



TRATON



I2CONNECT: INTELLIGENT, INTERACTIVE AND CONNECTED NEXT GENERATION OF REALTIME DRIVER SAFETY SUPPORT SYSTEMS

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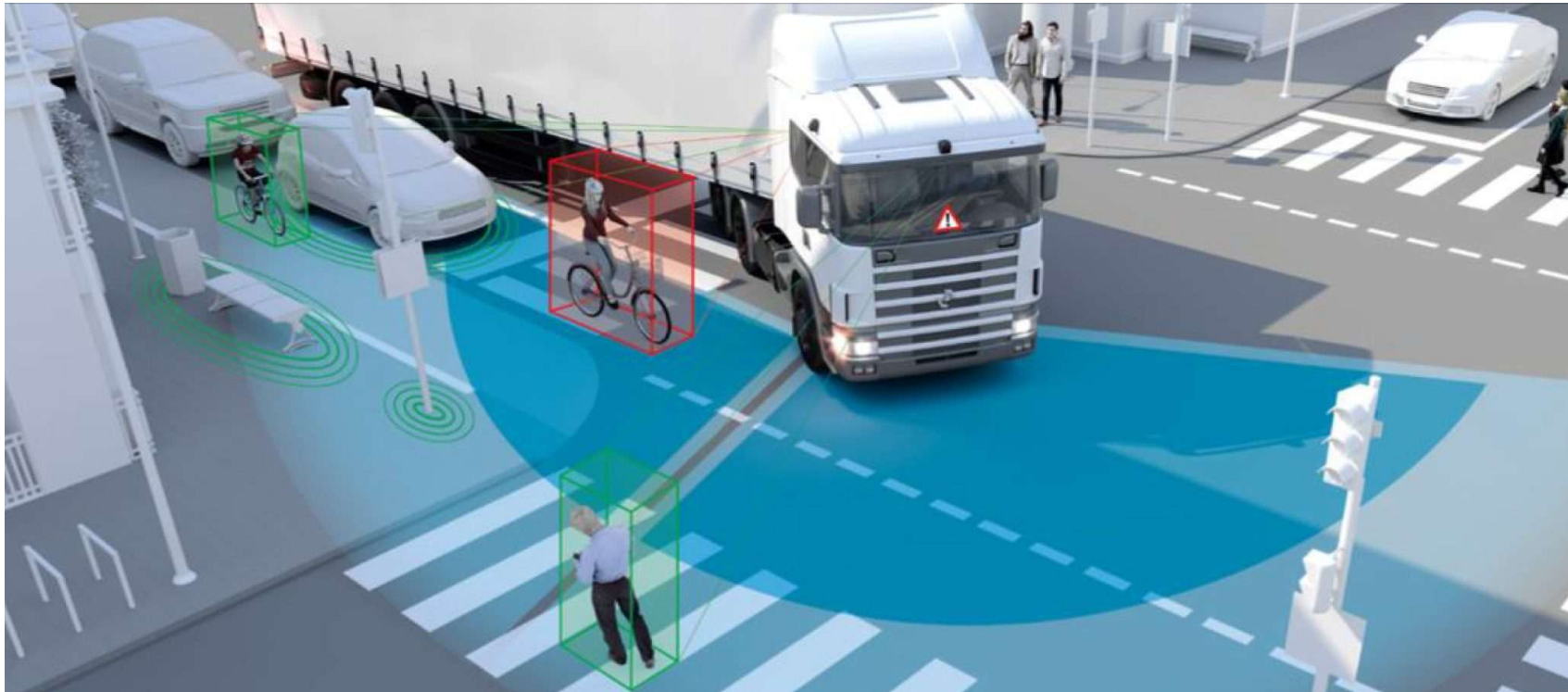
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This project was funded by Vinnova under the call Traffic-safe automation - FFI-autumn 2023, 2023-02611.

