

Online Advertisement System: A New Intelligent Approach

Thomas Chowdhury

Dept. of Computer Science & Engineering,
Chittagong University of Engineering & Technology,
Bangladesh

Happy Rani Debi

Dept. of Computer Science & Engineering,
Chittagong University of Engineering & Technology,
Bangladesh

Abstract-- Advertising over the internet has gained great momentum in recent years. Compare to other traditional media such as television and newspapers, the internet and World Wide Web provides a more rapid ways for advertising and it largely decreases the cost of publishing and updating advertisements. Currently different types of websites normally host lots of advertisements as an embedded system but apparently it is not relevant and consistent to the users' interest. In this paper, an online intelligent advertising system has been introduced which provides more efficient, effective, and smart solution for online advertising. It provides advertisements according to the user's activities such as user's visit like or dislike by calculating the priority from the trust network among the users. Besides, it represents advertisements according to user's information such as location, environment, gender, income etc. An intelligent approach has been proposed in the paper that attempts to learn a user's profile from his given information and finally suggest relevant advertisements accordingly.

Keywords: *online advertising system, trust network, embedded system, intelligent approach, subjective logic.*

I. INTRODUCTION

The growth of advertising on the World Wide Web requires research on users' general perceptions since these affect attitudes toward individual advertisements [1]. Intelligent advertising means where users are, when they are, and giving them what they want. Intelligent Advertising collects data that a user needs exactly. Advertising advertisements play a vital role for any type of business to develop awareness among the customers. It is one of the simplest and best ways to increase the product sale in the present competitive market. Among all the sources, online advertisement is one of the cheapest modes to advertise. Online advertising has been widely accepted and used in today's real world [2]. An online intelligent advertising system and solutions introduced to provide more efficient, effective, and intelligent solutions for online advertising. To deliver online advertisement to proper user is very important. It suggests proper advertisements according to users' information and activities. User's interest can be found from his visit and like of the advertisements, his friends' visit and like of the advertisements and so on. Priority calculation is done from the trust network of user.

II. LITARATURE REVIEW

Currently different types of websites normally host lots of advertisements which are not relevant and consistent to the users' interest. In many previous works, user interest discovery has been investigated, where most of them were targeting at the problems of personalized Web search, browsing, news articles or scientific paper discovery, etc. [3] and none of them ever worked with the trust network among users for suggesting user-targeted advertisements. The standpoint of the current effort is trust network. Trust network is a typical application of subjective logic. Trust networks can express the reliability of information sources for propositions, and can be used to determine subjective opinions about propositions.

There are many measures of "trust" within a social network. It is common in a network that trust is based simply on knowing someone. By treating a "Person" as a node, and the "knows" relationship as an edge, an undirected graph emerges. If A does not know B, but some of A's friends know B, A is "close" to knowing B in some sense. The trust network helps users to systematically document their trust-relationships, and to see which users have declared trust in another user. It is not a popularity contest or editor rating [4][5].

III. METHODOLOGY

A. Overview of the System

Advertisers upload ads to the broker which the broker then sends to clients. The ads are filtered locally by the clientbased on the user's profile and stored until needed[8].

The overall system consists of Trust Network Traversing using BFS (Breadth - First Search) and Priority calculation.

B. Algorithm

The algorithm implemented for online intelligent advertisement system is given in the consecutive steps below:

1. Read all advertisements in the database
2. Calculate priority for each advertisement

3. First calculate priority for user like or dislike of the advertisement
4. Calculate priority for user visit of the advertisement
5. Calculate priority for user like of the same category advertisements
6. Calculate priority for user visit of the same category advertisements
7. Apply BFS algorithm for finding user 1st label friends, user 2nd label friends and so on
8. Calculate priority for user friends' like of the advertisement
9. Calculate priority for user friends' visit of the advertisement
10. Calculate priority for user friends' like of the same category advertisements
11. Calculate priority for user location
12. Calculate priority for user season
13. Calculate priority for user environment temperature
14. Calculate priority for user gender
15. Calculate priority for user salary
16. Repeat iii to xv steps for calculating priority of all others advertisements in the database
17. Sort the list of all advertisements in the decreasing order according to priority
18. Show the first several advertisements of the list as output to the user

