Personalizing Driving Assistance and Autonomous Driving

Model Predictive Control lab, UC Berkeley

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Context

2013-2014: Inria@SiliconValley postdoctoral fellowship
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Focus of the MPC lab: Human-centered control strategies for intelligent vehicles
Problem formulation

- Human
- Vehicle
- Environment
Research themes

- Distraction detection
- Lane change models
- Car following models

Human

Environment

Vehicle

- Model-based control
- Control under uncertainty

- Motion prediction on highways
- Intention estimation at road intersections
Example: Personalized Adaptive Cruise Control

Goal of ACC

- Maintain speed set by the driver
- Adjust speed to maintain safe following distance with vehicle in front

Challenges

- Tuning for comfort and safety
- Different people value different things
Example: Personalized Adaptive Cruise Control

Proposed approach: Combine Driver Model + Model Predictive Controller

- Can generate acceleration sequences which feel natural to the driver
- Has no concept of what is safe and what is not safe

- Can enforce safety constraints
- Needs tuning for comfort

Take best of each approach
1. Use the driver model to generate an acceleration which imitates the driver
2. Use the model predictive controller to follow the reference and to enforce safety constraints
Example: Personalized Adaptive Cruise Control
Example: Personalized Adaptive Cruise Control
Study with human subjects: How do people react to personalized driving assistance / personalized autonomous driving?

Investigate lifelong learning approaches so that the car can learn from corrections applied by the driver
Thank you

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