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## **Interrelations Between Crash Rates, Signal Yellow Times, and Vehicle Performance Characteristics**

### **Problem**

Improving traffic safety has long been one of the primary responsibilities of both federal and local transportation agencies across the nation. Over the past several decades, a tremendous amount of resources have been invested in projects and programs to improve the safety and efficiency of our transportation systems. Despite the significant progress of these programs, traffic signal related crashes have not been reduced significantly over the past years. As highway agencies attempt to address this dilemma, one of the critical issues that yet to be sufficiently addressed is how the interrelations between driver behavior, the design of signal phases, and the recent technological advances in vehicle acceleration/deceleration performance affect a driver's response at signalized intersections.

### **Objectives**

- Explore the interrelationships between driver behavior, the design of signal phases, and the recent technological advances in vehicle acceleration/deceleration performance at signalized intersections;
- Identify critical factors associated with a driver's response to the yellow phase at intersections;
- Develop a set of statistical models for estimating the distribution of driving populations at signalized intersections, based on their responses during the yellow-light phase, which can be used as the basis for computing the "dynamic" dilemma zone.

### **Description**

The project consisted of three phases:

1. Theoretical analysis of the dilemma zone properties. The focus of this phase was to understand the spatial distribution of dilemma zones resulted from differences in drivers' perception/reaction times and vehicle performance characteristics. An extensive literature on state-of-the-art practices in design of the yellow-light phase was also been conducted.

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## Description Continued

2. Field observations of driver behavior. A carefully designed field study was conducted to observe the relations between the response of drivers during a yellow-light phase and the following factors: gender, age, vehicle type, talking-on-phone or other types of activities, and speed variance in the traffic flow.
3. Statistical analysis of observation results. The purpose of this phase was to identify the potential relationship between each contributing factor and the resulting responses of drivers during the yellow-light phase.

## Results

The research results reveal that driver responses during the yellow-light phase can be classified into the following types: “aggressive-pass”, “conservative-stop”, “normal-pass”, and “normal-stop”. The differences in their responses are due not only to their individual preferences, but also their encountered traffic conditions. Based on the speed evolution data recorded from each observed driver, this study has further computed the average deceleration/ acceleration rates of drivers during the yellow-light phase, and uses such information for estimation of dynamic dilemma zones.

## Report Information

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