EFFECTIVENESS EVALUATION OF ACTIVE SAFETY SYSTEMS.

ITS-Workshop on Automated Driving.
THE ROLE OF „VEHICLE SAFETY“.
ACTIVE SAFETY HAS HIGH POTENTIAL.

Developing concepts for increased vehicle safety considering:

• passive safety
• active safety
• functional safety
• operational safety
CURRENT ASSESSMENT OF ACTIVE SAFETY SYSTEMS.
EXAMPLE: AEB PEDESTRIAN FOR EURO NCAP.

Accident cases from accident databases (e.g. ca. 650 cases in GIDAS*)

Accident Scenarios
6 cases

Test scenarios
3 cases

Clustering

Reduction

in terms of
- representability as a test scenario
- reproducibility
- test effort

Assessment:
Speed reduction

AEB Pedestrian testing

- Development of potential solution concepts
- Development of tests based on existing technical solution concepts

* German In-Depth Accident Study
CURRENT ASSESSMENT METHODOLOGY. COMPARING PASSIVE AND ACTIVE SAFETY.

• The Passive Safety “laboratory only” approach is not suitable for active safety assessments:
  • Active safety systems can be optimized for specific scenarios. Numerous remaining scenarios not addressed and assessed.
  • Laboratory tests follow precise/well-defined protocols: highly reproducible, comparable, etc.
  • Laboratory tests by nature incorporate a very limited sample of real traffic conditions and contributing factors.
  • An excessive test effort is needed for active safety systems to address all relevant real-world traffic accident scenarios and negative side effects (e.g., false positive testing).

A “laboratory only” testing approach does not adequately assess the performance of active safety systems in real-world traffic.
FUTURE APPROACH TO EVALUATION OF ACTIVE SAFETY.

**Accident Data Base**
- Causation
- Type of Accidents
  - Small database, severe accidents

**Traffic Data Base**
- FOT, NDS, Driving Recs
  - Typical, "uncritical Situations"
  - Larger scale data base, less accidents

**Detailed description of safety-relevant scenarios for the effectiveness analysis**

**Contributing Factors**
- Driver reaction
- Pedestrian reaction
- Vehicle performance

**Simulation Model of the ADAS System (OEM) and overall simulation model**

**Model of Collision Avoidance System**
- Describing parameters of innovations
  - Provided by OEM, supplier or others
  - Model quality standard req.

**Modeling**
- Stochastic
  - Monte Carlo, ...
  - Creation of thousands of artificial, yet representative situations

**Simulation / Evaluation**
- Evaluation of system benefit
- Calculation of number and severity of unwanted side effects
- Prospective effectiveness analysis

**Output**
- Focal Points, Scenarios most important
- Parameters, describing the before identified focal points
- Factors that discriminate uncritical from critical situations

**Scenarios (e.g. Pedestrian)**
- Type of Road
- Visibility
- Driving Direction
- Ped. Moving Direction
- Daytime, Brightness

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EVALUATION PROCESS FOR ACTIVE SAFETY. DETAILS.

Accident data

Traffic Data

Human Factors Data

Parameter Variation

Neutral Instance

Computer model CAS

Analysis, Metrics

Results of Scenario

OEM Task

Case Selection

Spot Testing

Compare Results

Results Evaluation

Rating

Test Institute
HARMONIZATION OF EFFECTIVENESS EVALUATION.

OBJECTIVES.

• Representative assessment of active safety requires harmonized methods.

• For simulation: methods, processes, and models for prospective assessment have to be harmonized.

• Harmonization enables comparable and comprehensible assessments.

• World-wide harmonization / standardization as primary objective.

• Open harmonization initiative was very well received and supported by other OEMs, research institutes and suppliers.
HARMONIZATION OF EFFECTIVENESS EVALUATION.
CURRENT PARTICIPANTS.
CONCLUSION

• Even if Active Safety progresses, Passive Safety remains necessary as backup
• Utilization of drivers abilities provides great benefits
• Development and assessment of Active Safety features require new methods and competencies
• Suggested new approach for evaluation of active safety:
  i. Evaluation via simulation to ensure real world scenarios are adequately addressed
  ii. Verification of simulation results via random hardware tests
• Evaluation approaches to active safety need international harmonization and standardization.
THANK YOU VERY MUCH FOR YOUR ATTENTION!