KING: Generating Safety-Critical Driving Scenarios for Robust Imitation via Kinematics Gradients

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Problem: Critical driving scenarios are extremely rare and underrepresented in real world data. Simulation is a promising solution but limited by hand-crafted behavior that does not permit the necessary diversity.

Goal: Efficiently generate safety-critical driving scenarios via optimization and use them to augment regular data to improve brittle driving policies.

Key Idea: Consider partial derivatives through the direct path only. This has two main advantages:
- The backward pass is significantly less expensive.

Generation of Diverse, Safety-Critical Scenarios

Before

After

Motivation

Optimization via Kinematics Gradients

Improved Robustness

Procedure

Generation of Diverse, Safety-Critical Scenarios

Better and Faster


https://lasnik.github.io/king/