

What if a car could predict accidents before they happen?

New research at MIT and Volkswagen ERL uses data from 4000 in-car sensors to analyze driver behavior - and even predict accidents before they happen.

CAMBRIDGE, MA, 7 February 2017 - An average car today is equipped with over 4,000 sensors that collect internal and external data that make the car run. Now, for the first time ever, researchers at MIT, in collaboration with the Volkswagen Group of America Electronic Research Lab, have used this data for another purpose: to analyze driver behavior and the urban environment. The results of their research are published in the current issue of the Proceedings of the IEEE, a leading journal in advanced technological research, and could help reduce car accidents, alleviate driver stress and provide us with a better sense of how drivers interact with their environment.

“Over the past few years, cars have been transformed from the kinds of mechanical systems Henry Ford might have imagined into veritable computers on wheels, filled with thousands of sensors”, said Carlo Ratti, Professor of the Practice at the MIT Department of Urban Studies and Planning and Director of the Senseable City Lab, where the study was carried out. “We asked the question: what could we extract from this wealth of information? Could we use it to better understand how drivers make decisions, and to improve overall safety on the roads and in our cities?”

As the article shows, applications can be manifold, ranging from predicting driver's behavior to assessing the urban environment in high spatial and temporal resolution. Better models of driver behavior based on extensive data analysis allows us to detect risky behavior and predict consumption patterns of different drivers. It is like seeing a driver from the sensing eyes of the car. Also, by analyzing locations of frequent ABS and emergency braking activation, it is possible to identify dangerous points in the road network before accidents actually occur. “It is almost as if we could be able to predict accidents before they happen and this information could be useful for urban improvement”, says Paolo Santi, Research Scientist at the Senseable City Lab.

Cars are also constantly gathering environmental data, such as temperature, wind and quantity of rain. This data can help us to create an accurate environmental understanding of the city, and allows to develop novel micro-climatic models that can help us better monitor and fight environmental issues such as pollution emissions and global warming.

In the future, we could imagine that this data – which is already aggregated today at the level of the car's CAN BUS port – will be gathered in real time from large fleets. Imagine a scenario where the driving experience is enriched with real-time context-aware information, accident risk-aware navigation, constant monitoring of driving style for better efficiency, proactive safety warnings, and so on. Studying ambient and responsive vehicles will allow us to exploit the immense distributed data set formed by the millions of cars circulating in the world today in order to improve our understanding

of the urban environment and improve safety. “With self-driving cars becoming a reality, such research could really help us make our cities smarter”, adds Ratti.

The project on MIT’s side was directed by Paolo Santi, together with first author of the paper, Emanuele Massaro and other team members: Chaewon Ahn, Ruixian Ma, Carlo Ratti.

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ABOUT THE MIT SENSEABLE CITY LAB:

Started in 2005, the Senseable City Lab at the Massachusetts Institute of Technology is a multidisciplinary research group that studies the interface between cities, people, and technologies. It investigates how the ubiquity of digital devices and the various telecommunication networks that augment our cities are impacting urban living. With an overall goal of anticipating future trends, the Lab brings together researchers from many academic disciplines to work on groundbreaking ideas and innovate real-world demonstrations. This research is undertaken in partnership with cities, the private sector and other universities; through this collaborative approach we strive to reveal how a new, rapidly expanding network of digital devices is serving to modify the traditional principles of understanding, describing and inhabiting cities.

ABOUT VOLKSWAGEN OF NORTH AMERICA ERL:

Volkswagen Group of America, Inc. is a wholly owned subsidiary of Volkswagen AG, one of the world’s leading automobile manufacturers and the largest carmaker in Europe. It operates a manufacturing plant in Chattanooga, Tennessee and houses the U.S. operations of a worldwide family of distinguished and exciting brands including Audi, Bentley, Bugatti, Lamborghini and Volkswagen, as well as VW Credit, Inc. Founded in 1955, the company's headquarters are in Herndon, Va., Volkswagen Group of America brings vehicles to the U.S. that marry the science of engineering and the art of styling, with the goal of offering attractive, safe, and eco-conscious automobiles that are competitive and set world standards in their respective classes. The company has approximately 6,000 employees in the United States and sells its vehicles through a 1,000-strong dealer network.

ABOUT THE PAPER:

E. Massaro, C. Ahn, P. Santi, C. Ratti, R. Stahlmann, A. Lamprecht, M. Roehder, M. Huber, “The Car as an Ambient Sensing Platform”, Proceedings of the IEEE, Vol. 105, n. 1, pp. 3-7, 2017.