



Reactive Pushing Strategic Framework using Frequent Traveller Caching in Location Based Mobile Advertising

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Abstract— *Over the past decades, location based mobile advertising has grown to become a technology that allows an advertiser to advertise their products or services to the appropriate users efficiently and effectively. This is because the pervasive nature of mobile devices can provide contextual information and allow users to explain their preferences. This paper intend to construct/design an optimized mobile advertising system that works as a platform to provide both businesses and consumers with context/location aware advertisements. This approach designates the benefits of both mobile and advertising to allow businesses to spread location based advertising widely, while supporting push type and personalized advertisements for consumers. To explain the optimized mobile advertising system, we designate a platform to provide most relevant advertising to consumers which will benefit to both consumers and businesses.*

Keywords— *Location, Advertising, Mobile, Information, Framework, Traveller, Cache*

I. INTRODUCTION

Location based advertisement services goal is to provide personalized mobile transactions for aimed individuals in specific locations at specific times (15) using the information of the location of an individuals or both. The tremendous growth of smart phone has given an opportunity for such services. Because of the multi functionality of smart phones and they are always travelling along with the users at any time anywhere and context aware. By juniper research, nearly 1.5 billion [4] people will be using LBS by 2014, with the global market worth \$12.7 billion worldwide.

This paper focuses on designing an optimized location based mobile advertising system for mobile advertisement based on push-type business strategies. This combines the strengths of goal based advertising techniques, push-type and mobile advertisement technology. The push type technologies also referred as permission based marketing [5] is better for businesses who have an established relationship with users, who have accepted to receive such messages. This framework allows consumer to receive and access personalized advertisements and also for businesses used to identify and push advertisements to the appropriate customers. The remaining section of the paper organized as follows. Section 2 discusses the related works on location based mobile advertising, push type advertising. Section 3 concentrating the frameworks of the proposed system. Section 4 discusses the outcome of the framework. The last section concludes the paper.

II. RELATED WORK

In Internet environment the advertising has been received good response from the users. In this the areas like big data, statistics and context based matching are playing big role in designing a new system.[2] has given the proactive pushing strategy and proved that utilized cost and efforts are effective and also says this strategy suitable for location based mobile advertising. The smart phones are capable of collecting information, such as location which has become more convenient, so that m-commerce provides a venue for location aware and push type advertisements for consumers.

The major benefit of targeting location based mobile advertising is to increase the effectiveness of advertising by assuring that the advertisement sent to the right person at right time [2] also proven that the location based mobile advertising is important and mostly needed useful. Making personalize aims to deliver a proper/appropriate advertisement to a needy user rather than to a group of users. The personalization of an advertisements are based on [4] user profiles and context information.

The delivering of messages to the users are either push or pull type marketing strategy. In this for our framework, because of user willing and need, the push strategy is chosen [12].In push advertising, the messages are proactively [2] sent out to a mobile users, and the SMS is the key players in push based strategy. Some researchers have designed many mobile advertising framework. In this the following metrics have taken. The metrics are Location based service, context aware information need of advertising platform, personalized advertisements push type advertisements, need of consumer's active involvement and that should be targeted advertisements and here in optimized mobile advertising system for location based mobile advertising, instead of mobile agent API used for gathering the information.

III. STRATEGIC FRAMEWORK

Companies may like a platform which will develop a product to reach consumers in timely, effective and in low cost. Usually the consumers would like to receive relevant and useful advertisements. Here we have taken one scenario

about a newly opened shopping mall wants to develop its popularity and high profit. To draw the attention from nearby customers those who are regularly travelling through the way.

In this paper we developed an optimized mobile advertising system for location based mobile advertising. This system works like an intermediate to link companies and users/customers. This system uses personalization and push type technique used to send location based mobile advertising which will filter appropriate customers which will perfectly match with their needs. This system encourages the active participation of users to share their needs to personalize advertisements based on their preferences. The proposed architecture has given in figure 1 which consists of three key units. They are Advertiser unit, User Data management unit, and Advertising processing unit.

