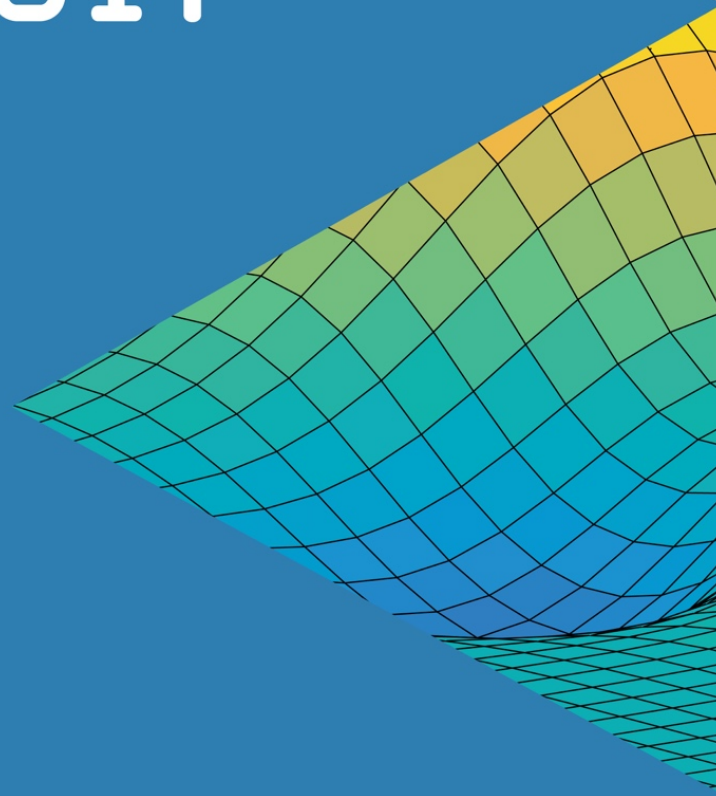# MATLAB EXPO 2017

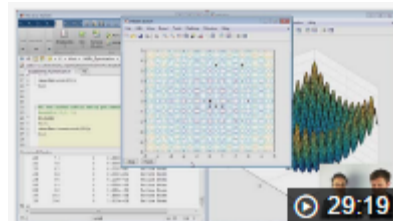## Design-Optimierung eines Rennwagen-Fahrwerks
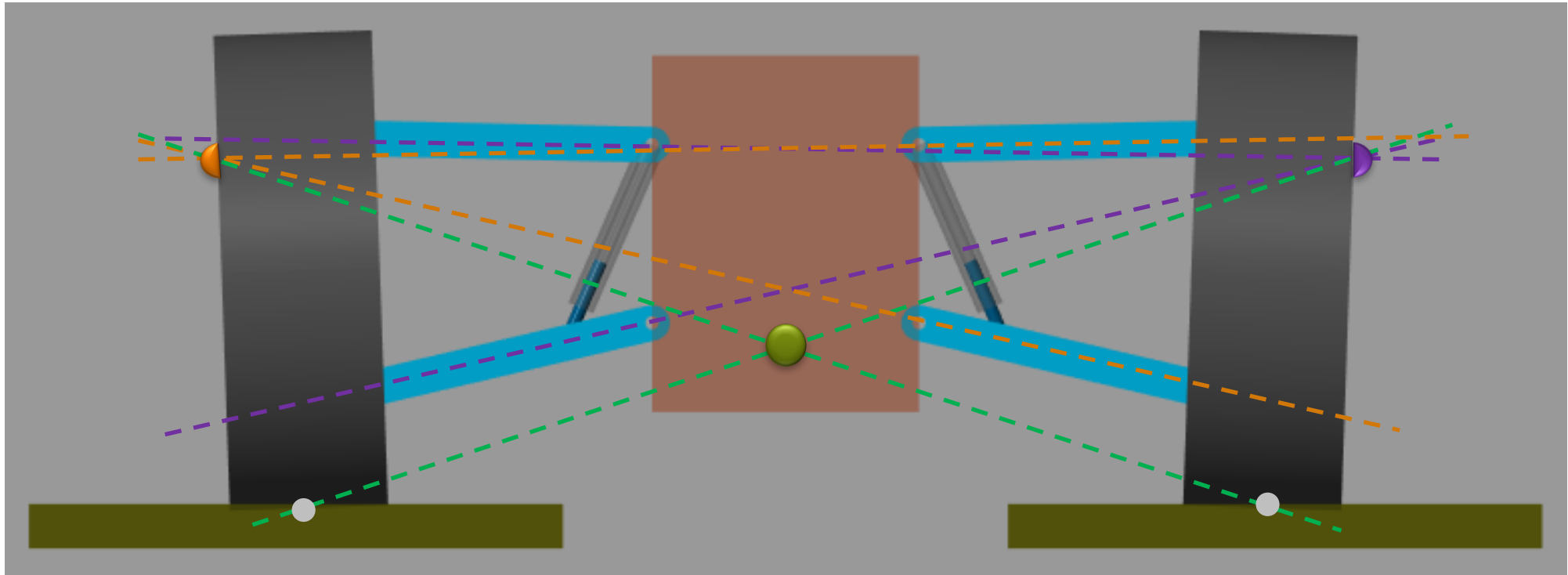
Dr. Christoph Hahn

