

Creation of a 3D simulation environment and variation of real accident scenarios based on a driver model

Simulation realer Unfallszenarien in einer 3D-Umgebung und Szenarienvariation mittels Fahrermodell

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Supported by:



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Focus 1: 3D accident scene

- **Simulation of real accidents in a 3D accident scene**
 - As precisely as possible
 - High level of detail
- **AIM: Evaluation of active safety systems and functions**
 - in Ko-KOMP: Evaluation of a cooperative system

Focus 2: Driver model and creation of scenarios

- **Creation of a larger database for the evaluation of systems**
 - Change of the simulation within sensible limits
- **AIM: Benefit estimation of systems in real accidents and evaluation of the system's acceptance in critical situations**

3D Accident scene

Methodology

Example

Driver model

Concept

Simulation

Accident sketch

- digital accident sketch
 - for each layer
 - ✓ edge of the carriageway
 - ✓ sidewalk
 - ✓ bordering area etc.
- *text-files as output parameters from the simulation process*

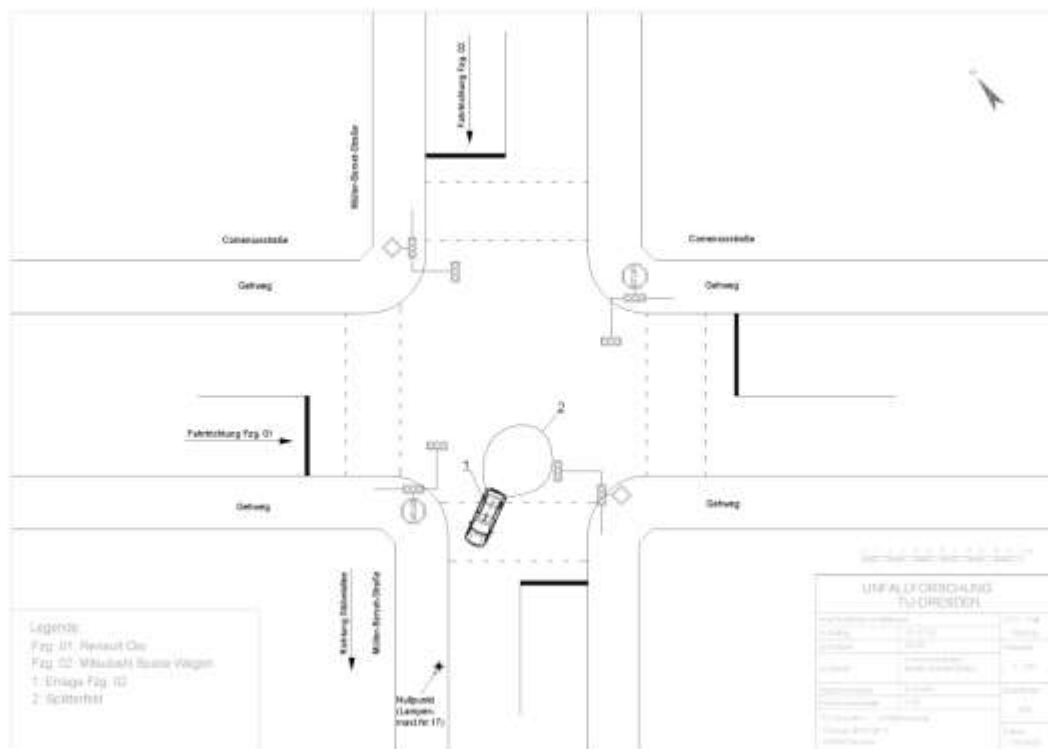
3D City model

- city Dresden
- the city model consists of
 - ✓ buildings (LOD1-3)
 - ✓ trees
 - ✓ bridges etc.

