

Transport Accessibility from a Human Point of View

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Accessibility, by car and by public transport, is a key indicator to assess urban and inter-urban transportation system. In the lecture, I review existing approaches to estimating transport accessibility within the city and the region and propose a high-resolution approach to accessibility estimation that is based on exact representation of the urban residential space and transportation network and on direct estimation of travel times or, more general, travel cost and travel time/cost variance. Travel time/cost variance is especially important for estimating the fit between urban transportation system and individual travel needs – for many urban citizens, uncertainty of the travel time/cost is the major reason of low attractiveness of the public transport.

High-resolution estimation of accessibility demands effective processing of the urban data at resolution of buildings, junctions, transit stops and departure times. This raises heavy computational problems: the typical metropolitan of several millions population demands processing of hundreds of thousands origins and destinations, tens of thousands street segments and thousands public transportation lines of different kinds. The latter is implemented by the novel AccessCity software, which is developed by Dmitry Geyzersky, Performit Ltd (<http://performit.co.il/en/Company/ManagementTeam>). AccessCity is a brand-new product that builds on the combination of traditional RDBMS system such as Microsoft SQL Server® and open-source, high performance graph database Neo4J® <http://www.neo4j.org/>. AccessCity software employs the recent achievement of the computational graph theory and is blazing fast. Designed with scalability in mind, AccessCity utilizes the modern principles of parallel programming. It may be scaled up and out, depending on the computational resources and is perfectly suited for the cloud deployment.

Comparison of the low- and high-resolution views clearly demonstrates that the adequate view of urban accessibility demands human view of the possibilities of traveling in the city. As an example, I present application of the AccessCity to the current and future public transportation system in Tel Aviv metropolitan area. The maps of accessibility and of accessibility variance, constructed for different hours of a day reveal essential spatial and temporal heterogeneity of accessibility over the metropolitan area and the lack of fit between current public transportation network and distribution of the carless population.

I claim that planners and transportation managers should make a step forward, and, instead of estimating accessibility based on flows of passengers and car between regions and neighborhoods, explicitly estimate individual's travel opportunities and costs. Adequate policy responses both for establishing effective public transport and reducing car-dependence demand high-resolution view of the urban mobility and, correspondingly, high-performance software tools.