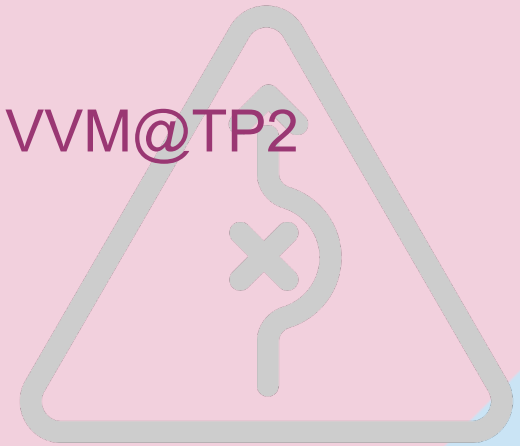
VERIFICATION
VALIDATION
METHODS

Criticality identification system (CriSys)

Martin Bollmann, Bogdanioan Cojocaru, Johannes Daube; all ZF, in VVM@TP2



Motivation: Analysing criticality of scenarios

General information

- **Criticality** and **Criticality Measure** (definitions due to funded project **VVMethoden**)

  - Kritikalität: Die (subjektive/objektive) Kritikalität bewertet die Unfallwahrscheinlichkeit einer
    - Verkehrssituation (aus Sicht eines Verkehrsteilnehmers oder Beobachters).

    - Kritikalitätsmaß: Bemessung der Kritikalität einer Verkehrssituation.

CriSys motivated by VVMethoden

- Implementation framework of criticality measures
- Comparing and benchmarking methods
- Software release within VVM

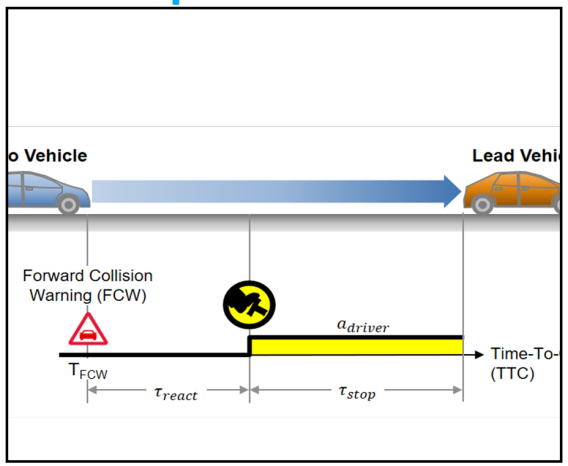
Current status of CriSys

- Research tool to explore criticality phenomena
- Criticality evaluation as required by VVM
- Development as generic framework for scenario analysis & KPI calculation

Classes of criticality measures

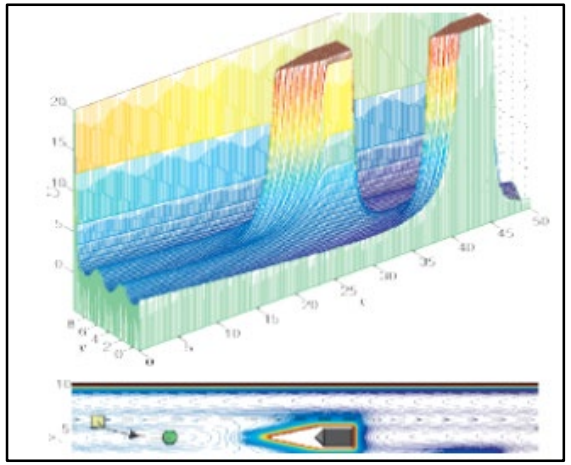
VERIFICATION VALIDATION METHODS

Simplified measures



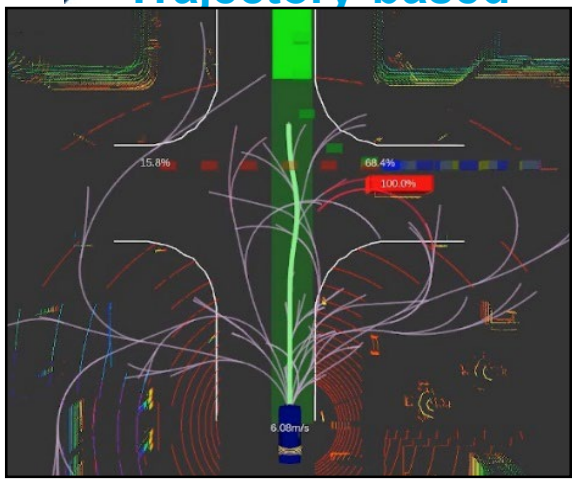
- Measures based on simplified geometric and physical relations between objects

