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Intelligent Web Recommender System Based on Semantic Enhanced Approach

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Abstract- Today'sworld the growth of the Web has created a big challenge for directing the user to the web pages in their areas of interest. This paper has presented a new method for better web page recommendation through semantic enhancement by integrating the domain and Web usage knowledge of a website. There are three different models are used, first model is ontology based model, second model is semantic network model and third model is Conceptual prediction model which is used for automatically generate a semantic network of the semantic Web usage knowledge.

Keywords- *Semantic network, ontology, Web usage knowledge*

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1. INTRODUCTION

The growth in the size of the World Wide Web (WWW) has made it the place of tremendous interest for the e-commerce, Web services and Web information system. Research is being done enormously in order to maximize the advantage of using the web sites for such web based applications. It is the ability of a site to keep visitors at a deeper level as well as to successfully guide them with useful information, which is viewed as a key point in site's final success. However lacking in the size, structure and complexity of the Web, it is the challenging task to access the relevant information efficiently.Effectively predict the Web page of website is the objective of Web page recommender system. Web page recommendation shows the links to different topics like books, stories, places or most viewed pages at websites.There are different issues arises when developing an effective Web page recommender system such as, how to learn from historical data, how to discover different patterns, domain knowledge from available data and how to use the data for better Web page recommendation.

There is one more important issue arises when Web page recommendation fully based on Web accesses sequences which is learnt from the Web usage data means predicted pages are limited within the discovered Web access sequences called as "new page model can be incorporated into a Web-page recommendation process.

2. LITERATURE SURVEY

In literature various data mining techniques are being used to model and understand the Web user activity based on web usage [3], [X]. Web Usage Mining processes are divided into three inter dependent stages: pre-processing, pattern generation and pattern analysis.Jespersen et al. [12] proposed a hybrid approach for analyzing the visitor click-stream sequences. A combination of hypertext probabilistic grammar and click fact table approach is used for Weblog mining that could also be used for general sequence mining tasks. According to Sebasti'an A-R' ios [6] Concept based approach allows obtaining results closer to visitors real browsing preferences, the main goal is discover concepts or topics to describe each document automatically. Using Web log mining technique rank algorithm is used for ranking the pages, hence the popular and relevant pages gain the upwards position in the recommendation list. [8]

3. WEB-PAGE RECOMMENDATION MODEL BASED ON SEMANTIC KNOWLEDGE

For better Web-page recommendations, need semantic Web usage knowledge which can be obtained by integrating the semantic network (TermNetWP) or domain knowledge model (DomainOntoWP) withWeb usage knowledge that can be discovered from Web log files using a Web usage mining knowledge. By integrating the FWAP means Frequent Web Access Patterns with DomainOntoWP or TermNetWP and the result in a set of frequently viewed term patterns (FVTP) as shown fig.

problem" Semantic enhanced approach becomes more popular because it is effective to overcome the new page problem. Domain ontology and the use of domain knowledge play an important role in semantic enhanced approach. Integrating Web usage knowledge with the domain knowledge can enhances the performance of recommender system. Semantic domain knowledge acquisition and representation is the one of the big challenges that facing these approaches. Manually construction of ontology is also challenging task for large size websites. Automatic construction of ontologies can save time and discover all possible concepts within a website, and the resultant ontologies are reusable.

To provide better Web page recommendation this paper presented new method which is based on Web usage and domain knowledge, and supported by three new knowledge representation models.

I. An ontology based model

In this model domain knowledge of a website is represents. The construction of this model is semi-automated so the efforts from the developers can be reduced.