3D Accident scene



Accident sketch



3D City model

Layer:

- edge of carriageway
- road marking
- obstruction
- sidewalk / cycle path
- rails
- traffic signs
- bordering area

3D Accident scene Methodology

Accident sketch

3D City model



[virtualcitysystems.de]

3D City model in the
simulation program 'blender'



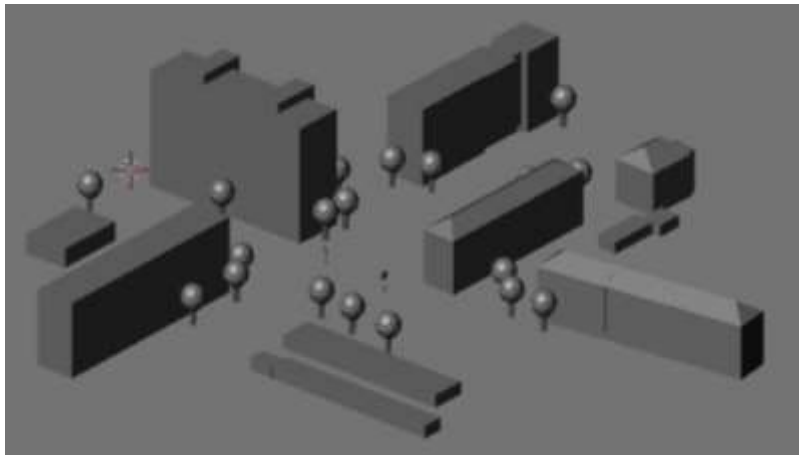
trees

bridges

buildings

3D Accident scene Methodology

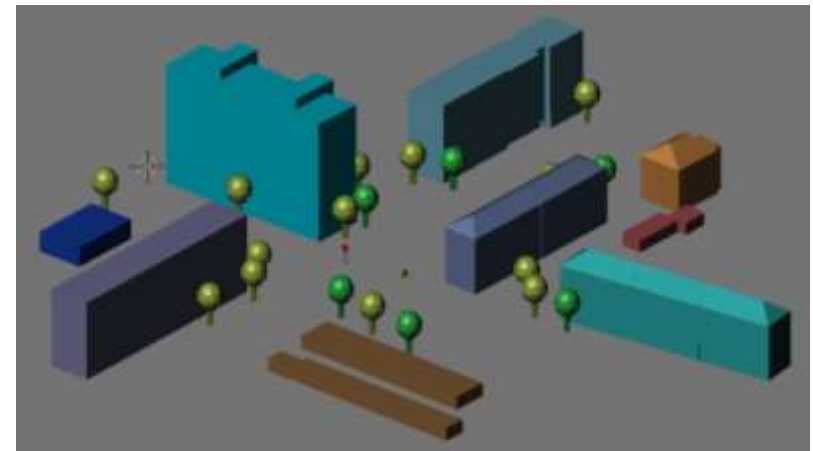
Accident sketch



assigned
properties

3D City model

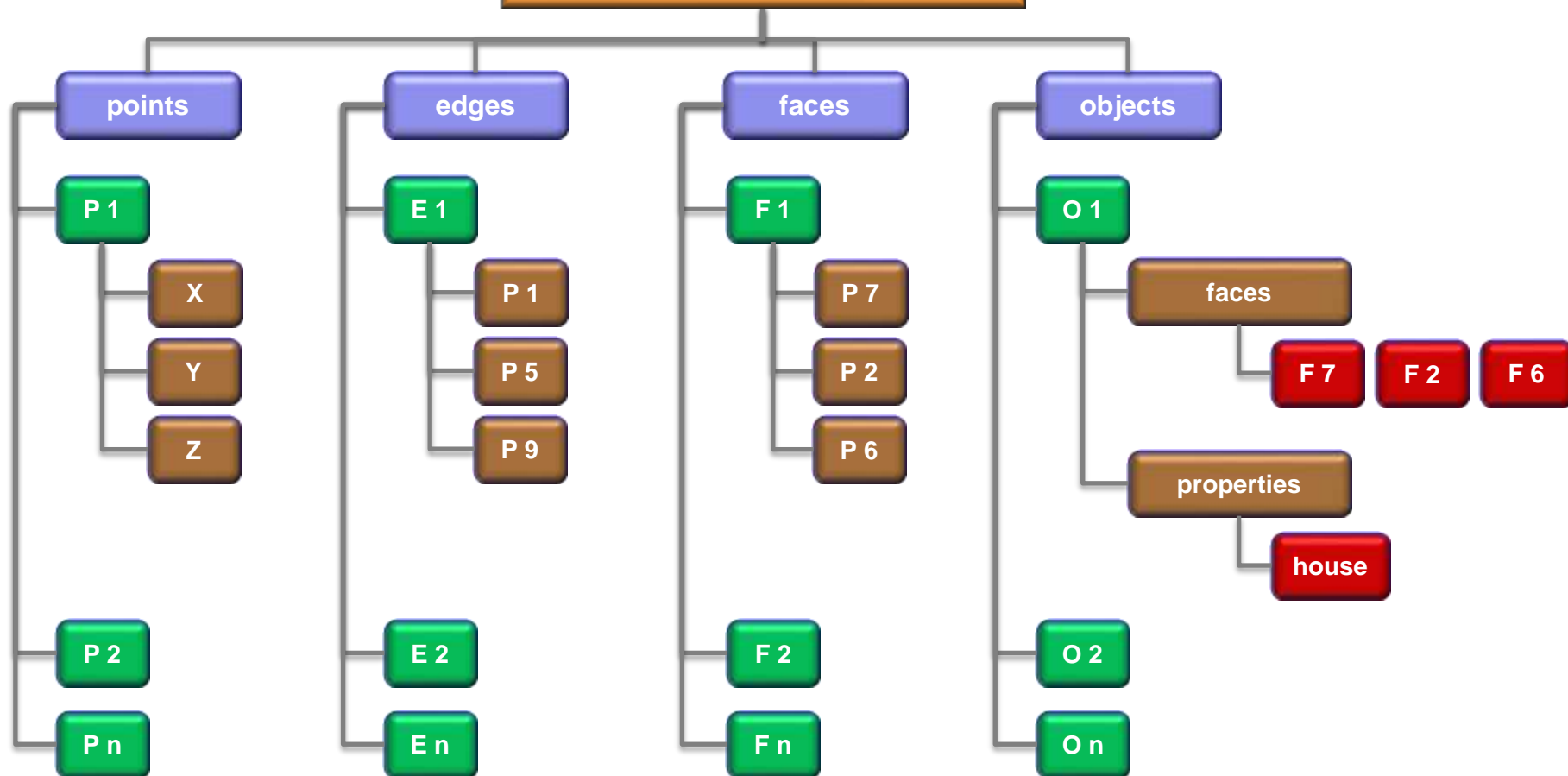
creating blender
files



Accident sketch + *3D City model* = *Structure*

