issue no. 112
SPRING 2016

# planning & technology TODAY

APA American Planning Association
Technology Division
*Making Great Communities Happen*

## In This Issue



# SALUIT: A Local Planning Tool from a Regional Agency

Doug Walker, Placeways & Bob Diogo, North Jersey Transportation Planning Authority

Imagine you are a county planner in northern New Jersey. A proposal has come forward for a small area land use project—a transit-oriented development (TOD), for example, or a neighborhood revitalization project. As a planner, you would like to know the project's potential impacts on both transportation-related factors such as roadway system impacts and mode share, and on broader topics such as economics, environment, and housing. But commissioning studies on all those elements would be too time consuming and expensive, especially at this early, preliminary stage.

Luckily, your region's MPO, the North Jersey Transportation Planning Authority (NJTPA), has a solution. NJTPA's Small Area Land Use Impact Tool—SALUIT—is a desktop-based analysis tool for local projects that sources data and models from the cloud. You input the proposed project (by sketching land uses on a map or importing digital plans), push a button, and sit back while a comprehensive analysis is performed. The results are packaged up in detailed reports and in a visual, presentation-friendly format that steps through a series of thematically organized maps and charts. The (cont. on page 5)

## 2016 APA National Conference | Phoenix | Technology Division Activities

**Smart Cities, Geodesign, and Big Data Session | Saturday, April 2nd, 2:30–3:45pm, S436**
This facilitated panel discussion is being sponsored by the Technology Division and will include an overview of how to effectively use geodesign and big data applications to achieve outcomes consistent with smart city principles.

**Business Meeting | Sunday, April 3rd, 7:00am**
All members are welcome. Location will be at conference hotel. See conference program for room assignment.

**#AppsforPlanning: Innovative Mobile Planning Apps Challenge | Sunday, April 3rd 2:30–3:45 Room 129A**
Watch students and emerging professionals pitch great web-based and mobile applications that will help the planning profession and the communities we serve.

**Reception | Sunday, April 3rd, 7:30-9:30pm | Desoto Central Market, 915 N Central Ave., Phoenix, AZ**
The Technology Division is partnering with the International Division, Sustainability Division, Urban Design and Preservation Division, and New Urbanism Division on a joint reception. This is a ticketed event. The cost is $5 and includes drink tickets and food. Space is limited so purchase tickets now at the web site: https://conference.planning.org/search/?tags=RECEPTIONS&section=RECEPTIONS&scope=program.

**For detailed descriptions of technology and smart city related conference sessions, see pages 6–7.**

# Urban Network Analysis toolbox for Rhinoceros3D

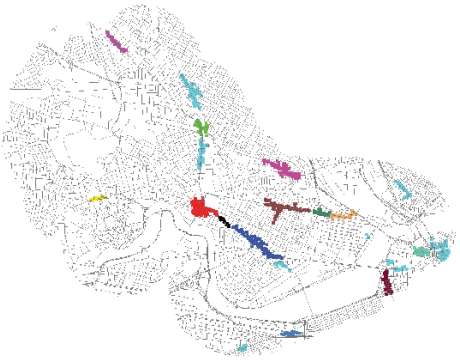
Andres Sevtsuk & Raul Kalvo, Harvard University and City Form Lab

The Urban Network Analysis (UNA) toolbox is a software plugin for measuring relationships between spatial activities and pedestrian activity along urban circulation networks. Available as an ArcGIS plugin since 2011, a new version of the toolbox with enhanced functionality was released for Rhinoceros 3D in 2015.

As the use of Rhinoceros drawing and modeling software has rapidly expanded from architects to urban designers and physical planners, it becomes important to make analytic decision support tools available to planners who work directly on drawing files. The Rhino UNA toolbox integrates powerful network analyses into hands-on design processes on a digital drawing canvas. This shortens the lengthy feedback cycle between design and analysis, where drawings from one software are exported to GIS or other platforms for evaluation, and results eventually returned to design software. Having UNA metrics in Rhino allows a planner to evaluate a specific plan or development proposal within seconds, incorporating analytics into a fast and iterative design process, where designs can be altered, evaluated and redesigned in seamless cycles to rapidly improve the outcome.

Rhino UNA toolbox requires two types of inputs from the user. First, a spatial network is needed to describe circulation paths along which travel can occur. Spatial network commonly utilize centerlines of streets and sidewalks, though they can also be extended to include two- and three-dimensional indoor networks. In dense urban settings, public space can flow seamlessly from sidewalks to building lobbies or multistory retail and service environments. Since Rhino is foremost design software, creating and editing networks is intuitive and highly flexible. Data exchange with ArcGIS and Excel is also enabled, making it possible to bring in shapefiles and to use Excel to graph and manipulate feature attributes.

