Optimal Vehicular Routing and Driving Directions with Human Intelligence

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***Abstract*—A time dependent land-mark graph to model the dynamic traffic pattern as well as the intelligence of experienced drivers so as to provide a user with the practically fastest route to a given destination at a given departure time. Variance-Entropy-Based Clustering method is used to estimate the distribution of travel time between two landmarks in different time slots. Based on this graph, designing a two-stage routing algorithm to compute the practically fastest and customized route for end users .**

***Index Terms*—Spatial Database, GIS, data mining, GPS trajectory, driving directions, driving behavior**

I. INTRODUCTION

Efficient driving directions has become a daily activity and been implemented as a key feature in many map services like Google and Bing Maps. A fast driving route saves not only the time of a driver. Therefore, this service is important for both end users and governments aiming to ease traffic problems and protect environment. The time that a driver traverses a route depends on the following three aspects: 1) the physical feature of a route, such as distance, capacity (lanes), and the number of traffic lights as well as direction turns; 2) the time-dependent traffic flow on the route; and 3) a user's driving behavior. a cloud-based system for computing practically fast routes for a particular user, and the user's GPS Devices.

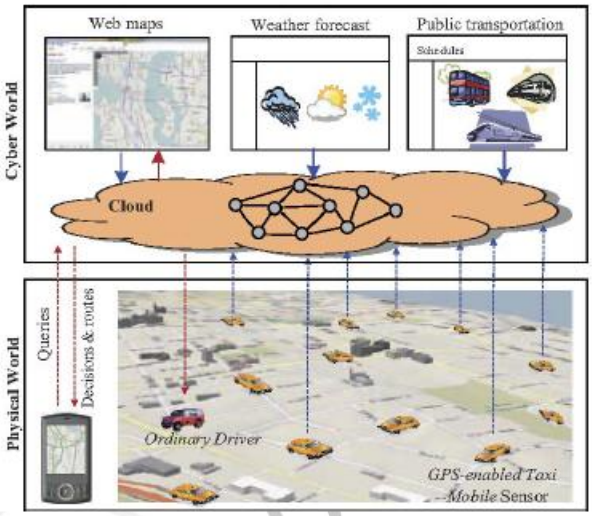

Fig 1 Cloud based driving directions.

From the above diagram, when the user requests a path by giving source and destination in a GPS device then location of the user and the destination latitudes and longitudes will be sent to cloud .The cloud will mine all the data corresponding to the user request and knowledge path is abstracted and sent from cloud to the device.

Road segment

A road segment r is a directed (one-way or bidirectional) edge that is associated with a direction symbol (r:dir), two terminal points (r:s, r:e), and a list of intermediate points describing the segment using a polyline. If r:dir= one-way, r can only be traveled from r:s to r:e; otherwise, people can start from both terminal points, i.e., r:s ➔ r:e or r:e➔r:s. Each road segment has a length r:length and a speed constraint r:speed, which is the maximum speed allowed on this road segment

Road network

A road network Gr is a directed graph,Gr= (Vr; Er), where Vr is a set of nodes representing the terminal points of road segments, and Er is a set of edges denoting road segments.

Time-dependent landmark graph

A landmark is one of the top-k road segments that are frequently traversed by taxi drivers according to the trajectory archive. Given a trajectory archive A, a time threshold *tmax*, two landmarks u; v, arriving time ta, leaving time tl, we say s = (u; v, ta; tl) is a transition if the following conditions are satisfied: u =ri; v= rj ta = pi.t , tl=pj.t . records all the historical arriving and leaving times.

Travel Time Estimation.
Partition time of a day into several slots (for different landmark edges. Estimate the travel time distribution of each time slot for each landmark edge using VE-Clustering.

VE-Clustering.
Variance clustering is a dividing the land mark graph obtained into set of users travels a particular landmark in a particular slot of time. Entropy clustering which will divide the obtained clusters in terms of stable distribution.

Route computing.
There are two types of route computing. The first one is rough route and the other is refined route. In rough route it nothing but a normal route travelled by every normal user traversing every landmark while refined routing is the shortest routes on times i.e, no need to traverse every landmark. In route computing there is a problem of roundabout routing can be explained by the diagram.

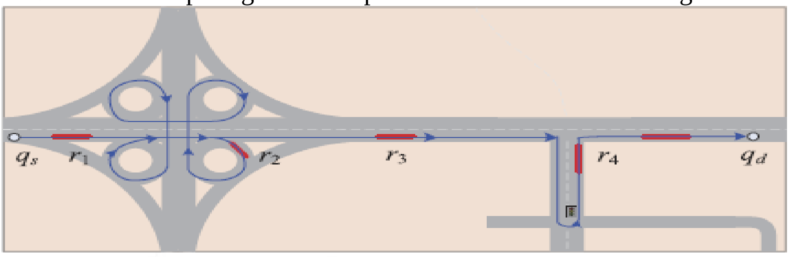

Fig 2 A diagram of roundabout rough routing

From Qs to Qd the user can go via r1,r3 and r4 and reach destination which takes very short time than the user who traverses via r1,r2,r3,r4 and reaches destination. The path r1,r2,r3,r4 is called roundabout routing while the path r1,r3,r4 are called refined routing.

