Secured user Participation in Offline Event Marketing using Location Based Social Network and Participant Interest

J.Deepa, A.Merry Ida, D.Ramya

Abstract— Online event marketing connects the offline market with the online world. This sends invitation to the people by using the online social media indicating about the offline business which helps for social gathering. This paper gives an idea to the marketers to improve effectiveness by carefully choosing the invitation of sponsored offline events through the location-based social networks. This framework also produces a platform where one user can interact with another through a secured chat channel, thus adding the customer base with customer-customer interaction.

Keywords—LBSN, PP, Node, Neighbour.

I. INTRODUCTION

Offline event marketing has gained lot of popularity recently. This system makes the people to participate in a sponsored gathering which allows the marketers to be in a close relationship with their present customers. The efficiency of the offline event marketing makes the offline merchants more benefited [1]. Nowadays, Social networks have become one of the most effective marketing channel by means of their low cost and easy accessibility[7]. An Event can have the following attributes:

1) Location: The place where the event is going to be held.

2) Products: The products sold or the sponsored item.

3) Scale: Expected number of participants.

4) Others: The event duration, event description etc.,

The main concepts of this paper are as follows:

a) We introduce a user-to-user communication channel. This communication channel will be secured, and it also hides the profile info about the user.

b) The location of the user decides the invitees for the event. Thus the merchant can concentrate on inviting the people who are within the markets range.

c) The users does not receive any duplicate invite, since the duplicates are removed automatically.

d) The acknowledgement system accounts to accurate calculation of the number of participants.

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Table 1 Notations

Symbol	Description
USER	Universal user set
Uj	A customer,uj€USER
Nuser	User number
VENUE	Universal set of venues
vk	A venue,vk€VENUE
ti	An item
NSCALE	Scale of users
f(uj,ui)	Is Friend of ui
d(uj,vk)	Distance between customer and venue
X	A solution

II FRAMEWORK

The notations used in this paper are given in the table as follows. USER= {u1, u2…..uNUSER} is the customer set, and VENUE = {v1, v2….vNVENUE} is the venue set, where NUSER is the user number and Nvenue is the venue number. The scale is denoted as NSCALE.. The distance between the user and venue are calculated to find the invitees. The friend of a user is found out using the function f(uj,ui). A solution is found after finding the users within a location, calculating the scale of users [2].

A. Abbreviations and Acronyms

LBSN- Location Based Social Networks, PP- Privacy preserving.

The system has two types of inputs: 1) The user- generated data from LBSNs and 2) the list of requirements from marketers. Finally a solution set with the number of participants is calculated.

The Existing system that uses Online social networks for participants selection for the event by means of posting an event for the users based on the users location, first-come first- serve(FCFS),more influenced people first, nearest first(NF),Random selection etc…and that does not lead to the more effective way of success of event[3]. The factors that considered for participant selection are distance, user interest (items covered by the user), influencing factor, etc….

The participant are selected only by means of user historical data such as regular visiting places, users interest, items that covered by the user, number of other user influenced by the user in case to limit the visiting of the event

to their required amount. And there may be chance of accounting the one user more than once while the user is influenced by more than more than one user.

B. Marketing strategies

The event provider post the ad's in the offline social media regarding the event agenda such as Location, Served items, scale, type of events, limitations to participate etc… in the ad . After choosing the participants the expected marketing maximization is calculated and chooses the better way of selecting the participants and implementing the methods.

The social media plays a major role in advertising the events that are to be held offline rather than any online contest or events[4][5][6]. This offline marketing concept has drawn a huge audience towards the targeted product such that the product sees a drastic improvement in the sales as well as production sectors[8].