Motivation

- Racecar development is all about optimizing designs

- Optimization is inherent in MathWorks tools
  - sometimes we just don't see it

- Let's together browse through a hands-on example

🔗 Models on [File Exchange](#)

[Video](#) with more details
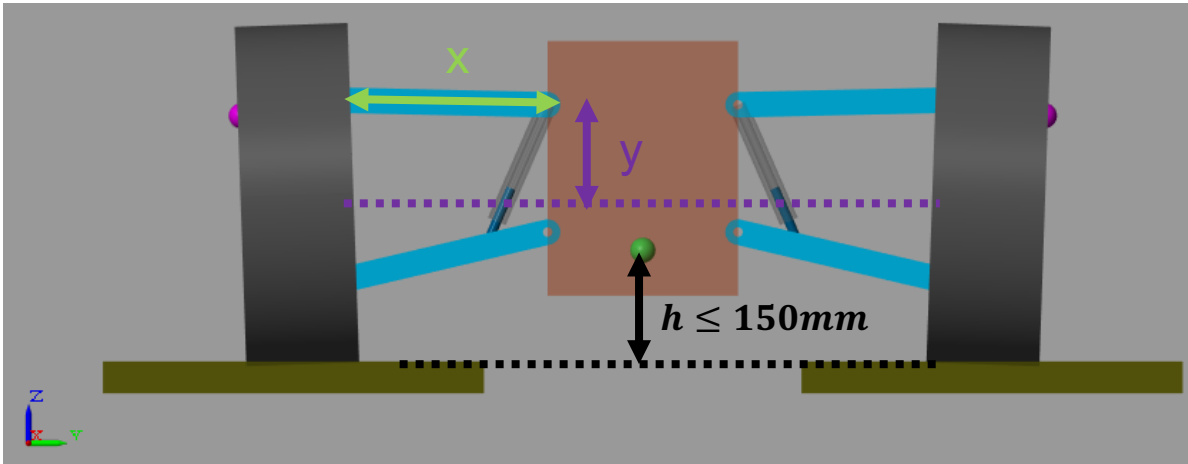
Roll Center

