



Research Project Highlight

Identification of Transportation Network Corridors, for Enhancing Network Resilience

TSRP Topic – PBE Tools, T4

Principal Investigator

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Start-End Dates:

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Abstract

The goal of this project is to use network analysis and network clustering techniques to identify and evaluate transportation corridors as a potentially useful analysis unit for managing transportation system risk. A corridor is defined here as a set of network links with dependence on each other for delivering network services. If corridors function as a unit, then vulnerabilities to components of corridors should be mitigated simultaneously in order to reliably deliver network services. An idealized corridor would be a set of links connected in series, so that each link must be functioning in order for the path to exist, though the situation is more complex in real-world networks. This project will evaluate algorithms for identifying corridors, and then performing seismic risk analysis using the PEER Framework to evaluate the effectiveness of strategies for retrofitting networks.

Deliverables

In addition to scholarly publications documenting the analysis results, the software used to perform this corridor analysis will be provided to the PEER community to aid follow-on studies. This is in keeping with our goal of open-sourcing analysis tools; our current network data and models are available at <https://web.stanford.edu/~bakerjw/infrastructure.html>.

Research Impact

We will evaluate the suitability of various network analysis algorithms for detecting corridors within the transportation network, and then evaluate whether retrofit strategies that consider these corridors are more effective in limiting seismic risk than alternatives. Figure 1 shows some preliminary results, performed



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using the Markov Clustering algorithm with road links weighed by their travel time and capacity. The approach is producing reasonably intuitive corridor results, but will be more valuable once we have evaluated the impact of considering larger versus smaller clusters of bridges, and once we have evaluated whether corridor-based retrofit strategies are in fact effective in reducing the probability of severe transportation disruptions after a large earthquake. The broader aim of this work is to develop new tools for identifying strategies to improve the performance of complex networks. While road networks are the specific focus of this project, the approach may be generalizable later to other critical infrastructure networks.

Project Image

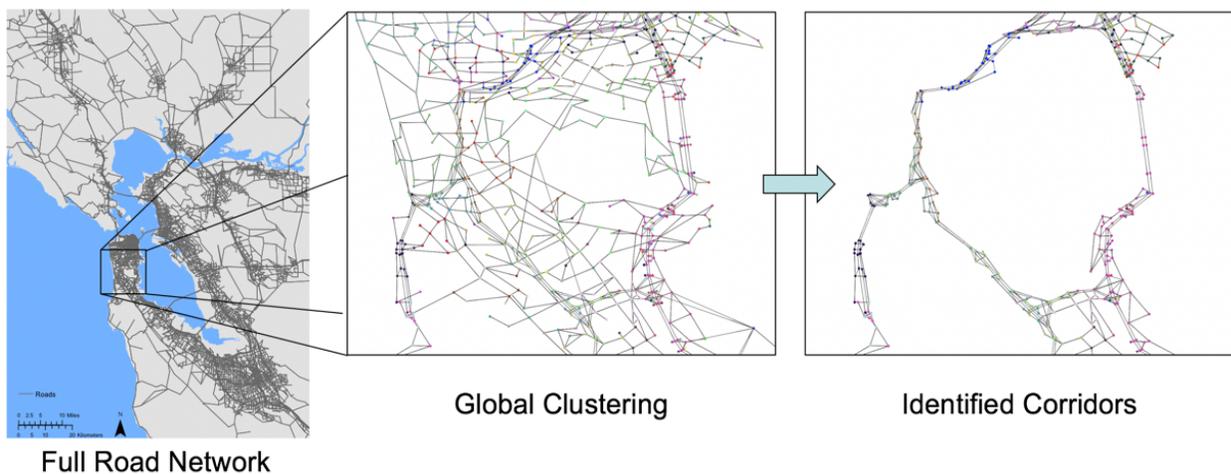


Figure 1: Preliminary results from Markov Clustering of the network, and identified corridors.