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A User Feed Back Approach for Recommendation in Personalized Mobile search

N. Jagadish Kumar

Department Of Computer Technology, Madras Institute of Technology, India.
Jagadishiva@gmail.com

ABSTRACT- *Mobile device interaction with users serves various purposes such as a location service, road map, traffic information, etc. It also helps users connect to the search engines. But the search query is limited to small words, unlike those used when interacting with search engines through computers. In most cases the information retrieved through mobile search is also not relevant to the user query. This leads to a major drawback for the user to communicate through mobile devices to the web server, as there are limitations in the form factor of mobile devices. To overcome this issue in mobile search several researchers have been conducted to build a solution to personalize the mobile search. Personalized mobile search is an effective way to retrieve query result for each user according to his/her interest. The existing personalized mobile search focused only on ontology based search and location based search to retrieve the relevant web document which is not user preference. Hence the objective of the proposed work is to integrate a user feedback mechanism to the existing personalized mobile search. Here the feedback given by the user in the form of ratings for the particular personalized search result is considered as the opinion of the user. With this opinion user's interest in particular search is analyzed and the user is collaborated with the similar interest users, who comes under same age and gender category. Thus the personalized mobile search proposed in this work will be able to provide user preference search based on his/her opinion and feedback search based on the opinion of another user with similar age, gender and interest.*

KEYWORDS: Personalization, User profile, User interest, Content mining, Location mining, Ontology mining, Re-ranking.

1, INTRODUCTION

The data and information available on the web are growing like a huge island of data where most of the data are unuseful and not to the interest of the user's trying to retrieve web data through search engine only because of this user has to spend a lot of time in searching for required information. The main drawback in today's search engine is it makes the first-time user who has no past history or specific interests to suffer randomly in search. This essentially means that when two different users with different interests type in the same query, they will be shown the same result even though their requirement might differ for an instance, a housewife and an iPhone user interpret "apple" differently in the search context. A housewife is likely to

know the apple variety and apple farms in and around the surrounding. While the iPhone user is interested in service and products related to iPhone. Researchers studied different methods and models to determine the query ambiguity. The search engines should, respond to the search queries of different users in different ways Based on the user's characteristics. This is known as "Personalization of Search Results" Personalization attempts at giving the user what he wants without asking him explicitly for it. This paper is structured as follows: Section II presents the related work in existing Personalized Framework. Section III Contains the stages in building the proposed personalized framework with required computing algorithms. Further,in section IV discussed about Implementation details and Result. Finally ,section V is the Conclusion and future enhancement of the work.

2, RELATED WORK

2.1 Existing Personalize Search Framework

The Personalized mobile search engine is an inventive approach for personalizing web search results. By mining content and location concepts for user profiling, it utilizes both the content and location preferences to personalize search results to a user.

K.W.-T. Leung et al. [1] Has proposed a new web search personalization approach that captures the user's interests and preferences in the form of concepts by mining search results and their click through. Due to the important role location information plays in mobile search, they separate concepts into content concepts and location concepts, and organize them into Ontology's to create an ontology-based, multi-facet (OMF) profile to precisely capture the user's content and location interests and hence improve the search accuracy.

K.W-T. Leung et al.[2] has proposed a framework that supports mining a user's conceptual preference from users' click through data resulted from web search. In the framework, an extended set of conceptual preferences was derived from a user based on the concepts extracted from the search results and the click through data.

K.W.-T. Leung et al.[4] proposed a new approach for personalization that combines all their previous work [1] [2] and existing framework and security based approaches [3] and incorporate context revealed users' locations (positioned by GPS) are used to supplement the location concepts in the personalized framework.

3, PERSONALIZED MOBILE SEARCH

The process flow shown in the fig1 is derived from the existing work of K.W.-T. Leung et al. [4] With an additional contribution of opinions from the user's for the search result in the form of ratings to the feature vectors.

