



Introduction to Transportation Systems

Transportation systems form integral building blocks for a modern society. Efficient and safe movement of people and goods ensures a thriving economy and provides for an improved quality of life. Because transportation systems are interrelated with many other activities, the challenges of creating and managing transportation systems must be addressed in an interdisciplinary manner.

The transportation faculty of the Department of Civil Engineering at Clemson University is involved in an array of transportation related research including instrumented vehicle studies of driving behavior, new sensing equipment for traffic surveillance, crash analysis using event data recorders, applications of advanced technologies in the transportation system, evaluation of methods for controlling speed in work zones, applications of geographic information systems in program management, the design of incident management systems, development of regional and statewide ITS architecture, multi-objective analysis and real-time traffic simulation, wide-area traffic sensor system deployment and evaluation study of traffic operations in short-term work zones, and the development of decision support tools for infrastructure design and operations.

Safety is a large focus of the transportation research undertaken by this group as evidenced in the multi-disciplinary efforts. Through the Automotive Safety Research Institute, led by Civil Engineering faculty member - Ms. Kim Alexander, the faculty is also working research programs with faculty in the departments of Electrical Engineering, Psychology, Industrial Engineering, Mechanical Engineering, and City and Regional Planning. The focus of these research efforts is comprehensive coverage of safety issues from all aspects of the transportation system including the driver, the vehicle, and the roadway.

Faculty and Research Interests

Dr. Jennifer Ogle

- Transportation Safety
- Driver Behavior
- Instrumented Vehicle Studies
- Safety Conscious Planning/Design
- Crash Reconstruction
- GPS/GIS Evaluation Tools
- Intelligent Vehicle Technology

Dr. Ronnie Chowdury

- Intelligent Transportation Systems
- Surface Transportation Safety and Security Infrastructure
- Traffic Engineering
- Multiobjective Decision Making
- Fault-Tree Analysis

Dr. Wayne Sarasua

- Highway engineering
- Geographic information systems
- Travel demand forecasting
- Work zone safety
- Traffic simulation
- Computer-aided design
- Knowledge-based expert systems

Ms. Kim Alexander

Director of ASRI

Transportation Safety Courses

- Transportation Safety Engineering
- Safety and Advanced Geometric Design of Roadways
- Crash Reconstruction for Civil Engineers
- Infrastructure and Safety Information Management Systems
- GIS in Transportation
- Security and Safety Infrastructure in Intelligent Transportation Systems

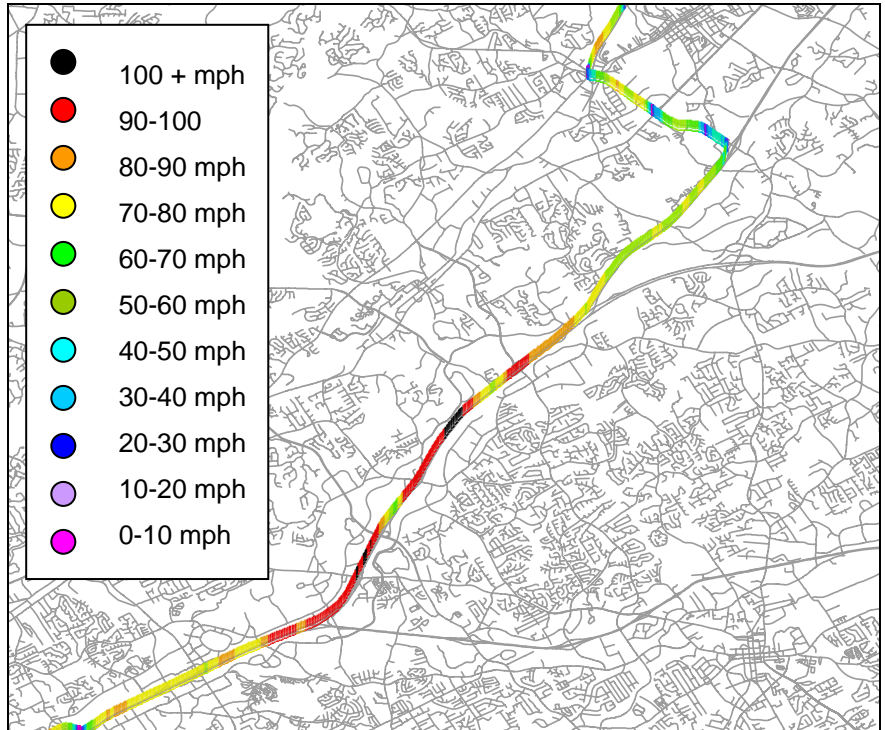
Civil Engineering Department



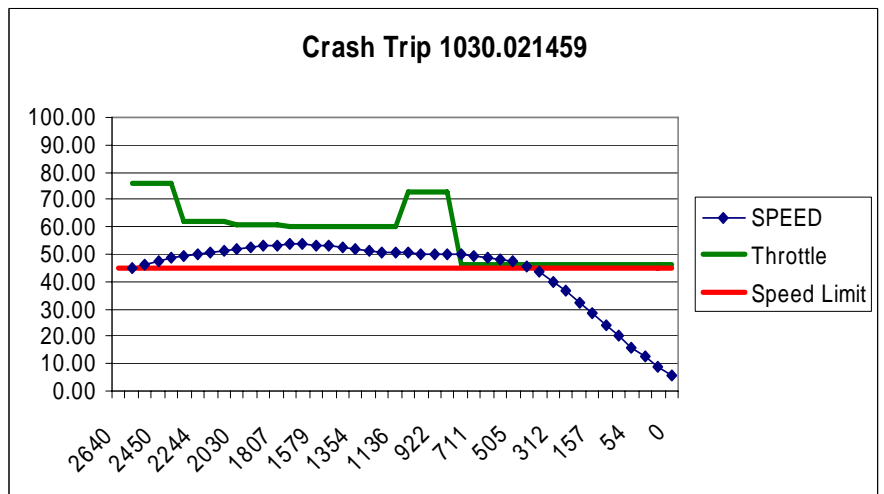
Instrumented Vehicle Research

One of the key components of the safety research conducted by faculty Civil Engineering Department is in-vehicle instrumentation. The instrumentation and monitoring of driving behavior holds a vast array of opportunity for the field of safety. The devices can be placed in nearly any make and model of vehicle to collect second-by-second driving data including: date, time, speed, heading, and geographic positioning system location. On later model vehicles, the system also allows connection to on-board computers and collection of engine parameters such as throttle position, RPM, and indications of engine malfunctions. The data can either be stored on the device or uploaded in real-time to a central facility via cellular data transfer.

These devices have been used to monitor driving behavior for safety studies quantifying urban speeding behavior, and matching location specific driving behaviors to behaviors occurring prior to actual crashes at the same location. Related to safety, the devices can also be used to locate sites along the roadway where drivers undertake extreme driving maneuvers such as hard decelerations. Once identified, these locations can be studied for potential safety or operational improvements. Aside from safety, the data can be capitalized for operations research such as travel time studies, measurement of delay and identification of recurrent congestion locations. A rather new area of deployment for in-vehicle instrumentation is for validation of driving simulators.



The map above shows driver speeds in excess of 100 mph along a section of interstate freeway where the posted speed limit is 55 mph. Comprehensive second-by-second monitoring of driving behavior in combination with crash experience allows researchers to determine the effects of speeding on safety.



The figure above portrays an actual crash event that occurred during the research program. The participant was approaching a signal and was rear-ended at the intersection. Travel by the same research participant on previous days shows a trend of exceeding the speed limit by 5 mph – however this was not a factor in this particular crash.