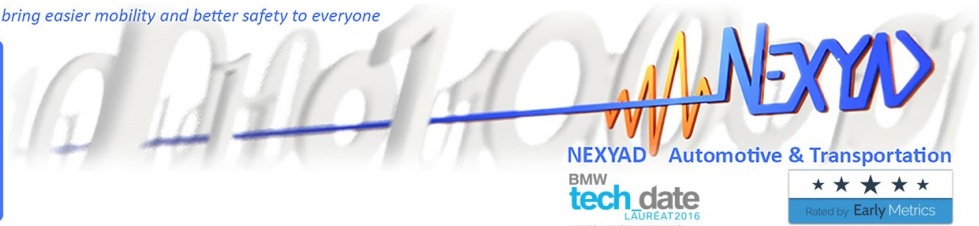


Our onboard technologies bring easier mobility and better safety to everyone



The value of driving risk notion for Telematics, ADAS and Autonomous Driving.

By NEXYAD

Every year, more than 25.000 persons die on roads in Europe which has the safest infrastructures anyway. Brasil, Russia, USA, have more fatalities and the situation is worst in development countries. Everywhere people are aware by these risk for their health or life. Driving can be dangerous for drivers and passengers, however most of people accept these risk fairly minimal (in average three dead by billion km in OECD countries) for all advantages of fast point to point terrestrial mobility. But by the way, what is exactly what people use to call driving risk?

Let's take an example, if someone plays Russian roulette: probability to die is one on six when one pulls the trigger. If one decides finally not to play, probability to die with a bullet in the head disappears completely. If you pull the trigger, risk to die is 100% (although probability is 1/6). Another example: if a car is static parked into garage, then driving risk is zero. On the opposite, if a car passes a stop sign at 20km/h, driving risk taken by the driver is equal to 100%: driver takes the full risk). Probability depends on the traffic at the intersection.

More generally, driving risk taken by driver (and we talk about "the risk you take" a priori) will goes from 0 to 100% depending on the adequate of driving behaviour to driving context. This driving context has several dimensions: complexity of infrastructure, traffic of other road users, weather conditions, etc. Inadequate of driving behaviour to complexity of infrastructure can predict 75% of accident.

Between 50's and 60's road traffic has exploded and at the same time accident ratio... Then in numerous countries, appeared road safety experts who tried to understand how, when and why accidents happen, in order to save lives. After studies and experiments, authorities began to hardening rules (safety-belt, speed limit, etc.) and they tried to change and reshape infrastructures (round about, "predicable" Euler curves instead of circles, etc.) for safer roads or "forgiving" roads.

But as mentioned above, complexity of road infrastructure is quasi infinite, and it is quite impossible for authorities to put road signs and the right speed limit everywhere it would be needed: cost would be astronomic. That is why some speed limits are very low: instead of putting ten road signs, authorities put only one or two (for cost reasons) and then they use minimum values... This sometimes lead drivers who understand that it is not risky to drive faster on some parts of road and to cross speed limits. The problem then appears on parts of those roads where speed limit was adequate.

So, how a driver can be aware of the real taken driving risk at each moment? In general, the driver have learned all the theoretical rules in the book of traffic laws... By the way, do you remember the rule of braking distance in case of rain? (most of drivers do not remember). It would be nice to have a tool that alerts on taken driving risk.

As written above, inadequate of car speed in regards of road infrastructure complexity, explains 75% of accidents. Three quarter of accidents is a huge amount that have to be considered.

Since 2000, Nexyad has worked in four national and international research programs on road safety. During 15 years, we have collected information from driving risk experts and researchers, we make them work together to standardize wording, to share differences of diagnosis in several countries, and to find consensus in order to build a knowledge-based database. This knowledge was implemented into demo car and validated or not. Nexyad extracted more than five thousands road safety rules taking into account all possible road infrastructures characteristics: elements of shape (curve, intersection, etc.) and functionalities (school, pedestrian crossing, etc.).

All of this work were implemented in knowledge based artificial intelligence.

Now, it is possible to give the driver (human or robot) an explicit value of driving risk twenty times per second. The module developed by NEXYAD is called **SafetyNex** (fusion of sensors plus digital map). The cheapest implementation of **SafetyNex** allows to cover 75% of driving risk and can run on a regular smartphone or low cost electronic device. It is possible to go up to 100% of driving risk explanation adding more sensors and more data streams (cameras, radars, lidars, weather data, traffic data, etc.) for taking into account the other mobiles on road, visibility conditions, driver's distraction, etc.

SafetyNex brings the notion of driving risk for drivers, ADAS, Telematics and Automated Driving systems. For the first time in history, smartphones, specific devices or car computers can give explicitly and quantitatively this value onboard and in real time (twenty times per second).

For a human driver, **SafetyNex** alerts when risk rises, letting time to slow down and avoid accident.

For an ADAS (Advanced Driver Assistance System) or for a robot car, **SafetyNex** triggers the automatic speed regulation of the car (intelligent ACC, anticipation automatic braking, etc.) High technology into cars is supposed to minimize risk of accident... well **SafetyNex** is able to "measure" this effect and give driving risk feedback to driving artificial intelligence for modulation of speed ("if risk too high then slow down").

