

Optimal Route Prediction for Multi-Way Transportation Using Geospatial Coordinates

I.Priyanga¹, V.Devi²P.G. Student, Department of Computer Engineering, NPR Engineering College, Tamil Nadu, India¹Assistant Professor, Department of Computer Engineering, NPR Engineering College, Tamil Nadu, India²

ABSTRACT:Transportation among world came across many challenges. Transportations can be categorized as by Road (Bus-B), by Rail (Train-T) & by Air (Flight-F) which can be considered as Modes here. These Modes can be characterized based on criteria such as Distance(D), Time(T), and Cost(C). Many available sites help users to plan their Journey only for particular mode as well as criteria. Example, by Bus with cost. The Journey planned by a user through sites helps to decide their mode of travel. Most of the sites helps to plan paths, fails to consider traffic & combination of modes and criterion. The RP Algorithm helps to predict paths and considers traffic as its Mandatory criteria. It introduces forty nine combinations among these modes, criterion example BTF & DTC. Data's are retrieved using geospatial coordinates and predicts the possible route to reach their destination. It suggests alternate paths, provide alert messages if congestion occur.

KEYWORDS:Route Planning, Real time traffic, Geographical Information System (GIS), Route Prediction Algorithm (RPA), Optimal Route, Geospatial.

I. INTRODUCTION

Route planning is an important problem for a number of diverse applications including intelligent transportation systems, space applications, autonomous robotics, and military guidance and navigation systems. The main issue which is important in our society is Mobility. Peoples used to travel from one location to another, in effect increasing the use of public transportation. Travellers aims in determining the best route to reach destination from source. Traversing from source to destination faces various types of congestions. The three major travel modes are only by Road, Rail and Air. According to the geographical position of the world, the distance, time and cost varies in this three modes between the same source and destination.

The basic route planning models the problem as a graph. The nodes of the graph represent geographic locations, such as nodes, and edges. A valid connection, from a source node to a destination node, is a sequence of edges connecting source and destination. Each edge is assigned a non-negative weight, for example the length of the road or an estimation of the travel time required to reach from one end to the other. The optimization problem is to find a shortest path between a source node and a destination node.

The users requirements in travel is limited up to the existing software solution version. The requirements is fulfilled in all aspects in this algorithm. The predicted route informs all required data in all combinations of Modes and Criteria. The user can immediately get the transient route and available Modes and Criteria information. They can book the travel from source and destination (transient route in that mode) early comparing the traditional version. So, the traveller /passengers confirm their journey initially. Suppose any failure occurs at any node, the user can execute the software from that node by assigning that node as a source. The whole process simplifies the decision making in travel.

A* algorithm provides the general solution for Shortest route in a particular map. It also provides the backtracking facility, that is appropriate for this application. This algorithm (A*) is used for all modes (B,T,F) to find shortest route, in addition to that it can also be utilized for fastest as well as cheapest predictions also. From the Transient Routes, common nodes are taken in account and the transient route between common nodes are calculated. To do so, the magnitude is calculated in percentage basis. Final route is found by combining by all the above results.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

The Route Prediction algorithm aims in predicting the routes available between various source and destination based on the live circumstances. The Route Prediction Algorithm achieves route prediction from source to destination by including transient nodes i.e., in between nodes for various multimode criteria combinations. The system provides optimal result for all user required Multimode & criteria combinations between the source and destinations. Provides real time traffic analysis between transient routes.

II. RELATED WORK

ROUTE PREDICTION ALGORITHM

In this algorithm the travel ways are referred as bus (B), train (T), air (F). These three ways may be considered as three modes of travel. The various steps involved in this algorithm are,

