New brake light system could mean fewer collisions

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A dynamic brake light system that enables rear lights on a leading vehicle to contract or expand during hard braking could help lessen how often rear-end automobile collisions occur, says new research from the University of Toronto.

University of Toronto mechanical engineers Zhonghai Li and Paul Milgram worked with the fact that drivers perceive the time separation between themselves and a vehicle they are following based on the size of image of the leading vehicle on the driver's retina. They hypothesized that if it were possible to exaggerate how quickly the retinal image expanded, drivers might brake sooner in potential crash situations. A preliminary study using a driving simulator confirmed that they did. The next challenge was to find an application for this knowledge.

"In the real world, we can't manipulate the retinal images of cars," said Milgram. "But we thought we could change the image of taillights. We guessed that if we could make a taillight system that appeared to change in size, it might have a significant effect on braking behaviour."

Milgram and Li investigated their concept by using a low-fidelity driving simulator to test the reactions of 40 young male participants to driving scenarios under various visibility conditions. A roadway was projected onto a large screen and participants used a standard game control steering wheel and brake pedal to respond to the brake lights of a leading vehicle.

Li and Milgram manipulated optical looming cues of the lead vehicle – that is, the rear window and right and left taillights, which sit in a triangular formation – so they would imperceptibly expand and separate in response to the distance between and relative velocity of the two vehicles. In night-time driving conditions where drivers rely heavily on brake light cues to gauge their distance from other vehicles, drivers showed a clear response to the illusion of the leading car nearing more quickly.

“We got people to brake 100 to 300 milliseconds sooner,” said Milgram, who emphasizes that while the inter-vehicle separation sensing technology required to create such a braking system does exist, much more development and testing is necessary before implementation. “That fraction of time may seem small, but given the millions of braking events every day, the difference could mean thousands of averted crashes per year.”

Source: University of Toronto