3.1 Stages In Developing Personalized Mobile Search Middleware

(I) Building User Profile

The Objective of user profiling is the creation of an information base that contains the preferences, characteristics, and activities of the users. A user profile can be either static, when the information it contains rarely altered (or) never be altered (or) dynamically when the user profile's data change frequently. Such information is obtained both explicitly using online registration forms and questionnaires such as name, age, sex, likes, and dislikes resulting in static user profiles, or implicitly by recording the navigational behavior or click through behavior and the preferences of each user, resulting in dynamic user profiles.

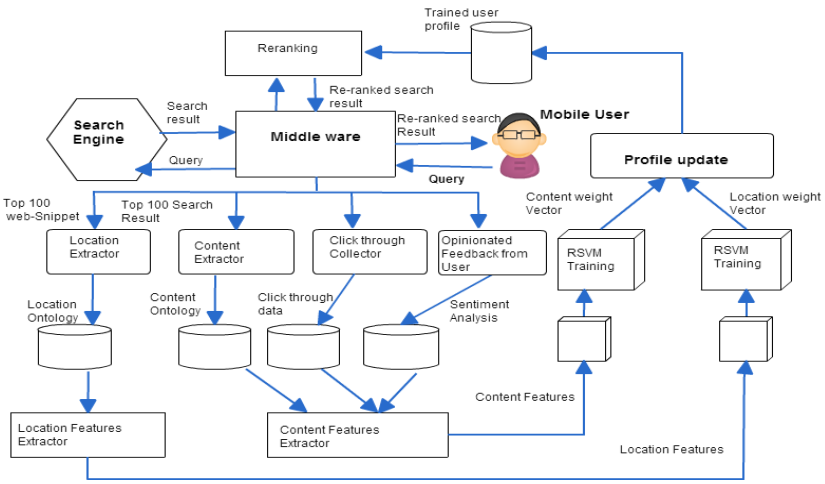

Fig:1 The Process Flow Of personalized Mobile search

(II) Ontology Mining

The depicted personalized middleware should have the capability to extract both the content concept and location concept from the search result,according to the user preference, and also to build a model to capture the relationship between the concept called ontology information and this ontology information is stored in a separate database.

Content Concept Extraction

According to K.W.-T.Leung et al. [4] The following formula used to measure the importance of particular keyword/phrase *ci* with respect to query *q.*

$$support(Ci) = \frac{sf(Ci)}{n} \cdot |Ci| \quad (1)$$

Where $sf(Ci)$ is the snippet frequency of the keyword/phrase *ci* ,*n* is the number of web-snippets returned and $|Ci|$is the number of terms in the keyword/phrase *ci*. If the support of a keyword/phrase *ci* is higher than threshold value we determined we treat *ci* as a concept for *q.*

Ontology formulation techniques:

(a) Similarity. Two concepts which coexist a lot of the search results might represent the same topical interest.

$$if\ coexist(ci, ci) > \delta(\delta\ is\ the\ threshold\ value) \quad (2)$$

(b) Parent Child Relationship. Generally a child concept will often occur with a parent concept, for example a child concept Mango tends to occur with the parent concept fruit at the same time the parent concept fruit will also occur with other child concept like watermelon, strawberry e.t.c.

$$if\ pr(cj|ci) > \delta(\delta\ is\ a\ threshold) \quad (3)$$

(III) Location Mining

In personalized mobile search location mining is highly important generally a mobile user has a IP address to his/her device which is unique and that can be used to trace the exact location details of that user based on Latitude and Longitude (spatial data) ,in the advancement of smart devices,GPS tracking is used to show the current location of the mobile user accurately, thus in personalization, user interested location is gathered in a database by tracking the mobility of the user either by IP of their device or GPS tracking during their visit to different places. For example a user searching for a nearby hotel will give preference to the content whose location information is closer to the user mobile area. This distance can be calculated using haversine formula. Haversine Formula for finding distance based on latitude and longitude expressed in terms of a two-argument inverse tangent function to calculate the great circle distance between two points on the Earth.

dlon = lon2 - lon1

dlat = lat2 - lat1

$$a = \left(\sin\left(\frac{dlat}{2}\right)\right)^2 + \cos(lat1) * \cos(lat2) * (\sin\left(\frac{dlon}{2}\right))^2 \quad (4)$$

*c = 2 * atan2(sqrt(a), sqrt(1-a))*

*d = R * c (where R is the radius of the Earth*

(IV) Collaborative Filtering Algorithm For Mining Opinions.

