

interactive



Accident avoidance by active intervention for Intelligent Vehicles

www.interactIVe-ip.eu

Near Range Perception for Pre-Crash Applications with Laser and Radar Sensors

Markus Schütz, Daimler AG
interactIVe Final Event

20th-21st November 2013

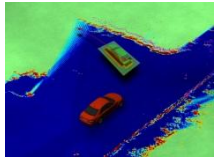
Table of contents



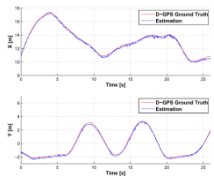
- Introduction



- Test vehicle and sensors



- Algorithms

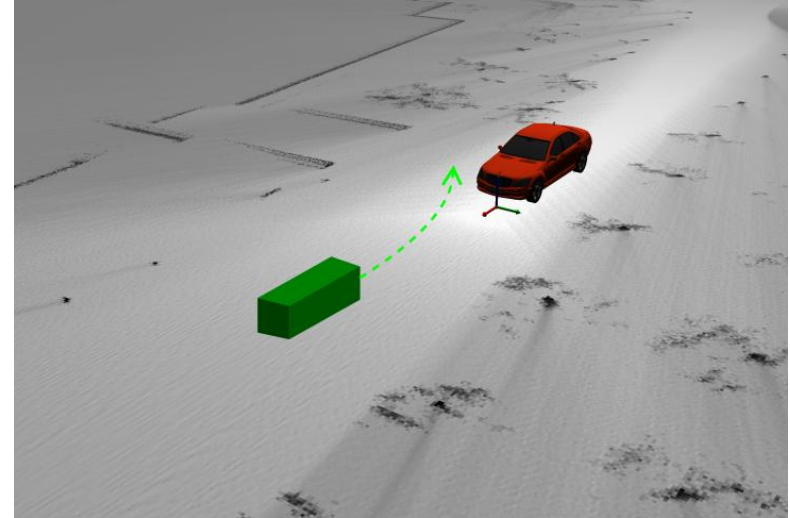


- Evaluation



- Future Work

Introduction



- Environment perception system for **pre-crash** applications in the **near range**
- Model the environment consistently with **static** environment and **dynamic** objects
- Tracking of extended objects with various shapes
- Fast detection and tracking

Test vehicle and sensors

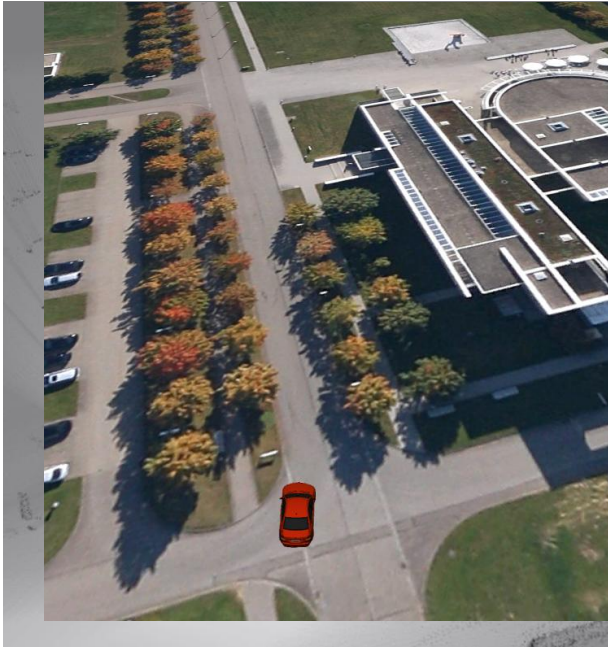


Frontal Near Range Perception (FNRP) concept

| Static and dynamic objects

Model static environment

- 2D-Space is divided into grid cells
- Raw data is integrated in grid cells
- Occupancy of each grid cell is estimated
- Object extraction from grid cells



