Assessment of speed variance

In Response to GRVA-17-11
(TF ADAS issues to seek guidance from GRVA)

EC JRC with the support of UTAC
Content

• Influential factors
• Statistical model
• Experience from Intelligent Speed Assistance (ISA) from UTAC (FR)
• Estimation of risk of perturbed traffic flow
Influential factors of risk of crash

Mean speed
Risk \sim \exp(\alpha \text{Mean}(v))

Mean speed, speed variation(s)
Risk \sim \exp(\alpha \text{Mean}(v)+\beta \text{Std}(v))

Speed difference
Risk \sim v^2

compare the average speed and the number of crashes before and after a speed management measure

Path analysis of traffic flow

\Delta v = v_{\text{post impact}} - v_{\text{pre impact}}

Forensic and accident reconstruction experts to describe accident severity

Source: JRC - UNR157-07-09
Speed variation in traffic flow

- speed differences among vehicles
- speed changes of individual vehicles
- between lanes speed variance

Wang et al, Accident Analysis and Prevention 113 (2018)
Choudhary, Accident Analysis and Prevention 121 (2018)

Simple model:
- All travelling at the same speed at the beginning
- 10 vehicles in the lane
- 5 km/h speed reduction per vehicle
Experience from ISA

ISA
- §5.3.1 – Traffic sign is partly obstructed or clearly not well positioned
- §5.3.2 – Traffic sign is missing or positioned ambiguously
- §5.3.3 – Ambiguous, additional, complementary or diverging informations

According to UTAC internal procedure to conduct the test:
- Latest test campaign shows following rate: 40km over 400km 10% is excluded from the calculation of the system performance
Effect of unintended speed reduction

- 1% increase in mean speed resulted 0.7% increase in crash frequency
- 1% increase in speed variation resulted in 0.74% increase in crash frequency

Wang et al, Accident Analysis and Prevention 113 (2018)

Simple model:
- All vehicles travelling at the same speed at the beginning
- 10 vehicles in the lane
- 5 km/h speed reduction per vehicle
String (in)stability is an important factor to be considered in reduction of crashes. The chance of unintentional speed change shall be minimised. 

- Mattas et al., [https://doi.org/10.1016/j.trb.2023.102785](https://doi.org/10.1016/j.trb.2023.102785)

ISA field experience: 10% ambiguous cases are excluded from the performance calculation.

90% correct recognition is required (ISA).

Human supervision of speed limit detected by the system is essential before it is applied.

Speed management measures shall be applied to all vehicles.
Thank you