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SEMANTIC RETRIEVAL OF SPATIAL OBJECTS ON LOCATION BASED SERVICES FOR EVERYDAY ESSENTIALS

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ABSTRACT

Omnipresence of internet and advance of technologies helps the user to locate and access various socio physical services. Geospatial Information System (GIS) integrate GPS data and location information for providing spatial objects to the user. Location based services for every day is essential for an Information system which can provides the desired services to the user in a day to day life. In a city like Chennai one who wander around the places where to get the services like hospitals, insurance, community certificates, licenses for running shops, educational institutions and other government services etc. It is a tiresome process as no system physically available to fulfill the needs. Therefore, the need of an hour is to propose a system which can able to provide the details of day to day needs of a user. The system covers 600 sq.km of Chennai city, and large number of data is collected for implementation.

Keywords: spatial data, query processing, spatial objects.

1. INTRODUCTION

Geographical Information System (GIS) is software used to locate and visualize the spatial data on the map. GIS software and its applications provide spatial information and location details can be visualized on the map. Spatial Data Infrastructure (SDI) combines spatial data from various sources and sharing the application among different users and it provide various rules for transaction and interaction [1]. The advancement of Information technology influences the other technologies to simplify the day to day activities of human life and societal needs. GIS technologies integrate GPS location information, spatial data, direction and other information [2]. Nowadays, GIS portals serving as a major resource for one who needs to identify the location details and direction. Chennai is the one of the densely populated metropolitan city in India for its kind of friendly environment, easy accessing and available facilities for day to day life. Since Chennai is the capital of Tamilnadu, there are large numbers of people coming to Chennai for medical treatment, educational, accessing government services etc. one who wander around the city and it is very difficult to identify where to getting these services from government and other private sectors for locating the desired service. The commuters are very hard to find where to find the medical treatment for a specialized decease, community certificate, tahsilder office, RTO office, Banks, ATMs, Universities and Colleges, Schools, Shopping malls and theaters, Police and Fire stations etc. Spatial data retrieval is a key research area where the spatial and attributed data can be retrieved for a users query. The unstructured data can be processed and group the relevant record by applying the clustering algorithms. Spatial query processing techniques involved in this system for semantic understanding of the user query and retrieve the matched records. If the user, Query like "To find the bank with locker facility near adyar" or "To find the schools with yoga and swimming facility in Tambaram". These user requests contain multiple queries and it should be optimized by the optimization algorithms.

Data mining and knowledge discovery defines extracting the essence of data for varied requirements. It comprises various processes that include data selection, preprocessing, discovery, visualization and analysis [3]. Spatial Data Infrastructure (SDI) disseminates the knowledge of spatial data. Spatial keyword queries comprising spatial location information and can locate spatial objects based on the semantics of the query [4].

1.1 Existing system

Though, Many systems are available for meeting the above mentioned needs, they have their own limitations as they are not providing all these services in a integrated manner. In detail, all these services are not visualized through the map. Therefore, the need of the hour is to propose a system which handles the user needs as a query and returns the results as services. Earlier version of our system Location based system for emergency services employs all health provider information in and around Chennai city. Various layers were created for road and street network, hospitals etc. and visualized in the map. The shortest path algorithm is implemented and it provides best path between the user location and the provider. GIS based Web services for emergency services are the extended version of the system which covers other emergency services like police and Fire in and around Chennai city. The system is implemented and it is available through the web application www.chennaiemergency.co.in. These systems employs various emergency providers like Hospitals, police, blood banks and Fire services are integrated in to the map.

2. PROPOSED ARCHITECTURE

The architecture of the proposed system is shown in Figure-1. The system consists of the following modules:

- Data Collection

- Integration of various layers
- Query processing
- Spatial data retrieval
- Visualization on the map

2.1 Data collection

The service provider's details are collected from the open sources like spotico, skyhook, Google etc. A total of 600 sq.km of Chennai city is considered for implementation of the system. The essential services include Schools and Colleges, Banks and ATMs, Theatre and Malls, Government Talukas and Tahsildar office etc. The detailed information of each and every services are collected such a way that the database is populated as a jumbo database. For example bank service, the details like name of the bank, weather it is public or private, address, locality, area landmark, latitude and longitude, loan availability, locker facility, website details, phone number etc.

