EXECUTIVE SUMMARY - *updated FEBRUARY 2019*

USDOT Tier-1 University Transportation Center

CM2

Cooperative Mobility for Competitive Megaregions

BEYOND POLITICAL BOUNDARIES
MEGAREGION NETWORK MODELS

Beyond Political Boundaries: Constructing Network Models for Megaregion Planning (#CM2-11)

Dr. Stephen Boyles, University of Texas at Austin

11/01/2017 - 10/31/2018

Project Information Form: http://sites.utexas.edu/cm2/files/2018/03/Year-2-Stephen-Boyles-Beyond-Political-Boundaries.pdf

Final Project Report: http://sites.utexas.edu/cm2/files/2019/01/Boyles-et-al-Year-2-CM2-Research-Report-Constructing-Network-Models.pdf

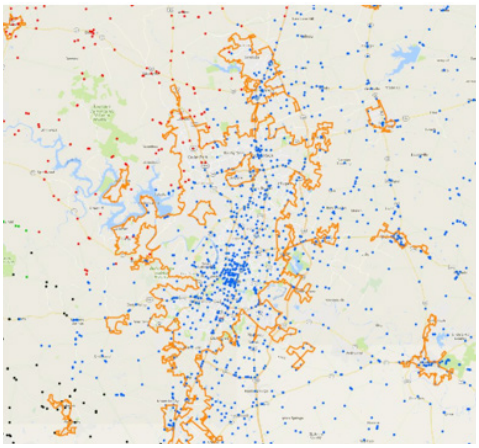
TEXAS
The University of Texas at Austin

The scale of urban planning is now focusing on megaregions in addition to metropolitan areas and states. The traffic assignment problem (TAP), used to study traffic flow patterns on networks, is a crucial step in urban planning. Megaregional networks transcend planning agency jurisdictions, challenging current network models and computational resources. This study aims to solve TAP on a megaregional scale by applying an algorithm based on the decomposition approach for the static TAP (DSTAP) that uses network decompositions based on network geography.

In the first part of this research, we compare two partitioning algorithms for finding network partitions for megaregions by minimizing the number of subnetwork boundary nodes and the time required to solve DSTAP. The flow-based spectral partitioning generates flow balanced subnetworks which reduce the per iteration computation time and lead to faster convergence compared to the agglomerative partitioning algorithm. In the second part of this research, we propose a decomposition heuristic for large scale networks, allowing parallelization of TAP.

The heuristic reduces the computational time for DSTAP by simplifying interactions within the subnetwork. For the uncongested Texas network, the proposed heuristic led to marginal 5% savings in computational time than state-of-the-art TAP methods, while for the congested scenario, the heuristic observed about 70% savings in computation time for the same convergence level. However, the heuristic leads to a lower bound on the relative gap value at termination (called heuristic gap) which ranges between 9E-3 and 5E-4 for the experiments conducted on the Texas statewide network.

Project Report Completed in December 2018.



Five-partition case for SDDA, with a focus on the Austin area

This study was funded by the consortium of Cooperative Mobility for Competitive Megaregions (CM²). CM² is a USDOT Tier-1 University Transportation Center (UTC). CM²'s consortium partners include The University of Texas at Austin, Louisiana State University, Texas Southern University, and the University of Pennsylvania, with affiliates at Cornell University and Rutgers University.