According to Xiyuan Wu et al. [5] Collaborative filtering systems invite users to rate objects or and then return information that is predicted to be of interest to them. This is based on the assumption that users with similar behavior (e.g. Users that rate similar object) have analogous interests. Assume U is the set of all the users. For each $u_i\ \varepsilon\ U$. R_i Is the set of the resources (search results) that u_i Clicked. $R = \cup R_i$ So we obtained the matrix M.

In the Matrix, $u_i \varepsilon U$ and $R_i \varepsilon R$ where M_{ij} Is the Recommendation value of user u_i To item r_j The recommendation or opinion can be given in the form of rating explicitly like grades say from (1 to 5) or implicitly by considering no of clicks. If no rate given or no click on the item r_j By the user $u_i.M_{ij}$ The value is set to 0.

$$sim(\overrightarrow{u_i}, \overrightarrow{u_j}) = \cos(\overrightarrow{u_i}, \overrightarrow{u_j}) = \frac{\overrightarrow{u_i} \cdot \overrightarrow{u_j}}{|\overrightarrow{u_i}| \times |\overrightarrow{u_j}|} \quad (5)$$

Where $\underset{ui}{\rightarrow}$ Is the vector $(M_{i1}, M_{i2}, \ldots M_{in})$ And $\underset{uj}{\rightarrow}$ Is the vector $(M_{j1}, M_{j2} \ldots M_{j3})$ For each user u_i, we compute the set of its nearest neighbors as c_i And its recommendation value R_{ij} To item r_j Based on Ci then we record the value R_{ij} In the i-th row and j-th column of matrix M_{out}.

$$R_{ij} = \begin{cases} M_{ij}\ if\ M_{ij} \neq 0 \\ P_{ij}\ if\ M_{ij} = 0 \end{cases} \quad (6)$$

$$P_{ij=} \frac{\sum_{c \in C_i} sim(u_i, c) \times M_{cj}}{\sum_{c \in C_i} |sim(u_i, c)|} \quad (7)$$

When a user, u send a search query, we first get the search result. And for each search result ,we Check the corresponding recommended value in the matrix M_{out}.If r_j Is not contained in the matrix M_{out} Its recommendation value will be set at 0. Then we update the matrix M when User u has clicked any search results or explicitly add a grade value the matrix M_{out} Will be updated in an iterative way.

4. IMPLEMENTATION AND RESULT

The implementation device of the system is an Android smart phone since it's an Android application. The application was designed using C# .net with Mono for Android. SQLite is the database system. Fig:3 shows the implementation process of personalized mobile search with the user feedback approach

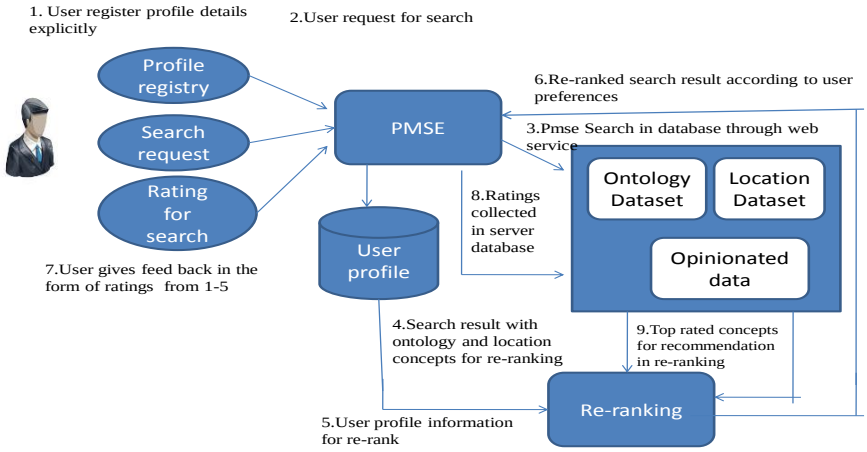

Fig: 2 Implementation process flow of Personalized framework.

