Efficient Clue-Based Route Search On Road Networks

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ABSTRACT

With the advances in geo-positioning technologies and location-based services, it is nowadays quite common for road networks to have textual contents on the vertices. Previous work on identifying an optimal route that covers a sequence of query keywords has been studied in recent years. However, in many practical scenarios, an optimal route might not always be desirable. For example, a personalized route query is issued by providing some clues that describe the spatial context between PoIs along the route, where the result can be far from the optimal one. Therefore, in this paper, we investigate the problem of clue-based route search (CRS), which allows a user to provide clues on keywords and spatial relationships. First, we propose a greedy algorithm and a dynamic programming algorithm as baselines. To improve efficiency, we develop a branch-and-bound algorithm that prunes unnecessary vertices in query processing. In order to quickly locate candidate, we propose an AB-tree that stores both the distance and keyword information in tree structure. To further reduce the index size, we construct a PB-tree by utilizing the virtue of 2-hop label index to pinpoint the candidate. Extensive experiments are conducted and verify the superiority of our algorithms and index structures.

I. INTRODUCTION

With the rapid development of location-based services and geopositioning technologies, there is a clear trend that an increasing amount of geo-textual objects are available in many applications. For example, the location information as well as concise textual descriptions of some businesses (e.g., restaurants, hotels) can be
easily found in online local search services (e.g., yellow pages). To provide better user experience, various keyword related spatial query models and techniques have emerged such that the geotextual objects can be efficiently retrieved. It is common to search a Point-of-Interest (PoI) by providing exact address or distinguishable keyword (i.e., only few PoIs contain the keyword) in a region which can uniquely pinpoint the location. For example, we type the address “73 Mary St, Brisbane” or the name “Kadoya” on Google Maps to find a Japanese restaurant in the CBD area.
Some existing work [8], [15], [26], [31], [33], [35] extends such query to more sophisticated settings, such as retrieving a group of geo-textual objects (usually more than 2) or a trajectory covering multiple keywords. However, it is not uncommon that a user aims to find a PoI with less distinguishable keyword such as
“restaurant”, but she can only provide more or less spatio-textual context information around the PoI. Liu et al. [25] formalize such

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Manuscript received April 19, 2005; revised September 17, 2014. context information as clues and use them to identify the most promising PoIs. Different with their work, we aim to find a feasible route on road networks by using clues. Particularly, in this paper, we investigate a novel query type, namely clue-based route search (CRS), which allows a user to provide clues on textual and spatial
context along the route such that a best matching route w.r.t. the clues is returned. More specifically, a CRS query is defined over a road network G, and the input of the query consists of a source vertex vq and a sequence of clues, where each clue contains a query keyword and a user expected network distance. A vertex contains a clue keyword is considered as a match vertex. The query returns a path P in G starting at vq, such that (i.) P passes through a sequence of match vertices (PoIs) w.r.t. the clues and (ii.) the network distances between two contagious matched vertices are close to the corresponding user specified distance such that the user's search intention is satisfied.

II. EXISTING SYSTEM

- Li et al. [23] studies the problem of direction aware spatial keyword search, which aims at finding the k nearest neighbors to the query that contain all input keywords and satisfy the direction constraint. Rocha et al. [27] address the problem of processing top-k spatial keyword queries on road networks where the distance between the query location and the spatial object is the length of shortest path. ROAD [21] organizes the road network as a hierarchy of sub graphs, and connects them by adding shortcuts. For each sub graph, an object abstract is generated for keyword checking. By using network expansion, the sub graphs without intended object are pruned out.

- G-tree [36] adopts a graph partitioning approach to form a hierarchy. Within each sub graph, a distance matrix is kept, and for any two sub graphs, the distances between all borders of them are stored as well. Based on these distances, it efficiently computes the distance between query vertex and target vertices or tree nodes. Jiang et al. [17] adopt 2-hop label for handling the distance query for kNN problem on large networks, and facilitates KT index to handle the performance issue of frequent keywords.

- Liu et al. [25] formalize the spatio-textual context information of the querying POI as clues and use them to identify the most promising PoIs, which is closely related to our CRS problem. Different with their work, we aim to find a feasible route on road networks by using clues. In addition, the spatial distance considered in our work is network distance so that the algorithms in [25] cannot be applied.

Disadvantages

- There is no Clue-based Route Navigation to find exact Route path

- The searching is slow due to lack of Greedy Clue search algorithm

III. PROPOSED SYSTEM

- In the proposed system, the system studies the problem of CRS on road networks, which aims to find an optimal route such that it covers a set of query keywords in a given specific order, and the matching distance is minimized. To answer the CRS query, we first propose a greedy clue-based algorithm GCS with no index where the network expansion approach is adapted to greedily select the current best candidates to construct feasible paths.

