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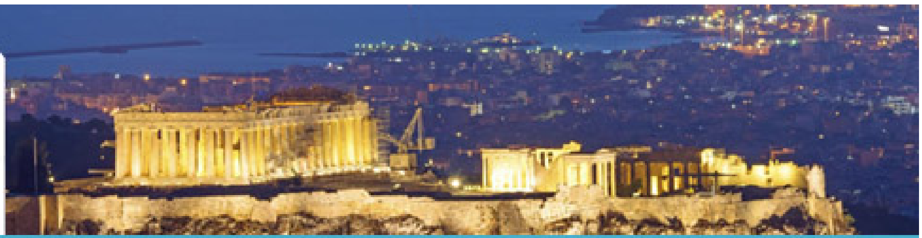

Les défis de développement pour les villes et les régions dans une Europe en mutation

Transit access: a new definition of transit connectors

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A1 and A2

Résumé / Summary

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Introduction

Transit access is a key factor in explaining and promoting transit use. In this context, transit access refers to the ease, in terms of proximity, with which residents can reach transit facilities. It is important because transit demand is highly sensitive to access conditions, especially walking conditions. In transport modeling, however, access to transit facilities is still modelled in a very approximate manner based on centroid connectors. Connectors attach zone centroids to transit stopping points in order to model transit access and egress. This definition, which is still widely used by practitioners, does not necessarily take account of the local access conditions encountered by transit users. Consequently, the standard definition of zone connectors may bias accessibility measurements and hence project assessment.

In transport modeling, all trip origins and destinations are aggregated into traffic analysis zones (TAZ). The entire information lying inside a zone is summarized by a single point called the zone centroid. This aggregation process results in a loss of information about access and egress conditions. One outcome of this is that transit access is modelled by ‘centroid’ connectors. Centroid connectors connect zone centroids to the nearest transit facilities. The walking distance which is supposed to reflect the access conditions to and from the corresponding transit stops is often directly deduced from the length of the connector. Hence, the standard definition of centroid connectors does not necessarily consider the variability of local access conditions and still less users' practices and behaviors.

In this paper, we shall describe a new method for modeling transit access. The method is made possible by the increasing availability of spatial data. It relies on detailed estimations of walking distances to and from transit stops using fine-grained spatial data and distance decay functions. The method is also automatic and needs no major intervention from the modeler. Contrary to standard method, the resulting transit connectors are unaffected by the aggregation bias and, in particular, the geographic position of the zone centroids.

Method

To alleviate the spatial aggregation bias, the new method relies on a detailed description of the study area. For each TAZ, a synthetic population of residents and jobs is positioned at the building level of resolution. Transit routes and stopping points are also accurately represented, as are the timetables. Unlike the standard method based on the geographic position of centroids, the new definition generates connectors on the basis of the actual position of residents/jobs and accessible transit stopping points. The resulting connectors are referred as 'stopping point' connectors or 'line' connectors, rather than 'centroid' connectors.

The new definition meets several objectives and tries to overcome some of the standard method's shortcomings by:

• Generating transit connectors on the basis of an actual measurement of transit access;
• Generating transit connectors independently of zone centroids position;
• Reducing user intervention by automatically generating transit connectors;
• Removing the standard constraints used in operational models to generate transit connectors (maximum number and maximum distance).

The main idea of this new method is to implement the original definition of zone connectors, namely, rendering the average local access and egress conditions to and from transit facilities. This method is based on the following steps:

• For each zone Z, we select the transit lines that are considered accessible from Z and then for each selected line, we identify the reachable transit stops;
• For each zone Z and each selected transit stop, we compute the distribution of walking distance from each building in the catchment area of the transit stop;
• For each zone and each selected transit line, we apply a distance decay function that averages the distribution of distances (computed in step 2). We assign the average distance to the connector of each line.

The new definition is applied to the urban area of Lyon, France. Results show that the new method improves significantly the main modeling results.

Results

Two principle results can be drawn from the case study of Lyon. First, main assignment outcomes depend on the definition of transit connectors. Second, the new definition of transit connectors reproduces the observed data better than the standard method.

Estimated transit journeys and tranfer rates are especially affected by transit access definition. The extent of this impact differs among transit modes but it is still significant for all modes. Moreover, the standard method seems to assign too many trips to every transit mode. Finally, as suggested by the literature, we found that using local access conditions improves the modeling results. The new definition of transit connectors reproduces the observed data better than the standard configurations. Modeling errors are also minimized with the new definition.

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