The 'twilight zone' of traffic costs lives at stoplight intersections

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Driver uncertainty about how to react when a light turns yellow at an intersection is often the cause of accidents. (Photo courtesy of Oregon State University)

(PhysOrg.com) -- Hundreds of lives are being lost each year in the United States because of mistakes made in what engineers call the "dilemma zone" – that area before a stoplight intersection where the traffic light turns yellow and the driver isn't sure whether to stop or go ahead.

New research at Oregon State University will help to more precisely identify that danger zone. Traffic engineers can then use than

information, along with advanced technology that can monitor the speed and location of oncoming traffic, to improve yellow-light timing and help address this problem.

When more widely implemented, this approach should help reduce driver confusion, add certainty to how intersections should be managed, and save lives.

"There are more than 30,000 traffic fatalities each year in the U.S., and about 2,000 of them occur in stoplight intersections," said David Hurwitz, an OSU assistant professor of transportation engineering. "We think those crashes can be reduced with a better understanding of exactly where the dilemma zone is and how traffic lights and other technology can be adjusted to help manage it."

Factors that lead to the problems in the dilemma zone include driving speed, distance to the stop light, driver skills, laws that vary by state, occasional scofflaws who are trying to "beat the red light," and simple confusion by drivers who want to do the right thing but aren't sure what it is.

There are many variables involved, Hurwitz said, such as vehicle speed and position. To help address that, researchers in one recent study used a tool called "fuzzy logic." This provides a way to produce more exact decisions with inexact data, which in this case can include everything from drivers with very different skill sets and reaction times to automobile speeds and road variability.

Based on their speed and proximity to an intersection, when the traffic light turns yellow a driver has to make a decision whether to stop or proceed. A driver who is some distance away usually stops; and a driver who is extremely close to the intersection usually will go ahead. Those decisions are fairly easy. But the "dilemma zone" is the area where the

choice isn't so obvious, and the wrong decision can have serious, sometimes fatal consequences.

Complicating that, Hurwitz said, is that laws vary widely by state. In Oregon, for instance, the law requires that a car stop on a yellow light if it is safe to do so. In some other states, it's legal to proceed on a yellow light, and even be in the intersection during a red light, if the front axle of the vehicle crosses the stop line before the light turns red.

Different laws can contribute to different driver behaviors, and national standards do not now exist.

Stop too suddenly, and you're apt to have a rear-end collision with the vehicle behind you. Proceed or turn left when you shouldn't, and even more serious crashes can occur, including head-on and side impacts. And based on the speed limit, the length of a yellow light at an intersection can vary greatly.

"In traffic engineering, consistency and uniformity is a critical concern," Hurwitz said. "We want conscientious drivers to know what is the right thing to do. Given so many variables and differences in state law, that can be difficult."

The findings have been published in two recent studies, in research that was supported by the Vermont Agency of Transportation and the Lilo and Richard Smith Transportation Fellowship.

"We want to help drivers know whether to stop or proceed, and do it in a manner that is safe," Hurwitz said. "This approach should help accomplish that, prevent accidents and save lives."

More information: Study online: ir.library.oregonstate.edu/xmlui/handle/1957/28205

Provided by Oregon State University

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