Optimization in Hybrid Electric Vehicle Design and Logistics

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Hybrid Electric Vehicles

Different operation modes:

- Combustion drive
- Pure electric drive
- Load Point Shifting
- Power-split
- Recuperation



Figure: HEV schematic

The big picture



Hybrid Electric Vehicle Design Optimization

Configure a Hybrid Electric Vehicle (HEV) to reduce fuel consumption

- High-detail computer simulation model
- Simulation of a specific driving cycle
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Problems

- Simulation requires a lot of time
- Parameter setting may overfit the driving cycle
- Simulation presents as a **black-box**

Given

- A central depot
- A set of customers with demands and time windows
- A fleet of Hybrid Electric Vehicles

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• What are the optimal routes?

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- What are the optimal routes?
- What is the optimal operation strategy?

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Questions

- What are the optimal routes?
- What is the optimal operation strategy?
- What level of model detail is needed s.t. the routes do not change?

Efficiency of Electric Machines



Figure: ICE efficiency map (Juraj, 2012, posterus.sk/?p=12975)

Efficiency of Combustion Engines



Figure: ICE efficiency map (Juraj, 2012, posterus.sk/?p=12975)

Thank you for your attention!