4.1 Result Scenario

The below Fig4: shows the personalized search result screen of a user john's scenario.

Fig:3 PMSE search result and Feedback gathering screen

The Location details of this example scenario are based upon Chennai region, which is in the southern part of India.

User name	Age	Gender	Current location	Location Coordinates
John	28	Male	Anna Nagar (Chennai)	13.0846Lat /80.219 Lon
Sham	26	Male	Anna Nagar (Chennai)	13.0846Lat /80.219 Lon

Table-I :Profile,details of two PMSE user from Same Location

John a PMSE (Personalized Framework) user as shown in Table-I is searching for a Hotel from a New location he travels to example Anna Nagar (Chennai),but their available only Fast food Restaurants in majority, Generally a typical search engine will display any other Hotel information located somewhere else from its current location because it can't classify ontology information in the web database. Were as PMSE can understand the relationship between restaurants and hotel and it will display the restaurant details in prior to the hotels located far from its current location. Similarly,john search for Theatre and Shopping mall, etc. and allowed to give feedback in the form of ratings from (1-5) as shown in Fig3.

User	Search Query	Search Result	User ratings
John	Hotel	Hotel Saravana Bhavan (Anna Nagar) KFC Restaurant (Anna Nagar) Marry Brown (Villivakkam)	- **5** -
	Theatre	PVR cinema(Anna Nagar) Abirami Theatre (Purasaiwalkam)	- -

		AGS Cinemas (Villivakkam)	**5**
	Shopping Mall	SKY WALK (Anna Nagar) BIG BAZAR (Nungambakkam) MEGA MART (Arumbakkam)	**5** - -

Table-II : User john's search result for his queries and his ratings for the search result

Table-II shows user john's search interest and the corresponding ontological result of his search based on his current location. Since John is interested in KFC restaurant located in his current location he rated 5 for it, similarly he is interested in a theatre in villivakkam is the place near to his current location and he rated 5 for it and same for shopping mall too. With this rating john's interest is gathered in user profile and used for future queries. Similarly, another user who gives the same query from same location will provide with opinionated result on top .If he also rate same value for the same set of results as like previous user, he will be collaborating on a group that based on his interest and ratings, from their his other interested area's are also predicted and shared as a Recommendation during his search as shown in Table-III.

User	**Search Query**	**Search Result**	**User ratings**	**Recommended Results**
Sham	Hotel	KFC Restaurant(Anna Nagar) Hotel Saravana Bhavan (Anna Nagar) Marry Brown (Villivakkam)	**5** - -	AGScinemas(Villivakkam) SKY WALK(Anna Nagar)

Table-III : Opinionated result on top and Recommended result that Sham may interested based on his ratings

5, CONCLUSION & FUTURE WORK

This paper presented a hybrid approach of Building the personalized mobile search framework over four stages (1) Building user profile.(2) Extracting ontological information for the user query (3) Extracting location details for the user query (4) Re-rank the search result ,according the user profile.(5) Gather user feedback in ratings and then collaborating same interest user's based on their ratings and predicting items they may interest based upon the user profile for future queries. In this work, the collaboration of same interest user based on the rating is focused only on location details of the user profile. In future work this collaboration can be done by focusing gender and age in the user profile along with location details to provide more accurate suggestions for their search.

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BIOGRAPHY:

I am Jagadish Kumar.N, Completed M.E (Computer science) In Madras Institute of Technology (Anna university). I have around 8 years of experience in Teaching & Training, Currently working as an Assistant Professor in a Reputed Engineering College,In the past ,I was a Corporate Trainer for 4 years in Data Warehousing & Oracle DBA. My research Interest is in the area of Business Intelligence & Data mining.