The marketers target a particular group of audience that those audience may either be nearby or attracted by their own interest towards the event or the product and as well as the friends influence[9]. These are the influencing factors by which marketers of any company rely on maximizing their own customer or client base which in turn going to help them with the profit maximization of the company[10]. These profit maximization can be calculated by various constraints according to the customer's participation in an event

1) The scale limitation is the participant number that equals the planned scale

$$\sum_{j=1}^{N_{USER}} x_j = N_{USER} \quad (1)$$

2) The item coverage limit is the tags of the participants who can cover all venue tags

$$\forall^{NTAG}\ t_i \sum_{j=1}^{N_{USER}} x_j t_i(u_j) \geq t_i(v_k) \quad (2)$$

3) Let E(X) be the marketing effect of a solution X.Our target then is to maximize this value

$$arg_x\ max\ \mathrm{E(x)} \quad (3)$$

The profit effect maximization can be obtained by greedy algorithm or metaheuristics such as simulated annealing (SA)

Simulated annealing is adopted because it is easily implemented in this kind of scenario. Genetic algorithm have also been attempted to be in use, but the results were not up to the expectations and we failed to find an easy way to generate several available solutions (i.e., population) in the initialization, crossover, or mutation step because the available solutions are very sparse in the corresponding vector space. Nevertheless, the efficiency of the maximizing algorithm is not a key issue in this paper. We focus only on demonstrating that this problem can be approximately solved in an acceptable running time.

Set $t_{max}; t_{min}; down;\ iterateTimes;$
X = initialSolution();
E = E(X);
t = t_{max};
while t > t_{min}
for iterate = 1:iterateTimes
[newX,deltaE] = neighbor(x);
If deltaE > 0 || rand < exp(deltaE / t)
X = newX;
E = E + deltaE;
end
end
t = t * down;
end

Algorithm 1: Marketting Effect Maximum Based on SA

Fig 1. Various events showcased in a map.

In the above figure, it is clearly visible that there are many events and happenings around a locality of New York City.

In this map, the events are generated using different elements so that it enables the customer or client to view it clearly. Marketers keep an eye on their client's interests and activities and make the people around the area to become their potential customers[11]. Various services provided by the shops attract the customer which in turn increases the growth of the merchant. By this way, the potential customers can be attracted towards the product.

The ads posted in various social networks like facebook, twitter, tumblr, pinterest, google +, foursquare, etc. are used to promote offline events via online[12].

The location based social networks works on proximity level and enables the users to make a connection with other users within the same location. The user may able to get the updates and related happenings in that location.

In the proposed system, the users can able to receive the relevant information about the events and any other product offers via a mobile application[13]. The received ads will be based upon the user's interest. The major advantage of this system is that the interested customers are targeted, making it a high probability of the invited customers to attend the event.

III. PROPOSED SYSTEM & RESULTS

In the existing system, the problems include multiple invites to the same customer which means the same user is invited for the same event for multiple numbers of times. This causes spamming of the users. This happens mostly in the situation like, if a friend who receives ads from the merchant for a particular event shares the ad with his another friend who have already received the invite from the same merchant for the same event. Also, there is no accurate way of calculating the total number of participant in an event[16][17]. Hence, in proposed system, multiple

exclusion algorithm is used to eliminate the multiple invites sent to the same user and accurate calculation is done.

The current system faces the possibility of privacy violation as the merchants can view each user's profile and misuse the user's personal information[18]. In the proposed system, privacy preserving algorithm is used for profile matching as well as to secure the user's privacy.

The Merchants posting the Advertisement can able to view the user's personal details for the purpose of the efficient participant selection. Here the user is in need to make visible to receive the advertisement based on their interest. But this condition violates the security policy of the user. The privacy preserving algorithm is applied to achieve the privacy condition of the user. The user profile is generated as an equivalent profile matrix and the merchant posting the advertisement is also converted as a profile matrix. And the remainder vector, hint matrix, profile key are generated from the profile matrix. If only the user's remainder vector matches with the merchant's remainder vector with certain threshold value the advertisement get posted to the user. And the advertisement get broadcast from the user to their friends only based on the same strategy.

The merchant's side profit is concentrated and there is no communication between the users in the existing system. Only participant's selection on merchant side is mentioned. The users are given the chance to communicate with each other, only if both are interested to chat with each other. In order to satisfy the privacy policy of user, the user's details are not even shared among the user by default. The privacy preserving algorithm is also applied for the user chatting if the users get interest to share the personal information with the stranger. Being it is an offline social network the user is able to communicate with the neighbor strangers alone.

