

# Behavior Planning

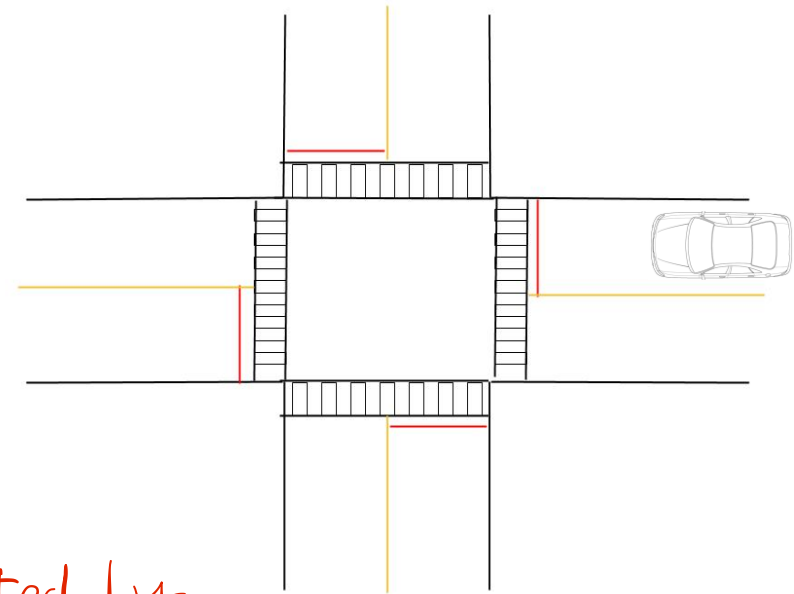
Course 4, Module 5, Lesson 1



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# Behavior Planning

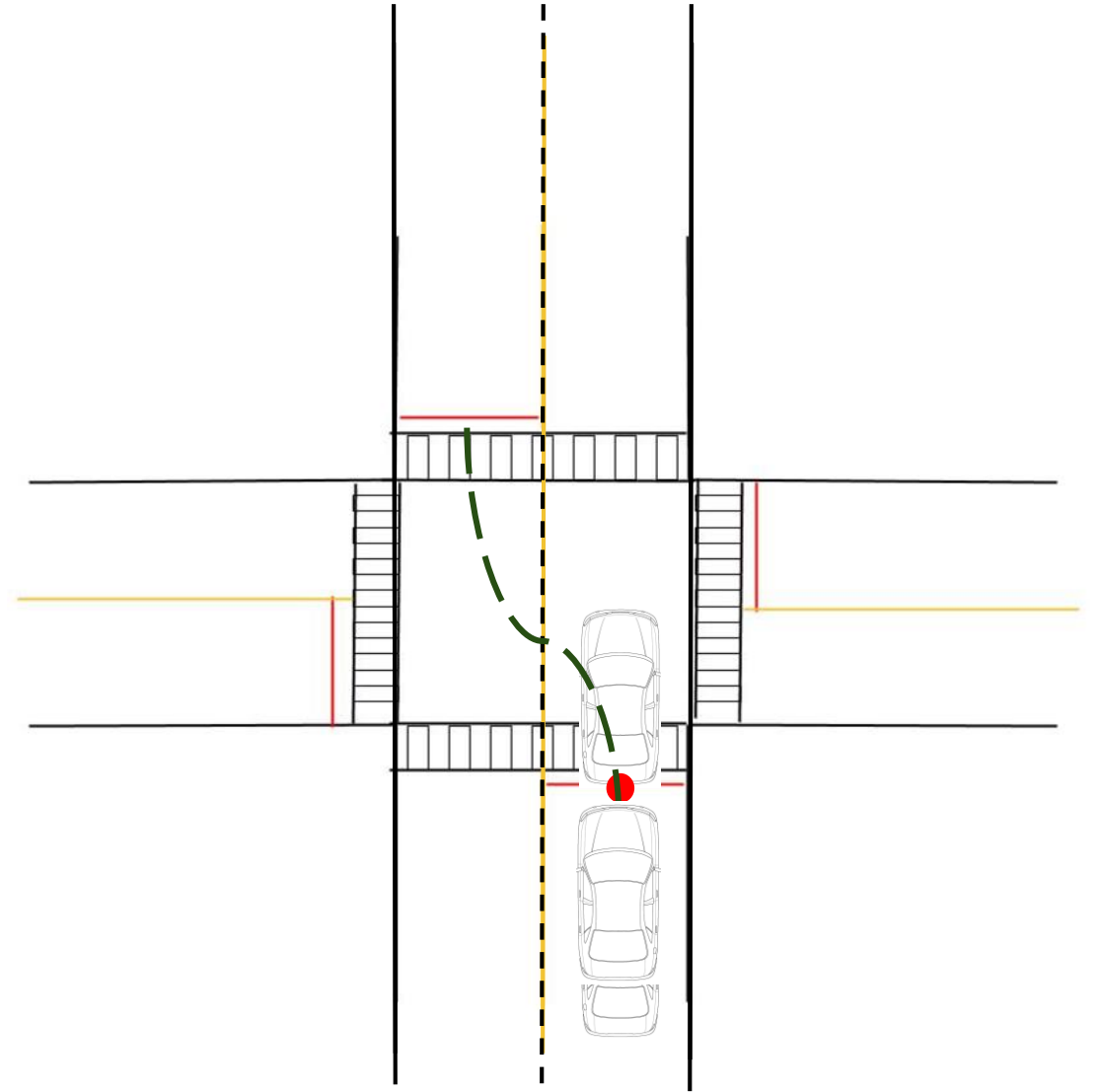
- A behavior planning system plans the set of high level driving actions, or maneuvers to safely achieve the driving mission under various driving situations
- Behavior planner considers:
  - Rules of the road
  - Static objects around the vehicle
  - Dynamic objects around the vehicle
- Planned path must be safe and efficient