Potential-based



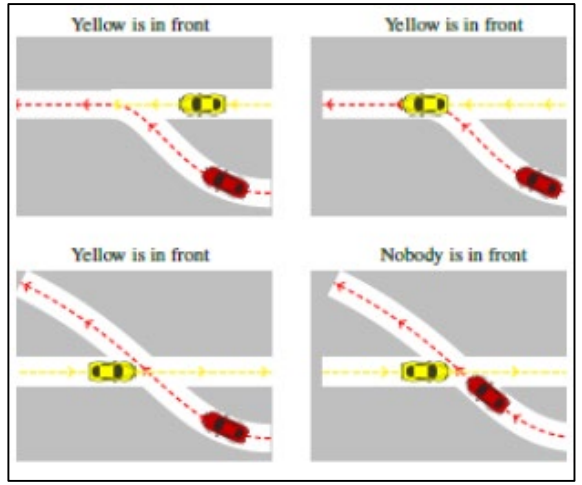
- Object motion induces spatial potential
- Superposition of potentials creates criticality

Trajectory-based



- Prediction of near-future trajectories
- Estimation of collision probabilty

Rule-based



- Distinction of scenarios according to rules or maneuvers
- Appropriate measures for given scenarios

CriSys framework

Measurement data

Synthetic data (CarMaker)

SUMO

Synthetic data (SUMO)

...

CriSys

Generic Traffic Participant

Methods

Potential-based (ZF)

Trajectory-based

Time-to-collision

...

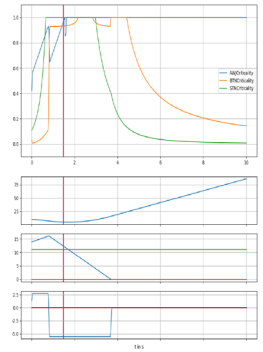
Results

Comparing measures

Report

Dashboard & Visualisation

...



- Interface for trajectory data sources

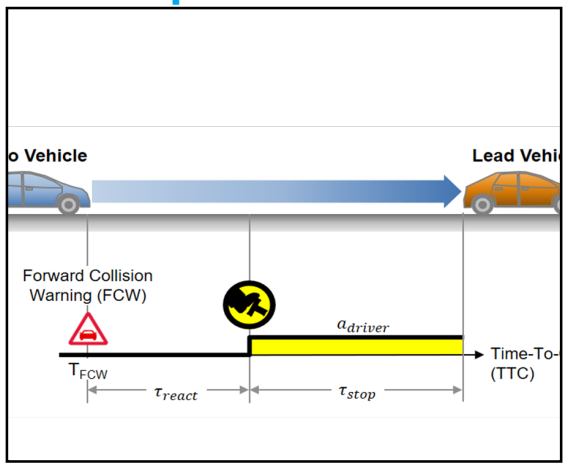
- Implementation of KPIs
  - Criticality measure
  - …
- Method benchmarking
- Continuous integration
- Applying to standards and best-practises