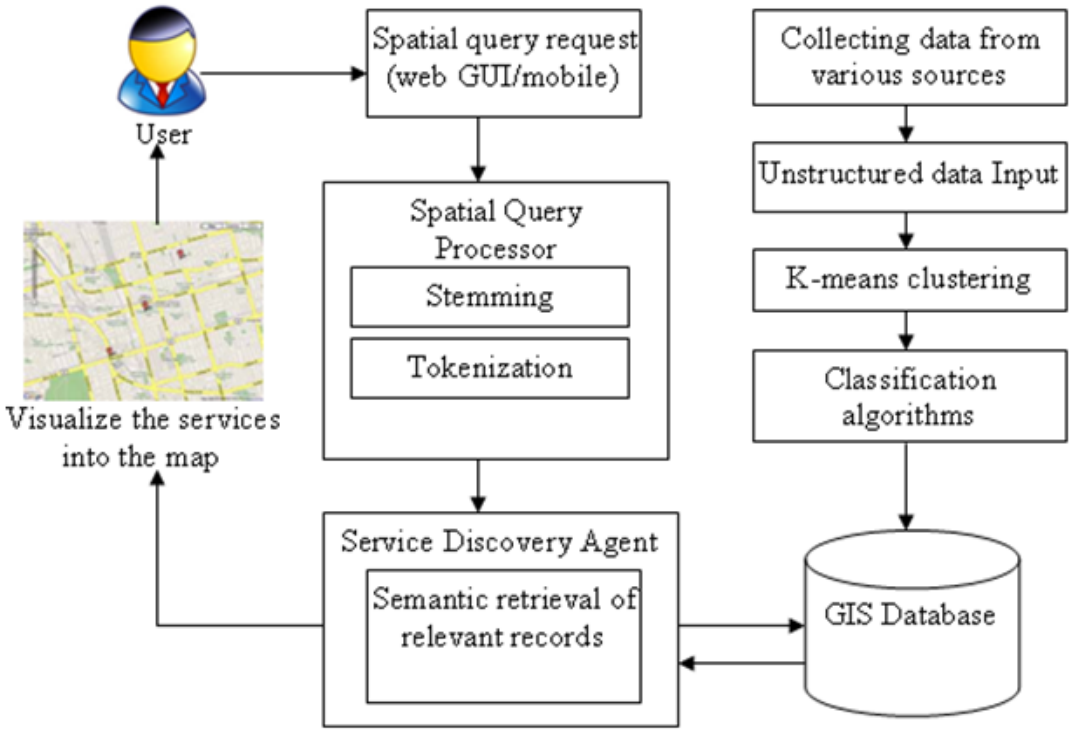

Figure-1. Architecture diagram of LBS for everyday essentials.

2.2 Creating of various layers

The open source Google map is used for implementing the system. Various layers are created for road and street network, and the various layers are created for these providers for making the system for completing the design.

2.3 Query processing

The user query can be processed semantically and it involves several steps like tokenization, named entity extraction and parsing etc. The user query has to be preprocessed by removing the stop words, connectivity and making as a meaningful query.

2.4 Tokenization

In the tokenization process, sentences are mapped into character strings and string of words. A tokenizer splits a stream of characters into a series of tokens. It involves set of rules such as Case change, Suffix numbers elimination, Underscore separator. Name similarity can be applied only after the tokenization process, which produces the set of terms to be actually compared.

2.5 Stemming algorithms

Stemming is the process of removing prefix, suffix and stop words. The output resulted into stemming (eg: a, was, need, value, of, from, to etc.). The importance of stemming at indexing time is for file compression and increase the search efficiency. The drawback is that the additional storage is required for storing the stemmed and unstemmed forms. Automatic approaches such as Affix removal algorithms removes suffixes or prefixes from terms leaving a stem. These stemming algorithms sometimes also can transform the resultant stem.
Eg: Input query - find RTO office near adayar.
// List of stop words to be removed after tokenization.
StopWords={"a","able","about","above","according","accordingly","across","actually","after","afterwards"…,I,….., need,…….etc};

After tokenization and removal of stop words: Input query is RTO, office, adayar.

A simple example of an affix removal stemmer is the one that removes the plurals from terms.

If a word ends in "ies" but not "eies" or "aies"
then "ies" → "y"
If a word ends in "es" but not "aes", "ees", or "oes"
then "es" → "e"
If a word ends in "s", but not "us" or "ss"
then "s" → NULL

2.6 Domain specific ontologies

Ontology provides a vocabulary for representing and communicating knowledge about some topic and a set of relationships that hold among the terms in that vocabulary. It is used to enable a machine to use the knowledge in some application and also multiple machines to share their knowledge. To help other people before, understand some area of knowledge. To compute the similarity among two names we rely on a domain-specific ontology and general purpose ontology. The domain-specific ontology includes terms related to a given application domain. The general-purpose ontology includes all the possible terms (at this stage, we adopt WordNet). We decided to rely on both ontologies since the domain-specific ontology offers more accuracy in the relationships of the terms, whereas the general-purpose one offers wider coverage.

2.7 K-Means clustering algorithms

The mean term for the similarity of list of terms are taken into an account. The terms relate with similar domain are clustered together based on the mean value. After the tokenization process domain specific mechanism will be implemented.

