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Providing Efficient Driving Directions Using GPS and Driver's Ability

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Abstract- The fastest services of path finding were provided by numerous web maps along with local search engines for a long instance. User behavior of driving typically differs in their progressing driving experiences hence a good quality routing service should believe three aspects such as routes, traffic, as well as drivers, which are far away from extent of shortest or fastest path computing. In our approach of finding driving directions, Variance Entropy Clustering method is used to find out allocation of travel time between two landmarks in dissimilar time period. Two stage routing algorithm used to find fastest and safest route to reach destination. Rough and refined are the two routing stage algorithm used. Label setting algorithm used to find shortest distance between source and destination. Interactive voting map matching algorithm used to construct Landmark graph. GPS equipped taxis are employed as mobile sensors searching traffic rhythm of a city in physical world. If instantaneous sensor data are obtainable for several road segments, our method is combined to make available improved routes for end users.

Keywords - Path finding, User behavior, GPS-equipped taxis, Qualified divers. GPS, Driving Directions, Data mining, Spatial databases and GIS, Time-dependent fast route, Taxitrajectories, Road network

I. Introduction

For the most part of web maps contain function of posting instantaneous traffic information on several roads. Due to coverage constraints as well as previous open challenges, instantaneous traffic condition offered by existing web maps is just in support of a user's information while has not been incorporated into driving direction service. There are a not many projects aiming to approximate real-time traffic flows along with forecasting future traffic conditions on several road segments in terms of floating car information. These methods are road-segment-level inferences, which forecast traffic conditions on individual road segments with adequate samples. Consequently these traffic conditions have not been actually functional in city-wide driving direction services. The routes offered to users are still based on shortest path devoid of the knowledge from experienced drivers.

A system was described to detect fastest route for a meticulous user at a specified departure time. Particularly, system mines intelligence of qualified drivers from a huge number of taxi trajectories [3, 4, 12] and make available the end user by means of a smart route, which include physical attribute of a route, time-dependent traffic flow and users' driving behavior's. As shown in Fig. 1, first, GPS equipped taxis are used as mobile sensors probing the traffic rhythm of a city in the physical world. Second, a cloud in the cyber world [11] is built to aggregate and mine the information from these taxis as well as other sources from Internet, like web maps and weather forecast. The mined knowledge includes the intelligence of taxi drivers in choosing driving directions and traffic patterns on road surfaces. Third, the knowledge in the cloud is used in turn to serve Internet users and ordinary drivers in the physical world. Finally, a mobile client, typically running in a user's GPS-phone, accepts a user's query, communicates with the cloud, and presents the result to the user. We put forward a cloud-based cyber-physical scheme for computing almost fast routes for a meticulous user, by means of a large number of GPS-equipped taxis [3] along with user's GPS-enabled phone. The mobile client steadily learn a user's driving behavior from user's driving routes, and maintain cloud to modify a sensibly best ever route for user. In our system, we initially partition the GPS log [5] of taxi into several taxi trajectories demonstrating individual trips consistent with taximeter's transaction records.

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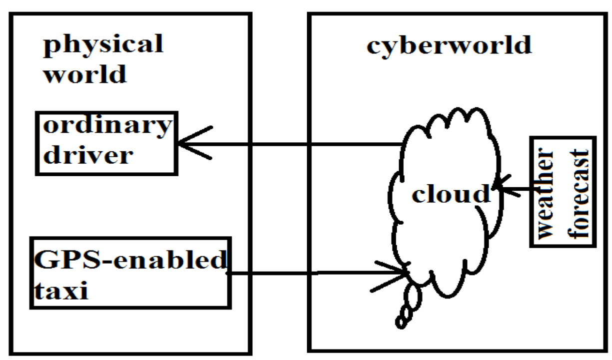

Fig1. An overview of cloud-based driving directions service

Finally user having GPS phone sends the query. Client gets the query, communicates with the server and gives the result to the user. Three challenges need to be faced by the user are

- Intelligence modeling.
- Data sparseness.
- Low sampling rate problem.

In Intelligence modeling user can select any source or destination .How to develop model using taxis driver intelligence is a challenge. In data sparseness we cannot guarantee there are many taxis are available but some time taxis may not travel through that particular route. In Low sampling rate to save energy consumption user need to report their location information like for every 2-5 minutes.

