AUDI AND MIT QUANTIFY DRIVER FRUSTRATION

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Audi and MIT have partnered on driver research to develop an index of frustration from which Audi could fine-tune future driving aids and connectivity technologies for its vehicles. FOTOLIA/Vladimir Muciba

Audi and Massachusetts Institute of Technology (MIT) have developed a way to quantify driver stress as a means of validating driver assistance systems and connectivity technologies.

In conjunctions with MIT's SENSEable City Laboratory, Audi created the Road Frustration Index (RFI), which seeks to narrow in on the individual factors that lead to driver frustration, to gain insight toward finding solutions that make driving safer and more enjoyable. The new methodology quantifies and contextualizes driver stress and frustration using skin sensors, facial/body tracking, and environmental recordings.

Findings were then compared with a variety of other activities – such as taking a test or engaging in adventure sports – to make the overall methodology and results more relatable.

"In addition to daily driving conditions, we are measuring stress levels under a variety of daily activities: at home, in the office, while having breakfast or attending a lecture at MIT. We found that certain driving situations can be one of the most stressful activities in our lives," said Kael Greco, project leader, MIT SENSEable City Laboratory.

The result? Chaotic city traffic can be as nearly as stressful as skydiving.

"The data we received is fascinating. One study showed that getting side swiped by an oncoming car can be almost as stressful as jumping out of a plane," said Filip Brabec, Director of Product Management, Audi of America. "By working with MIT to identify stress points for drivers, Audi is able to anticipate the needs for

approaches with leading universities to better understand the conditions that lead to driver stress, and subsequently, to driver enjoyment."

To calibrate the frustration algorithm, MIT designed a series of experiments that measure stress and frustration during real-world driving tasks using physiological sensors and an array of face/body tracking technologies, including: GPS to track the subject's location and speed; cameras to monitor both the subject's facial response and external driving environment; a modified Microsoft Kinect sensor to track the subject's body movements; and skin conductance sensors to monitor the subject's stress responses.

Preliminary trials were performed in the Boston metropolitan area over a 12-month period, over a variety of roadway types ranging from bustling highways to quiet suburban side streets, and taking into account a variety of road conditions - from stop-and-go traffic to confusing navigation. Observations were validated both by a driver questionnaire administered after the trial and a score determined by observable events from the recorded video.

"Cities, blanketed with networks and digital devices, are developing new forms of intelligence. The same is happening inside our cars, which are increasingly filled with different kinds of connected sensors. From the intersection of these two trends will emerge tomorrow's mobility systems - starting from the next generation of autonomous vehicles," said Professor Carlo Ratti, director, MIT SENSEable City Laboratory.

Full finding (in the form of interactive maps and stress charts, and videos) are found at senseable.mit.edu/rfi/.