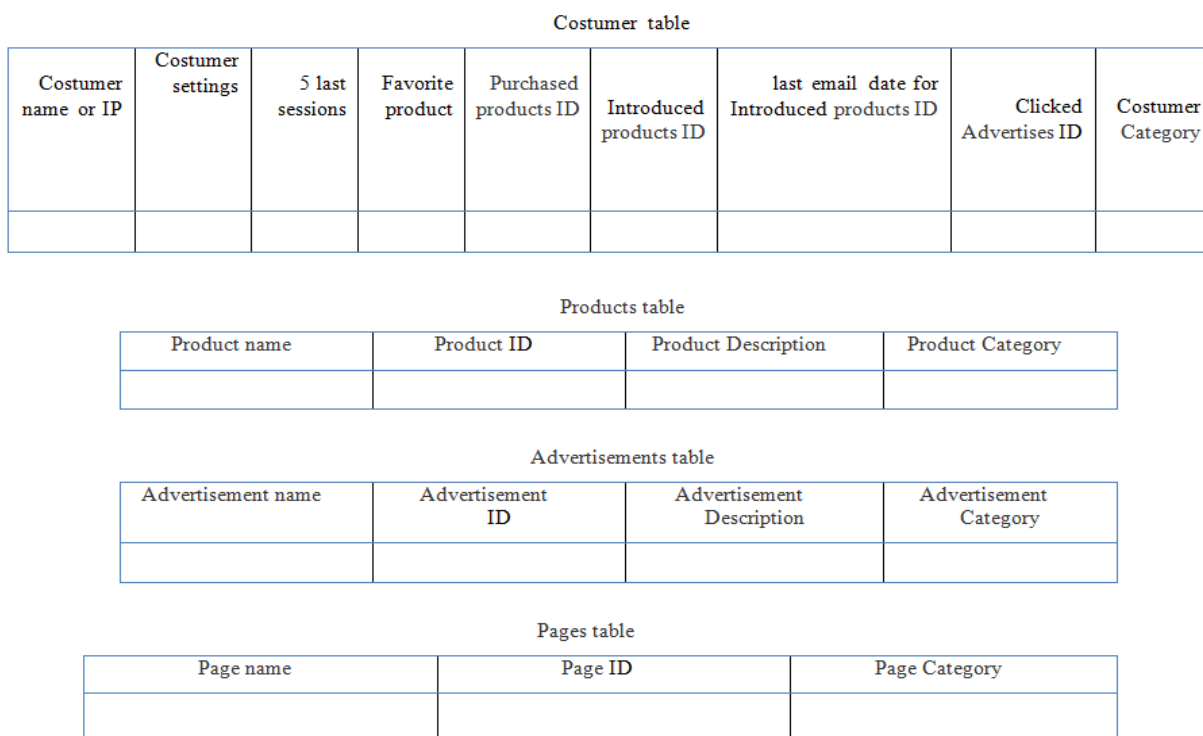| Page name	Page ID	Page Category

Figure 3. Tables of E-Shop's data base

Each customer is related to a particular category that by the "customer category" is determined. Purchased products ID, favorite product ID and clicked advertisements ID for each user is stored. For the last five

sessions of a client the list of viewed pages are stored. (In the 5 last sessions column) Suppose web site have m page that named url1 to url_m respectively, then the data field (named U) is an m-bit number that:

$$U_i = \begin{cases} 0 \leftarrow \textbf{\textit{if url}}_i \textbf{ \textit{has not been visited by customer}} \\ 1 \leftarrow \textbf{if url}_i \textbf{ has been visited by customer} \end{cases}$$

Formula (1)

The client settings (whether to receive emails or not) is stored in the field "Customer setting". Last email date is saved in the field "last email date for Introduced products ID" and the list of introduced product is stored in the field "Purchased products ID". Customer table's

fields that have multi-valued attributes are stored in another table.

C. Classification of Customers, Products, Pages and Advancements

The "Costumer Category", "product category", "Pages Category" and "advertisements Category" are Classifiers of the items. This work is done offline, within a predetermined time. Overall three matrices are required for the Classifications, which is presented in the following:

Products matrix:

$$P_{i,j} = \begin{cases} 0 \leftarrow \text{if the product}_j \text{ not purchased by customer}_i \\ 1 \leftarrow \text{if the product}_j \text{ purchased by customer}_i \\ 2 \leftarrow \text{if product}_j \text{ is customer}_i's \text{ favorite product} \end{cases} \qquad \text{Formula (2)}$$

Pages matrix:

$$U_{i,j} = \begin{cases} 0 \leftarrow \text{if url}_j \text{ has not been visited by customer}_i \\ 1 \leftarrow \text{if url}_j \text{ has been visited by customer}_i \end{cases} \qquad \text{Formula (3)}$$

