ADAPT Planner
Autonomous **D**riving for **A**dverse **P**erceived **T**errain

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System Description

- 1/5 scale vehicle

- Detects puddles on the road

- Needs a local planner in predefined road configurations

- Maximum velocity: 4 m/s

- Planning time budget: <0.5 s

Planning Representation

Planning Space (Independent Variables):

<X, Y, θ>

Position and heading

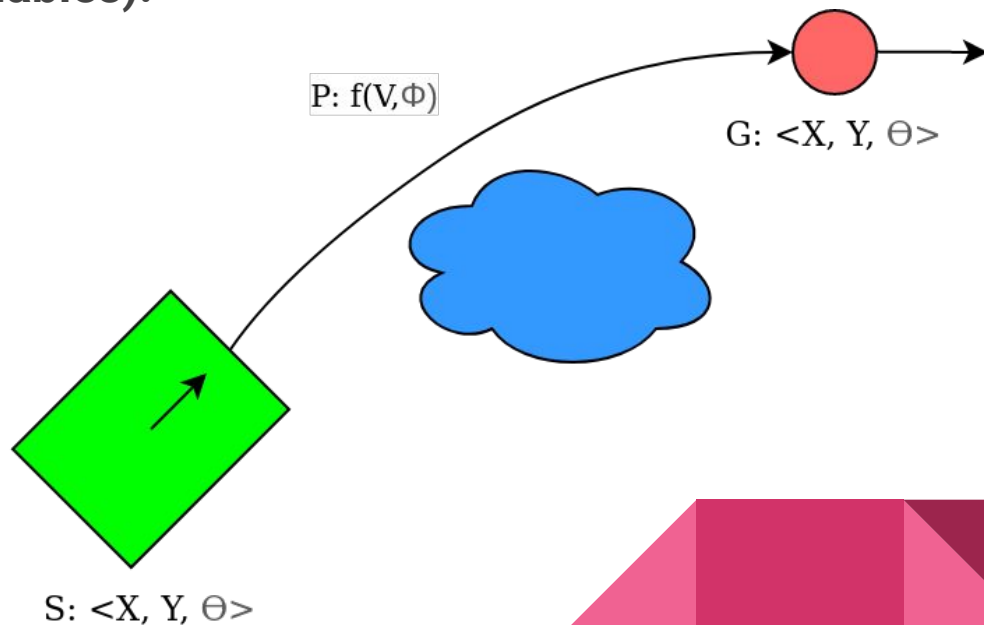**Action Space (All variables):**

$<x_i, y_i, \theta_i, \dot{x}_i, \dot{y}_i, \omega_i, \ddot{x}_i, \ddot{y}_i, \alpha_i>$

Future State

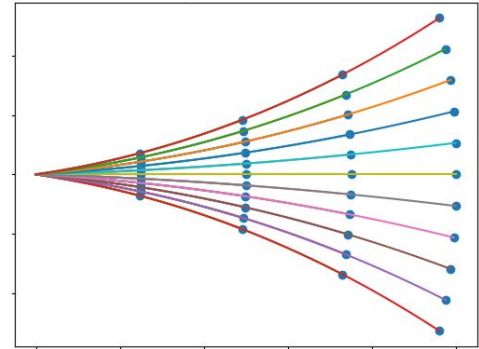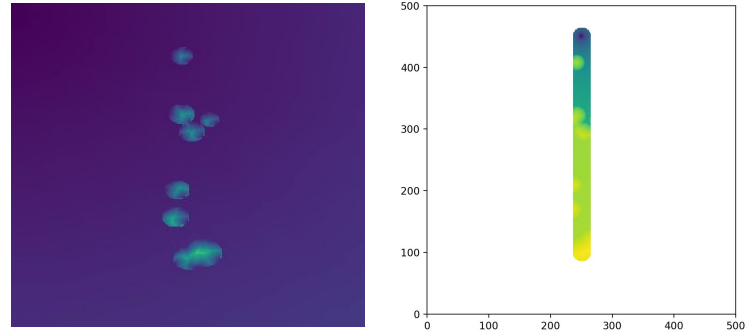**Cost Function:**

Elapsed time

P: f(V,Φ)

G: <X, Y, θ>

S: <X, Y, θ>

Algorithm Details

- A* with reverse Dijkstra heuristic

- 44 Ackermann Motion Primitives (4 velocity discretizations, 11 steering angles)

- Maximum planning time/plan distance

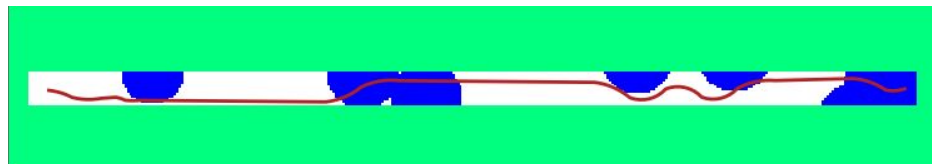- Avoid puddles if possible, decelerate to 2 m/s otherwise

Previously Generated Plans
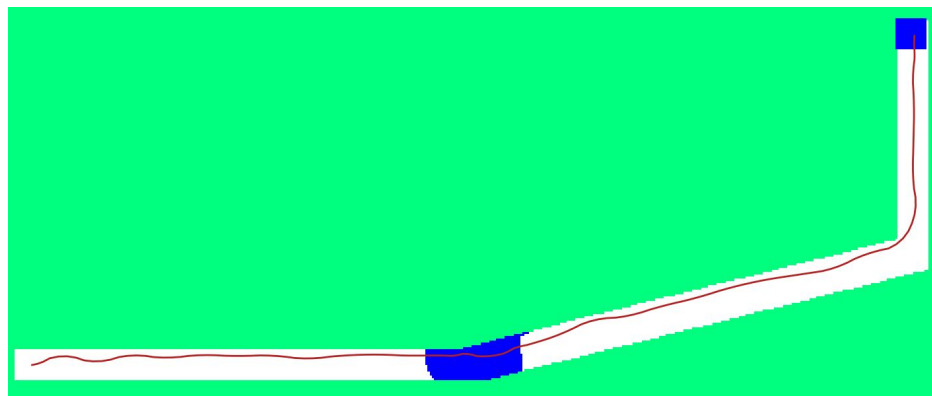
Top Path:

Successful puddle avoidance
Too few lateral primitives

Bottom Path:

Long planning path with 2 turns
Minimizes distance in the puddle

Planning Time: ~0.3s

Hardware Executing Precomputed Trajectories

Live Demo!