3. EXPERIMENTAL RESULTS

The system is implemented both in web based and android mobile based accessing services. The mobile based implementation of the proposed system is shown in the following Figure-1(a) to 1(d). Google map is considered for updating the spatial and attributed data for all essential services. GUI is created for specifying user query request and the system process request semantically and the result is visualized through the map. Therefore one can get the direction as well as details from the system. For mobile users, a separate android application is created for accessing the application. The user can download the application and can access the services. Two kind of accessing is provided. First one is through specifying query and second is the user has to locate the place on the map and select the required services from the list. The web based system is implemented by PHP as front end and MySQL software as backend storage. The shortest distance between source and destination is shown on the map.

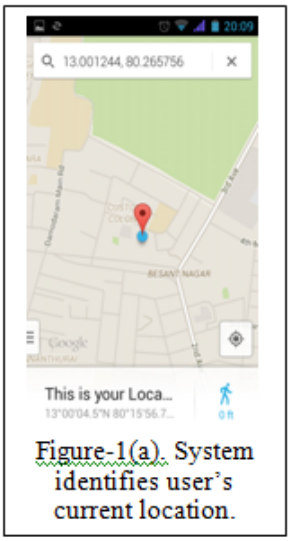

Figure-1(a). System identifies user's current location.

Figure-1(b). User selecting services

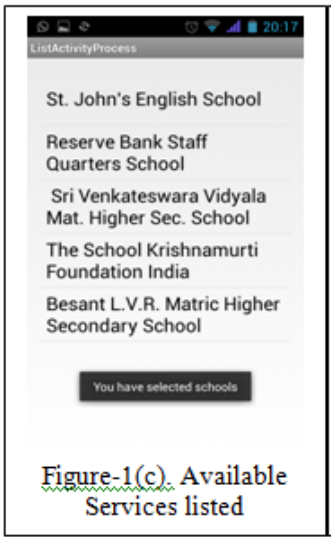

Figure-1(c). Available Services listed

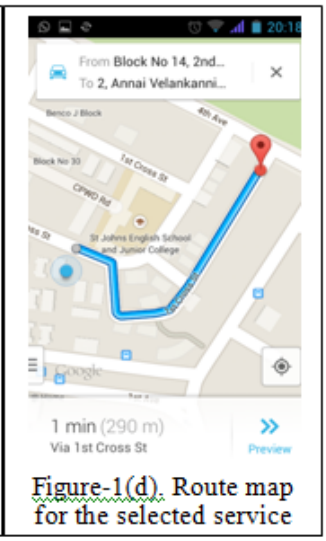

Figure-1(d). Route map for the selected service

Figure-1(a) shows the current location of the user. The system automatically detects the latitude and longitude of the location of the user and the interface has been designed such a way that the user can select the required services. Figure-1(b) shows the list of essential service selected by the user and Figure-1(b) shows the list of schools in and around the user's location. Figure-1(d) shows the route map for the selected service.

4. CONCLUSIONS

The location based services for Everyday Essentials (LBSEE) system is for finding the relevant services for day to day needs. Large amount of detail is collected for implementing the system. Various layers are created and also the location details. The query processor used to process the user query semantically and relevant spatial object is retrieved from the GIS database. The

system helps the user to locate the essential services though web and mobile. Therefore, the user can get the relevant services without any hindrance.

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REFERENCES

[1] Diansheng Guo, Jeremy Mennis. 2009. Spatial data mining and geographic knowledge discovery-An introduction. Computers, Environment and Urban Systems. 33, pp. 403-408

[2] Li Zhang, Xiaoping Sun, Hai Zhuge. 2013. Density-based spatial keyword querying, Future Generation Computer Systems, Elsevier, pp. 1-11

[3] Miguel Ángel Latre*, Francisco J. Lopez-Pellicer, Javier Nogueras-Iso, Rubén Béjar, F. Javier Zarazaga-Soria, Pedro R. Muro-Medrano. 2013. Spatial Data Infrastructures for environmental e-government services: The case of water abstractions authorizations, Environmental Modelling and Software. 48, pp. 81-92

[4] Mohamed Bakillah b,n, MirAbolfazlMostafavi a, SteveH.L. Liang b, AlexanderZipf. 2012. Real time query propagation strategies with Lightweight Coordination Calculus (LCC) for ad hoc networks of geospatial databases, Journal of Network and Computer Applications. 35, pp. 1918-1933.

[5] Madhav Prasad Nepal, Sheryl Staub-French, Rachel Pottinger, April Webster, 2012. Querying a building information model for construction-specific spatial information, Advanced Engineering Informatics. 26, pp. 904-923.

[6] Carlos Granell, Óscar Belmonte Fernández, Laura Díaz. Geospatial information infrastructures to address spatial needs in health: Collaboration, challenges and opportunities, Future Generation Computer Systems, Elsevier, pp: 1-10.