II. A semantic network model

This model also represents the domain knowledge and construction of this model is fully automated, so this

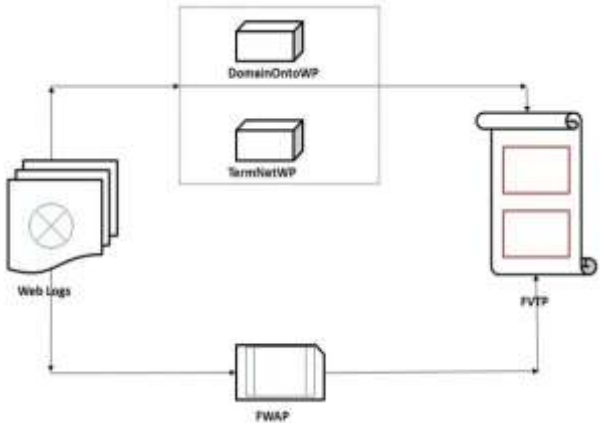


Fig.1 FVTP Search

Conceptual Prediction Model:
CPM is proposed to automatically generate a weighted semantic network of frequently viewed terms with the weight being the probabilities of the transition between two adjacent terms based on FVTP .We refer to this semantic network as WebNavNet.

III. A conceptual prediction model
This is a navigation network of domain terms based on the frequently viewed Web-pages and represents the integrated Web usage and domain knowledge for supporting Web-page prediction. The construction of this model is fully automated.

It has two important elements: state nodes and the relations between the nodes. CPM is developed as a self-contained and compact model. It has two main kinds of elements: state nodes, and the relations between the nodes. One node presents the current state, e.g. current viewed term, and may have some previous state nodes and some next state nodes. By scanning each term pattern $F \in \boldsymbol{F}$, each term becomes a state in the model.

There are also two additional states: a start state, *S*, representing the first state of every term pattern; and a final state, *E*, representing the last state of every term pattern. There is a transition corresponding to each pair of terms in a pattern, a transition from the start state *S* to the first term of a term pattern, and a transition from the last term of a term pattern to the final state *E*. The model is incrementally built by processing the complete collection of FVTP.

CPM acts as a formatter between the WebNavNet and FVTP. The transition probabilities in the CPM schema can be updated based on the first-order or second-order probability formula. Predictionn of next viewed term or previous viewed term is possible using the WebNavNet.

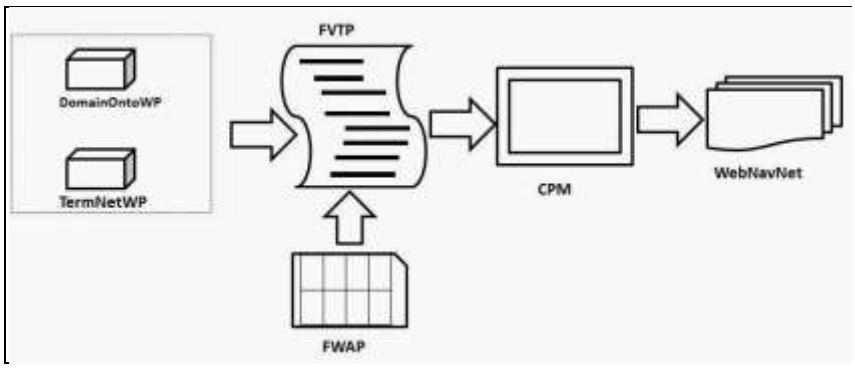


Fig.2 Term Prediction Process

Algorithm:

Building WebNavNet

Input: (FVTP)
Output: *M* (WebNavNet)
Process: Initialize *M*
For each $F=d_1....d_m \in \boldsymbol{F}$
For each $d_i \in F$
Initialize *cNode* objects with
NodeName = d_i, di_{-1}, di_{+1} and
Occur = 1 if they are not found in *M*
Initialize a *cOutLink* object with *Name*=$d_i_d_{i+1}$and *Occur*=1 if it is not found in *M*
Increase *di.Occur* and $d_i\_d_{i+1}$.*Occur* if they are found in *M*
$d_i\_d_{i+1}.linkTo = d_{i+1}$
$d_i.OutLink = d_i\_d_{i+1}$
$d_i.InLink = d_{i-1}$
Updateall objects into *M*
Update transition probabilities in the *cOutLink* objects
Return*M*

4. OUTPUT OF ALGORITHM

To implement WebNavNet algorithm, need to perform different steps as follows:
(We have database of 1000 records and five different patterns or domain i.e. FVTP)

Data Preprocessing:
Data preprocessing is a data mining technique that involves transforming raw data into an understandable format. Real-world data is often incomplete, inconsistent, and/or lacking in certain behaviors or trends, and is likely to contain many errors. Data preprocessing is a proven method of resolving

such issues. Data preprocessing prepares raw data for further processing.
Here, from Reuters database 1000 records (web pages) need to preprocess.

