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State-of-Practice of Surrogate Measures of Safety
Methods for Road Safety Analysis

• 2 main categories of methods, whether they are based on direct observation or not
  – Accidents are reconstituted → reactive approach
    • traditional road safety analysis relying on historical collision data
    • vehicular accident reconstruction
  – Road user behavior and accidents are directly observed
    • surrogate measures of safety → proactive approach
The safety hierarchy

adapted from (Chryster Hydén 1987) and (Svensson 1998)
Serious Conflict

provided by A. Laureshyn, Oslo, Norway
Serious Conflict

collected by S. Zangenehpour, Montréal, Canada
The severity hierarchy
adapted from (Chryster Hydén 1987) and (Svensson 1998)
Conflict Techniques

- Swedish – Hydén (1987)
- Dutch (DOCTOR) – Kraay et al. (1986)
- British – Baguley (1984)
- Canadian – Cooper (1984)
- Belgian - Mortelmans et al. (1986)
- German – Erke (1984)
Severity Indicators

- Speed, deceleration, jerk
- Distance
- Time difference: Post-Encroachment Time (PET)

\[ PET = t_2 - t_1 \]
Severity Indicators

• A traffic conflict is “an observational situation in which two or more road users approach each other in space and time to such an extent that a collision is imminent if their movements remain unchanged” (Amundsen et al. 1977)

• Evaluating the safety of non-collision events requires to evaluate what would have happened if the road users were not aware of each other
  – a method to predict each road user’s future motion is needed
  – several indicators depend on motion prediction: Time-to-Collision (TTC), predicted PET, deceleration to safety time (DST)
Severity Indicators

- TTC
Surrogate Measures of Safety Today

- Conflict techniques, esp. in Sweden
- Automated video analysis
- User-based data collection
- Traffic simulation
InDeV Project (Horizon 2020)

• In-Depth Understanding of Accident Causation for Vulnerable Road Users (VRU), 2015-2018

• Goals
  – develop an integrated methodology to study VRU accidents
  – improve assessment of VRU-accident costs

• Integrated methodology
  – accident databases (police & emergency)
  – in-depths accident investigations
  – traffic conflicts/observational studies
  – naturalistic cycling/walking (mobile app)
  – self-reported accidents
InDeV Output

• Methodology
  - 24 sites->3 weeks (7 countries)
  - 3 sites->1 year

• Technical support tools (open source)

• VRU safety handbook & software manuals
Watch Dog RUBA

https://bitbucket.org/aauvap/ruba/wiki/Home
T-Analyst

Conclusion

• Getting started
  – TRB and SAE committees and white papers
• Tools
  – in particular open source software: Traffic Intelligence, RUBA watch dog, T-Analyst
• Many open questions
  – methods to compare and validate surrogate measures of safety
Thank you very much for your attention!
Mobile app – fall detection