Optimal Route Computation For
Online Public Transport Enquiry System

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Abstract - For a developing country like India number of sectors are involved in economy. Transportation has played important part throughout the development of Indian economy. Transport has revolutionized our entire life, especially economy. Transportation services assist alike the production, consumption, exchange and distribution of wealth. There is a direct relation between transportation services and distribution of wealth. Development of transport facility has resulted in an increase or decrease of the respective shares. Shortest-route problem determines shortest routes from one node to another. In this paper A* Algorithm to determine shortest route between two nodes in the network is discussed.

Massive studies are being conducted for a development of an interactive enquiry system for public transport. An enquiry system is already available for railways, but there is still need for a reliable transport enquiry system for overcrowded urban cities and unorganized city layouts where people find difficult to reach a place on time with less cost.

Keywords— Public Transport Enquiry system (PTES); A* algorithm; Optimal Path

I. INTRODUCTION

An effective, integrated public transport system fulfils a significant role in the livability of any city, engaging and fostering communities. Reducing car dependency in favor of sustainable transport can deliver a wide range of notable improved economic, social and environmental outcomes.

Firstly, an efficient public transport system, that integrates residential and employment hubs, plays an important role in moving skills, labour and knowledge within and between markets, stimulating productivity [1]. Public transport corridors have shown to create ‘activity centers’ that encourage and foster transit orientated development, and in turn through providing easy access to public transport increase adjacent property values.

Furthermore, transport is a key factor in social inclusion: connecting communities to employment opportunities, education, healthcare and social activities. An efficient public transport network provides a fast and cheap transport option that facilitates social inclusion to low income earners, the elderly, people with a disability and the unemployed. Improving access to public transport for these groups is essential to social equality. With an increasing elderly population, the shift towards sustainable transport is paramount to decrease already existing high levels of transport disadvantage and social exclusion [3]. Additionally, an effective sustainable transport system through either walking or riding to transport hubs further supports healthy activity, whilst removing stress associated with driving a private vehicle through congested traffic.

A. Public transport and city character

Transport systems and city character are interlinked. Land use characteristics of a city can determine the type of transport system it needs, and once a transport system is put in place, it influences land use characteristics of the city over time. Therefore, the type of public transport system you want in a city will depend on the vision you have for the future of your city. If an economically vital large central business district (CBD) exists, it can become the main centre for both employment and retail, and thus contribute to the success of an urban rail system (if the system serves the
CBD) because it can generate and attract trips onto the system.

B. High-rise dense city:

If you want your city to develop as a dense congested city with a large proportion of high-rise buildings and one very large central business district, then you should think of introducing very high capacity transport systems that can carry more than 40,000 people per hour per direction. This can usually be done by elevated or underground rail systems.

On the other hand, if you put in place a high capacity rail system in a city that is not yet high-rise, then the rail system will ensure that over time a very dense and congested high-rise city develops where the rail lines converge. This happens because space becomes very expensive and the economics dictate that buildings go high-rise. In India, Mumbai is a good example of how the existence of the rail system has resulted in south Mumbai going high-rise and developing into a very dense and congested business district.

Low rise, multiple business centre cities: Cities which have multiple business districts and in which buildings are 2-5 stories high cannot feed very high capacity mass transit systems. Such cities do not need and cannot sustain very high capacity systems. Transit systems capable of transporting 15,000 to 25,000 passengers per direction per hour operating on all major corridors would be adequate. Such systems would not alter the character of the city. Such a demand can be met by modern bus rapid transit systems.

III. PROPOSED METHODOLOGY

A. A* Search Algorithm:

So far we have examined search techniques that can be generalized for any network (as long as it does not contain negative length cycles). However the physical nature of real road networks motivates investigation into the possible use of heuristic solutions that exploit the near-Euclidean network structure to reduce solution times while hopefully obtaining near optimal paths. For most of these heuristics the goal is to bias a more focused search towards the destination. As we shall see, incorporating heuristic knowledge into a search can dramatically reduce solution times.

The A* algorithm by Hart and Nilsson [2] formalized the concept of integrating a heuristic into a search procedure. Instead of choosing the next node to label permanently as that with the least cost (as measured from the start node), the choice of node is based on the cost from the start node plus an estimate of proximity to the destination (a heuristic estimate) described this approach to solve the problem of optimal path finding.

This project uses Euclidean distance as estimated distance to the destination. In the searching, the cost of a node V could be calculated as:

\[ F(V) = \text{distance from } S \text{ to } V + \text{estimate of the distance to } D. \]

\[ =d(V) + h(V,D) \]

\[ =d(V) + \sqrt{(x(V) - x(D))^2 + (y(V) - y(D))^2} \]

Where \( x(V) \), \( y(D) \) and \( x(V), y(D) \) are the coordinates for node \( V \) and the destination Node \( D \).

A* Search algorithm:

For each \( u \) \{ 
1. \( d[u] = \text{infinity} \);
2. \( \text{parent}[u] = \text{NIL} \);
3. \( \text{End for} \)
4. \( d[s] = 0 \);
5. \( f(V) = 0 \);
6. \( H = \{ s \} \);
7. \( \text{While Not Empty (H) and target Not Found:} \)
8. \( u = \text{Extract}_\text{Min} (H) \);
   a. label \( u \) as examined;
   b. for each \( v \) adjacent to \( u \):
   9. if \( d[v] > d[u] + w[u,v] \), then
      i) \( d[v] = d[u] + w[u,v] \);
      ii) \( p[v] = u \);
      iii) \( f(v) = d[v] + h(v, D) \);
      iv) Decrease Key \( v, H \);

B. Flowchart showing step by step process for computing best route using A* Algorithm

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START
Enter Destination And Source
Select all the routes from source to dest. from database
Select distance of each selected route from database
Create graph of the routes
Calculate the optimum path using A* Algorithm
Display the optimum solution
STOP
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Figure 1: Optimal Route Computation Process

III. EXPECTED OUTCOME

Collection of all the regarding information about an interactive web based PTES—its layout, main functionalities, and user interface. A detailed account of the required database and practical case-specific considerations in the system design to implement it in best way.

With a view to promote the use of public transport particularly in a dense city, a user-friendly but comprehensive multimodal transportation system is deemed necessary. The PTES is developed with strong inputs from users’ feedback and technical expertise of system designers and is characterized by the following:

1) A truly point-to-point route-searching engine at street block detail level;
2) Accommodating multiple criteria of preferred mode, least time, and fare;
3) Route searching, this takes into both generic and local contexts of transport data complexities.
4) Being user friendly particularly when navigating both text and map.

IV. CONCLUSION

The A* algorithm can achieve better running time by using Euclidean heuristic function although its theoretical time complexity is still the same as Dijkstra’s. It can also guarantee to find the shortest path if heuristics value is correctly estimated provide quick and fast results.

However, the success of a system often lies on not merely engaging with an effective system environment or the programming capabilities but also massaging the voluminous spatial and attribute data into a simplified, easily understood, and commonly adopted model. Here, we highlight the particular concerns in route operation and fare information. A* based on heuristics with the use of approximate values calculate shortest path easily and fast. Its working is same as Dijkstra but instead of visiting each and every node and wasting time it computes optimal path quickly and fast. A* will not evaluate a node more than once, since it believes that looking at a node once is sufficient, due to its heuristics. If a user can come up with good heuristics A* can be faster than other Algorithms.

V. REFERENCES


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