Instant center:
Intersection of upper and lower control arm
Roll center:
Connection of the instant center and the center of the tire-ground contact
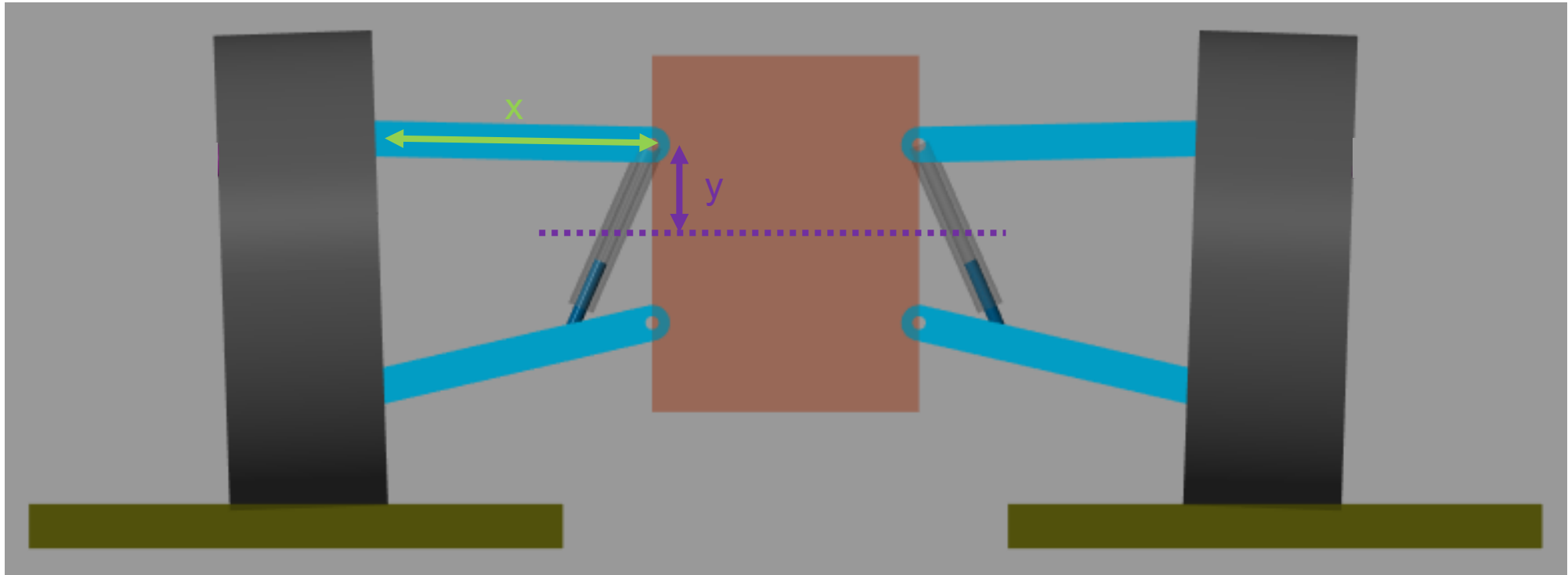
Design Goal

Design goal: Roll center height should
- not exceed 150 mm during the simulation
- Be as close as possible to 150mm

Objective function:

$$\textit{minimize} \ \ \max(\ \mathbf{h}(\mathbf{x},\mathbf{y}) - 150 \ mm, \ 0)$$

Design Parameters

Design variables
 x: upper arm length
 y: connection point of upper arm at chassis

Software Demonstration

HOME   PLOTS   APPS   SHORTCUTS

GoTo C-drive   GoTo OneDrive   Clean-up   Search Documentation   Christoph

New Script   New   Open   Find Files   Compare   Import Data   Save Workspace   New Variable   Open Variable   Clear Workspace   Analyze Code   Run and Time   Clear Commands   Simulink   Layout   Preferences   Set Path   Parallel   Add-Ons   Help   Community   Request Support   Learn MATLAB

FILE   VARIABLE   CODE   SIMULINK   ENVIRONMENT   RESOURCES

C: ▶ Work ▶ Susp_Opt_MLExpo2017 ▶ Models ▶

Current Folder

Name ▲	Git
fminconVsPS	.
slprj	.
Extr_Data_LinkHoles.m	●
susp_sdo_params.m	●
suspSDO.slx	●
wheels_input.mat	●

Command Window

```
>>
```

Workspace

Name ▲	Value

suspSDO.slx (Simulink Model)

Ready

Key Takeaways

- Simulink Design Optimization lets you optimize complex systems

- Quick and easy setup of optimization task

- Results are visual and accessible

- Approach can be embedded in the development workflow

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