- (1) If the criteria selection is 'DTC' or 'DT0' or 'D0C' or 'D00', Determine the shortest route from source to destination in bus route by using A* algorithm.
- (2) If the criteria selection is 'DTC' or 'DT0' or '0TC' or '0T0', Determine the fastest route from source to destination in bus using A* algorithm. In this step the straight line time is calculated by using average speed of the vehicle in bus route. The travel time between the terminals, waiting time and vehicle changing time in the terminals are taken account.
- (3) If the criteria selection is 'DTC' or '0TC' or '00C' or 'D0C', Determine the cheapest route from source to destination and calculated using A* algorithm in bus route. The straight line cost is calculated using average cost of the travel in bus route. Here, the cost for the particular trip is taken account. All the cost and time calculation are done on the basis of weekly schedule of the vehicles in that mode.
- (4) Find the common nodes for all the selected criterion.
- (5) If the criteria selection is 'DTC' or 'DT0', The total time for travel between the common nodes including waiting time in shortest bus route in earlier trip is calculated.
- (6) If the criteria selection is 'DTC', The total time for travel between the common nodes including waiting time in shortest bus route in lowest price trip is calculated.
- (7) If the criteria selection is 'DTC' or 'DT0',
The distance between the common nodes is calculated in fastest bus route.
- (8) If the criteria selection is 'DTC' or '0TC',
The cost between the common nodes is calculated in fastest bus route.
- (9) If the criteria selection is 'DTC' or 'D0C',
The distance between the common nodes is calculated in cheapest bus route.
- (10) If the criteria selection is 'DTC' or '0TC', The time (including waiting time and vehicle changing time in the station) between the common terminals is calculated in cheapest bus route.
- (11) The percentage differences between the various criterion & traffic are calculated in bus route.
- (12) According to the benefit in percentage, the route in particular criteria is selected in bus route.
- (13) Repeat the steps from (1) to (12) for train route by replacing 'bus' by 'train'.
- (14) Repeat the steps from (1) to (12) for air route by replacing 'bus' by 'flight'.
- (15) Find the common nodes in all bus, train and air route.
- (16) The percentage differences for the selected criterion between the common nodes are calculated.
- (17) According to the benefit in percentage basis, the particular route (bus, train or air) between the common nodes are determined.
- (18) The final route contains the in between nodes between the source and destination and the mode of travel between the nodes.

III. MODULES

- Separate Routes Prediction for Criterion of Modes
- Separate Common Routes of Modes

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

➤ Final Route Prediction

Module 1: Separate Routes Prediction for Criterion of Modes

Getting input of “source” , “destination” and required criterion combination, the following required routes are found.

- (1) Shortest Route in bus, train and air routes between source and destination.
- (2) Fastest Route in bus, train and air routes between source and destination.
- (3) Cheapest Route in bus, train and air routes between source and destination.

The total distance, time and cost are calculated for traversing in these various routes. In addition to that travel time in shortest route in fastest trip and cheapest trip are calculated. Similarly, cost in fastest trip and cheapest trip between source and destination are calculated. These values are calculated by adding separately between transient nodes of the route. The required data are taken from database through Java Data Base Connectivity. Traffic data is considered as one mandatory criterion.

Module 2: Separate Common Routes of Modes

According to the mode criterion selection by the user the following things are done. First the common nodes in the various required criteria based routes of the particular nodes are found separately from module 1. All in between nodes between Common nodes are taken account according to that best criterion route (percentage basis). The same method is followed for finding common route and in between nodes for all required nodes. The distance, time and cost (whichever is required) is calculated and registered.

Module 3: Final Route Prediction

According to the mode criterion selection final route is found. From the separate mode routes of module 2 final common route is found. There also the path between common nodes are selected from particular mode route in percentage basis. The final route contains the in between nodes of source and destination and the required criterion values between the nodes with traffic information.

