Online Shortest Path Computation on Time Dependent Network

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***Abstract*: Nowadays, several online services provide live traffic data such as Google-Map, Navteq , INRIX Traffic Information Provider , and TomTom NV. But still computing the shortest path on live traffic is big problem. This is important for car navigation as it helps drivers to make decisions. In presented approach server will collect live traffic information and then announce them over wireless network. With this approach any number of clients can be added. This new approach called live traffic index-time dependant (LTI-TD) enables drivers to update their shortest path result by receiving only a small fraction of the index. The existing systems were infeasible to solve the problem due to their prohibitive maintenance time and large transmission overhead. LTI-TD is a novel solution for Online Shortest Path Computation on Time Dependent Network.**

***Index Terms*: LTI-TD,shortest path,transmission overhead.**

I.INTRODUCTION

With the popularity of online map applications and their wide deploymentin mobile devices and car-navigation systems, an increasing number of users search forpoint-to-point fastest paths and the corresponding travel-times[3]. This problem has been extensively studied on static road networks where edge costs are constant. Manyefficient speed-up techniques have been developed to compute the fastest path in a matterof milliseconds. The quickest path approaches make theassumption that the travel-time for each edge of the road network is constant. In real-world the actualtravel-time on a road heavily depends on the traffic congestion and, therefore, it is time-dependent. one can observe that the time-dependent travel-times yield a change in the actual quickestpath between any pair of places throughout the day. Specifically, the quickest pathfrom one place to another varies depending on the departure-time from the source.

II.EXISTING SYSTEM

Nowadays, several online services provide live traffic data such as Google-Map,Navteq , INRIX Traffic Information Provider , and TomTom NV. Online services analysed collected data from road sensors, traffic cameras. These systems are able to compute shortest path based on current live traffic data. But they do not provide routes to drivers. Traffic data provides information about speeds on specific road changing over time. It is important in network analysis. Traffic affects travel times, which in turn affect results hence network analysis is important. If you are planning a route from one place to another and without considering traffic, expected travel and arrival times could not be accurate. You may miss routes that save time by avoiding the slower and congested roads.

The following two diagrams show that the quickest route can change at different times of the day due to traffic.

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Fig 1.At 7:00 a.m., traveler traffic is heavy, but traffic to the suburbs is light; therefore, the quickest route from the city to the suburbs at this time is along the divided highway.

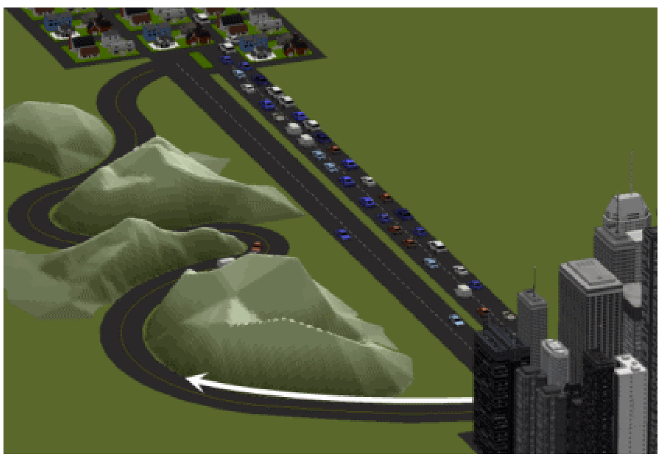

Fig 2.At 5:00 p.m., travelers are driving home, which increases the travel time in that direction. Travel has become slow enough on the divided highway that the serpentine alternative now offers a quicker route to the suburbs.

The main challenges in computing live shortest paths areScalability limitations in terms of network bandwidth and server loading and Online Shortest Paths computation is not much attention.

III.PROPOSED SYSTEM

A new solution based on the index transmission model is alive traffic index-time dependent (LTI-TD)[1]. LTI-TD[1] is expected to provide relatively short cost (at source side), fast query response time (at source side), small broadcast size (at destination side), and light maintenance time (at destination side) for OSP depending on time.