C. Flow Chart

The flow chart of advertisement search for current user is given in **Figure 1**:

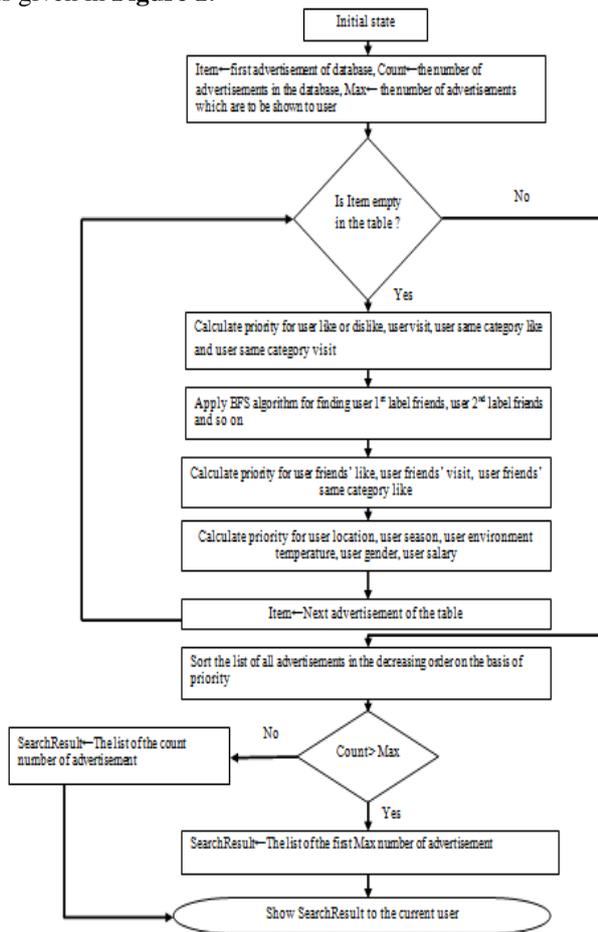


Figure 1: Flow chart of advertisement search for current user

D. Use Case Diagram
1. Use Case Diagram of the entire system

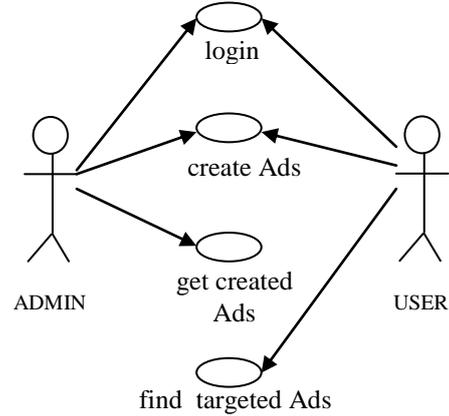


Figure 2: Use Case Diagram of the entire system

2. Use Case Diagram for user

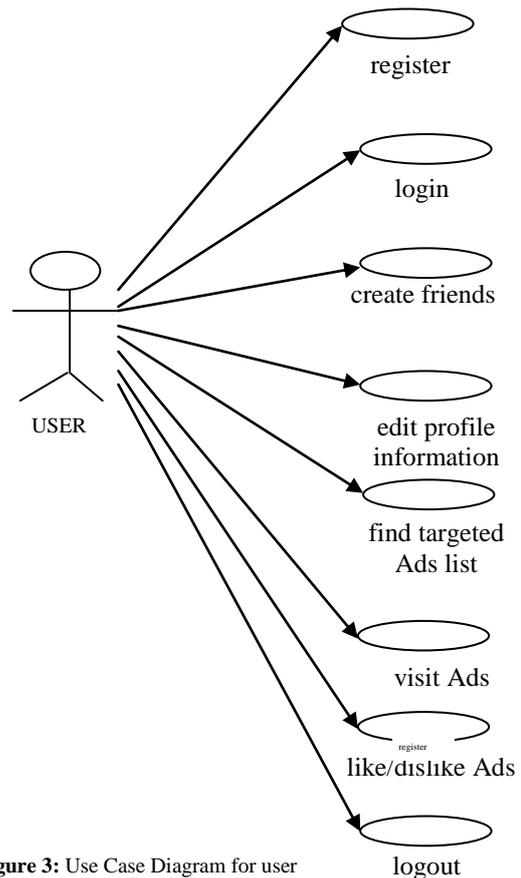


Figure 3: Use Case Diagram for user

3. Use Case Diagram for admin

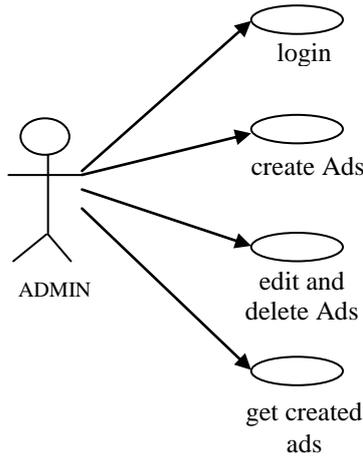


Figure 4: Use Case Diagram for admin

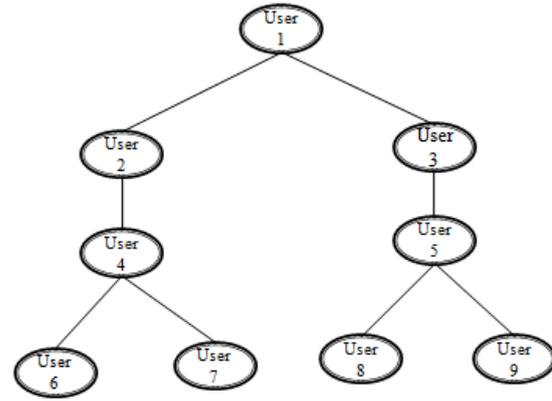


Figure 4: Example of a trust network

Fig

IV. IMPLEMENTATION AND PERFORMANCE ANALYSIS

A. IMPLEMENTATION

1. Factors of Performance Measure

The factors are taken into consideration for measuring the performance is given below:

- a. User visit, like or dislike of the advertisements
- b. User same category like
- c. User same category visit
- d. User friends visit, like or dislike
- e. User friends same category like
- f. User friends same category visit
- g. User location
- h. User current season.
- i. User environment temperature
- j. User gender
- k. User income

2. Priority Calculation

The network among the users of a site is one kind of trust network.