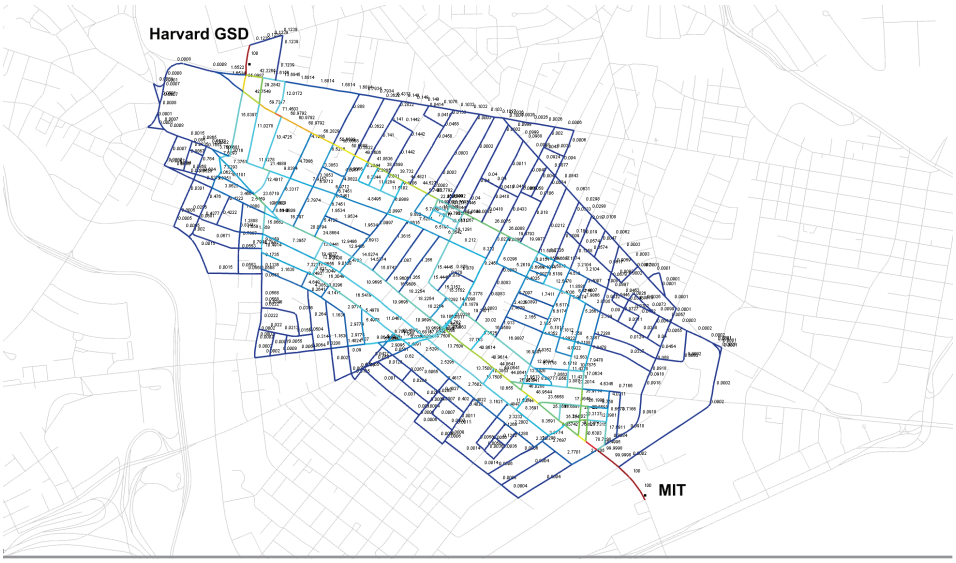
The second input involves origins and destinations for modeling movement along networks. Origin points—buildings, businesses, transit stations, schools or parks—designate where movement starts. Origin points can be weighted by attributes describing their real-world properties—a weight called "jobs" in commercial buildings can describe the number of employees in each building. Weights can either be imported from shapefiles or directly created in Rhino. Destination points describe the terminal locations that movement flows to. Using office building entrances as origins and Metro stations as destinations allows one to estimate how employees are likely to distribute over a street network while going from jobs to transit stations.



Spatial clusters of retail and food service establishments in Cambridge, MA. Clusters are detected as groupings that contain at least 25 establishments and where each establishment in a cluster is no further than 75 yards from the nearest neighboring member in the same cluster.

Given these inputs by the user, the following describes a few example functions of the toolbox. Accessibility tools offer different indices for measuring how readily origins on spatial networks can access a set of destinations. The Reach metric quantifies how many destinations each origin can reach within a give walk radius. It can be used to describe how many households or jobs are available within a five-minute walk around each bus stop or retail business, for instance. The Gravity metric models accessibility as a ratio between destination weights and transportation cost for reaching them. Accessibility to a park can be specified as a ratio between the number of beneficiaries that are found within a given walkshed, divided by each beneficiary's walking distance to the park.

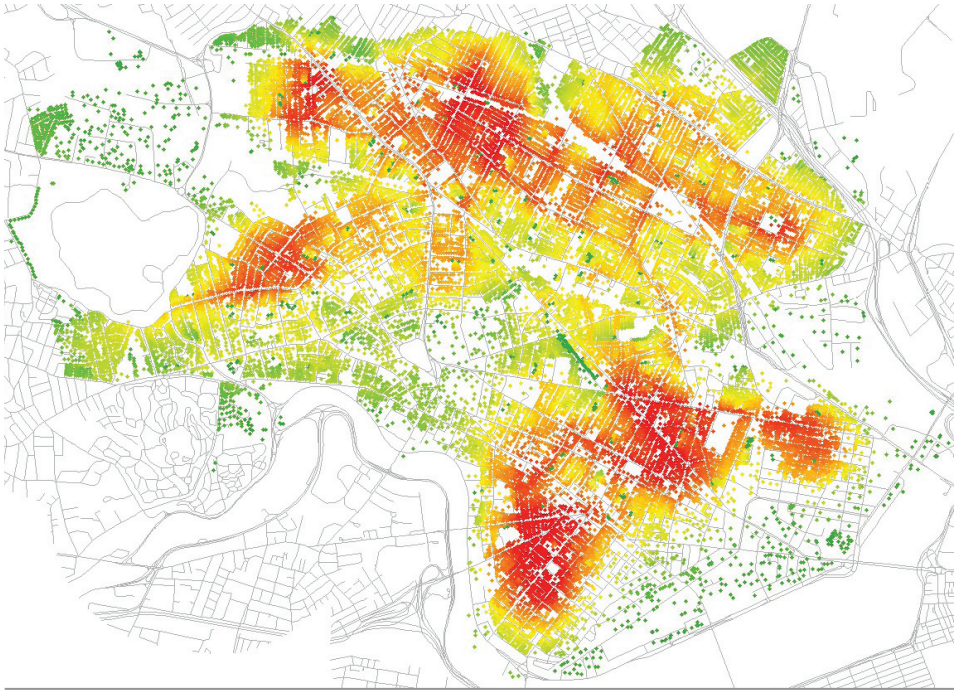
Betweenness tool can be used to estimate pedestrian flow at particular locations. Since pedestrians do not always choose shortest routes, movement between each origin and destination can not only be modeled along shortest paths, but users can also input an allowable "detour ratio" to include longer routes. If homes are taken as origins and retailers




