

DEVELOPING A QUALITY OF SIGNAL TIMING PERFORMANCE MEASURE METHODOLOGY FOR ARTERIAL OPERATIONS

By Lindsey Costello



Key Points:

Project Number:

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Start Date:

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Duration:

24 Months

Project Cost:

\$272,986

Professor, UNR:

Zong Tian, Ph.D, P.E.

Assistant Professor,

UNR:

Hao Xu, Ph.D, E.I.T.

Assistant Professor,

UA:

Yao-Jan Wu,

Ph.D, P.E.

PROBLEM

An urgent need in both Nevada and the nation is to establish performance measures criteria used to judge the quality of signal timing and coordination along major arterials. Efficient arterial operations and desirable performance outcomes could not be achieved without traffic signals operating at their optimal levels. There must also be an established evaluation and data collection methodology for assessing the quality of signal performance. The difficulty of assessing the quality of signal timing lies in the fact that many factors could contribute to the performance outcome.

OBJECTIVE

In Nevada's urban areas, signalized arterials carry nearly 40% of the total travel, and they play a critical role in the overall transportation system's efficiency. The goal is to develop a scoring methodology for assessing the quality of signal timing along these arterials. It is envisioned that the methodology will yield an index score based on common performance measures obtained through probe vehicle travel runs or sensor and timing data from signal controllers. The index will reflect the quality of signal timing, suggesting if the signal operations along an arterial, particularly in coordination and progression, are at the optimal level or if there is room for further improvement.

METHODOLOGY

Task 1. Project Management

A technical panel will be formed to guide the direction of this project, comprised of experienced traffic signal engineers from various jurisdictions in Nevada.

Task 2. Comprehensive Literature Review

Literature review will be conducted to determine existing research in this area.

Task 3. Selection of Arterials and Data Collection

Identify at least three arterials, one in northern Nevada and two in southern Nevada, as case study sites. Ideally, the selected arterials will have different congestion levels and different road properties, such as number of lanes and intersection spacing. The data to be collected includes intersection spacing and speed limits, existing signal timing plans, GPS trajectories of travel runs, and traffic demand.

Task 4. Definition of Quality Levels of Arterial Traffic Signal Timing

Quality of signal timing levels will be defined in letter grades A through F, which will be determined by the index score. Initial traffic simulation models will be established and calibrated using data from the selected arterials. Simulation scenarios will be created by changing the traffic demands and signal timing plans. For each quality level, a general definition will be given.

Task 5. Development of Measurement Function of Arterial Traffic Signal Timing

In this task, the developed scoring function for performance measurement of arterial signal timing will be compared with performance measurement of the PCD method and the Orange County index to ensure a certain degree of consistency among different methods.

Task 6. Evaluation and Implementation

Two arterials in Nevada, different from the ones used for function development, and two arterials in Arizona will be selected for testing the proposed methodology. This is to ensure practicability and acceptability of the methodology in general applications.

Task 7. Final Report

A final project report will be prepared to document all the major findings and work from the above tasks and will be submitted to NDOT for review.

IMPLEMENTATION POTENTIAL

Improving urban arterial operations through high-quality signal coordination is one of the most cost-effective strategies to reduce travel delay, decrease fuel consumption and air pollution as well as improve intersection safety. Signalized arterials play a decisive role in the overall transportation system's efficiency in Nevada, as they carry nearly 40% of the total VMTs nowadays. Efficient arterial operations could not be achieved without signal timing being set and maintained at optimal level. Currently, many urban arterials in Nevada are not operating at their optimal level due to resource constraints and are costing travelers millions of dollars each year in wasted time and fuel.

Contact Information:
Nevada Department of
Transportation Research Division
Annex 14-15
1263 South Stewart Street
Carson City, NV 89712
(775) 888-7895
<https://www.nevadadot.com/doin>