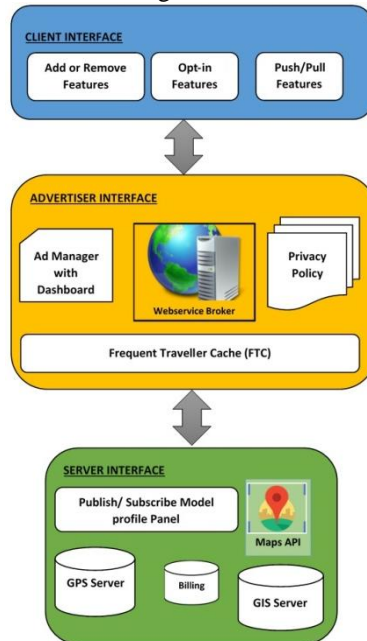


Figure 1. Communication Framework for LBMA

The advertiser unit manages the advertisement content, the user data management unit deals with the profile creation, user intent and updating in the user needs. The Advertisement Processing unit is the important part in the system, here the frequent traveller cache is located, this doing the process of filtering the user based on their regular travelling location, on their interest and their preferences. The flow of data given in figure2

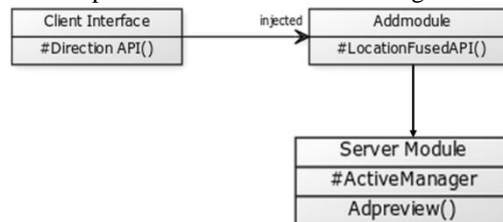


Figure.2 Flow of data in optimized location based mobile advertising

IV. FREQUENT TRAVELLER CACHE (FTC)

As discussed in the framework, The FTC stores the frequently visited location of mobile device. In conventional system each and every time while pushing messages the server has to send to all the smart phone users, where as in our proposed strategy all the frequent visitors were filtered by using FTC. In this way the pushing of messages to the client is appropriate and meaningful. We term this reactive Pushing, since the exact customers getting the benefit.

However any caching technique bring about maintenance cost as well. To keep the frequent visitors information upto date, there is a need of extra cost of storing the information, also it has to inform to the central server whenever updates occur. To calculate the approximate cost we are taking the following parameters. As given in the figure the location based service environment is modelled as consisting the following major entities.

- MD -The client mobile device
- FTC- the Frequent Traveller cache.
- LS - Local server of the cell where the client resides
- LS²- The neighbouring sever (i.e) the local server in neighbouring cells
- S -The central server

While calculating the cost, we have to consider the connection cost also. As per our considerations, the mobile device access he network through a wireless connection to the local server while all other connections between servers are through wired links. As the current technology the cost of a wireless link is always greater than of a wired link. The connection cost between neighbouring servers is relatively lower than the cost of accessing from a remote central server. So for calculating the cost we have taken the following metrics.

- P- The communication cost between client and its local server
- q- The communication cost between the neighbouring servers
- r-The cost of accessing remote server.

Here in a detail analysis of the potential benefit of FTC hose objects in a particular local server based on the information stored in FTC. To prove that the following statistics are followed.

- R - The total number of hits of a device in the same region which stored in FTC.
- T - The total number of updates in FTC about the device location
- H - The average hit rate in the same locations
- a - The average hit rate in the FTC

To push an advertisement to the client din an attempt to minimize the access cost and response time experience by the clients, provided the pushed message should beneficial message to the clients. Pushing of beneficial message with respect to their frequent visit we call this reactive pushing, the server pushes the advertisements only to the selected clients. By this we can determine exactly to how many appropriate clients, the message has to be pushed. With two additional parameters we can calculate the effectiveness of this strategy. The parameters are x and y.

- x - The percentage of device frequently travelled in the same region that to be receive the reactively pushed message
- y - The percentage of updates done in the FTC about their frequent visit.