Advertisements matrix:

$$A_{i,j} = \begin{cases} 0 \leftarrow \text{if customer}_i \text{ has not been clicked on advertisement}_j \\ 1 \leftarrow \text{if customer}_i \text{ has been clicked on advertisement}_j \end{cases} \qquad \text{Formula (4)}$$

These matrices can be easily made from the data in the database. After the construction the matrices, for advertisements, pages, and products classification it is sufficient that classify column A, U and P of matrix them according to their similarity. For classification, KNN algorithm can be used or simply first select an item and then verify other elements similarity to it.

$$\text{sim}(\text{product}_i, \text{product}_j) = \frac{\sum_{x=1}^{\text{number of users}}(P_{x,j} \text{ and } P_{x,i}) \text{ or not}(P_{x,j} - P_{x,i})}{\text{number of users}} \qquad \text{Formula (5)}$$

$$\text{sim}(\text{url}_i, \text{url}_j) = \frac{\sum_{x=1}^{\text{number of users}} \text{not}(P_{x,j} - P_{x,i})}{\text{number of users}} \qquad \text{Formula (6)}$$

$$\text{sim}(\text{advertisement}_i, \text{advertisement}_j) = \frac{\sum_{x=1}^{\text{number of users}} \text{not}(A_{x,j} - A_{x,i})}{\text{number of users}} \qquad \text{Formula (7)}$$

In the Above statement the "and" operator is a logical operator that returns one only if the two inputs are non-zero. "not" operator, converts the zero input to one and one input to zero, "or" operator returns a 1 when one of its inputs is non-zero.

Then order items at the similarity degree (descending) and put $\sqrt{\text{number of items}} - 1$ of the elements in the set of selected elements and so we continue to $\sqrt{\text{number of items}}$ classes are achieved that each has $\sqrt{\text{number of items}}$ members.

For customers classification all of the three matrices are required, it is better to amend the three matrices and build a unique matrix so that the significance of columns of the matrix be considered. Unique matrix is obtained from equation 1 formula. (Multiplied by 2 have been added for significance of the products purchased by the customer in relation to other items.)

$$\text{Cij} = \begin{cases} P_{ij} \qquad j \leq \text{number of products} \\ P_{ij\text{- number of products}} \qquad (\text{number of products}) < j \leq (\text{number of products}) *2 \\ U_{ij\text{- (number of products*2)}} \qquad (\text{number of products}) *2 < j \leq (\text{number of products}) *2 \\ + \text{ number of urls} \\ A_{ij\text{- (number of products*2 + number of ruls)}} \qquad (\text{number of products}) *2 + \text{number of ruls} < j \\ \leq \qquad (\text{number of products}) *2 + \text{number of urls} + \text{number of} \\ \text{advertisements} \end{cases}$$

Figure 4. Equivalent matrices mixed up

After that matrix acquired customers can be classified using KNN algorithm or use this formula to determine the degree of similarity between users:

Total = umber of products ∗ 2 + number of urls + number of advirtisements

$$\text{sim}\big(\text{customer}_i, \text{customer}_j\big) = \frac{\sum_{x=1}^{Total}\Big(\big(C_{x,i}-(C_{x,i}\text{ and }C_{x,j})+\big(C_{x,j}-(C_{x,i}\text{ and }C_{x,j})\big)\big)\ast 2\Big)}{Total} + \frac{\sum_{x=1}^{Total} not(C_{x,i}-C_{x,j})}{Total} \qquad Formula\ (8)$$

At this time, the same method can be used to classify customers.

In this way we divided customers, products, advertising, and web pages into similar categories. Now, the results are stored in the database.

D. Application Analysis, and Display of the Customer Personalized Profile

Each request is given to the website the customer can be detected by "user identification" and identified by the filtering is done on the client. For example, reptiles, and users who are connected through a proxy, by the "filter" are identified.

Then the request will be determined If customer clicked on an advertisement, advertisement ID is stored in the database by customer click. If a product is bought, the product ID is stored database. But if the application is opening a page the products that have not been brought or pages that have not seen it should be advised to him. To do this we can use different strategies.

1. Find a bunch of pages or more products that customers have expressed interest in it and report to him, or products found on those.(If there is enough information about this customer).

2. Considered the customers similar to current customer and show the products or pages of their interest to him.

The advertisements should be displayed at opening page. Suitable advertisements display can be took from the above ways. After the page has seen its bit on the database becomes one.