DIFFICULTIES NAVIGATING INTERSECTIONS



PROFESSIONAL DRIVERS

- very good, experienced drivers
- sometimes tired, sometimes bored
- many find ADAS functions annoying and more than 50% of Europe's commercial drivers switch all or some of the functions off.
(Roberts, G. (2024). One in Two Drivers Switch Off Driver Assistance Systems. Fleet News.
<https://fleetnews.co.uk/drivers-switch-off-driver-assistance-systems>)
- very conscious about that they do not want more information that they do not need
- appreciate information that actually helps them when they need it.



SITUATION AWARE RISK ASSESSMENT

- Supporting only when the driver needs the support.
 - Systems needs to be aware of the situation/risk
 - System needs to be aware of it the driver has noticed the situation/risk



USE CASE: DRIVING THROUGH AN INTERSECTION

- A general risk warning for the upcoming intersection
 - For the time the truck arrives
- Simple common sense assumptions:

▪

“The more is going on at the intersection the more risk there is of something leading to a problem!”

“The more there is going on, the longer the driver needs to build up their own situation awareness.”

- While information about specific risks are appreciated they also potentially divert attention from the overall situation.

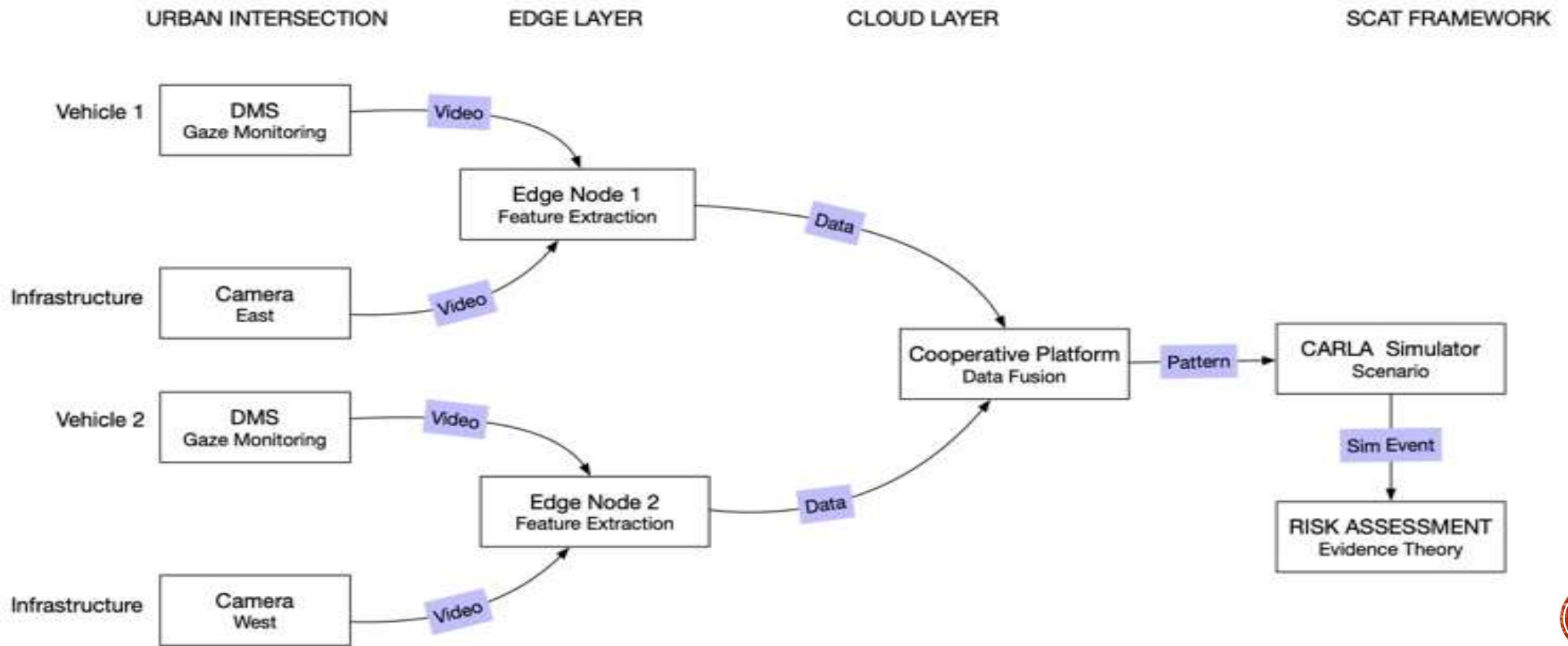


CONTRIBUTORS

- The more traffic the higher the potential risk
- The more roadworks the higher the potential risk
- The more visibility is reduced the higher the potential risk
- The more drowsy drivers are present the higher the potential risk
- The more drunk drivers are present the higher the potential risk
- The combination of all these provide the general risk of the situation