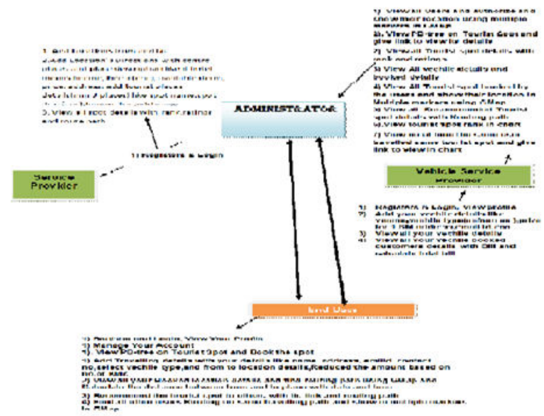
- Then, we devise an exact algorithm, namely clue-based dynamic programming CDP, to answer the query that enumerates all feasible paths and finally returns the optimal result. To further reduce the computational overhead, the system proposes a branch-and-bound algorithm BAB by applying filter-and-refine paradigm such that only a small portion of vertices are visited, thus improves the search efficiency.

- In order to quickly locate the candidate vertices, we develop AB-tree and PB-tree structures to speed up the tree traversal, as well as a semi dynamic index updating mechanism. Results of empirical studies show that all the proposed algorithms are capable of answering CRS query efficiently, while the BAB algorithm runs much faster, and the index size of PB-tree is much smaller than AB-tree.

Advantages

- Efficient Routing path due to Clue-based Route Navigation to find exact Route path
- The Searching technique is fast by Greedy Clue search algorithm

IV. ARCHITECTURE DIAGRAM



V. IMPLEMENTATION

- Admin
  In this module, admin has to login with valid username and password. After login successful he can do some operations such View all Users and authorize and show their location using multiple markers in Grapeview PB-tree on Tourist Spot and give link to view its details, View all Tourist spot details with rank and ratings ,View All vechile details and booked details,View All Tourist spot booked by the users and show their location in Multiple markers using GMap,View all Recommended Tourist spot details with Routing path, View tourist spot rank in chart,View no.of time the same user travelled same tourist spot and give link to view in chart

- User

  In this module, there are n numbers of users are present. User should register before doing some. After registration successful he can login by using valid user name and password. Login successful he will do some operations like View Your Profile, Manage Your Account, View PB-tree on Tourist Spot and Book the spot, Add Travelling details with your details like name, address, emilid, contact no, select vechile type, and from to location details, Reduced the amount based on no.of KMs,View all your Booked location details and find routing path using GMap and Calculate the distance between from and to place with date and time ,Recommend the tourist spot to others with its link and routing path, Find all other users Routing on same travelling path and show in multiple markers in GMap.

- Service Provider

  In this module, there are n numbers of users are present. Service Provider should register before doing some. After registration successful he can login by using valid user name and password. Login successful he will do some operations like Add Locations from and to Add Location's Directions with centre places and place description like if hotel means hname, hdesc(enc), available items, price, address, add tourist places details(min 3 places) like spot name, spot desc(enc),famous for ,add image View all spot details with rank, ratings and route path.

VI. CONCLUSION

In this paper, we study the problem of CRS on road networks, which aims to find an optimal route such that it covers a set of query keywords in a given specific order, and the matching distance is minimized. To answer the CRS query, we first propose a greedy clue-based algorithm GCS with no index where the network expansion approach is adopted to greedily select the current best candidates to construct feasible paths. Then, we devise an exact algorithm, namely clue-based dynamic programming CDP, to answer the query that enumerates all feasible paths and finally returns the optimal result. To further reduce the computational overhead, we propose a branch-and-bound algorithm BAB by applying filter-and-refine paradigm such that only a small portion of vertices are visited, thus improves the search efficiency. In order to quickly locate the candidate vertices, we develop AB-tree and PB-tree structures to speed up the tree traversal, as well as a semidynamic index updating mechanism. Results of empirical studies show that all the proposed algorithms are capable of answering CRS query efficiently, while the BAB algorithm runs much faster, and the index size of PB-tree is much smaller than AB-tree. Several directions for future research are promising. First, users may prefer a more generic preference model, which combines PoI rating, PoI average menu price, etc, in the query clue. Second, it is of interest to take temporal information into account and further extend the CRS query. Each PoI is assigned with a opening hours time interval [To; Tc], and each clue contains a visiting time t, where the resulting query aims to find a path such that the time interval of each matched PoI covers the visiting time. Third, requiring users to provide exact keyword match is difficult sometimes as they are just providing "clue", which may be inaccurate in nature. Thus, it is of interest to extend our model to support the approximate keyword match. Hence, the matching IEEE Transactions on Knowledge and Data Engineering,Volume:29,Issue:9,Issue Date:Sept.1.2017 14 distance can be modified by incorporating both spatial distance and textual distance together through a linear combination.

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