

Comparison of Different Numerical Solvers for Optimal Control Problems on the Example of an Autonomous Car

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Control of Dynamical Systems

- Dynamical systems can be modeled using differential equations with states (position, velocity, etc.) and inputs (steering, acceleration, breaking, etc.)
- **Task:** Find an input sequence such that the car/robotic arm moves from the initial position to a desired end position

Optimal Control

- Many possible input combinations. How to choose?
 - Additional restrictions through
 - Costs (time, energy consumption, forces) → should be minimized
 - Constraints (obstacles/other cars, maximum forces, maximum time) → must not be violated
- ⇒ Constrained optimization problem

Topic: Comparison of Different Numerical Solvers for Optimal Control Problems on the Example of an Autonomous Car

- Different possible methods to solve these optimization problems
- For each method, many different solvers exist
- **Tasks:**
 - Obtain an overview of existing optimization tools
 - Implement an optimal control problem for an autonomous car and solve it with different solvers
 - Compare the performance and accuracy of different solvers
- **Required:** Basics in control theory and optimization

Questions?

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