SIMULATION FRAMEWORK

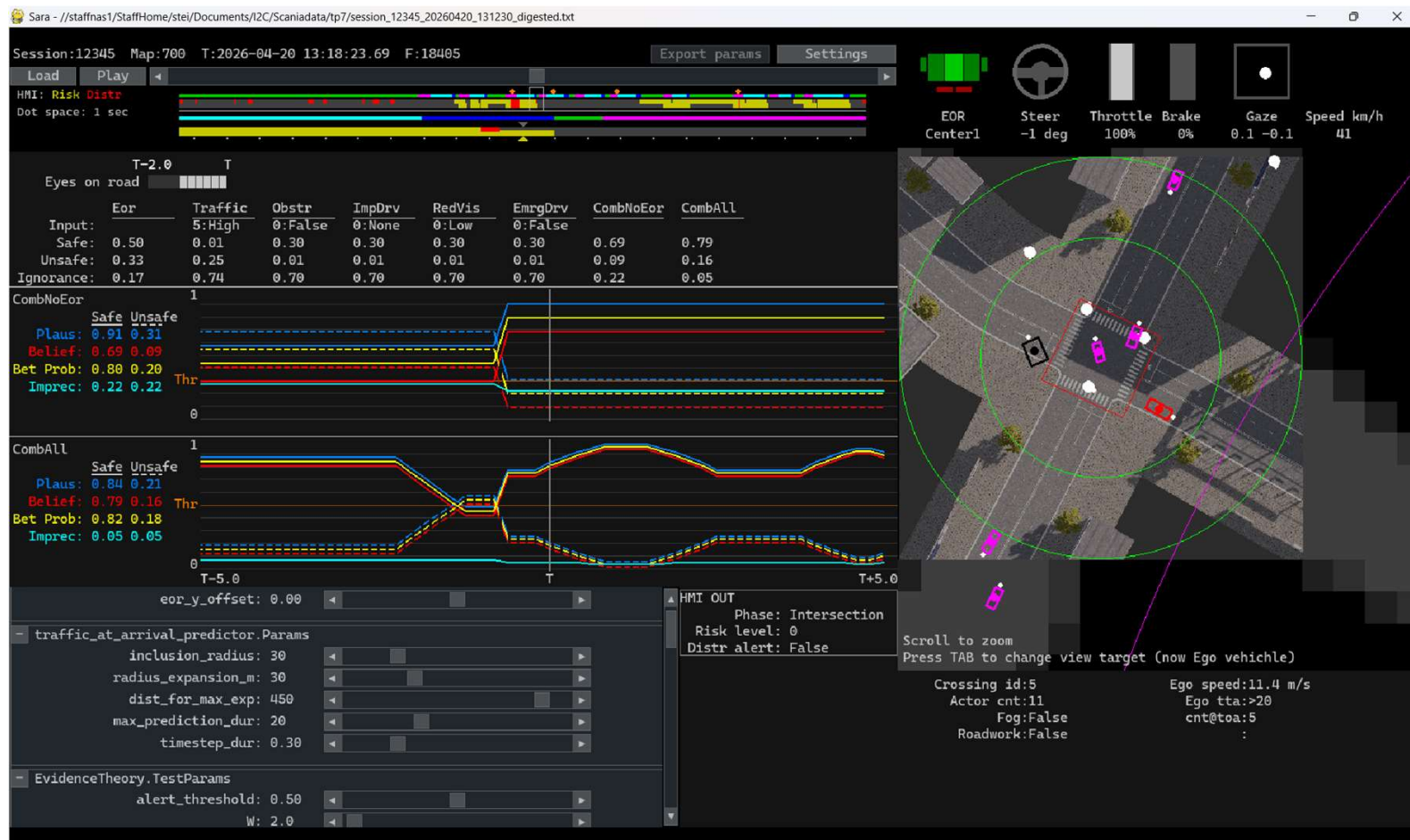


EVIDENCE THEORY

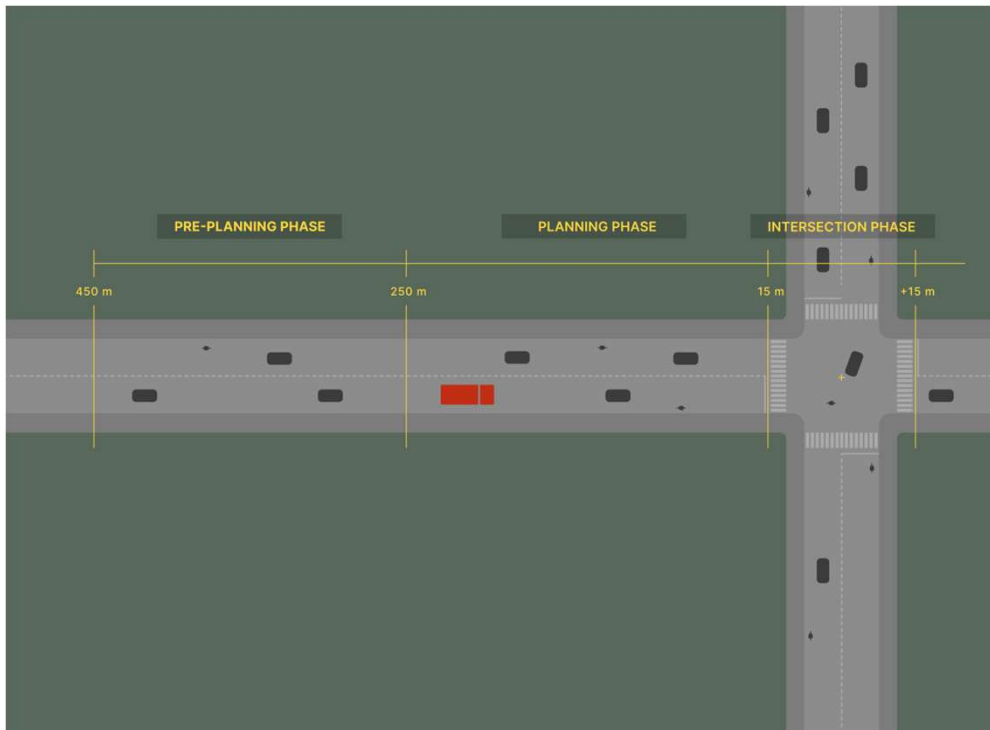
- A generalization of Probability Theory where uncertainty can be explicitly expressed through a probability mass distributions between all alternative states and the state of not knowing.
- Evidence is collected from all the factors contribution to the general risk
- Frame of discernment: $\Omega = \{\text{safe}, \text{unsafe}\}$
- For example: High traffic at the intersection provides evidence towards a potential unsafe situation:
 - $m(\text{safe}) = 0.01$
 - $m(\text{unsafe}) = 0.3$
 - $m(\text{ignorance}) = 0.69$



SARA - RISK ASSESSMENT FRAMEWORK



EXPERIMENT