Also, the "Sender E-mail" is used to send E-mail to users who have a request during registration. After adding a product to stores for introducing it via email it have to be bought by 30% of users of a category, then the product is introduced to other people in category that didn't buy it and have an E-mail request.

However, user group may be changed, in the last E-mail date and introduced product ID for that user is stored in database to prevent a burst of E-mail and post duplicate products.

V. EVALUATION

Web pages personalization is mandatory is attended nowadays that so far many various structures have been provided for it. The proposed structure fixes some of the existing problems in other structures and provides accuracy and speedup together. In this structure various solutions provided for elements classification so that according to the environment of structure implementation balance between the accuracy and speed had been established.

The provided structure in addition to the told advantage is developable in all of the Web application language (such as PHP, ASP and ...). Also, due to the fact that the users are detected through the register and also through number IP, possibility to personalize pages for most users is provided. for the storage of users ' sessions the structure suggests a method that makes so many information is not stored in the database (potentially redundant data or information redundancy can't arise) as well as the information stored is sufficient to personalize Web pages. This Web site contains a recommendation system and also the ability to personalize home page and index page of products based on user interests.

The introduced structure due to the environment and database that is developed can be different in efficiency. But generally this structure act smarter with increasing the information contained in the database and has better results to show to the customer, but rather more work is done for the classification of elements.

Using the formulas provided for classification of elements due to the fact that they were mostly using Boolean operators could improve the speed of the process. With regard to the evaluation saving the last 5 completed sessions for each user is affordable for web sites with less than 1000 users and close to 1000 pages. With the more number of users or pages, it is recommended that only the ID of the visited pages be saved.

An important point is that the structure is notable, its a simple version of this flexibility is the structure of a Web shop can be used in other small girdo can be used in several products, users and bezrgkah stores darndniz this structured implementation. the only difference, is used in the algorithm for the category of elements.

An important point that is notable in the structure is its flexibility. A simple version of this structure can be used in a small web shop as it can be developed in big stores that have several products and users. The only difference is in the algorithms used for the classification of elements.

VI. CONCLUSION

As mentioned above, web mining, is one of the branches of web browsing to uncover the user's interests. Uncovering these interests could have many applications, such as that it can be used to personalize Web pages. One of the reasons for the importance of personalizing Web pages is due to high growth in the information contained on the Web page that makes it hard to access the useful information. A successful electronic commerce Web site, should have a particular behavior with the oldest users who purchase products. In this paper, we develop a

structure that provides Web store a step more close to success. If customers have everything that they want available, the store sales and profit rate rise considerably.

REFERENCES

[1] A. Ghiasi, "Marketing", Journal of Management, vol. 81, no. 59, pp. 74-88, 2007.

[2] Behkamal Sanaye Plastic Khozestan, "Extract qualitative properties of software E-commerce", Journal of Technology Management, vol. 88, no. 2, pp. 19-34, 2005.

[3] M. Taleb, "Factor in the maturity of an organization's approach to e-business models using FCM", Journal of Information Technology Management, vol. 88, no. 2, pp. 85-102, 2008.

[4] H. Zhang, J. Shen, Z. Zhong-zhi and A. Yang, "Web Mining Model for real-time webpage personalization", Management Science and Engineering, ICMSE '06, 2006.

[5] Domain Counts & Internet Statistics, "Domain Tools", www.domaintools.com/internet-statistics, 2010..

[6] C. Shahabi and F. Banaei-Kashani, "Efficient and Anonymous Web-Usage Mining for Web Personalization", INFORMS Journal on Computing, vol. 15, no. 2, pp. 123-147, 2008.

[7] P. Galeas, "Web Mining", http://www.galeas.de/webmining.html.

[8] J. Srivastava, P. Desikan and V. Kumar, "Web Mining-Accomplishments & Future Directions", University of Minnesota, 2012.

[9] C. Zhang and L. Zhuang, "New Path Filling Method on Data Preprocessing in Web Mining", Computer and Information Science, vol. 1, no. 3, pp. 112-115, 2008.

[10] R. Kosala and H. Blockeel, "Web Mining Research: A Survey", Katholieke Universiteit Leuven, SIGKDD Explorations, 2003.

[11] M. Motiei, "Fuzzy Intrusion Detection System via Data Mining Technique With Sequences of System Calls", Journal of Information Assurance and Security, vol. 5, np. 12, pp. 224-231, 2010.

[12] J.B. Schafer, J. Konstan and R. Riedl, "Recommender Systems in E-Commerce", In E-COMMERCE 99, Denver, Colorado, 1999.

[13] W. Hill, L. Stead, M. Rosenstein and G. Furnas, "Recommending and evaluating choices in a virtual community of use", In Proceedings of ACM CHI'95 Conference on Human Factors in Computing Systems, pp. 194-201, 1995.

