

A distance-based accessibility index

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Abstract

We attempt to develop a suitable index of what geographers have called the accessibility of each vertex in a network. Accessibility index is a kind of centrality measure, providing a numerical answer to questions such as 'How accessible is a vertex from other vertices in the network?' or 'What is a node's relative geographical importance in the network?' Such an index could be used in a number of interesting ways, for instance:

- Knowledge of which nodes have the highest accessibility could be of interest in itself by revealing their strategic importance or suggesting a site for a new facility;
- The accessibility of vertices could be statistically correlated to other economic, sociological or political variables to test theoretical hypotheses;
- Accessibility indices for the same nodes (e.g. urban centers) in different (e.g. transportation) networks could be compared;
- Proposed changes in a network could be evaluated in terms of their effect on the accessibility of vertices.

A classical accessibility index is the distance sum or short path array connectivity, i.e., the sum of the distances between a vertex and all other vertices. However, it does not take into account a potentially essential feature of the network, that is, whether a node is placed close or far-away from the 'centers'. Therefore a parametric family of accessibility measures is proposed. Some properties of the index are considered and it is applied to famous examples from the literature.

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