

Embedded perception and situation awareness for improving driving safety

Christian Laugier

Senior Researcher INRIA, Scientific Leader of the e-Motion Team-Project

Co-authors:

Christopher Tay Meng Keat (former PhD student), Stephanie Lefevre (PhD Student) and
Javier-Ibanez Guzman (Renault)

Robust analysis of dynamic scenes in urban traffic environments is needed to estimate and predict collision risk level during vehicle driving. The risk estimation relies on monitoring of the traffic environment of the vehicle either by means of on-board sensors, or by means of Vehicle-to-Vehicle (V2V) communications. In both cases, the collision risks are considered as stochastic variables.

When traffic perception is performed using onboard sensors, Hidden Markov Model and Gaussian Processes are used to estimate and predict collision risks and the likely behaviors of multiple dynamic agents in road scenes; this work has been performed in collaboration with Toyota. When V2V communication is used in the vicinity of road intersections, we have shown that it is more efficient to identify dangerous situations by comparing “*what drivers intend to*” with “*what they are expected to do*”. What a driver intends to do is estimated from the motion of the vehicle, taking into account the layout of the intersection; what a driver is expected to do is derived from the current configuration of the vehicles and the traffic rules at the intersection. This second approach has been developed in cooperation with Renault. Both approaches have been experimentally validated in simulation and on real experimental vehicles.