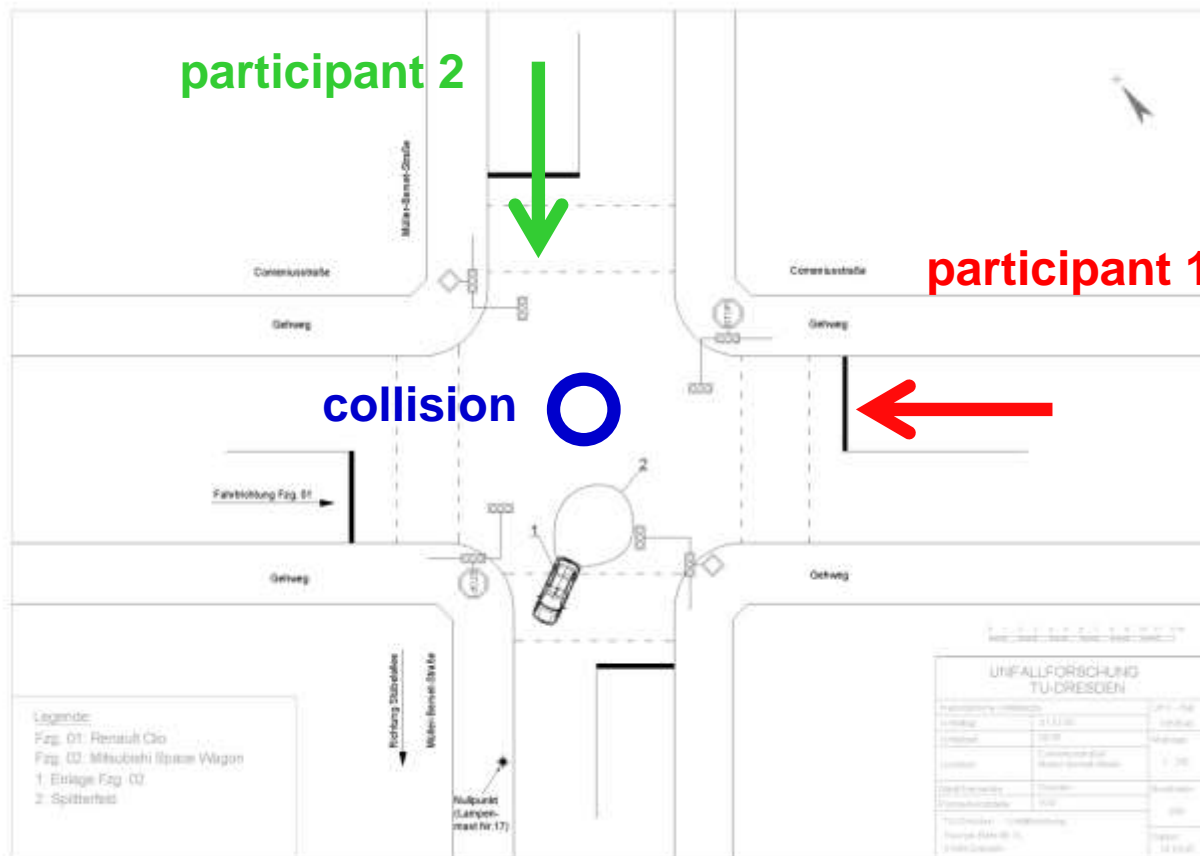


Structure (Matlab)



3D Accident scene Example

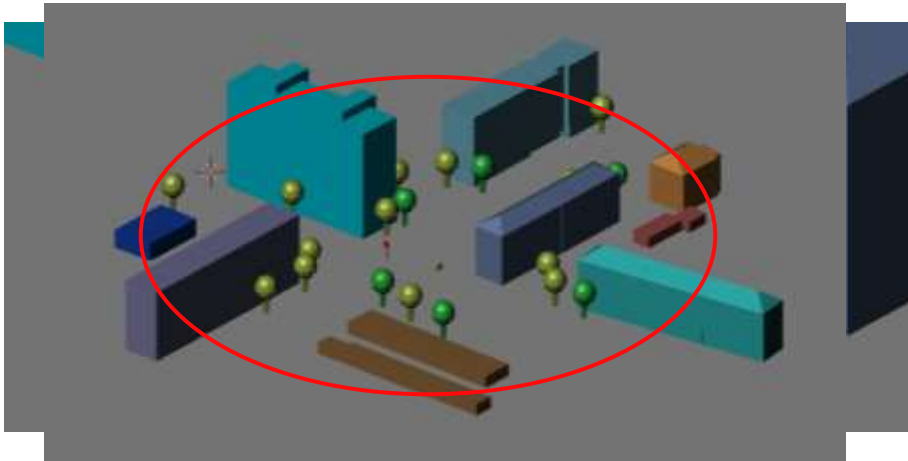
Accident sketch



3D Accident scene Example



3D City model



fit in details like traffic signs

<i>properties</i>	<i>R</i>	<i>G</i>	<i>B</i>
TS_306	1.0	3.0	6.0
TS_205	1.0	2.0	5.0
TS_123	1.0	1.2	3.0

