Srinivasa Sunkari, PE

Senior Research Engineer

YEARS OF QUALIFYING EXPERIENCE: 30

Education

- B.S., Civil Engineering, Osmania University, India 1988
- M.S., Civil Engineering, Texas A&M University, 1992

Background and Qualifications

Mr. Sunkari is a Senior Research Engineer at the Texas A&M Transportation Institute and has over 30 years of experience as a professional engineer and a researcher in the field of traffic signal operations, hardware-in-the-loop simulation, and Connected Vehicle Initiatives. Mr. Sunkari was a key researcher in development of the Concept of Operations (ConOps), User Needs, System Requirements, and a prototype system for the generation and broadcast of Signal Phase and Timing (SPaT) and related messages to vehicles in a Connected Vehicle Environment. The SPaT prototype was deployed and tested at the FHWA Turner Fairbank Highway Research Center (TFHRC). He also led the development of a hardware-in-the-loop platform to evaluate Connected Vehicle Applications and Connected Vehicle Technologies. Mr. Sunkari was also the principal investigator in a project to identify and eliminate conflicts in the Connected Vehicle Messages from the infrastructure to the mobile devices. He was also the lead researcher to deploy and operate the infrastructure for the Traffic Optimization for Signalized Corridors (TOSCo) for USDOT.

Mr. Sunkari was one of the contributing authors of the first version and the second version of the FHWA's Traffic Signal Manual. Mr. Sunkari was also a key researcher that developed the Signal Timing Handbook for the Texas Department of Transportation. He has developed and presented numerous workshops specifically for the Texas Department of Transportation and ITE. These include workshops in arterial optimization, diamond interchange operations, rail preemption at intersections near highway-rail grade crossing, advance coordination features, and hardware-in-the-loop simulation. He has frequently been relied upon to provide technical support to various TxDOT districts for traffic operations.

Prior to returning to TTI, Mr. Sunkari led the field evaluation of Real-Time Traffic Adaptive Control Systems (RT-TRACS) for FHWA as a Transportation Engineer for ITT Industries.

Recent Work Experience

Dates	Position(s)	Organization
1998–Present	Senior Research Engineer, Research Engineer, Associate Research Engineer, Assistant Research Engineer	Texas A&M Transportation Institute
1995 – 1998	ITT Industries	Transportation Engineer
1992 – 1995	Assistant Research Scientist	Texas Transportation Institute

Accomplishments and Professional Affiliations

- Institute of Transportation Engineers
- Current Vice Chair of the ITE CAV Standing Committee
- Former Chair of a Technical Committee to develop an Informational Guide for the Traffic Engineering Council
- Friend of the TRB Signal Systems Committee
- Professional Engineer, State of Texas

Relevant Project Level Experience

Traffic Optimization for Signalized Corridors (TOSCo). The Traffic Optimization for Signalized Corridors (TOSCo) application uses wireless data communications sent from a Roadside Unit (RSU) to connected vehicles to encourage "green" approaches to signalized intersections. The application, located in a vehicle, collects SPaT (Signal Phase and Timing) messages, MAP Messages, and additional application specific information related to traffic queues and green window timing (SAE J2735 RSM, formerly known as BIM) using Vehicle-to-Infrastructure (V2I) communications and data from nearby vehicles using Vehicle-to-Vehicle (V2V) communications. Upon receiving these messages, the application performs calculations to determine the vehicle's optimal speed to pass the next traffic signal on a green light or to decelerate to a stop. This information is then sent to longitudinal vehicle control capabilities in the host vehicle to support partial automation. In the current phase TTI team will build, implement, and evaluate the TOSCo system on a real-world corridor in Houston, Texas.