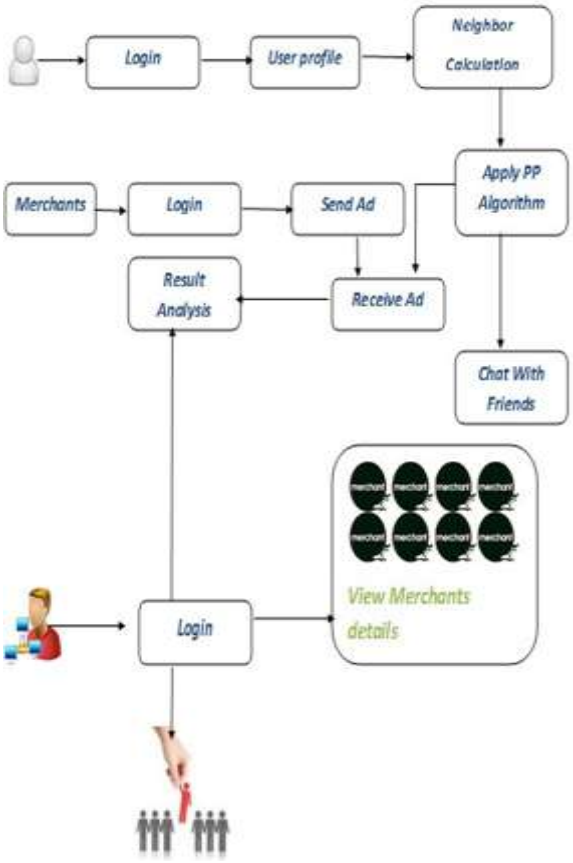

Fig 2. Architecture of the proposed system.

A. Architecture

In this system, there are three actors involved namely the users, the admin and the merchants. The user login through the mobile device, where the events connect with the application. Through this mobile application, the user enters the credentials to successfully login to the system. The user can update their own profile details. The location of the user is calculated based on the longitude and latitude of the mobile devices and this leads to the neighbor calculation[14][15]. By applying privacy preserving algorithm, the users with same interest are matched and a secured chat connection can also be established based on the user's request. Merchants present in that particular location can able to view the product listing ads and can post them to all the users in that network. Admin analyze with the result produced and has the right to add or remove the merchants.

B. Privacy preserving algorithm

In enhancing the security and to match the users based on their interest, privacy preserving algorithm is used. After matching, the user's interest neighbor list as well as friends list are generated. The users in the same location or in the same store or mall are shown as neighbor to the existing users logged in to the mobile application and location of the users must be shared in order to generate the neighbors list. The friends list is generated based on the interest of a particular user. This interest is of temporary interests such as reading books, shopping, playing sports, etc. A user can send a chat request in order to communicate with any stranger who matches the user's interest and a secured chat server is established between the different users. The user can even request to share the profile information to the other users if the user on the other end is trustworthy. Whenever the user request for the profile information, privacy preserving algorithm is applied and the profile matrix is generated. From this profile matrix, hint matrix is generated with reference to the temporary user interest. The messages are encrypted with profile keys and then sent to the user at the other end. The remainder vector consists of the user's interest and by comparing this with the other users, friends list can be generated and if the request is successful, the messages are decrypted.

```
//sender
if neighbour > 0
prof_matrix = req % 7;
hint_matrix = prof_matrix;
remainder_vector = prof_matrix % 7;
profile_key = prof_matrix % 7;
//encrypt the message by calling encrypt(),
Encrypt_msg = encrypt(profile_key,secret_msg);
//send the package using
Send_Package(hint_matrix,remainder_vector,encrypt_msg);
end
```

Algorithm 2: Privacy preserving algorithm at sender's end

```
//receiver
reveive()
```

hint_matrixR = hint_matrix
remainder_vectorR = remainder_vector
encrypt_msgR= encrypt_msg
//compare the received and calculated remainder vectors,
if remainder_vectorR = remainder_vectorS
calculate profile key,profile_keyR = request_profile(remainder_vectorR,hint_matrixR)
//decrypt the message using decrypt_msg(profile_keyR,encrypt_msg)
end
break and proceed to next profile
end