II. RELATED WORK AND EXISTING MODEL

A speedy driving route saves not only the instant of a driver but also authority utilization Therefore, this overhaul is vital for both finish users and governments aim to alleviate traffic problems and guard environment. Given the same route, precautious drivers will likely drive pretty slower than individuals prefer driving very rapid and belligerently. Also, users' driving behaviors typically vary in their making progress driving experiences. For example, travelling on a strange path a user has to disburse consideration to the road signs, hence drive quite leisurely. Usually, large cities have a more number of taxi cabs traverse in metropolitan areas. Bing map page relatively loads the pages slower than Google Maps. It is not relatively included in Bing search which do not boost of using the map. With Google Maps [5] scores points with users by giving a wide selection of different ways to view the map.

A. Building the Landmark Graph:

Landmark is the road segment which is frequently traversed by taxi drivers as well as ordinary drivers. A landmark graph is a directed graph that consists of a set of landmarks and a set of landmark edges conditioned by threshold and travel time. The reason of using "landmark" to model the taxi drivers' intelligence is by considering firstly, the sparseness and low-sampling rate of the taxi trajectories do not support us to directly calculate the travel time for each road segment while we can estimate the travelling time between two landmarks (which have been frequently traversed by taxis).Secondly, the notion of landmarks follows the natural thinking pattern of people. After the detection of landmarks, we convert each taxi trajectory from a sequence of road segments to a landmark sequence (landmark graph) and then connect two landmarks with an edge if the transitions between these two landmarks exist.

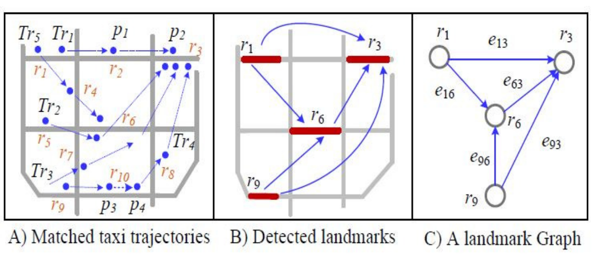

Fig2. An example of building landmark graph

B. Travel Time Estimation:

Travel time estimation is used to calculate travelling time for each road segment. VE-Clustering algorithm [3, 11] is used to find travel time estimation and to learn different time portioning from different Landmark. Travel time estimation based on cluster of landmark together. The distance of the travel times can be found using the Entropy based clustering (E-Clustering) which is found using the results of the V-Clustering which is used for finding the travel time estimation. The Entropy Clustering algorithm runs in a similar way to the V-Clustering to iteratively find out a set of split points. The only difference between them is that, instead of the WAV, we use the weighted average entropy of S_{xc}.

V-Clustering: We first sort T u, v according to the values of travel time (tl - ta), and then partition the sorted list L into several sub lists in a binary-recursive way. In the each iteration, we first compute the variance of all the travel times in L. Later, we find the "best" split point having the minimal weighted average variance (WAV). As a result, we can find out a set of split points dividing the whole list L into several clusters each of which represents a category of travel times.

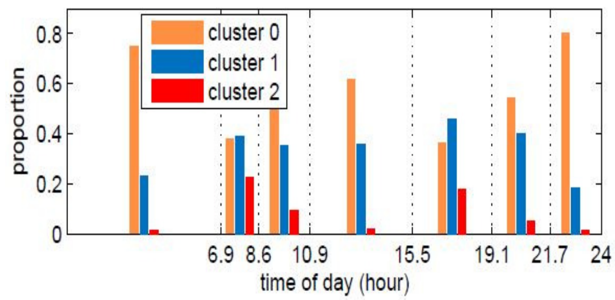

Fig3. An example of VE-Clustering Algorithm

E-Clustering: This step aims to split the x-axis into several time slots such that the travel times have a relatively stable distribution in each slot. After V-Clustering [3, 11], we can represent each travel time y_i with the category it pertains to (c (y_i)), and then sort the pair collection Sxc = {(xi, c (y_i))} for i=1 to n according to xi (arriving time).

C. Route Generation

Route Generation consist of two phases. They are rough routing in the landmark graph and refined routing.

i. Rough route Generation

The routing algorithm is a route generation algorithm, which consist of two phases. They are rough routing in the landmark graph and refined routing in the real road network. Sometimes, different drivers take different amounts of time to traverse the same route at the same time slot. The reasons are driving habit, skills and familiarity of routes of user and driver's ability. Given a user's custom factor, we can determine his/her time cost for traversing a landmark edge in each time slot based on the learned travel time distribution. Three principles that are followed in rough routing as follow

a. Source-Farther Principle
b. Destination-Closer Principle
c. Next-Nearest Principle

ii. Refined Routing

This stage finds in the real road network a detailed fastest route that sequentially passes the landmarks of a rough route by dynamic programming. The landmark sequence obtained from the rough routing.