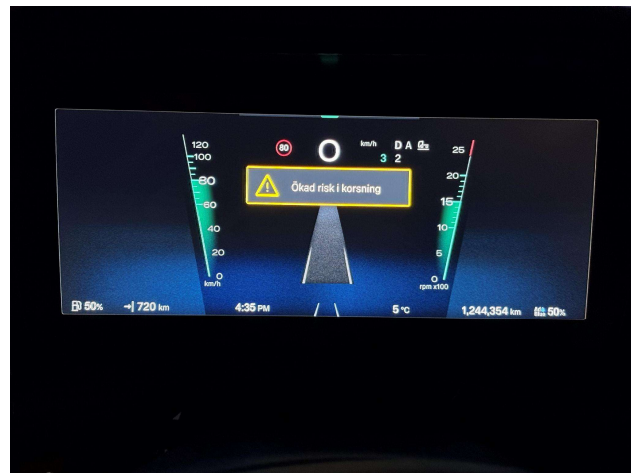
- Concept A
 - displays the indication of an increased general risk in the upcoming intersection in the vehicle's dashboard
 - When the driver enters the planning phase at 250 meters before the intersection the same information is moved into the HUD until the driver has left the intersection phase where the information disappears.
- Concept B
 - displays the same information in case of increased risk at the upcoming intersection starting as soon as the vehicle reaches the 450-meter mark in the dashboard.
 - the information stays in the dashboard even during the planning phase and until the driver has left the intersection.
- Baseline
 - Driving without any help



