

Urban Mobility Modeling Using Volunteered Geographic Information and High-Resolution Population Data

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Mobility has been an important measure to evaluate the efficiency and livability in urban areas. With the increasing amount of volunteered geographic information, such as OpenStreetMap, we can build applications to study urban mobility and dynamics at national and even global level. By taking advantage of the LandScan high-resolution population distribution data (30m by 30m in United States and 1 km by 1 km in other countries), we developed the TUMS (Toolbox for Urban Mobility Simulations) system, a microsimulation approach to address transportation problems at global level. The TUMS integrates the National Household Travel Survey (NHTS) data and Census Transportation Planning Products (CTPP) special tabulation for travel demand modeling in US case studies. To demonstrate the system capability and performance, two kinds of traffic scenarios in Alexandria, Virginia are modeled: daily normal traffic scenario and emergency evacuation scenario. The first scenario is modeled with selected NHTS data and simulated with microscopic traffic models in the TUMS. The second scenario is modeled based on the no-notice emergency evacuation assumption – everyone leaves the affected area with shortest paths. Through the comparison study and vehicle-based microscopic visualization, users can easily find the urban mobility patterns under different scenarios. This can help transportation planners to identify system bottlenecks and to test different operation strategies for special events, such as game-day traffic operation and disaster management. The TUMS system is easily scaled to any geographic locations with its unique GIS data resources. With proper analysis and process of NHTS data, it is fairly fast to simulation traffic mobility in a multiple-county megaregion area.