Beating the commuting crunch with intermodal routing

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Executive Summary

Ever-greater urbanization is a well-publicized trend. With 66% of everyone expected to be living in urban areas by 2050, cities are being forced to expand[1]. Their transportation systems are growing – more roads, more railway tracks, more subway lines, more bus routes and more travel choice for people entering, leaving and traversing cities.

With more choice comes higher complexity. As journeys involve multiple modes of transport, the risk of the unexpected rises. Construction works, or an accident may block a road. Train timetables change. Technical faults may cause subway delays. Bad weather can affect bus timetables. One-off events may cause traffic congestion and car parks to fill more quickly than usual.

Even when there are no public transportation delays and road congestion is normal, the time needed to find a parking space in a city, or even in a suburb, can be so unpredictable that carefully planned journeys can be wrecked. It has been estimated that more than 30% of traffic in a city is caused by drivers searching for a parking spot[2]. Ten minutes wasted driving around looking for parking can mean a missed train connection.

Regular commuters, people making one-off journeys and tourists needing to find their way around an unfamiliar city can find it daunting to re-plan the best routes when the unexpected happens.

While there are apps available that provide journey guidance, travelers are often forced to use separate apps for public transport and driving information, or switch between separate screens to gain an overall journey picture. This is inconvenient and can be frustrating.

Such difficulties can be erased by a door-to-door intermodal journey planning service that intelligently processes real-time transit and real-time road traffic information to provide guidance that is accurate and meaningful on a single screen. Constantly updated data from a wide range of sources and agencies enables the service's algorithms to automatically find the optimum route for any user, whether the regular commuter or occasional visitor to the city. The service can advise on the best routes and timetables for the journey, including interchanges to public transport with suggested nearby parking, including park and ride facilities or other off-street car parks, as the commuter changes plans to account for delays.

The more complex the journey, the greater is the need for an effective, real-time and easy-to-use intermodal routing service that can quickly provide the best solution for users.

The commuting challenge

Many challenges face the commuter seeking to achieve a quick, trouble-free journey into a city, one that balances cost against travel time. The challenges can multiply if the commuter seeks to change transport modes at various stages, travelling part of the way in their own car, then boarding a train or bus and finishing on foot.

Challenges can include traffic congestion and road construction along a route, increasing journey time or requiring diversions. These and other factors can cause the commuter to spend more time in the car, increasing fuel consumption and therefore costs. Congestion results in increased carbon dioxide emissions - it also wastes commuters' time, leads to lost opportunities and can produce inefficient city services.

These and unexpected events such as signal failures on rail systems can make it difficult to estimate arrival times. Environmental zoning and car restrictions in city areas can make it difficult to find the optimum route in the city, while parking itself may be severely limited and usually come at a high cost. It has been estimated that more than 30% of traffic in a city is caused by drivers searching for a parking spot[2]. In fact, finding suitable parking can take on average up to 20 minutes, significantly affecting total journey time.

Park and ride is a growing trend around cities. Commuters who travel every day from outside the city to downtown are encouraged to drive for a certain distance and park where they can take a public transport method like train, tram or bus. This can solve many commuter problems and issues for the cities themselves, like pollution and congestion, accidents and the need to provide parking in the city center.

Tourists or visitors to a city who don't want the expense of parking in the center or don't want to spend the time needed to find parking in an unfamiliar area can also find park and ride useful.

Intermodal travel and routing

It's estimated that 76.4% of US commuters drive to work, using no other form of transport or even carpooling[3]. By switching to intermodal travel, in which a single journey is made using different forms of transport, commuters could experience more reliable journeys and even shorten their travel time.

Intermodal journeys can also help drivers reduce the stress caused by daily commutes by avoiding traffic or construction work along a route.

However, intermodal journeys by their nature involve coordination of travel time and are more complex to plan, both before a trip and during the journey when unexpected delays arise. Mobile applications that provide intermodal travel guidance can solve this complexity by advising the traveler about where to best enter the city, where to park and how and when they can continue via public transit systems.