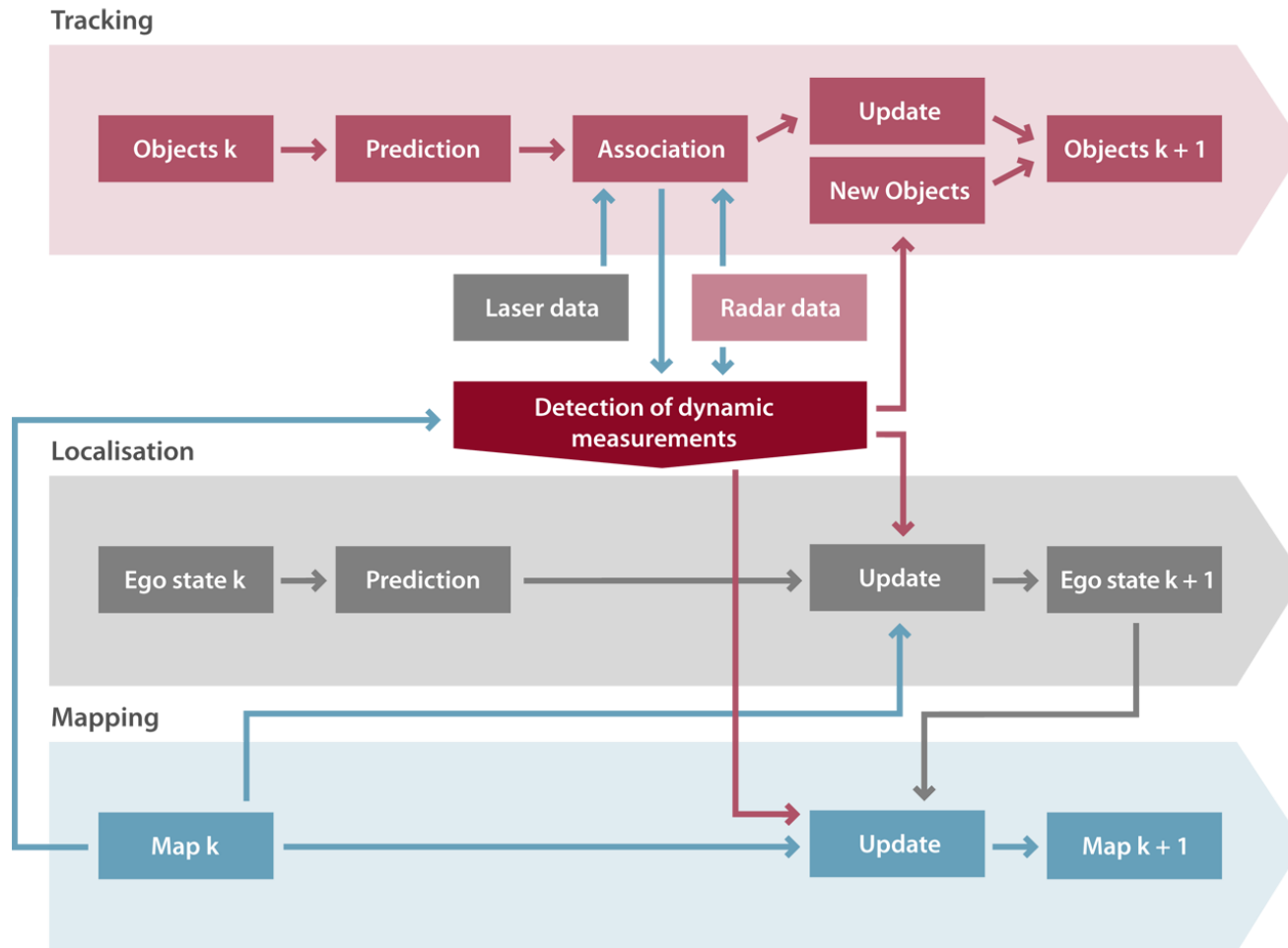
Model dynamic objects

- Static shape represented as Occupancy Grid map
- Rao-Blackwellized particle filter for tracking extended objects



