4.2.1 **Optimizing pedestrian system function and experiential quality with integrated network and agent based simulation models**

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Service quality of transportation systems can be approached from both system- and user-based perspectives. This is particularly true for pedestrian travel where characteristics of the traveler experience are as important to service quality as the efficient functioning of the transportation systems. These two dimensions of service quality operate at different scales. System function is generally analyzed at the neighborhood or regional level, considering pedestrian networks in their entirety. User experiences are generally analyzed locally, focusing on individuals and events at specific locations. Integrating these disparate levels in a single approach is a complex and ongoing challenge for transportation managers and behavioral analysts.

Modeling is a powerful and flexible research approach for addressing such complex challenges. Models enable analysis of alternative scenarios, facilitating adaptive management and providing insight about future service and quality conditions. This research develops a spatially explicit modeling approach that integrates regional GIS-based network models for assessing whole system function with local agent- based microsimulation models for assessing the quality of individual pedestrian experiences. Pedestrian facilities are modeled with vector spatial data. Pedestrian agents are parameterized by behavioral data including preferences, tolerances and contingent decisions. Based on these inputs, network models estimate pedestrian demand for network links. These demands serve as inputs for the microsimulation models, which evaluate functional and experiential quality for localities. The models are iteratively operated to identify optimum conditions. Such a modeling approach integrates system and individual levels, enabling efficient and flexible pedestrian planning and facilitating holistic evaluation of transportation policy.