Here the x percentage clients has to be received message, that cost to be added and there is a maintenance cost also need to be considered for the total updates done in FTC. It must have a lower cost than the conventional system while using the FTC.we therefore have the following formula

$$Rm+R(1-m)xp+R(1-m)(1-x)(p+r)+Ty < Rm+R(1-m)ap+R(1-m)(1-a)(p+r)$$

By simplifying this,

$$Ty < R (1-m)(x-a)$$

Where Ty - the total updates and time spend in FTC.

Which means that if the extra number of maintenance updates due to reactive pushing in FTC is less than the message totally send by the conventional system. Here we note that whenever x increases the y also increases. When the update cost overwhelms when compared to the number of pushed messages sent by the conventional system. This proves that the cost spent for updates and the cost for pushing message is less than the cost used to push message to all the clients using conventional system.

Once the data received from the user profile it stored in database and then goes to the processing unit, then it processing the data with their regular travelling location stored in FTC, then filtering also done using filtering strategy. Finally it will list the customers and also decides to which customers benefit to the company while pushing advertisements.

V. IMPLEMENTATION

The location based mobile advertisement system is built using multiple architecture which comprises of both client and server side models. The system connects with the multiple clients through mobile networks such as GPRS, EDGE, 3G, and HSPA+. The Client interface used for this particular demonstration is Google's open source Mobile Operating System Android (API level 17 equivalent or greater).

Similarly the server side model is equipped with a Postgresql database and Web Framework Ruby on Rails (RoR).The server architecture provides both physical and logical secured access to Postgresql database, authentication features, user location tracking, advertisement management and a slew of administrative features. The server and the client system is connected with the middleware API built using a separate Ruby on Rails API module residing at the server and runs parallel with the administrative web service program.

By using the above implementation Technique, to illustrate the above discussed strategy we use a shopping mall wants to promote its popularity and to gain profit. Initially the shopping mall decided to push some advertisements based on their mobile phone users' location from the mobile network operator without taking any of the user preferences. Then the number of customers and the profit gain is recorded. For the next advertisement the shopping mall pushed advertisement based on their frequent travelling location and the user preferences given in the user profile unit. In this scenario the frequent visit of users recorded to push advertisements to the appropriate users, the extracted location given below.

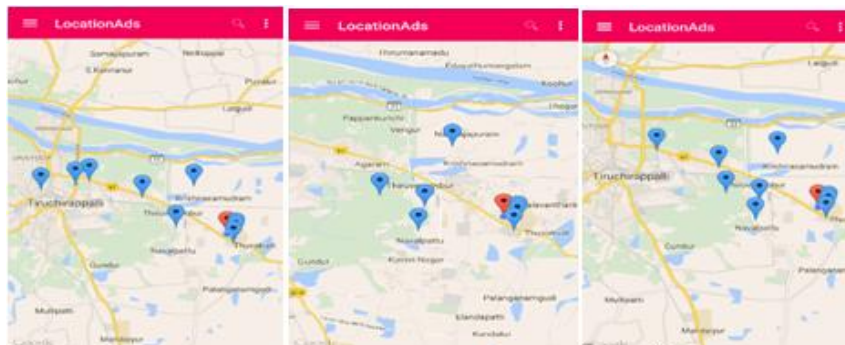


Figure 3

The following table shows the extracted frequent visitors location and the details of the starting and ending latitude, of the users.

| <i>Id</i> | <i>start_point_lat</i> | <i>start_point_lng</i> | <i>end_point_lat</i> | <i>end_point_lng</i> |
|------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|
| 1 | 10.807774 | 78.6805636 | 10.8091422 | 78.6805345 |
| 2 | 10.8091422 | 78.6805345 | 10.8102616 | 78.679639 |
| 3 | 10.8102616 | 78.679639 | 10.8013087 | 78.689838999 |
| 4 | 10.8013087 | 78.68983899999 | 10.7889695 | 78.6963514 |
| 5 | 10.7889695 | 78.6963514 | 10.7903633 | 78.7038527 |
| 6 | 10.7903633 | 78.7038527 | 10.8089053 | 78.7119337 |
| 7 | 10.8089053 | 78.7119337 | 10.8131471 | 78.711964 |
| 8 | 10.8131471 | 78.711964 | 10.7792954 | 78.7850892 |
| 9 | 10.7792954 | 78.7850892 | 10.7580741 | 78.810972900 |
| 10 | 10.7580741 | 78.81097290000 | 10.7568208 | 78.8131794 |
| 11 | 10.7568208 | 78.8131794 | 10.7579651 | 78.8132929 |
| 12 | 10.7579651 | 78.8132929 | 10.7579382 | 78.8121735 |
| 13 | 10.7579382 | 78.8121735 | 10.7624644 | 78.8120244 |