HMI

- A warning that the crossing ahead entails an increased risk, but only given when the driver is not paying enough attention already.
- Two different designs were tested

Dashboard



Hood



EXPERIMENT

- The simulator driving experiments took place 14th–29th April 2026
- Eighteen commercial heavy vehicle drivers were recruited,
 - two drivers were forced to discontinue the experiment due to simulator sickness
 - one driver could not proceed due to technical problems.
 - Complete data from 15 drivers



RESULTS (THEMATIC ANALYSIS)

- Increased situational awareness in demanding situations.
 - The majority of drivers described the risk indicator as valuable because it helped them **anticipate risks earlier**.
 - could be especially **valuable when tired or visibility is limited** or when driving long and monotonous roads
 - **HUD supporting eyes on road** and often perceived as more natural and less distracting, no scanning between the road and the dashboard needed and risk indicator was easier to notice
 - Concept A was generally preferred.
- Appropriate timing.
 - **50% found the timing appropriate**, it allowed to adjust speed and planning ahead.
 - Also disappearance of the indicator happened at appropriate time
 - However, the timing **might depend on the driving context**.
- Appropriate HMI design
 - Generally drivers felt that the design was good, appreciated the **simplicity and the explaining information** which made it easy to understand.



RESULTS (THEMATIC ANALYSIS)

- Indicator appeared too early
 - Some drivers found the warning was too early and then they forgot about it when they arrived at the crossing
- Redundant information
 - Some drivers believed they were observant enough and did not need the warning because they already knew the risks.
- Risk for excessive alerts
 - Some drivers, even though they did not feel annoyed by the alerts in this experiment mentioned a risk that there might be too many alerts in general.



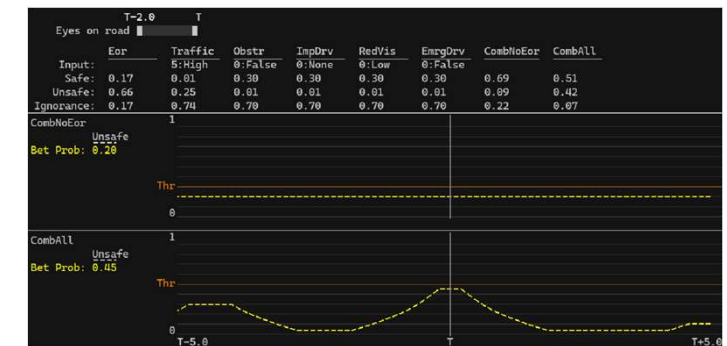
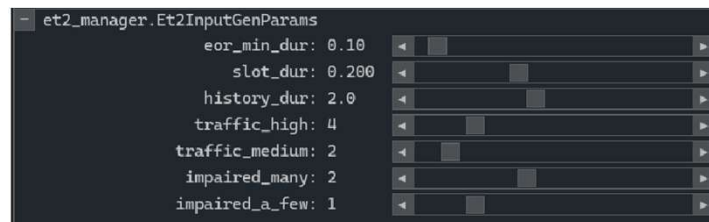
CONCLUSIONS

- A general risk indicator seems to be appreciated
- Little but appropriate information is key
- Timing is key
- HUD is more natural and keeps eyes on road



FUTURE WORK

- Take the drivers attention to the road into account



- Take the black-box-effect into account
 - Because of how the risk is calculated, the driver might not always understand why a risk indication is presented.



THANK YOU

