Advanced Methods for Behavior Planning

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Learning Objectives

- Identify issues with the state machine based behaviour planner
- Identify the open areas of research in behaviour planning

State Machine Behaviour Planning Issues

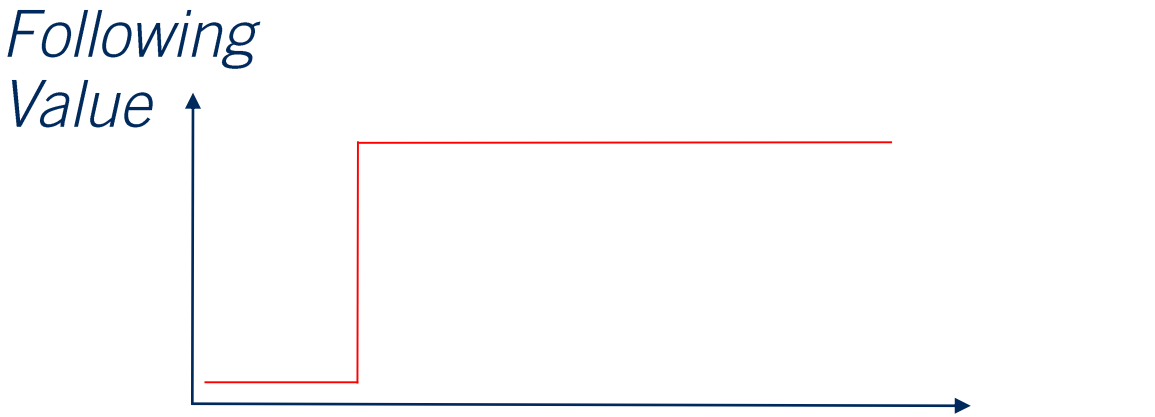
- Rule-explosion when Dealing with Complex Scenarios
- Dealing with a Noisy Environment
- Hyperparameter Tuning
- Incapable of Dealing with Unencountered Scenarios

Rule-Based Behaviour Planner

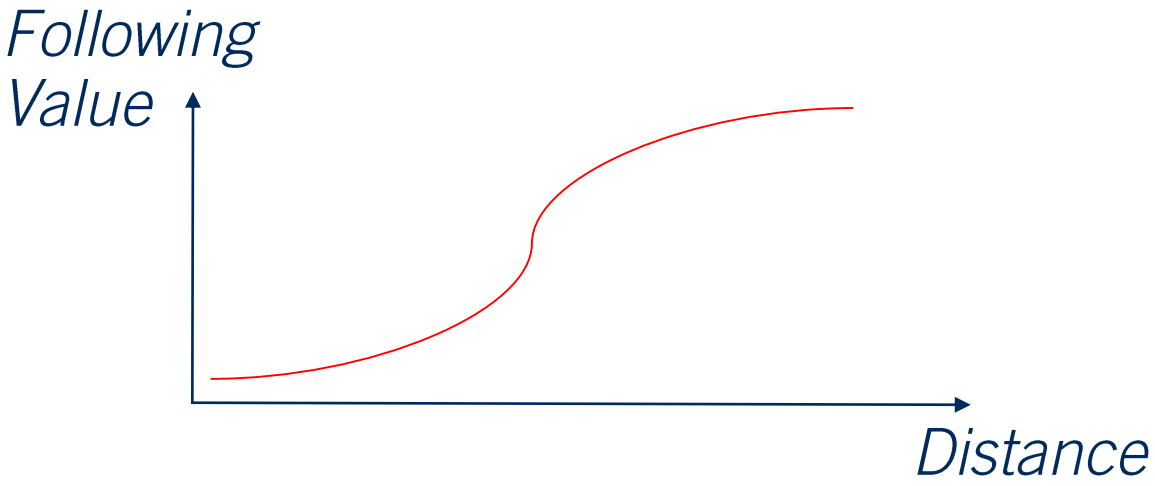
- Hierarchy of rules
  - Safety critical
  - Defensive driving
  - Ride comfort
  - Nominal behaviours
- Reduced need for duplication
  - Rules can apply throughout ODD
- Suffer from same challenges as finite state machines
  - Common to all expert system designs

