Automatic Generation of Rich Multi-Agent Behaviors in CARLA
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Introduction

- Safety-critical autonomous systems cannot be tested in physical space as it is too expensive and dangerous
- Address pedestrian-vehicle safety systems and autonomous driving in pedestrian-dense environments by running computer simulations of pedestrian-vehicle interactions
- While other cars generally follow traffic rules and therefore have more predictable movement, pedestrians can move in any direction, at any time, with little warning
- Show how diverse pedestrian behavior can be automatically generated using semantic descriptions

Pedestrian Behavioral Models

lawful, jaywalking, or hurried behavior

Systems Under Test

parking garage, city, neighborhood, etc.

CARLA

- It is not feasible to test autonomous vehicle performance in real world situations involving pedestrians
- Autonomous vehicles need different validation than what is used for today's cars
- Current physical methods of testing cannot assess for the range of behaviors pedestrians display
- More cost effective and safer to use a simulator

Path Selection

Figure 1: Vehicles driving in autopilot mode in CARLA follow traffic regulations. The vehicle in the figure above is not stopped in front of a stop sign, but rather is stopped due to the pedestrian crossing in front of it.

Figure 2: Waypoints are selected randomly, following the description above, given the bounds of the crosswalk. The pedestrian is controlled by a PID controller in order to travel through the waypoints.

Results

Figure 3: Lawful pedestrian trajectories
Figure 4: Hurried pedestrian trajectories
Figure 5: Jaywalking pedestrian trajectories
Figure 6: Jaywalking pedestrian heat map

Future Work

- Integration into the CARLA repository
- Designing more pedestrian behavior, not just pedestrians at crosswalks
- Automatic generation of scenarios

References


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