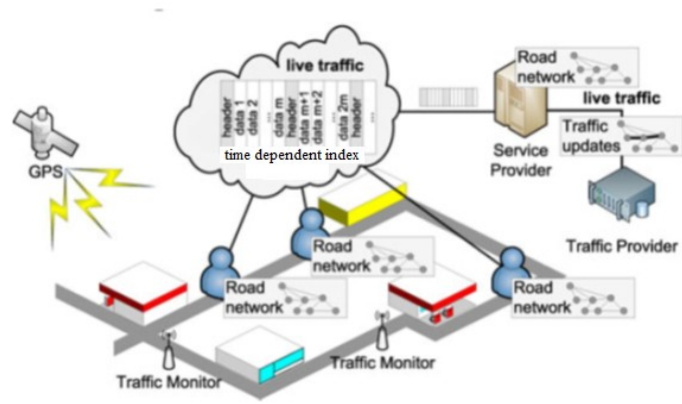

Fig 3 System architecture for LTI-TD.

IV.LTI-TD FRAMEWORK

The broadcasting model uses transmissionmedium such as 3G, Mobile WiMAX. When the traffic provider broadcasts a dataset all driver can listen to the dataset concurrently.Thus, this transmission model balances well independent of the number of driver. In the wireless broadcast model the traffic provider repeatedlytransmits broadcast cycles, containing the database andair index. The broadcast cycle consists of fixed-sizepackets.The most common wireless broadcasting method is the (1, m)interleaving scheme [3], shown in Figure 3.

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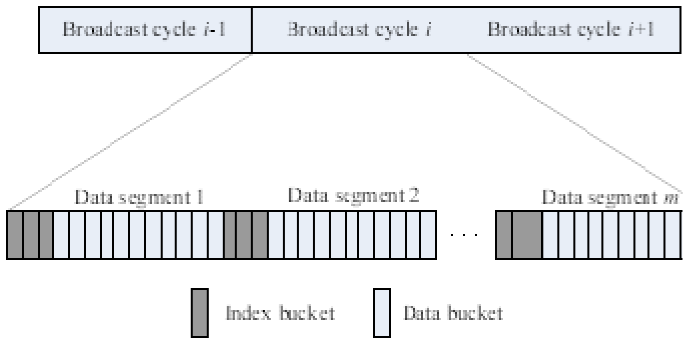

Fig 4(1, m) interleaving scheme.

The datasetis divided into m distinct segments, and each datasegment is preceded by the index. This way the driver may receivea copy of the index immediatelyafter the completion of the currently transmitted datasegment. [4]

A driver can raise Algorithm 1 first in order to find the shortest path from a source to a destination After reading the necessary segment, it computes the shortest path. In each broadcasting cycle, the driver first collects live traffic updates from the traffic provider, and then updates the graphs. The ALT algorithm was proposed to find shortest path on road networks. With ALT, a set of nodes are chosen and then the shortest path between all the nodes in the network are computed. The time-dependent ALT algorithm calculates the leaving time from a source to find the correct path[5].

A driver can raise Algorithm 2 in order to find the shortest path froma source to a destination. First, the client generatesa search graph G based on current position anddestination. When the driver keeps listeningto the broadcast channel until it discovers a necessary segment.In order to keep the newness of LTI-TD, the system is required to broadcast the newest weight of edges alternatingly .

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AlgorithmALT(graph G = (V, E), Vertices s and t)

1: L = generate Landmarks(G, k) {select set of k andmark}

2: for all v ∈ V do

3: parent(v) ← ⊥

4: state(v) ← unreached

5: dist(s, v) ← ∞

6: dist(s, s) ← 0

7: state(s) ← reached

8: while vertex v with state(v) = reached exists and state(t) 6= reached do

9: Select v ∈ V with state(v) = reached and minimal cost(v) = dist(s, v) + πLt(v)

10: for all u ∈ V with (v, u) ∈ E do

11: if dist(s, v) + len(v, u) + πLt(u) <dist(s, u) + πLt(u) then

12: parent(u) ← v

13: dist(s, u) ← dist(s, v) + len(v, u)

14: state(u) ← reached

15: state(v) ← settled

Algorithm driver(s:source; t:destination)
1: generate G based on s and d
2: listen to the channel for a segment
4: decide the necessary segments 5:
6: compute the shortest path (from s to t) on G.

Algorithm traffic-provider(G:graph)
1: construct G.
2: for each broadcast cycle do
3: collect traffic updates from the traffic provider
4: update the graphs G .
5: broadcast the graph G

IV.CONCLUSION

To address the problem of efficient fastest path in modern navigation systems in the presence of varying speed conditions on a large scale road network, a promising architecture that broadcasts the index on the air depending on time is required.The existing systems were infeasible to solve the problem due to their prohibitive maintenance time and large transmission overhead. LTI-TD is a novel solution for Online Shortest Path Computation on Time Dependent Network.Since a system is currently underdevelopment implementation details and results are not given.

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