Assignment of properties using the RGB code with decimal places

Example

H_cement_1 0.9 0.9 0.1



object

material

number

object: house, material: cement, number: 1

<i>properties</i>	<i>R</i>	<i>G</i>	<i>B</i>
H_cement_1	0.9	0.9	0.1
H_cement_2	0.9	0.9	0.2
H_stone_1	0.9	0.8	0.1
T_leaves_1	0.8	0.9	0.1
O_wall_1	0.7	0.9	0.1
O_trafficlight_1	0.7	0.4	0.1

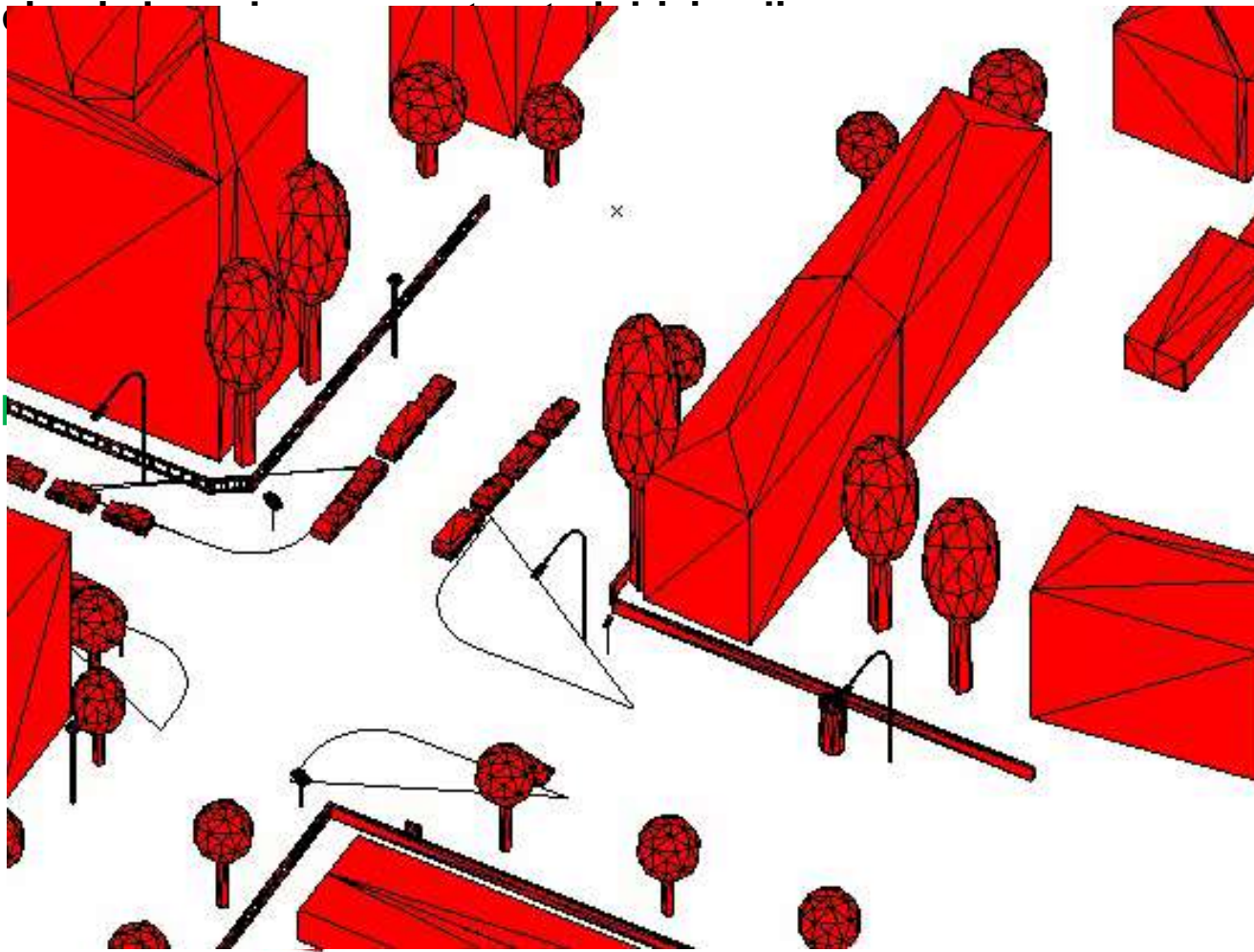
3D Accident scene Example - figure



FORSCHUNGSINITIATIVE
K O - F A S

The reference

collision



3D Accident scene

Methodology

Example

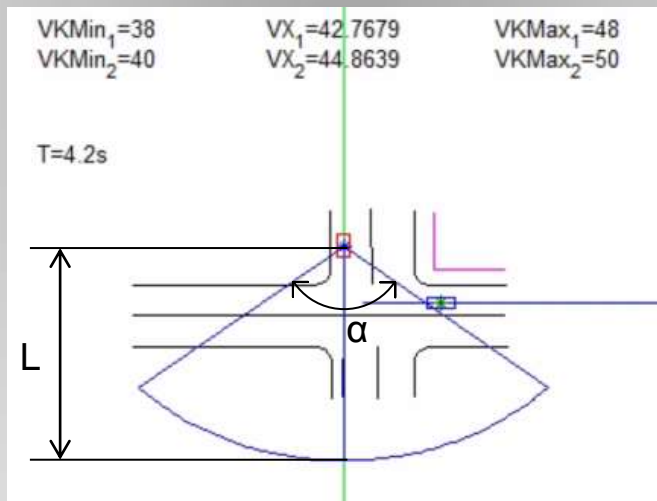
Driver model

Concept

Simulation

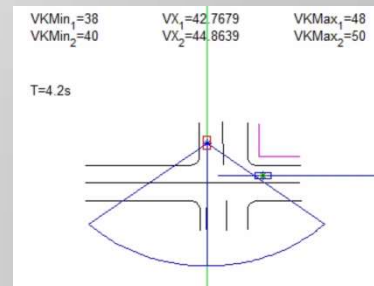
Vision

- Driver models generates the field of view
- 3s before fixation
- Length (L) and opening angle (α) of the field of view are speed-dependent

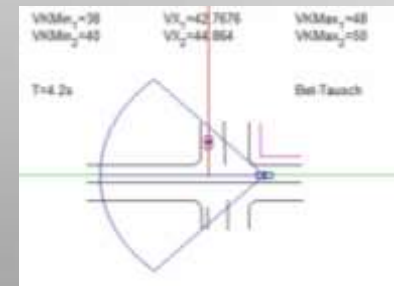


Simulation

base



participant exchange



- Simulation of driver's field of view

Time of the first eye contact to the collision opponents