New Approaches for Testing Connected Highway and Vehicle Systems. In this project, the Texas A&M Transportation Institute (TTI) team developed a platform that FHWA can use to test, validate, and verify connected vehicle concepts, applications, and technologies in a laboratory testing environment that replicates actual field deployments. The TTI team constructed this platform based on previous experience developing and testing the Signal Phase and Timing (SPaT) system currently deployed at the Turner-Fairbank's Connected Vehicle Test bed, developing, and utilizing hardware-in-the-loop simulation systems for testing and validating advanced traffic management concepts and algorithms, and knowledge of simulating different communication technologies and environments. The team developed, a "plug and play" platform whereby different connected vehicle communications technologies and vehicle- and infrastructure-based applications can be safely vetted, tested, and verified under different operating and communications environments. The testing platform integrated a microscopic traffic simulation model (VISSIM), a communication simulation model, interfaces for connecting real connected-vehicle hardware (traffic control devices, and communications equipment), and vehicle- and infrastructure-based applications. The platform was transferred and deployed at the Saxton Transportation Operations Laboratory at the Turner Fairbank Highway Research Laboratory facility.

Signal Phase and Timing (SPaT) and Related Messages for V-I. This project, a cooperative effort between Battelle and TTI, defines and demonstrates the interface and messages to provide traffic signal phase and timing (SPaT), and other related data, to mobile devices participating in a Connected Vehicle environment. The resulting interface leverages existing communications standards, including SAE J2735:2009 Message Set for DSRC, as well as a selection of signal controller-related standards from the NTCIP family of standards, to facilitate two-way wireless communication between roadside equipment, housing the traffic signal controller, and mobile devices, including vehicles and potentially other consumers. In addition to the SPaT data, the interface also supports dissemination of geometric intersection design (GID) data and position correction information. Transit Signal Prioritization (TSP) and emergency vehicle preemption service requests also will be supported by this interface via the Service Request Message (SRM) and NTCIP 1211.

The project consisted of two major phases: the systems design and development, and then a prototype demonstration. The work performed to develop this interface followed a rigorous Systems Engineering process and includes the elicitation of needs through stakeholder workshops, the development of ConOps; the elaboration of system requirements, and ultimately the development of the system interface. Demonstration of the resulting interfaces, in the form of a SPaT System prototype, was conducted at the Tuner-Fairbank Highway Research Center (TFHRC) using signal controllers from two different vendors and representing the two major controller architectures in use today: the NEMA TS-2 and the 2070 architectures.

Signal Timing Manual

This project developed the second edition of the Signal Timing Manual for the Federal Highway Administration which was released In September 2015. Mr. Sunkari was the primary author for the Chapter on Preferential Treatment which included Rail Preemption for heavy rail as well as light rail. Mr. Sunkari was also one of the authors for the first edition of the Signal Timing manual and was responsible for the chapter on Basic Signal Timings.

Evaluation of the Benefits of Automated Traffic Surveillance and Control System (ATSAC). The Texas A&M Transportation Institute (TTI) conducted an independent evaluation of the benefits of the Automated Traffic Surveillance and Control System (ATSAC) for the Los Angeles Department of Transportation (LADOT). In consultation with LADOT engineers, TTI selected Balboa Boulevard (2.7 miles) and Huntington Drive (2.6 miles) as samples of ATSAC implementation in LA. TTI performed field studies to collect travel time runs along these two corridors for two days. ATSAC was turned off during one of these days, during which signals operated under time-of-day (TOD) control. Next day ATSAC was turned back on and made fully operational. TTI then analyzed the data collected in the field and used Highway Capacity Manual (HCM) analytical methods (using Synchro 8.0) to calculate operational and environmental measures of effectiveness (MOEs) under ATSAC and TOD modes for both corridors. The study found that ATSAC is responsive to fluctuations in traffic patterns by changing cycle length, phase splits and offsets. Improvements observed along Balboa Boulevard are consistent with improvements produced by other adaptive systems across the country. We can expect ATSAC corridors using similar methodologies to improve speeds by 13% and decrease average stopped delay for heavier flows along the arterial by 32 to 43%. ATSAC may also reduce the total delay, fuel consumption and emissions (CO, NOx, VOC) by 3 to 4%.

Best TxDOT Practices for Signal Timing and Detection Design at Intersections

The objective of this two-year research project was to assess the current state-of-the-practice for traffic signal operations in the state of Texas. The latest research was reviewed, and the results combined with the state-of-the-practice review to produce a *Traffic Signals Operations Handbook* that promotes consistent statewide options for traffic signal operations and maintenance. Workshop materials were also developed to introduce the contents of the *Handbook* to TxDOT employees.