- Batch processing
- Automated reporting

CriSys implementation

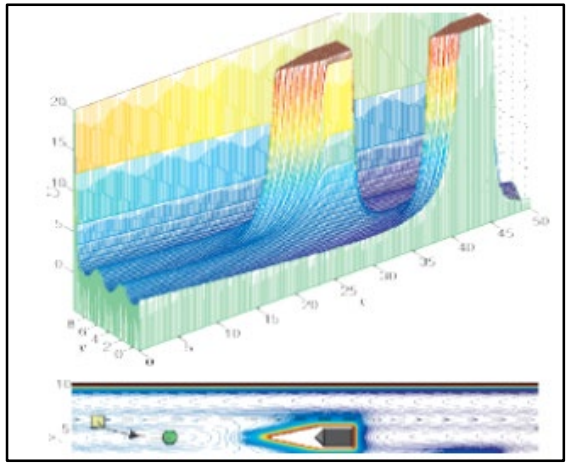
VERIFICATION VALIDATION METHODS

Simplified measures



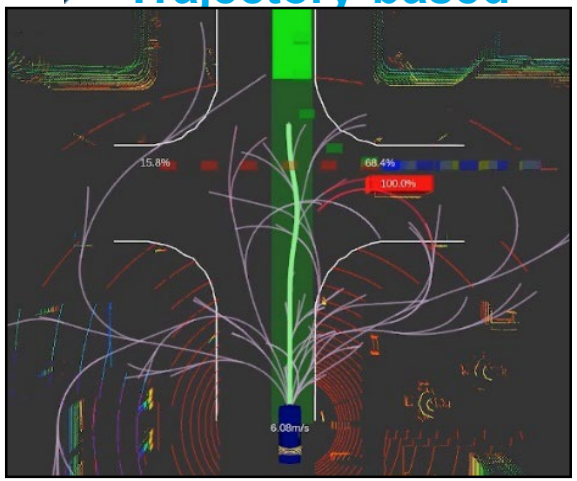
- Distance measure
- Time-to-collision (TTC)

Potential-based



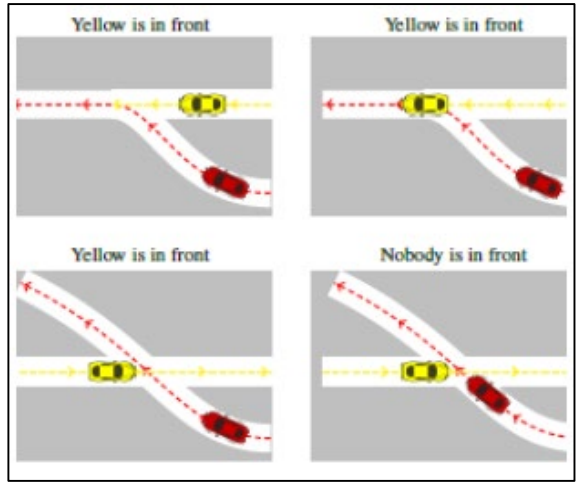
- MerLin (ZF developed at VVM)