[14] F. Abel, "A Rule-Based Recommender System for Online Discussion Forums", Proceeding AH '08 Proceedings of the 5th international conference on Adaptive Hypermedia and Adaptive Web-Based Systems, pp. 12-21, 2008.

[15] D. Mican and N. Tomaei, "Association-Rules-Based Recommender System for Personalization in Adaptive Web-Based Applications", Current Trends in Web Engineering; Lecture Notes in Computer Science, vol. 6385, pp. 85-90, 2010.

[16] Minghao, L., Web Personalization Based on Association Rules Finding on Both Static and Dynamic Web Data, University of Toronto, 2005.

[17] H. Qingtian, G. Xiaoyan and W. Wenguo, "Study on Web Mining Algorithm Based on Usage Mining", Computer-Aided Industrial Design and Conceptual Design, CAID/CD 2008. 9th International conference, 2008.

[18] C. Shahabi and F. Banaei-Kashani, "A Framework for Ecient and Anonymous Web Usage Mining Based on Client-Side Tracking", Proceeding WEBKDD,

[19] B. Mobasher, "Data Mining for Web Personalization", Chicago, De Paul University, 2007.

[20] B. Mobasher, "Web Usage Mining and Personalization", Chicago, De Paul University, 2004.

[21] O. Nasraoui, "World Wide Web Personalization. Olfa Nasraoui", www.webmining.spd.louisville.edu, 2003.

[22] M. Pazzani and D. Billsus., "Content Based Recommendation Systems", Lecture Notes in Computer Science Pazzani, vol. 4321, pp. 2031-2045, 2007.

[23] F. Heylighen, "Collaborative Filtering". Principia Cybernetica Web, www. pespmc1.vub.ac.be/collfilt, 2005.

[24] T., Saravanan, "A Detailed Introduction to K-Nearest Neighbor (KNN) Algorithm. God", Your Book Is Great, www. saravananthirumuruganathan.wordpress.com, 2010.

[25] M. Yannis, M. Morzy, T. Morzy. A. Nanopoulos, M. Wojciechowski and M. Zakrzewicz, "Indexing Techniques for Web Access Logs", Web Information Systems , 2004.

[26] Log Files, Apache HTTP Server, www.attpd.apache.org/docs/2.0/logs, 2009.

[27] What is proxy server, www.whatis.techtarget.com, 2011.

[28] Web Proxy Server 2.0 Log File Format, Microsoft, www.support.microsoft.com, 2003.

[29] HTTP cookie, the free encyclopedia, Wikipedia, www.en.wikipedia.org/wiki/HTTP_cookie, 2010

[30] Applets, Sun Microsystems, www.java.sun.com/applets, 2005.

[31] B. Mobasher, R. Cooley and J. Srivastava, "Automatic Personalization Based on Web Usage Mining", Chicago, DePaul University, 2000.

[32] M. Hasan Nejad and S. Soltani, "Web Usage Mining: A way for Web Structure improvement", Iranian Data Mining Congress, 2008.

[33] U. Fayyad, G. Piatetsky-Shapiro and P. Smyth, "From Data Mining to Knowledge Discovery in Databases", AI Magazine, 1996.

[34] O. Nasraoui, H. Frigui, A. Joshi and R. Krishnapuram, "Mining Web Access Logs Using Relational Competitive Fuzzy Clustering", In Proceedings of the Eight International Fuzzy Systems Association World Congress, 1999.

[35] Ch. Willy, "Web site personalization", IBM, 2001.

[36] M. Spiliopoulou, B. Mobasher, B. Berendt and M. Nakagawa, "A Framework for the Evaluation of Session Reconstruction Heuristics in Web Usage Analysis", INFORMS Journal of Computing, Vol. 15, no. 2, pp.171-190, 2003.

Hamid Alinejad-Rokny is a member of *School of Computer Science and Engineering, The University of New South Wales, Sydney, NSW, Australia*. He is the author/co-author of more than 65 publications in technical journals and conferences. He served on the program committees of several national and international conferences. He was *Guest Editor-Chief* for special issue at *IJFIPM*. Also He is *Deputy Editor-Chief* at *International Journal of Software Engineering And Computing* and he is editorial board member at *IJSEI, IJFIPM, JETWI, IJSCIP, IJCSCS, IJCNT and IJEIS.* His research interests are in the areas of Data Mining, Bioinformatics, Artificial Intelligence and Biological Computing.

Mir Mohsen Pedram is a member of Kharazmi University, Karaj, Tehran, Iran. He has many papers in international journals and conferences. His research interests are in the areas of Data Mining, Bioinformatics, Artificial Intelligence.