

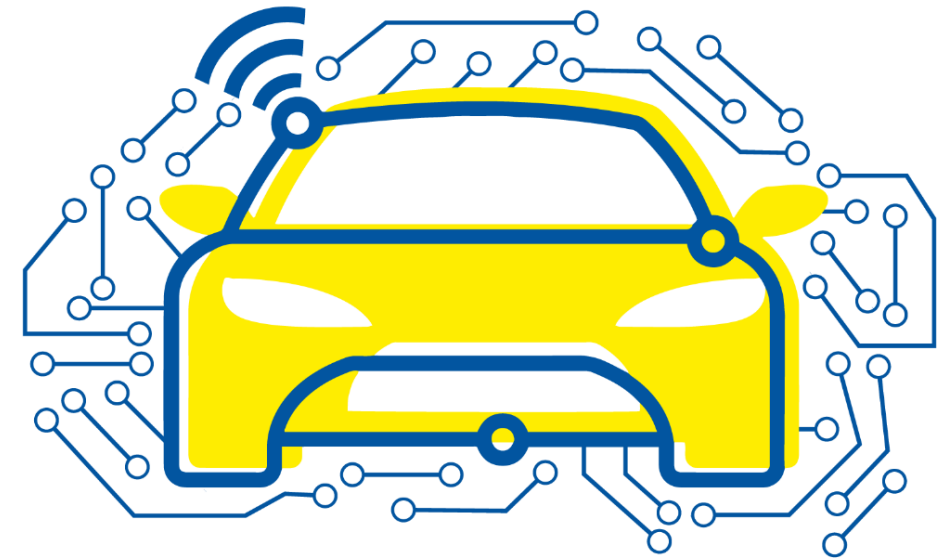
# Automated and Connected Driving Challenges

Section 2 – Sensor Data Processing

## Camera-based Semantic Grid Mapping Challenges

Bastian Lampe

Institute for Automotive Engineering





# Camera-based Semantic Grid Mapping – Challenges

## *Challenges for Deep Learning Approaches*

- **Generating labeled datasets takes a lot of effort**
  - Dense label in BEV perspective necessary
  - Possible solution: Drone-based labeling
    - Semantic segmentation of drone images
      - Vehicle is not always accessible by drone (e.g. tunnel)
      - Drone does not provide an orthographic view
  - Possible solution: Synthetic data
    - Reality gap
- **Usage of publicly available datasets difficult**
  - Absence of densely labeled datasets in 3D space
  - Many available datasets have labels only for a few classes
  - Other available datasets have labels only in 2D (image) space

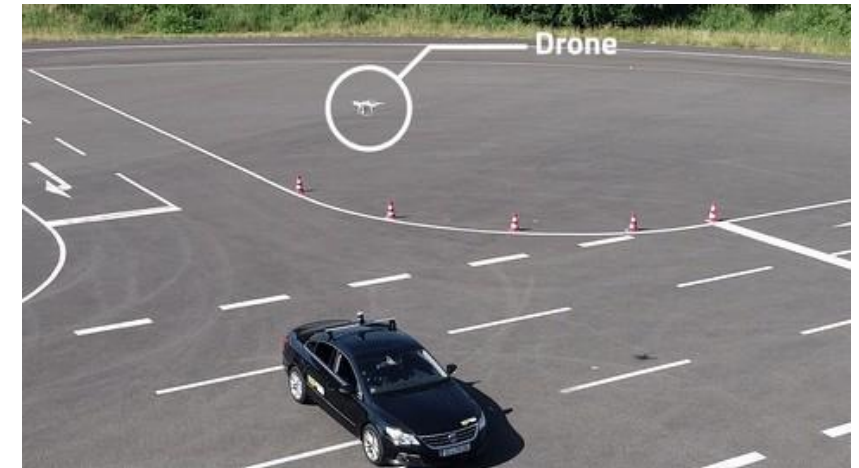


Image: ika



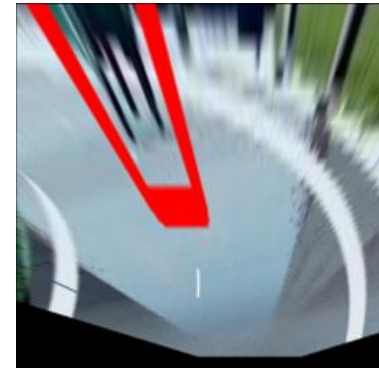
# Camera-based Semantic Grid Mapping – Challenges

## *Challenges for Geometric Approaches*

- Inverse perspective mapping (IPM) assumes a **flat world**
- **Distortions** of objects with vertical extent
- Flat world **assumption often wrong** for presumably flat surfaces
  - Sag and crest curve roads
  - Cross slope roads
- Effective **resolution drops** with distance



Image: [Autozeitung](#)



Images: ika

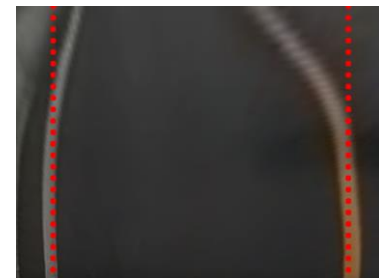


Image: [YouTube](#)



# Camera-based Semantic Grid Mapping – Challenges

## *Challenges for all Approaches*

- **Changes in perspective** due to dynamic vehicles
- Challenging especially for **strong accelerations**
  - Lateral: high speeds + large curvature
  - Longitudinal: braking and acceleration
- **Roll and pitch** of the vehicle must be accounted for
- **Camera movement** relative to vehicle can cause additional problems (esp. vibrations)

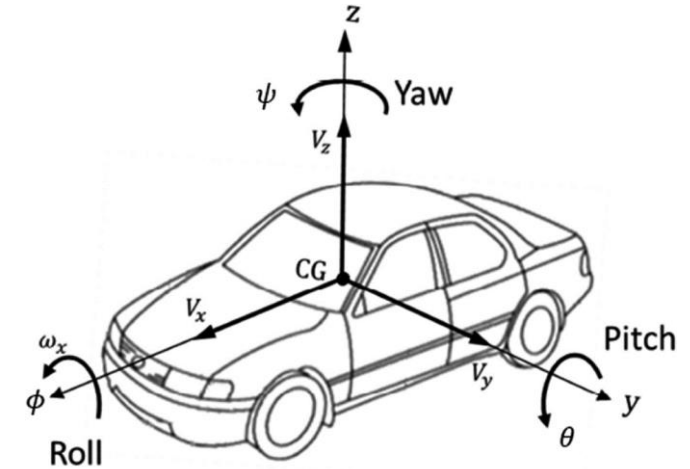


Image: [Vehicle Dynamics](#)



Video: [Waymo](#)