Time 1

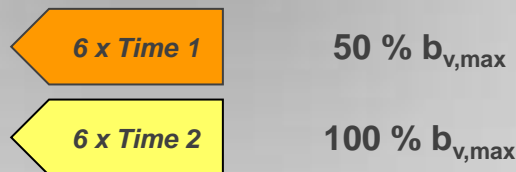
Time 2

Variation

based on different reaction times and braking intensity for each time
(Time 1, Time 2)



for each case 12 variation are created



Adding the basic simulations 14 simulation files and scenarios are available.

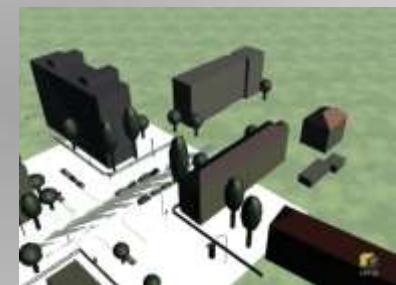
If the detection of the collision opponent fails, no variations are created.

CarMaker simulation

Main 1
basic simulation
participant 1



Main 1
Reaction: 0,55 s
Braking: 100% $b_{v,max}$



Main 2
Reaction: 0,70 s
Braking: 50% $b_{v,max}$



- Use of alternative data sources for creating a 3D environment
- Development of a method for a dynamic response of a 3D environment (structure)
- Possibility of combining the 3D environment and simulation
- Generation of varied simulation files based on a driver model
- Driver model takes into account the driver's field of view
- Creation of simulation scenarios with varying reaction and braking

Thank you for your attention!