VI. CONCLUSION

Location based advertising offers identical, pervasive and timing based services to customers, with the enormous growth of smart phones. It becomes convenient to deliver location based mobile advertising to specific customers, This system being act as an intermediate between companies and customers in an effective, efficient and optimized way of service to get higher profitable way. In this paper we proposed an optimized mobile advertising system for identifying user desires to provide relevant advertisements. This system will be an interactive one which benefits both customers and companies. This system pushes advertisements on the basis of frequent visiting location, context and preference given by the user .The graphical representation and implementation shows the effectiveness of the system. In this technology the information are more personalized, here the drawback is protection of privacy. In future we will be working on how the effective location based mobile advertising can be done with protection of privacy.

REFERENCES

- [1] Kai Li, Timon C. Du, Building a targeted mobile advertising system for location-based services Elsevier Decision Support Systems 54 (2012) 1–8.
- [2] Shioh-yang, Wu Kun-Ta Wu, Dynamic Data Management for Location Based Services in Mobile Environments, National Dong Hwa University
- [3] D.J. Xu, S.S. Liao, Q. Li, Combining empirical experimentation and modeling techniques: a design research approach for personalized mobile advertising applications, Decision Support Systems 44 (2008) 710–724
- [4] P. Barwise, C. Strong, Permission-based mobile advertising, Journal of Interactive Marketing 16 (1) (2002) 14–24.
- [5] J.S. Breese, D. Heckerman, C. Kadie, Empirical analysis of predictive algorithms for collaborative filtering, in: S.M. Gregory, F. Cooper (Eds.), Proceedings of the Fourteenth Conference on Uncertainty in Artificial Intelligence, University of Wisconsin Business School, Madison, Wisconsin, 1998, pp. 43–52.
- [6] Carat Interactive, The future of wireless marketing, White Paper, Boston, MA, available at: http://www.bjoconsulting.com/download/Wireless_WhitePaper.pdf, 2002.
- [7] Y. Li, B. Steinberg, Sales call: more advertisements hit cell phone screens, Wall Street Journal, Eastern Edition 247 (27) (2006) B3
- [8] Mobile location based services marketing white paper, www.mmaglobal.com, Location Based Services. White Paper ©Mobile Marketing Association 2011.
- [9] F. Sultan, A.J. Rohm, How to market to generation mobile, MIT Sloan Management Review 49 (4) (Summer 2008) 35–45.
- [10] S. Okazaki, How do Japanese consumers perceive wireless advertisements? A multivariate analysis, International Journal of Advertising 23 (4) (2004) 429–454.
- [11] C. Peters, C.H. Amato, C.R. Hollenbeck, An exploratory investigation of consumers' perceptions of wireless advertising, Journal of Advertising 36 (4) (Winter 2007) 129–146.
- [12] A.K. Tripathi, S.K. Nair, Mobile advertising in capacitated wireless networks, IEEE Transactions on Knowledge & Data Engineering 18 (9) (September 2006) 1284–1296.
- [13] M.M. Tsang, S.Ho, T. Liang, Consumer attitudes toward mobile advertising: an empirical study, International Journal of Electronic Commerce 8 (3) (Spring 2004) 65–78.
- [14] E. Turban, D. King, J. Lang, Introduction to Electronic Commerce, Second edition Prentice Hall, 2009.