Algorithm 3: Privacy preserving algorithm at receiver's end

C. Modules

The modules that are used in this system are as follows

1. Node creation and Neighbor calculation.
2. Applying Privacy Preserving Algorithm and Chatting Between users.
3. Event distribution and communication with the mobile node.
4. Participants selection and optimization calculation

1. Node creation and Neighbor calculation.

The Nodes that we create are said to be the mobile nodes. The location of the nodes are calculated only by means of the latitude and the longitude of the particular node. Being an offline social network, the node can communicate with the other node only if the node is neighbor to the desired node. The neighbor is calculated between any two users by means of its latitude and longitude. By defining a range to the node and if the new node comes under the range of that node, then the two node is said to be the neighbor nodes.

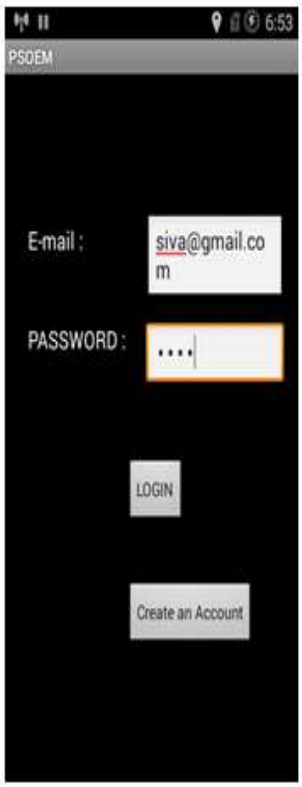

Fig 3.Login page

Fig 4.location tracker

2. Applying Privacy Preserving algorithm and chatting between the users:

The Privacy preserving algorithm is the way of communicating with the stranger through the secure channel. The user is not needed to share their personal information for the strangers to find them. After finding the strangers with their interest, they may communicate (chat) with the stranger through the secure channel. The interested user may share their profile information with the stranger.

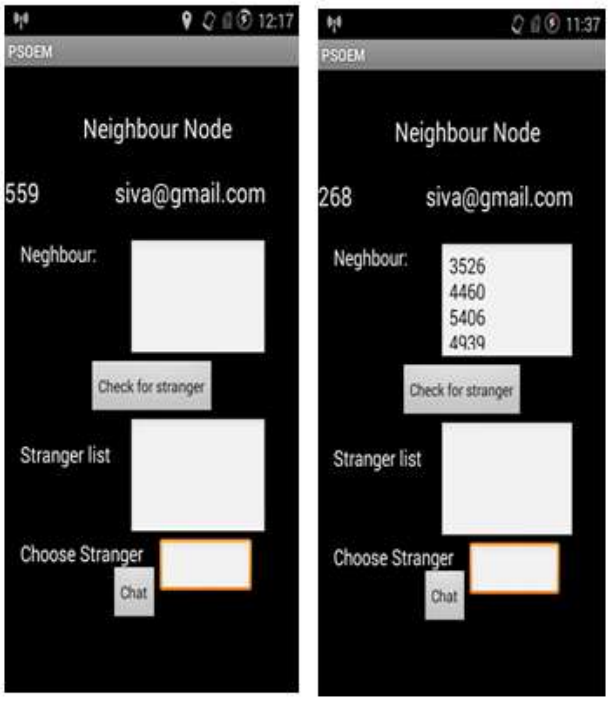

Fig 5.Neighbour nodes

Fig 6.Sending chat request

3. Event distribution and communication with the mobile node:

The mobile node can communicate with the other MANET node that we create. The MANET node gets the latitude and longitude from the mobile node. The event distribution is to advertise the event with the information such as date and time, venue, type, etc. by the event provider.