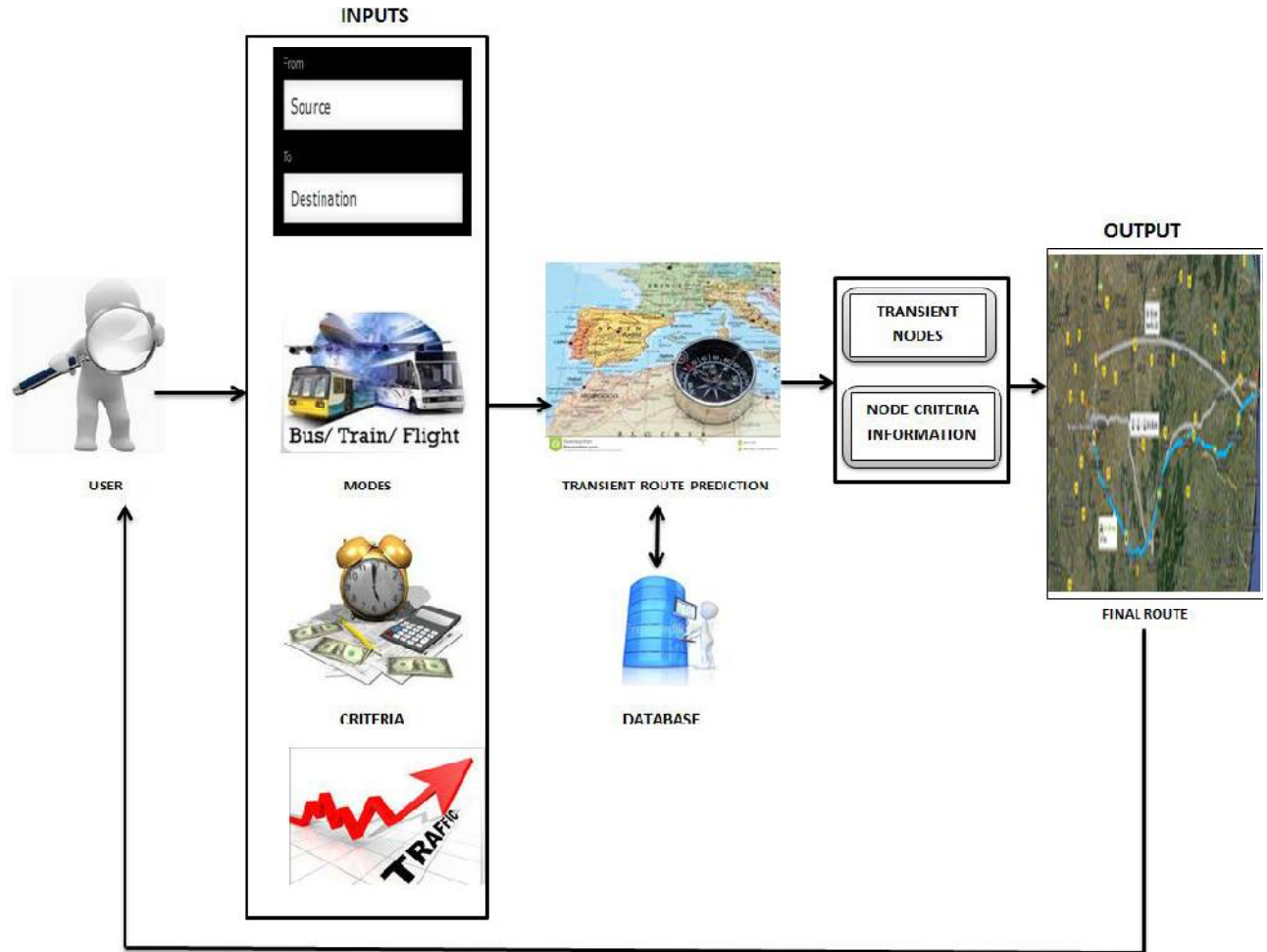
IV. ARCHITECTURE

This figure shows how the optimal Route Prediction is done from source to destination by using Route Prediction Algorithm. The Table 1 shows the forty nine combinations introduced.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016



I. FIG 1- ARCHITECTURE OF RPA

This architecture shows the work flow of Route Prediction Algorithm, which in turn takes inputs as Source, Destination, Mode of Travel, Criterion & Finally Traffic is being considered as a Mandatory Criterion here. After received the inputs the RPA retrieves data through geospatial coordinates and predicts routes as per user selection.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

M	C	M	C	M	C	M	C	M	C	M	C	M	C
00F	00D	0T0	00D	B00	00D	0TF	00D	B0F	00D	BT0	00D	BTF	00D
00F	0T0	0T0	0T0	B00	0T0	0TF	0T0	B0F	0T0	BT0	0T0	BTF	0T0
00F	0TD	0T0	0TD	B00	0TD	0TF	0TD	B0F	0TD	BT0	0TD	BTF	0TD
00F	C00	0T0	C00	B00	C00	0TF	C00	B0F	C00	BT0	C00	BTF	C00
00F	C0D	0T0	C0D	B00	C0D	0TF	C0D	B0F	C0D	BT0	C0D	BTF	C0D
00F	CT0	0T0	CT0	B00	CT0	0TF	CT0	B0F	CT0	BT0	CT0	BTF	CT0
00F	CTD	0T0	CTD	B00	CTD	0TF	CTD	B0F	CTD	BT0	CTD	BTF	CTD

TAB 1- Mode(M) & Criteria(C) Combinations

This table shows the forty nine combinations of modes and criteria introduced in RPA.