Trajectory-based



- Collision probabilty estimator

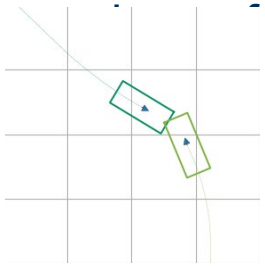
Rule-based

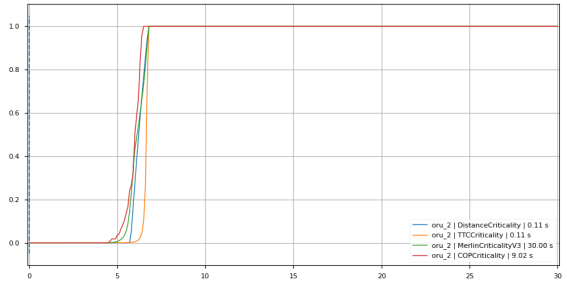


- Junietz-Winner
- Brake-Threat-Number

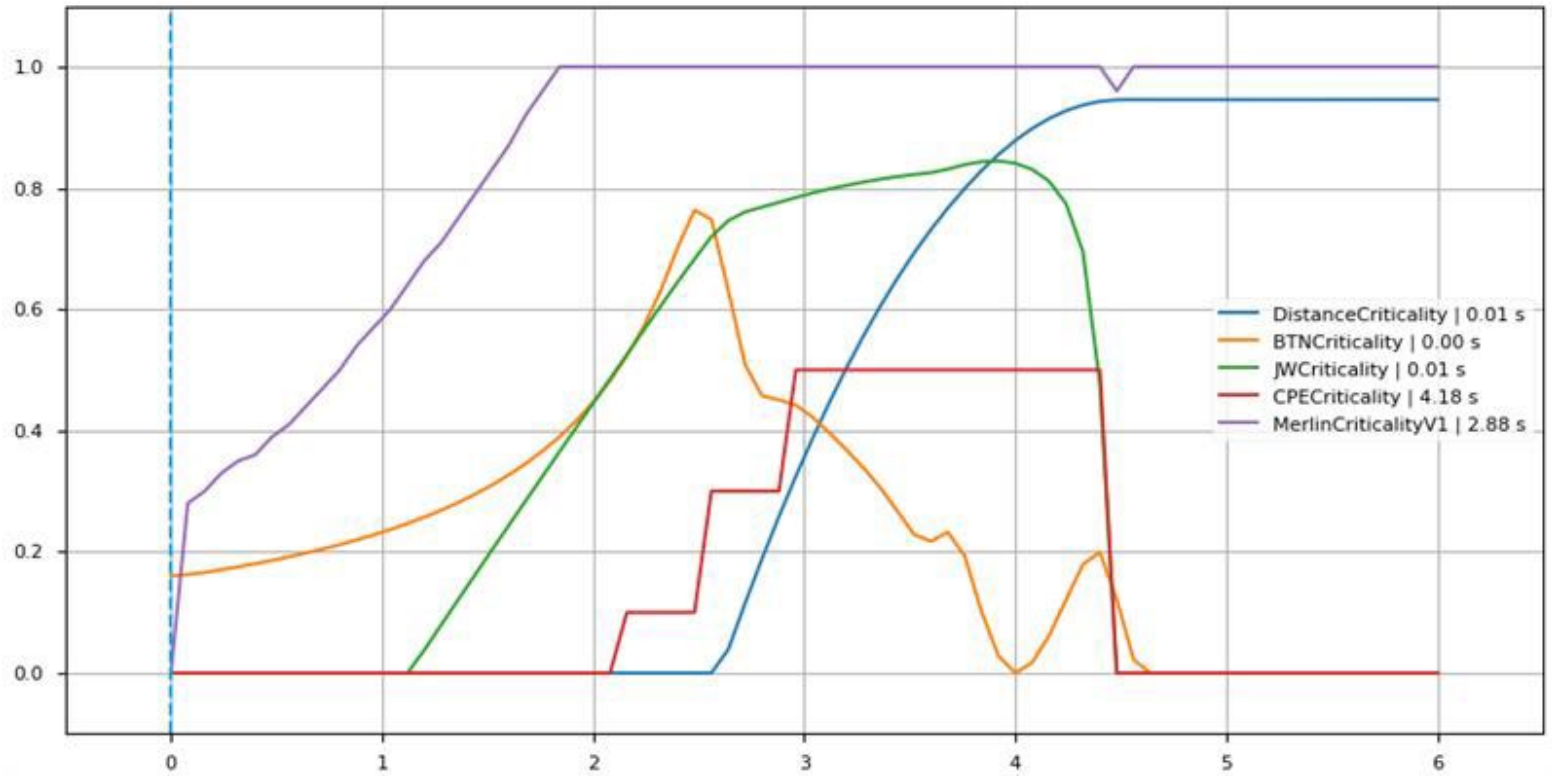
CriSys Release 0.2

- UC integration with openPASS:
  1. Result XML as Input
  2. Criticalities appended in result
- Additional features and improvements:
  1. Result CSV as Input (GIDAS, AMP)
  2. Usage as standalone app or as python libra
  3. etc.
- CriSys installation:
  1. TBD: at the moment, CriSys is just available for VVM





Live demonstration



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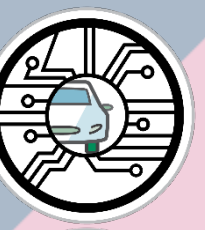
Vielen Dank für Ihre Aufmerksamkeit!



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