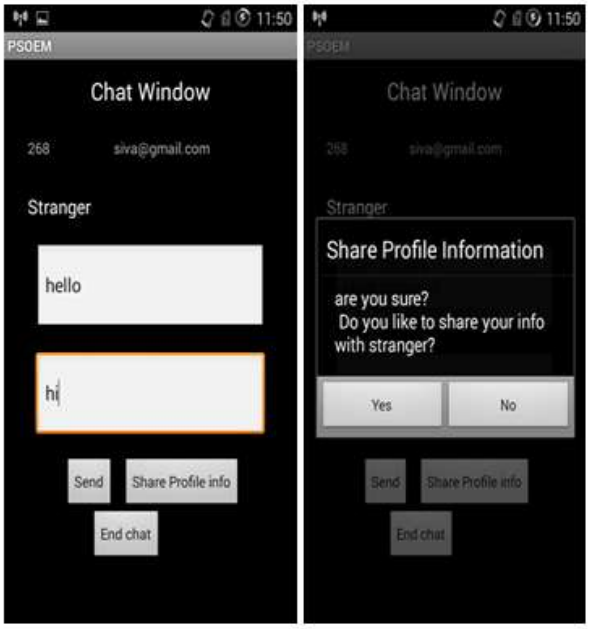

Fig 7.Chat window

4. Participants selection and Result optimization:

To reduce the number of participant to the required amount by the event provider, they select the participants based on the business maximization as a main objective. In that case we apply the same techniques to choose the participants with the same interest as event and influencing the other friends and some other maximization problem.

By checking the possibility of participant selection the business maximization is calculated and the best solution is selected.

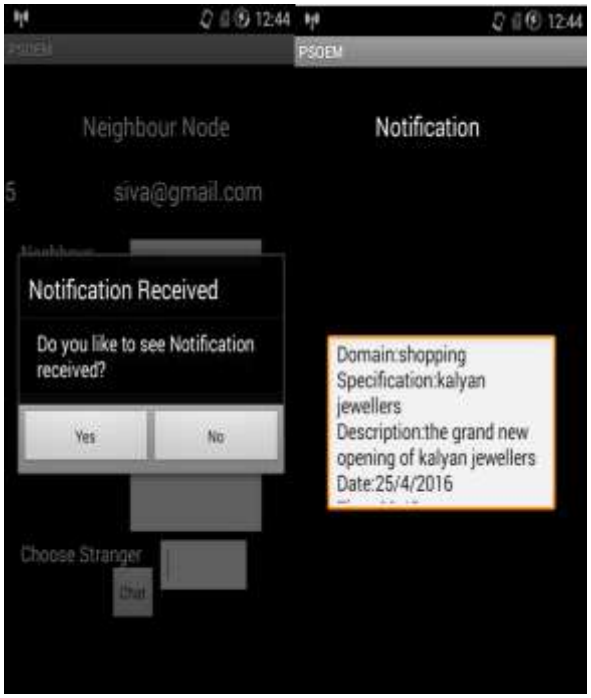

Fig 8. User receiving notification.

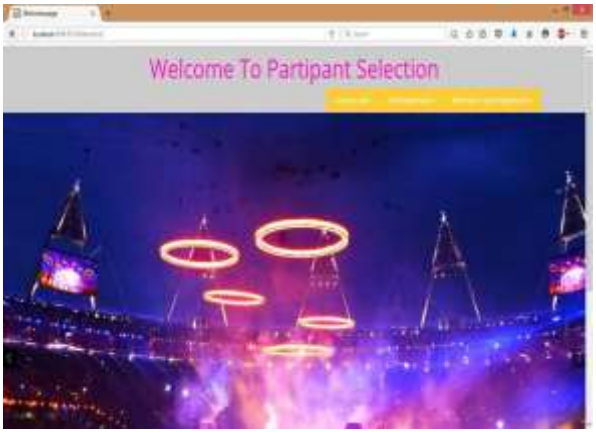

Fig 9. Admin login.

Fig 10. Merchant list

IV CONCLUSION

The participant selection can be done efficiently to maximize the business development. The users can communicate with each other based on their interest but without exposing the interest as a public factor. Thus connection between offline and online world is established through a secured channel of communication between the users.

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