Such guidance must be dynamic and constantly updated with real-time public transport timetables and delays, as well as real-time traffic reports to deliver more meaningful guidance and help ensure a more accurate arrival time. Adding information about off-street car parking facilities, as well as accurate walking times between connections is also essential. This enables the user to choose the best route at the best time. It also helps in the re-planning of a journey, say switching from road travel to a train before encountering an area of congested traffic.

Guidance must be comprehensive to be useful

To date, routing applications have been unable to provide a convenient solution. They either offer simple A to B routing guidance or, if they do incorporate different transport modes, they fail to consider all the potential points of delay when switching from one mode to another, from car to tram for example. Many also fail to take account of real-time data on road traffic and public transport delays.

It's vital that effective intermodal routing considers factors such as transfer time. This plays an important role in ensuring the optimal route and accurate arrival times are returned to the user.

Important criteria include walking from and to the station or parking lot, taking into account the actual distance. A good intermodal routing application adds the time needed to walk from a parking lot to a transit stop, to transfer to another transit line and to walk from the transit line to the final destination.

Strategies for intermodal routing

Intermodal routing provides information and advice that can help commuters make the most efficient journeys based on combinations of the major stages of travel - drive, park and ride. These are:

1. Pre-planning, which includes drive and park early, and drive and park late, with ride to final destination
2. En route planning, which covers drive, park while on the go and ride to final destination

Drive, park early and ride

This provides for the shortest drive to a transit stop outside the city area, where parking is easily accessible. It gives access to transit options that provide for the fastest transit commute to the final destination.

Information it provides includes a nearby transit station that can be quickly reached by car. It also suggests parking near to the transit stop, either in the station's own park and ride facility, or at a nearby off-street parking lot or garage. Transit lines are suggested offering the minimum number of transfers and the fastest route.

Traffic information and service delays and disruptions are provided to avoid possible bottlenecks, as are any pedestrian instructions for the last segment of the trip.

Drive, park late and ride

This provides for the longest drive to a transit stop close to the city area, where parking is easily accessible, and which gives access to transit options that offer the shortest transit commute to the final destination.

Information is provided on transit stations close to the city area which can be reached by car, as well as parking near to the transit stop, again this may be a park and ride facility or other off-street parking. It also offers a transit line selection with the minimum transfers and shortest route. Traffic information is considered by the applications, as well as service delays and disruptions to avoid possible bottlenecks. Pedestrian instructions for the last segment of the trip are also provided.

Drive, park on the go and ride

When traffic or other congestion along the road happen unexpectedly, intermodal routing guidance can provide alternative routes to a final destination using public transit. It avoids congestion by providing driving instructions from the current location to a transit stop that can be reached along the route and which gives access to transit options that provide for a similar arrival time at the final destination.

It provides information on transit stations along the route which can be reached before hitting traffic or congestion, suggests nearby parking, selects an appropriate transit line offering a fast journey and considers traffic information, and service delays and disruptions to avoid bottlenecks. It also offers pedestrian instructions for the last segment of the trip.

Use cases supported by intermodal routing

The ability of intermodal routing to provide this type of information allows the user to plan their journey in a number of ways, either deciding on their route and mode of travel before leaving or to vary and change their plans en route to take account of changing conditions.

Journey planning can take one of four forms, either before the journey commences (pre-trip) or while the journey is in progress (on the go).

Pre-trip

The user is planning a one-time trip by car and is informed of potential traffic congestion. The user therefore plans to take public transport instead of driving all the way to the final destination. They need to park the car as close as possible to the railway station, depending on what options fit best within their day. When parking in the city is not desired, knowing how far you can drive before parking at a transit stop or nearby is important.

Pre-trip: park before entering the city

The user knows that it is difficult to find parking near the final destination and would like to drive as far as possible before parking at or near to a transit stop with convenient connections to the final destination.

Ideally, the user would like to drive to work but needs to use various transportation modes because of issues such as legal restrictions for city zoning, parking is hard to find, or parking fees are high. Downtown traffic conditions are also often unpredictable.