II. RELATED WORK

A continuous query system for dynamic route planning.
Addressing the problem of answering continuous route planning queries over a road network, in the presence of updates to the delay (cost) estimates of links. A simple approach to this problem would be to recomputed the best path for all queries on arrival of every delay update. However, such a naive approach scales poorly when there are many users who have requested routes in the system. Instead, two new classes of approximate techniques are proposed – K-paths and proximity measures to substantially speed up processing of the set of designated routes specified by continuous route planning queries in the face of incoming traffic delay updates. Our techniques work through a combination of precipitation of likely good paths and by avoiding complete recalculations on every delay update, instead only sending the user new routes when delays change significantly.

Discovering popular routes from trajectories.
,Investigate the problem of discovering the *Most Popular Route* (MPR) between two locations by observing the traveling behaviors of many previous users. This new query is beneficial to travelers who are asking directions or planning a trip in an unfamiliar city/area, as historical traveling experiences can reveal how people usually choose routes between locations. To achieve this goal, firstly develop a *Coherence Expanding* algorithm to retrieve a transfer network from raw trajectories, for indicating all the possible movements between locations. After that, the Absorbing Markov Chain model is applied to derive a reasonable *transfer probability* for each transfer node in the network, which is subsequently used as the popularity indicator in the search phase. Finally, propose a *Maximum Probability Product* algorithm to discover the MPR from a transfer network based on the popularity indicators in a breadth-first manner

Statistical modeling and analysis of sparse bus probe data in urban areas.
Congestion in urban areas causes financial loss to business and increased use of energy compared with free flowing traffic. Providing citizens with accurate information on traffic conditions can encourage journeys at times of low congestion and uptake of public transport. Installing the measurement infrastructure in a city to provide this information is expensive and potentially invades privacy. Increasingly, public transport vehicles are equipped with sensors to provide real time arrival time estimates, but these data are sparse.

III. PROPOSED ARCHITECTURE

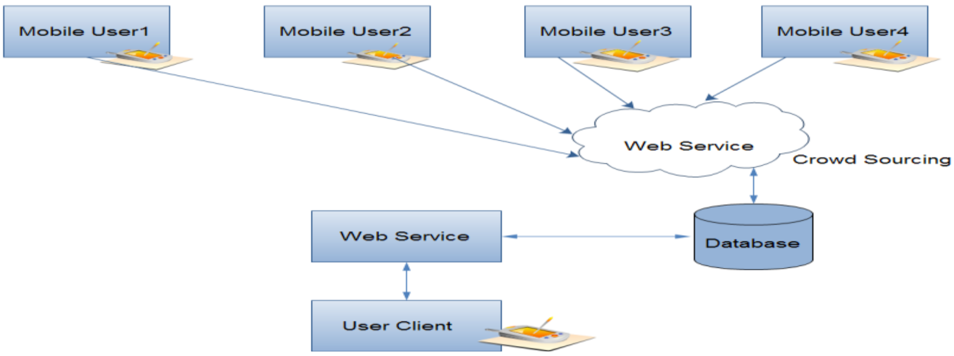

Fig 3 Architecture Diagram

Problems addressed.

It has been efficient driving directions has become a daily activity and been implemented as a key feature in many map services like Google and Bing Maps In the previous system we cannot guarantee there are sufficient taxis traversing on each road segment even if we have a large number of users.

Implementation.

Based on crowd sourcing technique we collect the location information of users and store it in Database.We determine the raw location data collected from DB and find the following knowledge info:.Find path of each and every user using location data .Find the common path of all the users based on time .Extract travel time from one point/route to another point/route .Extract route and time knowledge from the above processing and update it with DB .Write web service to expose the knowledge map to any users.

IV. EXPERIMENTAL SETUP

Experimental setup is user defined criteria for any project on which it should be run or execute. Without this setup there will be no clear understanding of the project execution path. Experimental setup consists of Eclipse 7.0 to run the project and execute. JDK 7 . Includes a complete JRE plus tools for developing, debugging, and monitoring Java applications. From JDK it gets all the packages required to run the program. Apache tomcat -7.0.37 version as a server which stores all the locations like latitude and longitudes, IMEI no. of the phone, date and time in the server. This will run through the Wamp server which creates a cloud environment.JAVA ADT- This application is like a eclipse to develop android java tools and applications like apk (android packages).This application should be installed in android device (4 series).GPS application in android device which extracts all the location information of the present device and will be stored in server. Immediate Internet service is required to run the application. In any other case it will not work.

V. EXPERIMENTAL RESULTS

The results shows an accuracy of shortest path which is dependent on time rather showing the shortest path based on distance in latest Google maps and Bing maps. When the system is being used by more number of users then the efficiency of the system will increase as it will obtain more data from users giving a detailed path

VI. CONCLUSION

Describes a system to find out the practically fastest route for a particular user at a given departure time. Specifically, the system mines the intelligence of experienced drivers from a large number of taxi trajectories and provide the end user with a smart route, which incorporates the physical feature of a route, the time-dependent traffic flow as well as the users' driving behaviors of both the fleet drivers and of the end user for whom the route is being computed.

In Future work driving directions with effective paths will be composed by weather prediction and path prediction on weekend days.

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