Probability distribution of walking routes from MIT to Harvard GSD. Warmer colors denote path segments that are more likely to be used, cooler segments routes that are less likely to be used. Routes that are not highlighted in colors are more than 20% longer than the shortest available walk.

as destinations, then the number of residents starting from each home location is distributed over all paths within the allowable detour, giving each route that is found an equal probability. The analysis keeps track which route segments receive most overall users, indicating their total estimated pedestrian flow.

Facility patronage tools can be used to estimate the patronage of spatial facilities—e.g shops, public spaces, transit stops—in a network. A discrete choice model is used to allocate a proportion of demand from all origin points to all destination facilities such that a higher allocation is given to facilities that are closer to the user or have higher weights. The results can be used to examine how many people or what share of the total demand is likely to patronize each facility. Testing different planning scenarios iteratively can improve facility patronage for individual destinations or all destinations collectively.



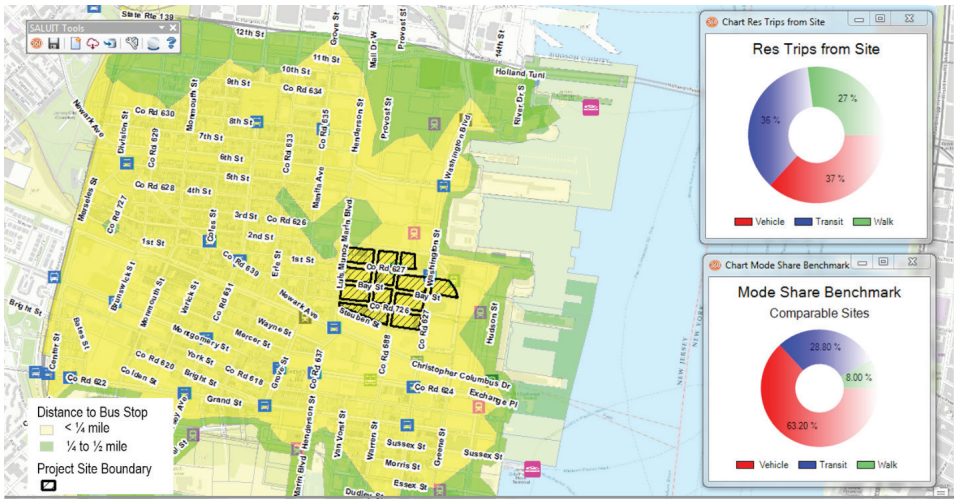
Reach to residents from each building in a 10-minute walkshed in Cambridge, MA. Red colors indicate buildings that can reach more residents, green colors less residents in a 650-yard network radius.

The toolbox includes a number of additional functions that cannot be elaborated here for brevity. A comprehensive help file is available along with tutorial videos for getting started. The UNA toolbox can be downloaded from the Harvard GSD City Form Lab website; it is distributed free of charge as a plugin for Rhinoceros 5.0.

(cont. from page 1) results tell you and your constituents all about the potential impacts of the proposal. Want to experiment with changes that might improve the project? You can do that, too.

This is no generic analysis. It is using local GIS data and modeling parameters for estimating the results for specific locations, and it also lets you supplement the results with your own information. It uses the latest available data on where people in your area live and work, what the transportation infrastructure is and how it performs, and even how comparable projects in similar place types perform.

Here's how it works: the necessary GIS data comes from NJTPA's cloud-based regional data repositories. Impact models and the locally-calibrated parameters were researched and developed when SALUIT was first created, and they are reviewed and updated periodically. Many calculations happen in real-time using local spatial relationships and the specifics of your proposal. The desktop platform is a free, custom add-in to ArcGIS and CommunityViz planning software.




A screenshot of NJTPA's Small Area Land Use Impact Tool (SALUIT). The planning analysis application provides a pre-packaged, comprehensive impact analysis of small area project proposals that covers transportation, housing, environment and other topics. (Image: Placeways LLC)

Starting to wish you were in NJTPA's region? So far, no other MPO has quite the same system, but now that it has been built once, the application would be easier to build again in other locations. Some of SALUIT's reusability features are already finding their way into the next version of CommunityViz, and Placeways and NJTPA staff would be pleased to share their knowledge and experiences with other groups who may be interested.

*The SALUIT website: http://njtpa.org/data-maps/modeling/land-use-impact-model.*