

**Project Title:**

Analyzing Traffic Layout Using Dynamic Social Network Analysis

**Principal Investigators:**

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\$81,507

**Matching Funds:**

\$81,507

**Project Description:**

It is essential to build, maintain, and use our intermodal transportation in a sustainable manner that meet our current needs while addressing the social and economic needs of future generations. In today's world, the problem of congestion in our infrastructure transportation systems has been causing serious negative time and cost impact to our societies. To this end, researchers have been utilizing various statistical methods to better study the flow of traffic into the road networks. However, these valuable studies cannot realize their true potential without solid in-depth understanding of the interrelated connectivity between traffic intersections in resolving transportation congestion problems. This project fills in this knowledge gap.

This intellectual merit of this project lies in bridging between engineering and social science domains to gather analytic information which should enable decision makers to effectively and efficiently prioritize and optimize future infrastructure transportation projects. This project creates a dynamic social network analysis framework to study the centrality of the existing road networks. This new approach utilizes the well-established fields of graph theory and network analysis where: (1) visualization and modeling techniques allow capturing the relationships, interactions, and attributes of and between network constituents, and (2) mathematical measurements facilitate analyzing quantitative relationships within the network and of the overall network topology. This will allow understanding the connectivity and popularity of an intersection with respect to its spatially neighboring intersections and provide alternative routes within the network. Also, this project will use Monte Carlo simulation to study the uncertainty resulting from the different probability distributions resulting from potential modifications to existing traffic layouts. Thus, decision makers will be able to examine their suggested development strategies using directed network structures. This project would open horizons for a new research stream where social network analysis will be used to enable improved and more robust analysis for traffic flows, accidents, and number of cars in a specified location of interest.

The broader impacts of this project are realized through developing a dynamic management toolset to help decision makers improve the existing infrastructure transportation systems. At the educational level, the research activities are expected to enhance the understanding of the importance of proper planning concepts and systems thinking in transportation applications for the research community, practitioners, as well as the undergraduate and graduate students. The proposed educational activities will also establish a partnership between Mississippi State University (MSU) and Louisiana State University (LSU) on this project and others to come. For the society, the enhancement of current construction and management practices has the potential to increase the effectiveness and efficiency of intermodal transportation systems through decreasing wasted time and cost due road congestions.