Output of this step is the input of next step.

Fig.OuputofImplementation

The main goal is web page recommendation based on semantic knowledge, after this algorithm implementation it helps the user in web page recommendation for the particular query.
Result will be definitely satisfied the user.

Term Generation :

After preprocessing next step is "Term Generation", here extracts the different terms from the records what we have and then in the next step using this generated terms classification done. Output of this step is text file which display the different generated terms from records.

CPM Schema:
A set of frequently viewed term patterns, namely FVTP is the given input, constructing WebNavNet by populating the CPM schema with FVTP. Schema consists of classes *cNode*and *cOutLink*and relationship properties between them as a inLink,outLink and linkTo as shown in fig.3 where *cNode* and *cOutLink* defines the current state node and the association from the current state node to a next state node, respectively. The class *cNode* has two object properties *inLink* and *outLink* referring to *cNode* and *cOutLink*, respectively. The number of occurrence of each *cNode* object is represented by *Occur*, i.e. *∂x*. *inLink* represents an association from a previous state node, e.g. a previous viewed term, to the state node it belongs to. *cOutLink* represents an association from the state node to one next state node with a transition probability *Prob*, e.g. *ρx,y*.

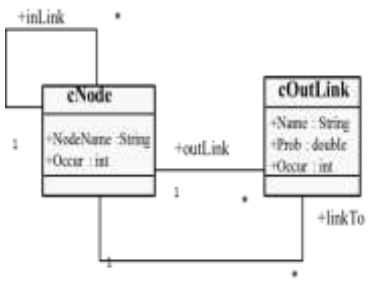
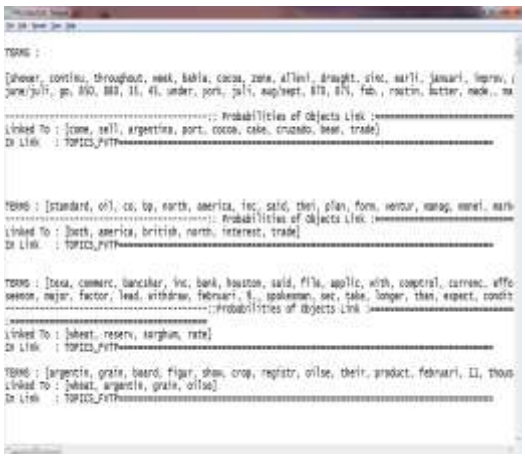


Fig.3 Schema of CPM

Classification of Terms :
There are five different patterns (input) namely,EXCHANGES_FVTP,ORGS_FVTP,PEOPLES_FVTP,PLACES_FVTP, TOPICS_FVTP
According to these patterns terms which we extract from records (web pages) are classified to the particular domain with frequently generated terms probability.
Output of this step is text file TNN_Output.txt which display the terms with attached particular domain with occurrence probability.



5. CONCLUSION

This paper aims to address the challenges in developing Web-page recommendation such as the "new page" problem. The study has developed a conceptual framework to facilitate the discovery, representation and integration of the useful knowledge of a website, including the domain and Web usage knowledge, to support effective Web page recommendations.

Two new models have been designed for representation of domain knowledge of a website. One is an ontology-based model, namely**DomainOntoWP**, and the other is a semantic network of Web-pages, **TermNetWP.**

The Web usage knowledge is the frequent Web access patterns (FWAP) of website users, which is discovered from Web logs using an advanced sequence mining technique, namely PLWAP-Mine. The Web usage knowledge is then transformed into a weighted network of Web-pages, namely WebNavNet. Each node in the network represents a Web-

page and each edge represents the transition from one Web-page to another; the weight of each edge represents the transition probability.

This method substantially enhances the performance of Web page recommendation system in terms of precision & satisfaction.

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