III. PROBLEM STATEMENT

A fast driving route saves not only the time of driver but also the energy consumption (as most gas has been wasted in traffic jams). The problem statement gives the challenges that are faced in this work. Some of them are given below.

i) That is it can't answer any user query by directly mining trajectory pattern from data. Thereafter, how to model taxi driver's intelligence can answer a variety of queries is a challenge.
ii) It can't guarantee there are sufficient no. of taxis traversing on every road segments even if it has large number of taxis.
iii) That is it can't estimate accurately the speed pattern of every road segment.

***a) Intelligent modeling**:* As users can select a place as source or destination, there would be no taxi cabs trajectory exactly [3] passing the query points. That is, we cannot answer any user query by directly mining trajectory pattern from the data. Therefore, how to model the taxi cabs drivers intelligent is used to answer a variety of queries is a challenge.
b) Data sparseness and coverage: It can't guarantee that there are sufficient taxi cabs traverse on each road segment even if we have large number of taxi cabs. That is, we cannot estimate accurately the speed pattern of road segments.
c) Low sampling rate problem: To save energy and the communication loads, the taxi cabs usually report on the locations with very low frequencies like two to five minutes per point of each and every taxi trajectories [2, 3].

IV. AN OVERVIEW OF PROPOSED SYSTEM

We put forward a cloud-based cyber-physical scheme for computing almost fast routes for a meticulous user, by means of a large number of GPS-equipped [5] taxis along with user's GPS-enabled phone. GPS equipped taxis are employed as mobile sensors searching traffic rhythm of a city in physical world. A cloud in cyber world is built to combine and mine information from these taxis and other sources from Internet. The mined information includes intellect of taxi drivers in deciding driving directions as well as traffic patterns on road surfaces. The knowledge in cloud [1, 9, 8] is employed in turn to provide Internet users and normal drivers in physical world. Our system provides users by means of personalized routes subsequent to learning their driving behaviors. Our method is not perfect, as it only leverages historical data and challenges cannot be completely tackled. As shown in Fig.4.(a)(b)(c), our system results evaluations a mobile client, normally running in a user's GPS-phone, recognizes a user's query, converse with the cloud, and present consequence to the user.

GPS equipped taxis exist in most important cities, generate a massive number of GPS trajectories each day. Instinctively, taxi drivers are skilled drivers who can typically find out the best ever route to send passengers towards a target based on their information. The time that a driver traverses a route relies on three aspects: such as the physical feature of a route, for instance distance, capacity as well as the number of traffic lights with direction turns; the time-dependent traffic flow [6, 7, 10] on route; and user's driving performance. The mobile client steadily learn a user's driving behavior from user's driving routes, and maintain cloud to modify a sensibly best ever route for user. In our system, we initially partition the GPS log of taxi into several taxi trajectories demonstrating individual trips consistent with taximeter's transaction records. There is a tag connected with a taxi's reporting when taximeter is turn on or else off, specifically a passenger board or off taxi. Then, we make use of IVMM algorithm which has enhanced performance than algorithms of existing map-matching when dealing with low-sampling rate trajectories [1, 2]. This algorithm make use of spatial-temporal restrictions to get hold of candidate road segments, subsequently considers mutual influences of GPS points in trajectory to compute static/dynamics core matrix for a trajectory as well as carry out a voting-based approach between all candidates consequently every taxi trajectory is transformed to sequence of road segments.

Fig4. (a)

Fig4. (b)

Fig4. (c) Verified Results in normal user GPS-moble

V. CONCLUSION

There are a not many projects aiming to approximate real-time traffic flows along with forecasting future traffic conditions on several road segments in terms of floating car information. A speedy driving route saves not only occasion of a driver but also energy expenditure hence this service is significant for end users as well as governments aiming to alleviate traffic problems as well as defend environment. A system was described to detect fastest route for a meticulous user at a specified departure time. Particularly, system mines intelligence of qualified drivers from a huge number of taxi trajectories and make available the end user by means of a smart route, which include physical attribute of a route, time-dependent traffic flow [3,10] and users' driving behavior's. A mobile client, normally running in a user's GPS-phone, recognizes a user's query, converse with the cloud, and present consequence to the user. We make use of IVMM algorithm [1, 2] which has enhanced performance than algorithms of existing map-matching when dealing with low-sampling rate trajectories. This algorithm make use of spatial-temporal restrictions to get hold of candidate road segments, subsequently considers mutual influences of GPS points in trajectory to compute static/dynamics core matrix for a trajectory as well as carry out a voting-based approach between all candidates consequently every taxi trajectory is transformed to sequence of road segments. As for privacy concern, attribute of learning users 'driving behaviors can be controlled off by users.

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