V. RESULTS

The sample possible result of this Route Prediction Algorithm be depicted as follows,

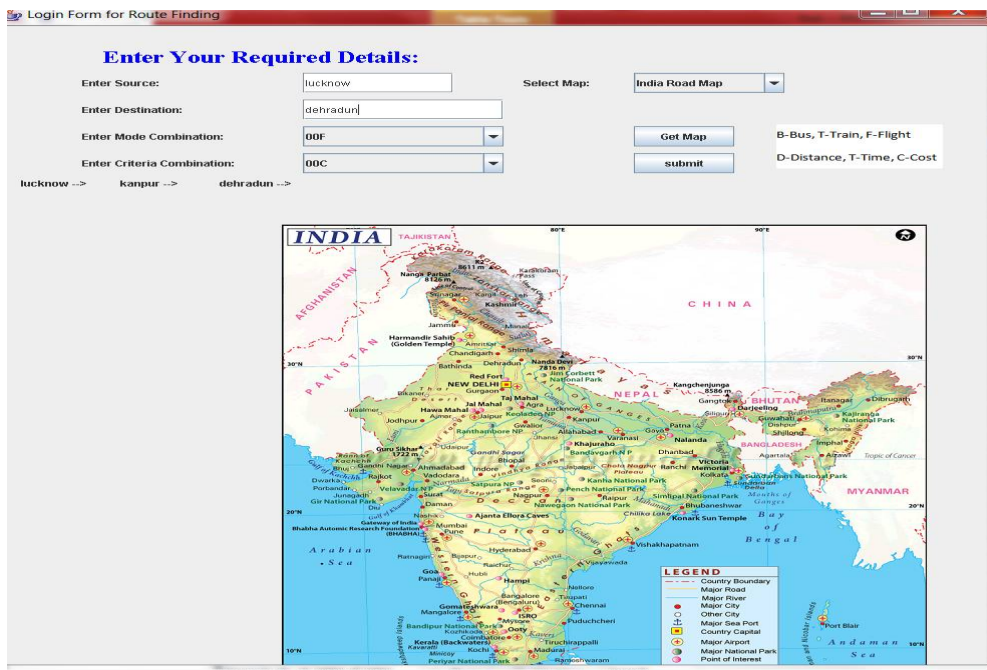


FIG 2 – Mode (00F) and Criterion (00C) for INDIA

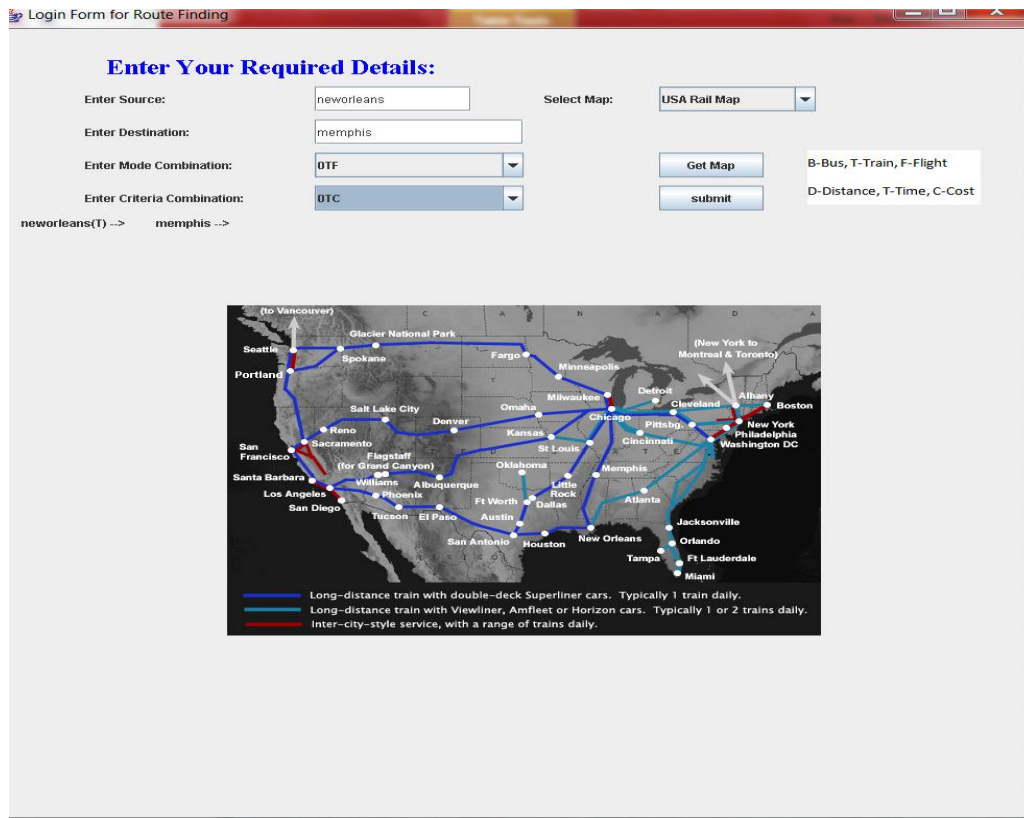


FIG 3 – Mode (OTF) and Criterion (OTC) for USA

These two figures Fig 2 & Fig 3 shows the sample results. Fig 2 shows the predicted route from Lucknow to Dehradun for Mode 00F and Criterion 00C. Fig 3 shows the predicted route from New Orleans to Memphis for Modes OTF and Criterion OTC.

