

(The following slides contain an excerpt of the original presentation)

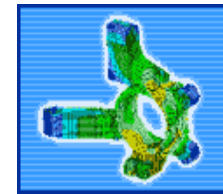
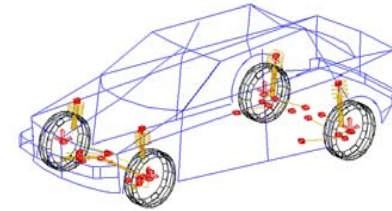
# Plausibility Checking of Road Profile Measurements

K. Martin Saeger,  
Institut für Kraftfahrwesen Aachen

John B. Ferris,  
ZF Technologies Inc.

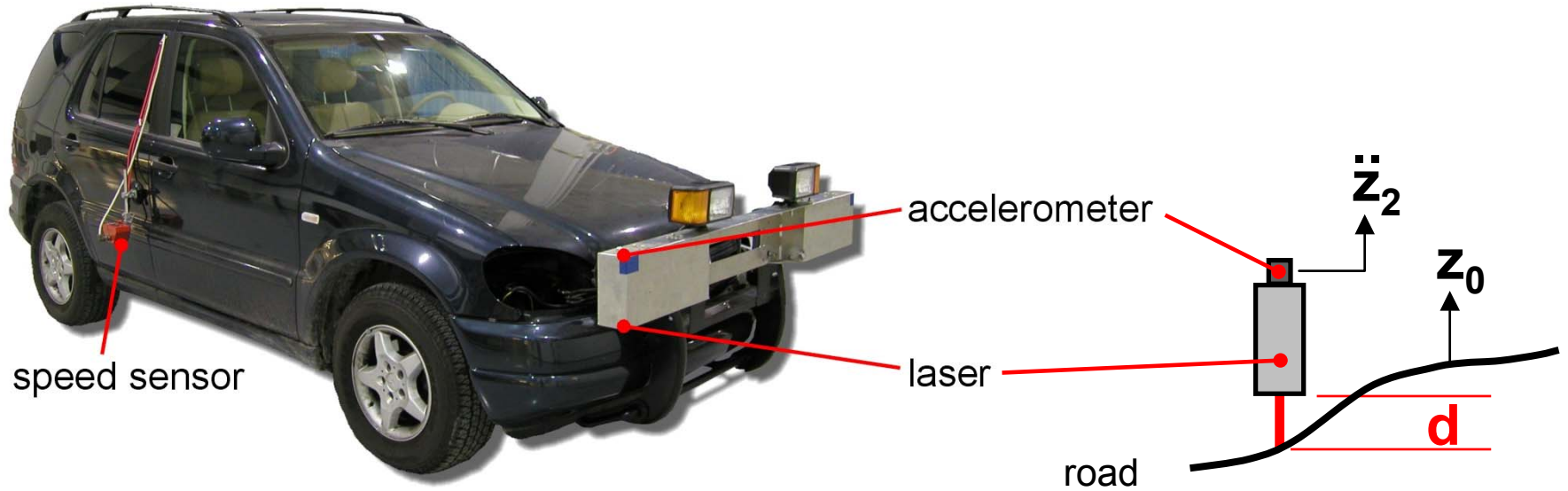
## Target loads for development process:

- Road data as simulation input
- Multi-body simulation (e.g. ADAMS) and FEM

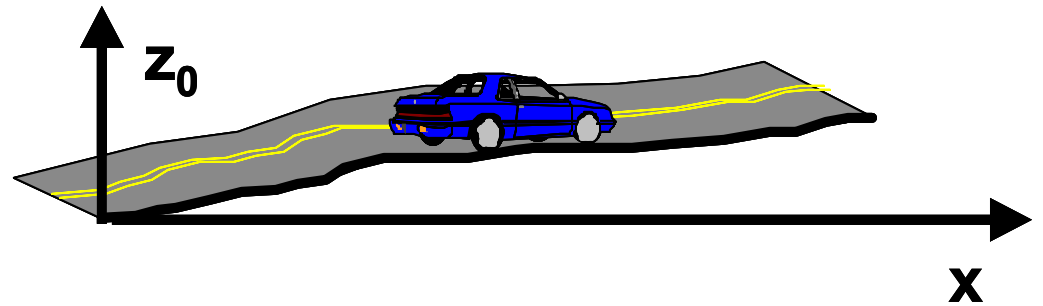


## Accurate prediction of chassis loads early in development process

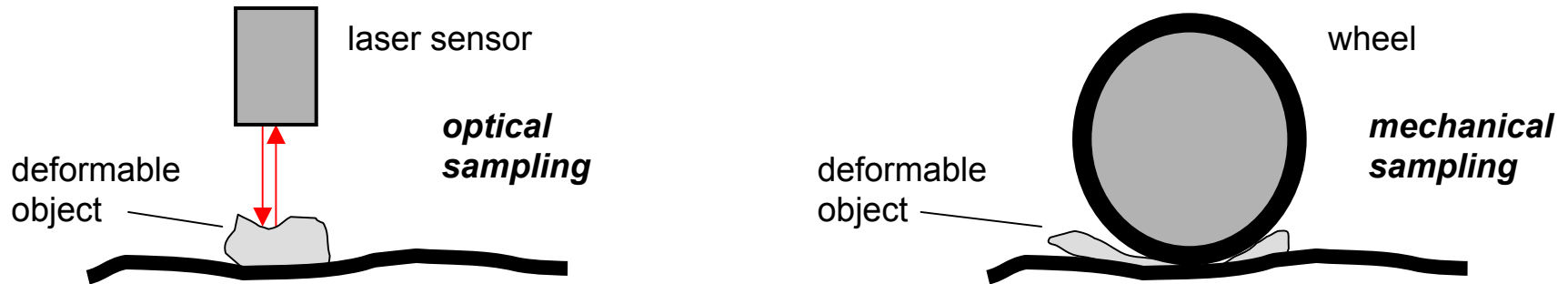




$$z_0 = \int \ddot{z}_2 dt - d$$



## Error source: Laser distance measurement



Different interpretation of road surface by laser / tire

- Discrepancies between measured and actual road profile
- High impact on load and durability prediction

Translucent  
surfaces

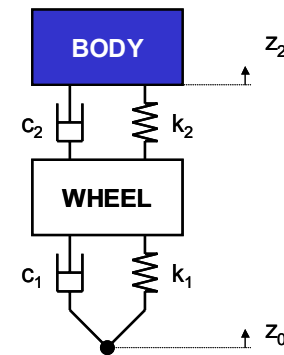
Reflecting  
surfaces

Deformable  
surfaces

## Reference Signal required for road profile verification

Adequate and available reference signal:

**Vertical body position  $z_2$**



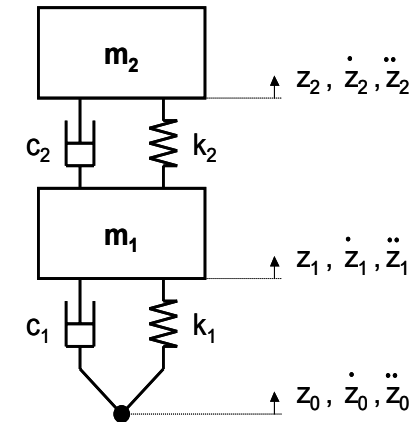
**Comparison of**

- **Road profile data (input) and body position (output)**

## Two different strategies for plausibility checking:

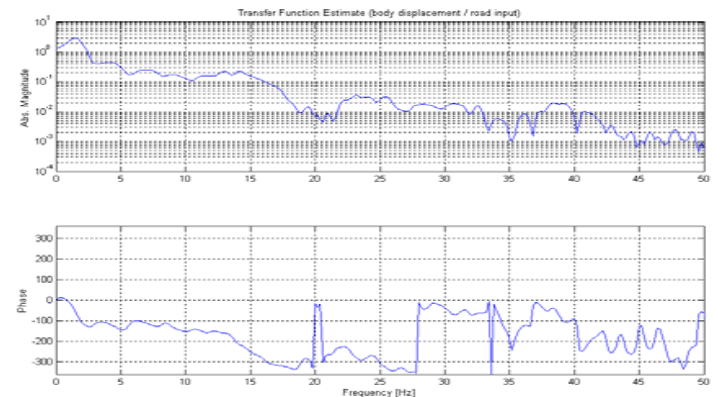
### Quarter Car Model Simulation

- Road profile as excitation
- Simulation of vertical body motion



### Transfer Function Estimate

- Calculation of an estimated transfer function
- Comparison to reference function



## Process for detection of possible signal defects in measured road profiles

- Several plausibility checks highlighting road profile sections likely to contain defects
- Defect information enables user to select sections for further investigation, helps deciding upon validity recorded data
- Functionality of process demonstrated with signals artificially corrupted by predefined defects