Can deal with inputs that are inaccurate (corrupted by measurement noise) & incorrect (perception errors, FP or FN detections)

# Driving maneuvers

- **Track Speed** - maintain current speed of the road
- **Follow leader** - match the speed of the leading vehicle and maintain a safe distance
- **Decelerate to stop** - begin decelerating and stop before a given space
- **Stop** - remain stopped in the current position
- **Merge** - join or switch onto a new drive lane



# Output of Behavior Planner

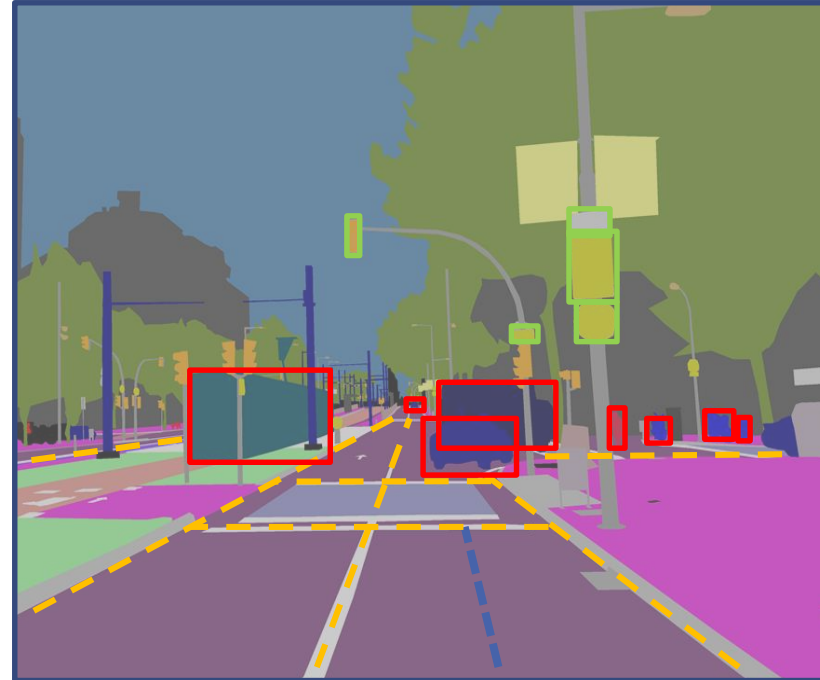
- Driving maneuver to be executed
- Set of **constraints** which must be obeyed by the planned trajectory of the self driving car which include:
  - Ideal path *center line of current lane*
  - Speed limit
  - Lane boundaries
  - Stop locations
  - Set of interest vehicles