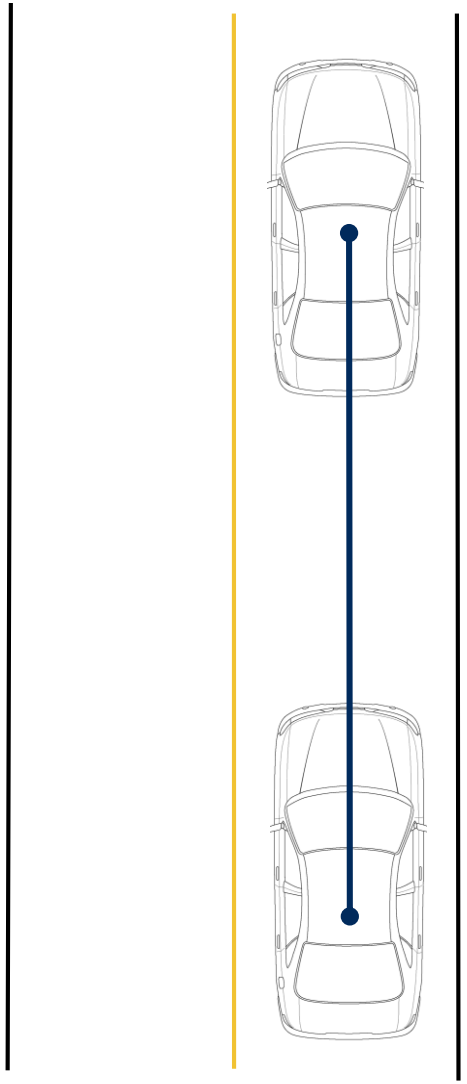
Fuzzy Logic

Non Fuzzy logic:

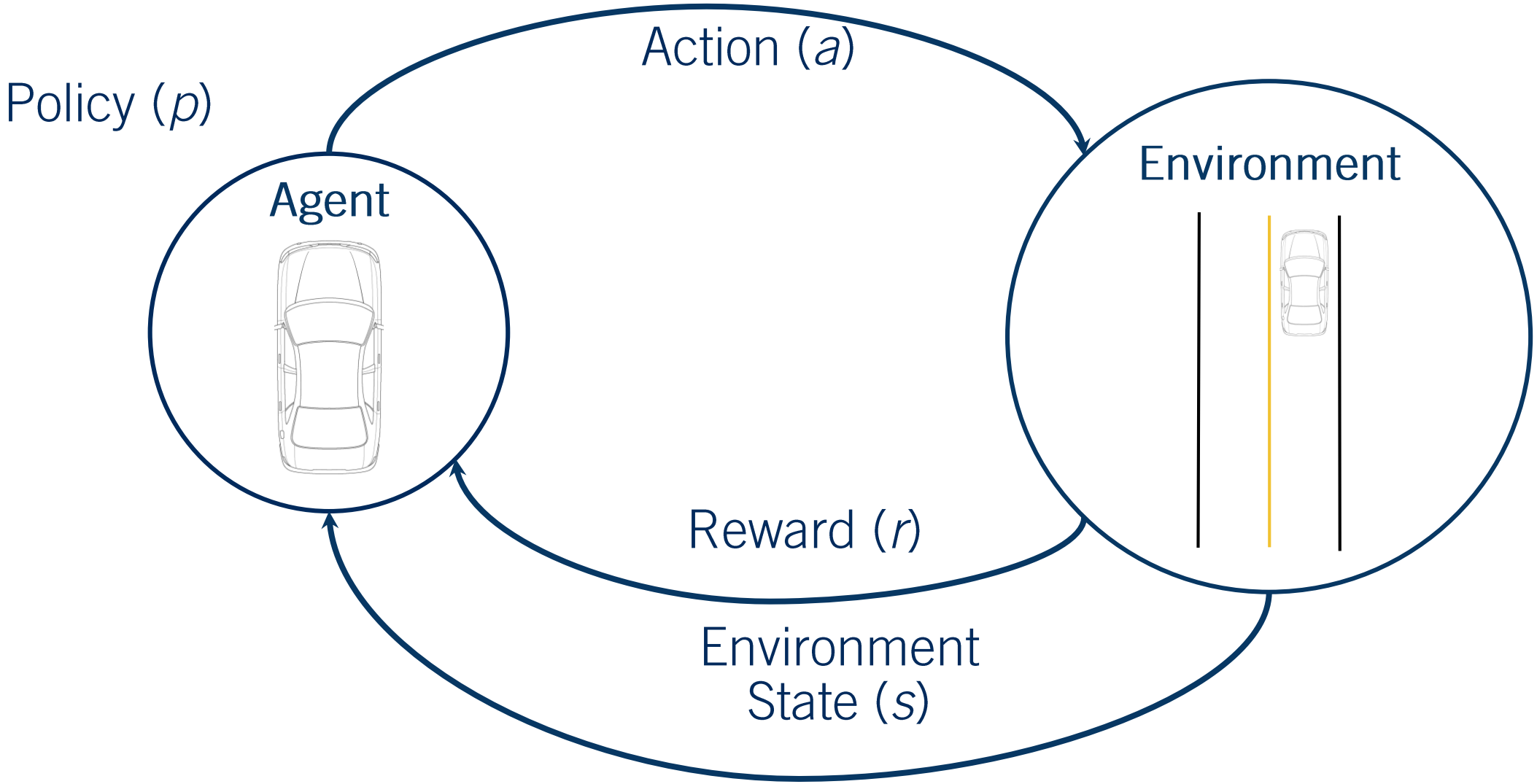


Fuzzy logic:



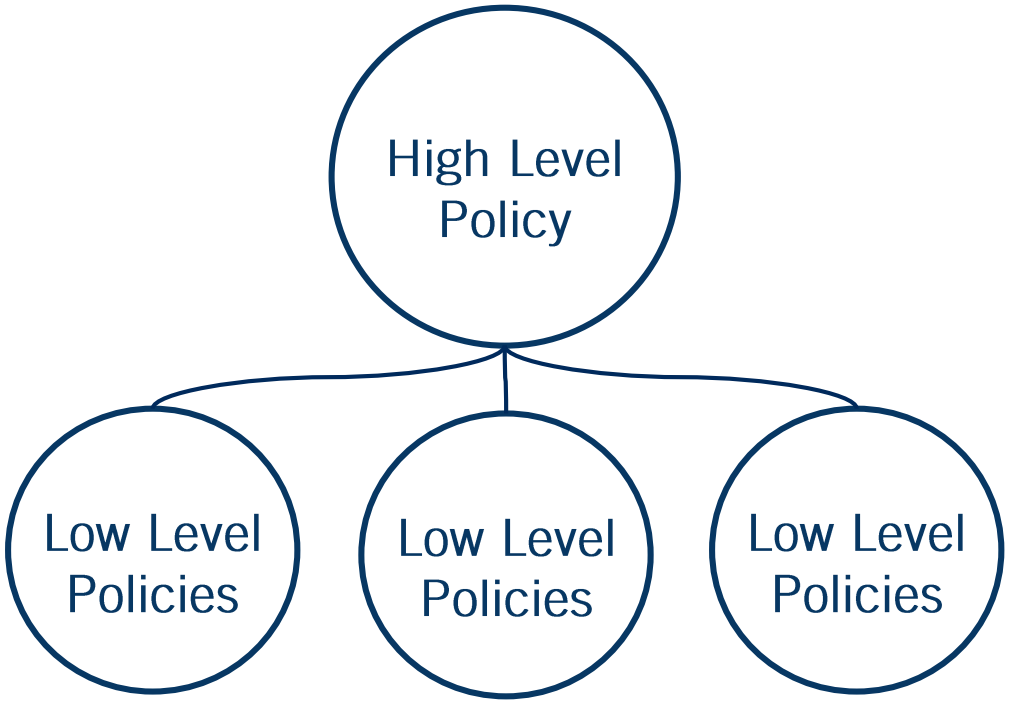


Reinforcement Learning

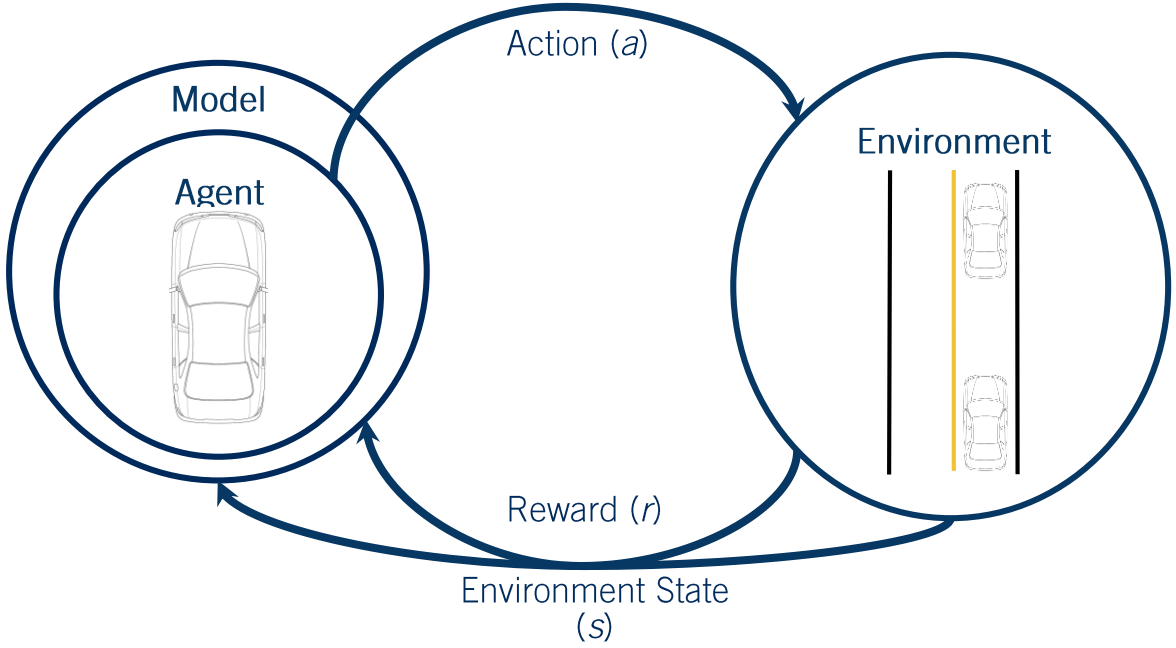


Reinforcement Learning

Hierarchical Reinforcement Learning

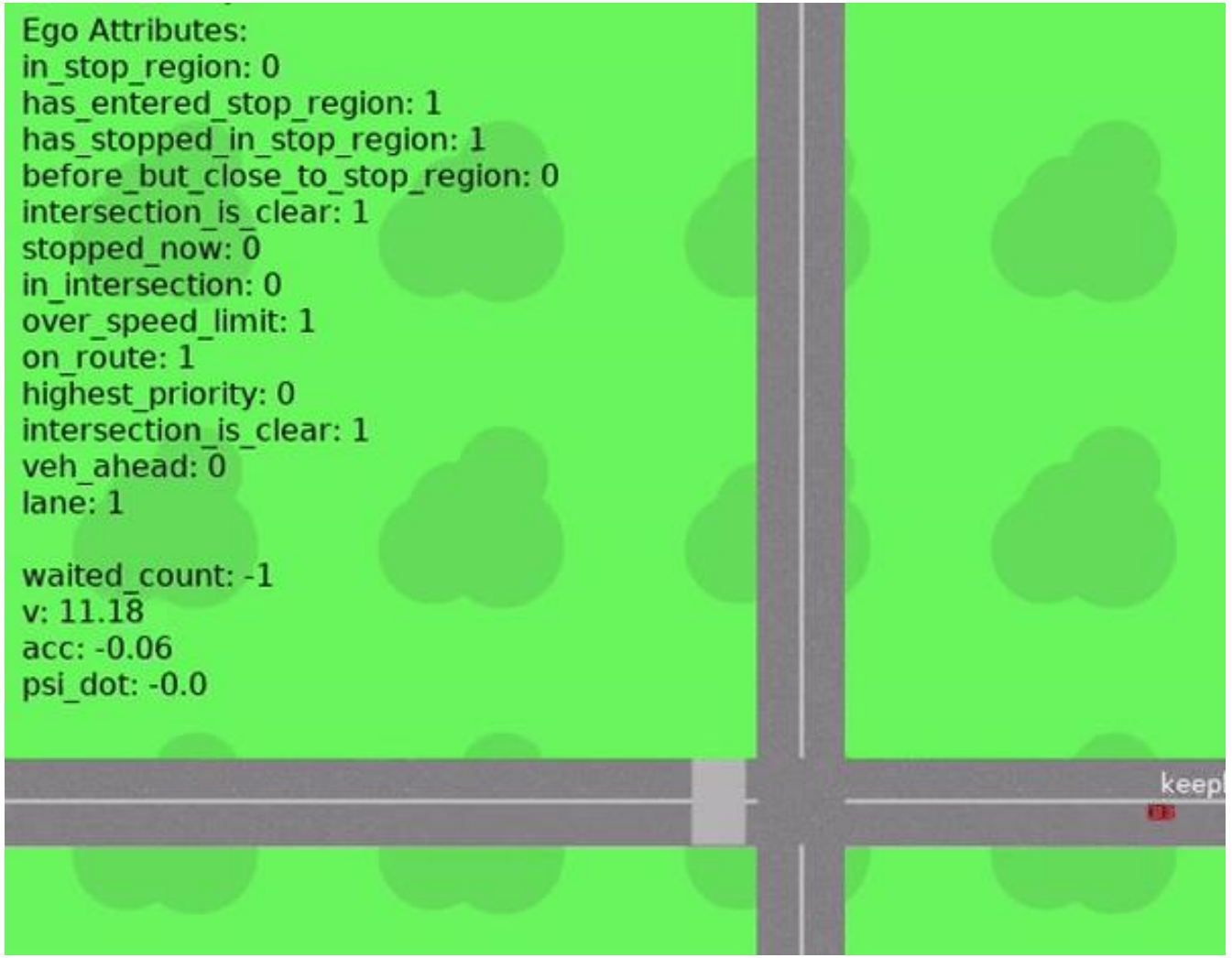


Model-based Reinforcement Learning



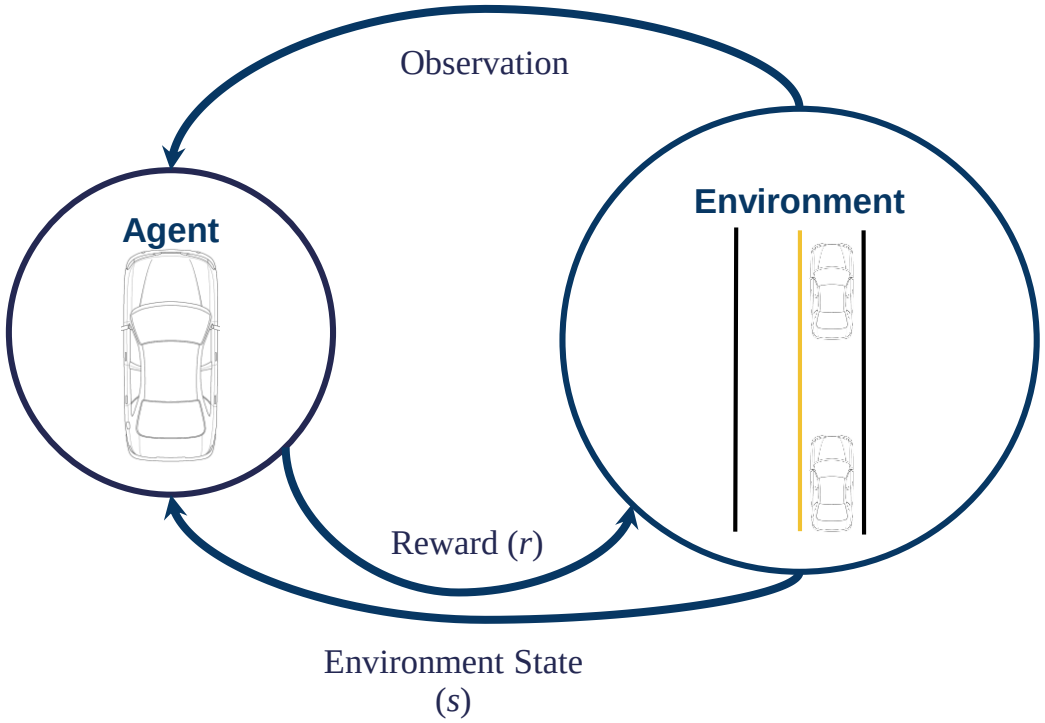
Reinforcement Learning Issues

- Simple Simulation Environments
- Ensuring Safety

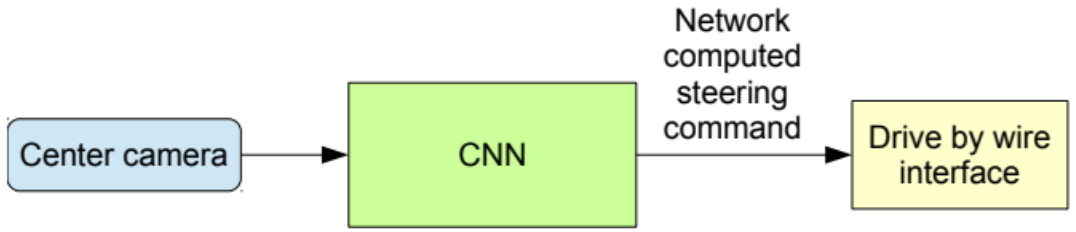


Machine Learning

Inverse Reinforcement Learning



End-to-End Approaches



Summary

- Identify issues with the state machine based behaviour planner
- Identify the open areas of research in behaviour planning

- **Next**: Building a full local planning solution