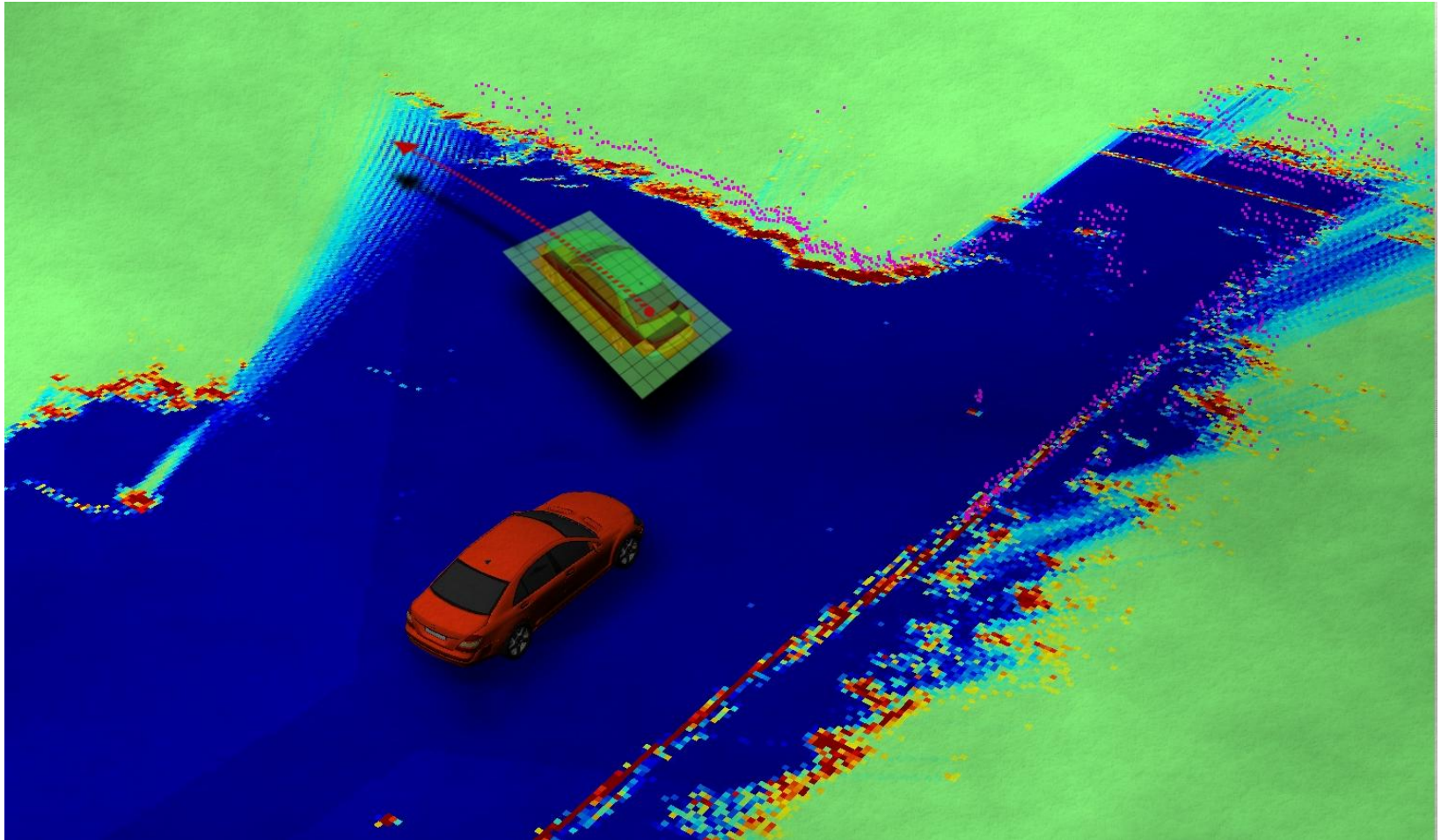
FNRP algorithm

Interaction of submodules



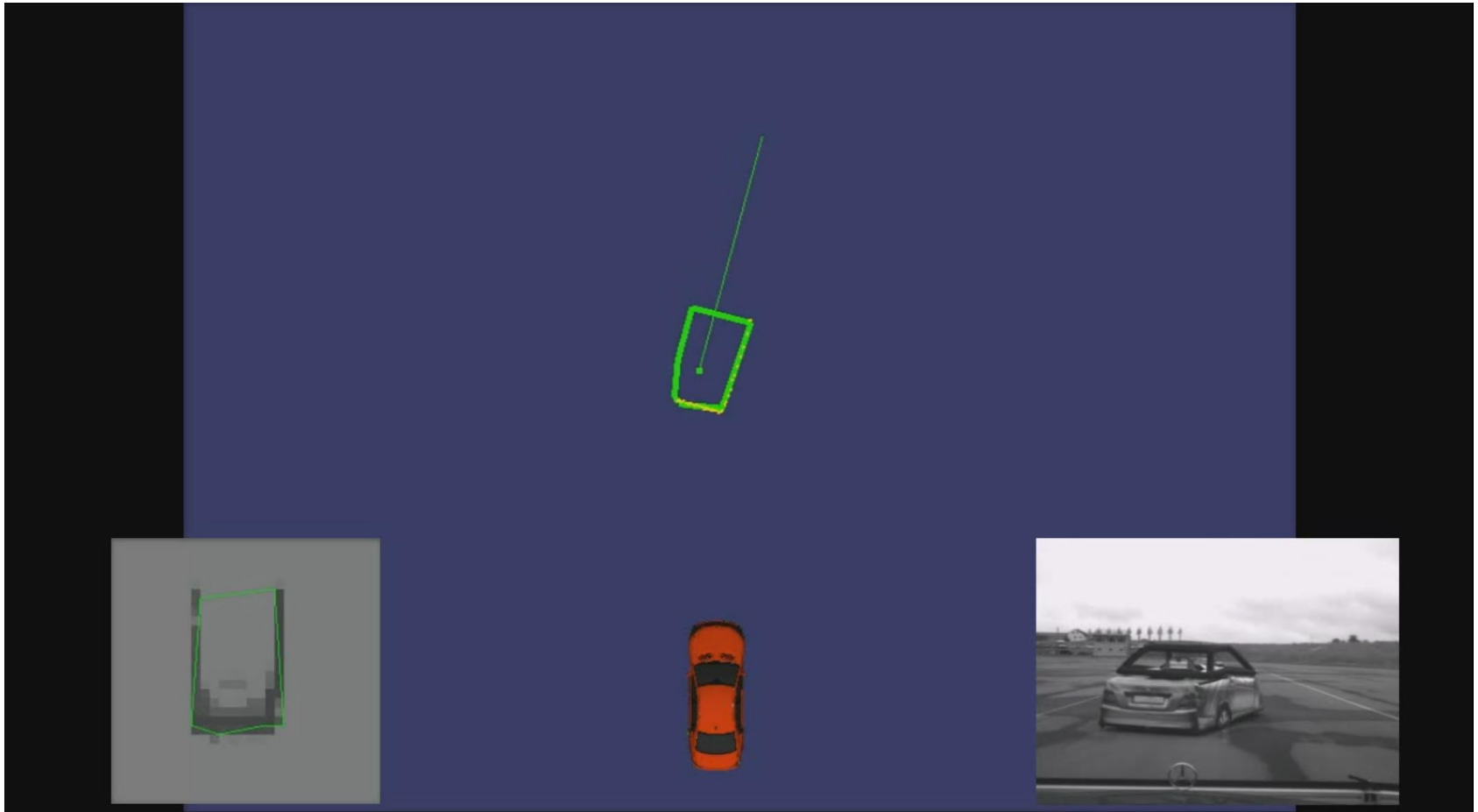
Frontal Near Range Perception

| Output representation



FNRP demo

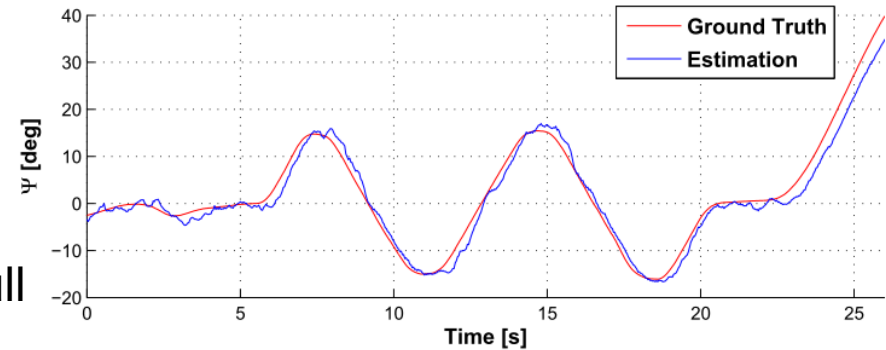
| Tracking the sinusoidal trajectory soft-crash target



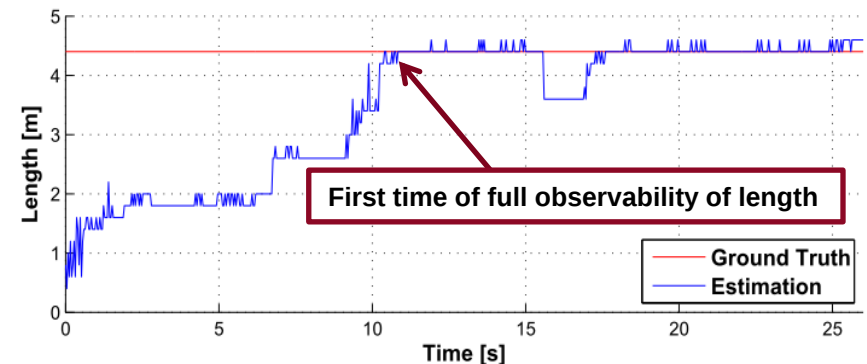
Results

| Tracking the sinusoidal trajectory soft-crash target

- Good results in tracking position and velocity.
- Error in yaw rate due to high responsiveness of the filter.
- Evaluation of length after first time full observability



Δx	[m]	0.2659
Δy	[m]	0.1611
$\Delta \Psi$	[°]	2.3643
Δv	[m/s]	0.2226
$\Delta \omega$	[°/s]	4.6472
ΔL	[m]	0.2984
ΔW	[m]	0.1855



Future Work and Conclusions

Conclusions

- Sufficient accuracy for test cases proved by multiple measurement campaigns
- Successfully tested in combination with the “RUCS” module to realize a pre-crash application perception system

Future Work

- Closer link between static and dynamic representation
- Classification of objects by shape
- Different, classification-based motion models for tracking (e.g. pedestrians)

Acknowledgements

- We'd like to thank all partners of the interactive Perception team for the collaboration.



- Special thanks to our partners from Delphi, University of Passau and Université Joseph Fourier, Grenoble.



interactive



Accident avoidance by active intervention for Intelligent Vehicles

www.interactive-ip.eu

Thank you.

Co-funded and supported
by the European Commission



SEVENTH FRAMEWORK
PROGRAMME

Markus Schütz
Environment Perception
Daimler AG
markus.m.schuetz@daimler.com

DAIMLER