Figure 2 represents a trust network. Here User 1 is directly connected to User 2 and User 3 that means User 2 and User 3 are 1st label friends of User 1. User 4 and User 5 are 2nd label friends of User 1. User 6, User 7, User 8 and User 9 are 3rd label friends of User 1.

The equation for calculating priority is given below:

If friends of current user like a specific advertisement, then the priority is calculated by the equation 1:

$$\text{Priority} = \text{ItemLikeCount} * (10.0 / \text{label}) \dots \dots \dots 1$$

Where ItemLikeCount = the number of persons among the friends of the label of the current user who liked the item.

If friends of current user like same category advertisements, then the calculated priority is described as given in equation 2:

$$\text{Priority} = \text{CategoryLikeCount} * (2.0 / \text{label}) \dots \dots \dots 2$$

Where CategoryLikeCount = the number of persons among the friends of the label of the current user who liked the items of this category

If friends of current user like a specific advertisement, then priority follows equation 3:

$$\text{Priority} = \text{ItemVisitCount} * (1.0 / \text{label}) \dots \dots \dots 3$$

Where ItemVisitCount = the total number of visits of the item which was visited by the label friends of the current user

Assuming User 6 given in Figure 2 liked and visited an item of a specific category such as, NOAH car of the category car. The priority of showing this item to user 6, user 4, user 2 and user 1 is given in the Table 1.

