TravelR: Travel Demand Modeling in R

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Travel demand modeling is widely applied for analysis of major transportation investments and air quality conformity. Yet this field has remained conservative in its methodology, and unable to keep pace with evolving policy analysis goals (TRB, 2007). Since the US Department of Transportation ended development of its Urban Transportation Modeling System (UTMS) in the mid-1980s, most agencies have depended on expensive and inflexible proprietary software platforms. Where advanced travel models have been implemented, they have been large customized software systems, with all the expense and risk inherent in such efforts (VDOT, 2009).

Travel model developers have begun experimenting with open source tools. The R statistical environment has drawn attention because of its fast vector and matrix processing, powerful graphics, and vast collection of statistical tools for estimating and applying statistical models. The Oregon Department of Transportation has implemented considerable portions of their travel demand modeling system in R (ODOT, 2010). The author has used R for model estimation at the Virginia Department of Transportation.

Until now, however, it has not been possible to build complete travel demand models in R, due primarily to the lack of solutions for the equilibrium traffic assignment problem (which allocates travel demand on congested transportation networks). Travel models written in R have remained dependent on proprietary traffic assignment routines.

This presentation introduces **TravelR**, which implements common algorithms for highway assignment and other basic travel demand modeling functions. The highway assignment function supports features that are important to practical large-scale models: turn penalties (used to simplify network coding), multiple interacting vehicle classes (such as cars and trucks operating with different cost functions on different network subsets), and select link analysis (to extract travel patterns through portions of the network). Written in C++ and R, it handles large problems with reasonable speed. **TravelR** also inter-operates with the R packages **igraph** and **sp**, allowing access to R tools for graph algorithms and geospatial analysis.

In addition to providing tools to build entire travel demand models in R, **TravelR** makes possible an R-based framework for travel demand modeling in which new methods can be explored, tested, and rapidly put into practice. The author hopes that an open source platform for travel demand modeling in R will accelerate the investigation and adoption of new travel modeling techniques that can respond to increasingly challenging environmental, social and financial issues in transportation systems.

References

Oregon Department of Transportation (ODOT) (2010). *(Travel) Modeling with R*,
http://www.oregon.gov/ODOT/TD/TPAU/R.shtml.

Transportation Research Board (TRB) (2007). *Metropolitan Travel Forecasting: Current Practice and Future Direction*, Special Report 288,
http://onlinepubs.trb.org/onlinepubs/sr/sr288.pdf

Virginia Department of Transportation (VDOT) (2009). *Implementng Activity-Based Models in Virginia*,
http://www.virginiadot.org/projects/resources/vtm/VTMRP09-01_Final.pdf