Pre-trip: user checks commuting alternatives for the day

The commuter wants to know whether taking public transit is a better alternative today. Depending on the user's departure time and the frequency of the trains going to the final destination, the user decides to go to the station or by car to the final destination. The user also knows there is a significant traffic jam along the route and plans to take public transport instead of driving all the way to the final destination

On-the-go: User is driving and sees an unpredicted event along the route

In this situation, the driver is in the middle of a journey as traffic starts building up unexpectedly along the route. A roadblock, accident or a special event may be in progress, with little or no information about the event duration.

The user would like to drive as far as possible before hitting a traffic jam and then park at or near to a transit stop with convenient connections to their final destination.

Ideally, commuters would get information on unexpected events along the route before departing. When driving becomes less attractive, having access to other commuting options and the information to use them in a timely manner, is important. Being able to get information on the next departures when near the railway station is also beneficial.

Solving the routing challenge

To meet these needs, HERE Technologies has created a comprehensive intermodal routing service that provides a complete commuting experience, using various transportation options and navigation guidance to a final destination either by foot, car or public transit. The service can be easily incorporated into any commuting apps by developers who want to add more value.

The intermodal routing service gives access to a comprehensive routing algorithm that makes intelligent calculations based on real-time traffic and transit data to find the best commuting options. It takes into account various transportation modes, traffic conditions and transit service disruptions, as well as walking times to take a user to a final destination in the fastest and easiest way. The route options provided show users every step of the journey, including where to change trains and walking directions.

Live information about traffic and train delays as well as details of road construction and incidents, or transit time tables, allows users to stay moving with the confidence that they will meet their ETAs.

The service uses a variety of HERE Location Services to provide advanced routing options for commuters traveling into city centers:

- o   Vehicle routing
- o   Public transit routing with real-time and timetable departures
- o   Pedestrian routing with pedestrian connectivity
- o   Real-time traffic and traffic incidents
- o   Delays and disruptions to public transit service based on information from transit authorities
- o   Amenities available at or near transit stations

Conclusion

As modern life becomes more urbanized and more people live in cities, transportation systems are growing to deal with the travel needs of booming populations – more roads, more railway tracks, more subway lines, more bus routes and more travel choice for people entering, leaving and traversing cities.

This choice means more options for commuters but also causes greater complexity and restrictions. Cities often restrict parking for private vehicles to encourage greater use of public transport, making intermodal journeys more commonplace.

For the commuter, coordinating these journeys to guarantee a desired time of arrival can be challenging, particularly when the timetables of different transit providers are uncoordinated. The challenge is increased when roadworks, accidents or unexpected events intervene to slow the journey.

To solve this, commuters need journey planning apps that not only let them plan their commute before setting off, but also advise them of live events that will disrupt their plan and suggest alternative routes and times.

HERE Technologies has created a comprehensive intermodal service that can provide complete transportation options and navigation guidance to any app. As well as commuters, it can also be used by cities or public authorities to help visitors and citizens get around the city more easily.

The intermodal routing service gives access to a comprehensive routing algorithm that makes intelligent calculations to provide the best commuting options. It takes into account various transportation modes, real-time traffic conditions and real-time transit service disruptions, as well as walking times to take a user to a final destination in the fastest and easiest way.

The route options provided show users every step of the journey, including where to change trains and walking directions. Importantly, the complete journey plan can be seen on a single screen, avoiding the need to switch between separate apps, which can be confusing.

Sources cited

[1] https://esa.un.org/Unpd/Wup/Publications/Files/WUP2014-Highlights.pdf

[2] http://www-03.ibm.com/press/us/en/pressrelease/35515.wss

[3] https://www.bts.gov/content/commuting-work

About HERE Technologies

HERE, the Open Location Platform company, enables people, enterprises and cities to harness the power of location. By making sense of the world through the lens of location we empower our customers to achieve better outcomes – from helping a city manage its infrastructure or an enterprise optimize its assets to guiding drivers to their destination safely. To learn more about HERE, including our new generation of cloud-based location platform services, visit http://360.here.com and www.here.com