Table 1: Priority of Showing NOAH Car to Users

User Name	Priority of showing Noah Car
User 6	100+3 = 103
User 4	10/1+1/1 = 11
User 2	10/2+1/2 = 5.5
User 1	10/3+1/3 = 3.67

In 2nd row of Table 1, 100 is to be used for giving like on the Ad of NOAH car by User 6 and 3 is to be used for visiting the Ad of NOAH car by User 6. The priority of showing this category other items such as Mitsubishi car to User 6, User 4, User 2 and User 1 is given in the Table 2.

Table 2: Priority of Showing Mitsubishi Car to Users

User Name	Priority of showing Mitsubishi Car
User 6	$10+1 = 11$
User 4	$1*(2.0/1) = 2.0$
User 2	$1*(2.0/2) = 1.0$
User 1	$1*(2.0/3) = 0.67$

From Table 1 and Table 2 we see that priority of showing any advertisement will decrease with increase of friend's label.

Priority calculation also done using current system from user information based on user location, user environment, gender, income.

B. ANALYSIS

In this section we use the above methodology to deliver more relevant advertisements to users. In previous works, profile information (gender, age, education, sexual-preference, etc.) [6] has been considered and none of them ever worked with profile information: user current season, user environment temperature, user salary but my proposed approach does this. Moreover, my proposed approach works with trust network among users for suggesting user-targeted advertisements which reflects user's interest. The proposed intelligent approach represents more relevant advertisements (~80%) to users compare to previous works. It works based on users' targets, information and activities. Proposed intelligent approach is more efficient and effective means for marketing.

V. CONCLUSION

Online advertising has been recognized as one of the efficient and effective means for marketing and advertising due to its global visibility, low-cost, effective performance tracking and measurement. With the quick growth of Internet users and the fast advancement of Internet and e-commerce, more businessmen and manufacturers began to pay their attention to online advertising. The proposed approach provides intelligent advertising system which makes possible from users's information and activities. The system attempts to learn a user's profile from his given information and activities and suggests relevant advertisements accordingly. It learns the user interest from activities of a user, his friends, and his friends' friends and so on. It represents top ranked

advertisements as output. The results of experiments have showed that the solution has better results. These results demonstrate that the proposed intelligent approach is suitable for suggesting relevant advertisements. Future researcher can improve the suggested advertisements by considering more profile information such as birthday information, religion etc.

REFERENCES

- [1] Ducoffe, R. H., *Advertising value and advertising on the web*, Journal of Advertising Research, September, 1996.
- [2] Gao J., Sheng B., Chang L., Shim, S. "Online Advertising - Taxonomy and Engineering Perspectives", San Jose State University.
- [3] Wang, X., Yu, M., Zhang, L., Cai, R., Ma, W., "Argo: Intelligent Advertising by Mining a User's Interest from His Photo Collections".
- [4] http://en.wikipedia.org/wiki/Wikipedia:Trust_network_k. [Access 07 August, 2012]
- [5] http://en.wikipedia.org/wiki/Subjective_logic. [Access 16 August, 2012]
- [6] Guha S., Cheng B., *Challenges in Measuring Online Advertising Systems*.
- [7] S. Guha, A. Reznichenko, K. Tang, H. Haddadi, and P. Francis. Serving Ads from localhost for Performance, Privacy, and Profit. In Proceedings of the 8th Workshop on Hot Topics in Networks (HotNets '09), New York, NY, Oct. 2009.
- [8] Michael McCandless, "Web Advertising", IEEE Intelligent Systems.
- [9] Robbin Zeff, Brad Aronson, "Advertising On The Internet", Wiley Computer Publishing, 1999.
- [10] Clinton Wilder. "Interactive Ads". Information Week, October 3, 1994: 25-29.