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An Agent-based Spatial Urban Social Network Generator: A Case Study of Beijing, China

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Abstract

This paper proposes an agent-based spatial social network model, which combines a utility function and heuristic algorithms, to formulate friendships of agents in a given synthetic population comprising individuals and households, as well as their attributes and locations. In order to better and explicitly represent the real social networks, the model attempts to generate both close and somewhat close social networks by linking agents with either close or somewhat close friendships, fitting both distributions of network degree and transitivity, which are two basic characteristics of a network. Here, a utility function, which incorporates the similarity between agents in individual attributes (e.g., sex), as well as the spatial closeness of their residential locations and workplaces, is developed to judge whether a friendship between a pair of agents can be built. Furthermore, the social network model is developed as a key component of an agent-and Geographic Information System (GIS)-based virtual city creator that is a set of synthesis methods used to generate spatially disaggregate urban data. Finally, Beijing, China is used as a case study. Both close and somewhat social networks are generated with the target and generated distributions well matched, and the generated networks are further analysed from a geographical perspective.

Keywords: Agent-based Modelling; Close and Somewhat Close Social Networks; Network Degree; Network Transitivity; Spatial Network; Beijing, China

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