# Input Requirements

- High definition road map
- Mission path
- Localization information

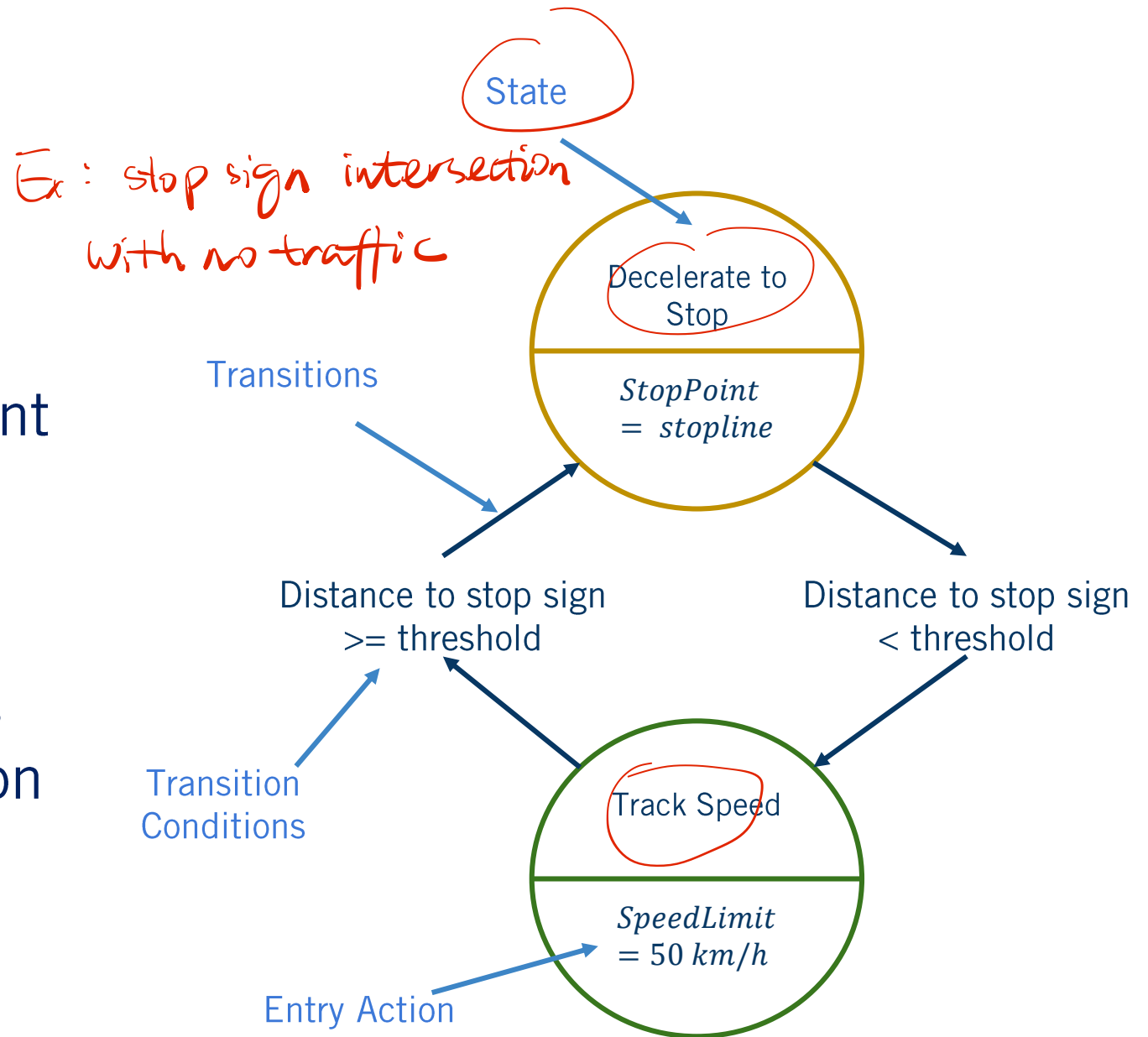
## Perception Information:

- All observed dynamic objects
  - Prediction of future movement
  - Collision points and time to collision
- All observed static objects
  - Road signs
- Occupancy grid *defining the safe areas to execute maneuvers*



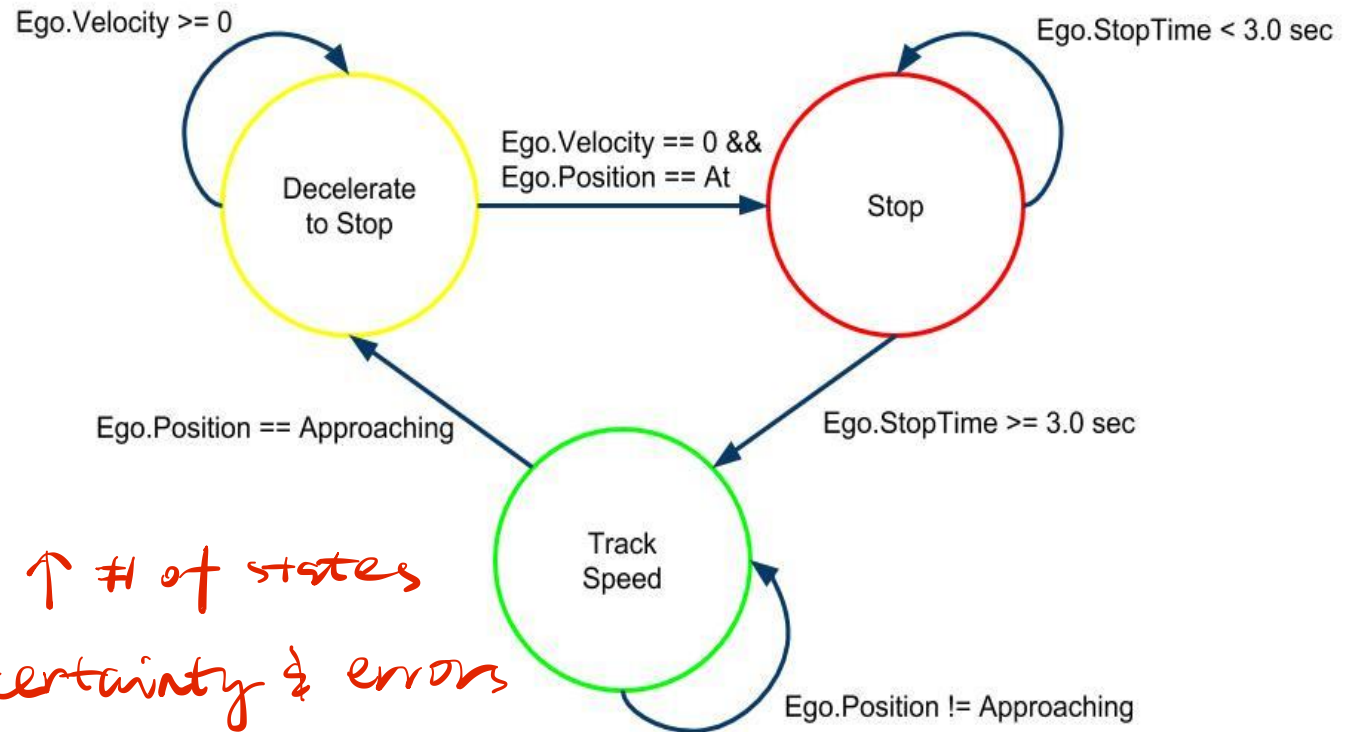
# Finite State Machines

- Each state is a driving maneuver
- Transitions define movement from one maneuver to another
- Transitions define the rule implementation that needs to be met before a transition can occur
- Entry action are modification to the constraints



# Advantages of Finite State Machines in Behaviour Planning

- Limiting number of rule checks
- Rule become more targeted and simple
- Implementation of the behavior planner becomes simpler



Cons: complexity ↑ with ↑ # of states  
• cannot handle uncertainty & errors in the input data

# Summary

- Defined the role of a behaviour planning system
- Standard input and output of a behaviour planner
- Deploying State Machines as a Behavior Planning
  - Advantages of using a state machine for behavior planning
- **Next:** Building a state machine to handle an intersection scenario without dynamic objects