VI. CONCLUSION

We have implemented an route prediction technique for determining optimal route from source to destination. This RPA algorithm helps in predicting optimal route from source to destination for all possible user required modes and criterion as well as its combinations.

REFERENCES

- [1] Bei Pan, Ugur Demiryurek, Cyrus Shahabi, "Utilizing Real-World Transportation Data for Accurate Traffic Prediction", 2014.
- [2] Carlos Martín García and Gonzalo Martín Ortega, "Route planning algorithms: Planific@ Project", 2009.
- [3] Chao-Lin Liu, Tun-Wen Pai, Chun-Tien Chang, and Chang-Ming Hsieh, "Path-Planning Algorithms for Public Transportation Systems", 2001.
- [4] Hannah Bast, Daniel Delling, Andrew V. Goldberg, Matthias Müller-Hannemann, Thomas Pajor, Peter Sanders, Dorothea Wagner, Renato F. Werneck, "Route Planning in Transportation Networks", 2014.
- [5] M. Herbster and M. K. Warmuth, "Tracking the best expert," Machine Learning, vol. 32, no. 2, pp. 151–178, 1998.
- [6] Ittai Abraham, Daniel Delling, Amos Fiat, Andrew V. Goldberg, and Renato F. Werneck, "Highway dimension and provably efficient shortest path algorithms", Technical Report MSR-TR-2013-91, Microsoft Research, 2013.
- [7] Ittai Abraham, Daniel Delling, Andrew V. Goldberg, and Renato F. Werneck, "Alternative routes in road networks", ACM Journal of Experimental Algorithmics, 18(1):1–17, 2013.
- [8] Julian Arz, Dennis Luxen, and Peter Sanders, "Transit node routing reconsidered", In Proceedings of the 12th International Symposium on Experimental Algorithms (SEA'13), volume 7933 of Lecture Notes in Computer Science, pages 55–66. Springer, 2013.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 5, May 2016

- [9] Leonid Antsfeld and Toby Walsh, "Finding multi-criteria optimal paths in multi-modal public transportation networks using the transit algorithm", In Proceedings of the 19th ITS World Congress, 2012.
- [10] W. Liu, Y. Zheng, S. Chawla, J. Yuan, and X. Xing, "Discovering spatiotemporal causal interactions in traffic data streams," in *KDD*, 2011, pp. 1010–1018.
- [11] Mahalia Miller, Chetan Gupta, "Mining Traffic Incidents to Forecast Impact ", 2012.
- [12] B. Pan, U. Demiryurek, C. Shahabi, and C. Gupta, "Forecasting spatiotemporal impact of traffic incidents on road networks," in *CDM*, 2013, pp. 587–596.
- [13] Robert J. Szczerba, Peggy Galkowski, Ira S. Glickstein, Noah Ternullo, "Robust algorithm for Real-Time Route Planning", 2000.
- [14] A. H. Sayed, S.-Y. Tu, J. Chen, X. Zhao, and Z. J. Towfic, "Diffusion strategies for adaptation and learning over networks: an examination of distributed strategies and network behavior," *Signal Processing Magazine, IEEE*, vol. 30, no. 3, pp. 155–171, 2013.
- [15] Younshik Chung and Wilfred W. Recker, "A Methodological Approach for Estimating Temporal and Spatial Extent of Delays Caused by Freeway Accidents", 2012.
- [16] Takuya Akiba, Yoichi Iwata, and Yuichi Yoshida, "Fast exact shortest-path distance queries on large networks by pruned landmark labeling", In *SIGMOD*, pages 349–360, 2013.
- [17] H. Zheng, S. R. Kulkarni, and H. V. Poor, "Attribute-distributed learning: models, limits, and algorithms," *Signal Processing, IEEE Transactions on*, vol. 59, no. 1, pp. 386–398, 2011.