Long-term planning for ring-radial urban rail transit networks
Date/Time: Monday July 18, 2pm-3pm
Location: JAB 474

Speaker: Dr. Saeid Saidi
Transportation Planner, HDR

Abstract

Extensive work exists on regular rail network planning; however, few studies exist on the planning and design of ring-radial rail transit systems. With more ring transit lines being planned and built in Asia, Europe and the America’s, a detailed study on ring transit lines is timely. An analytical model with continuum approximation approach is first introduced to find the optimal number of radial lines considering a city with a radio-centric street grid with the city center at the origin. The optimization is basically a trade-off between access cost to radial line versus cost of operation and construction of radial line to find optimal number of radial lines or optimal radial line spacing. An approximate analytical model for ring radial rail network planning is then introduced allowing analysis of the feasibility and optimal alignment of a ring transit line in a city, based on a route choice model that identifies circumstances under which passengers would choose to take the ring line. Factors, such as capital and operating cost, ride cost, OD patterns, and existing transit network configuration are found to play an important role in the feasibility and the circumference of a ring line. However, the most important factors are OD patterns and the existing radial network configuration. This study also shows the potential net benefit of introducing a ring line by assessing anticipated reductions in total passenger costs. The previously developed Full Ring-radial transit network model is then extended to allow simultaneous consideration of radial and ring lines and analyzing a transit network with partial ring and radial lines. This extension allows a more realistic idealization and analysis of rail transit networks. A benchmark analysis of six cities with ring transit lines (London, Moscow, Tokyo, Paris, Berlin, and Madrid) is used to identify prominent types of lines in an idealized ring-radial transit networks. The cities are then assessed based on their unique network patterns using identical model inputs such as length of rail transit network and trip distribution patterns. Unlike simulations and agent-based models, this model is shown to be easily transferable to many ring-radial transit networks. Therefore, with a daily OD trip matrix and transit network supply characteristics and parameters as input, the model can be implemented for many cities. This model can be used to compare performance of different rail transit networks. It can also be used for cost benefit analysis to compare total passenger cost savings versus the cost of network extension. The benchmark analysis using the Ring-radial rail transit network model is a mathematically sound platform to compare different topologies of rail transit networks and propose the best examples of rail network topologies.

BRIEF BIO

Dr. Saeid Saidi is recently graduated from University of Calgary in Transportation Engineering. Currently, he is a Transportation Planner at HDR. His research interest is on Transit Network Planning, Transportation Modeling, and ITS. He is recipient of Alexander Graham Bell Canada Graduate Scholarship from Natural Sciences and Engineering Research Council of Canada and Izaak Walton Killam Memorial award, the most prestigious award offered by University of Calgary. He is a member of Rail Transit Systems Committee at the Transportation Research Board. He has more than 10 publications overall, which includes 5 journal articles.