

Adaptive Pedestrian Agent Modeling for Scenario-based Testing of Autonomous Vehicles through Behavior Retargeting

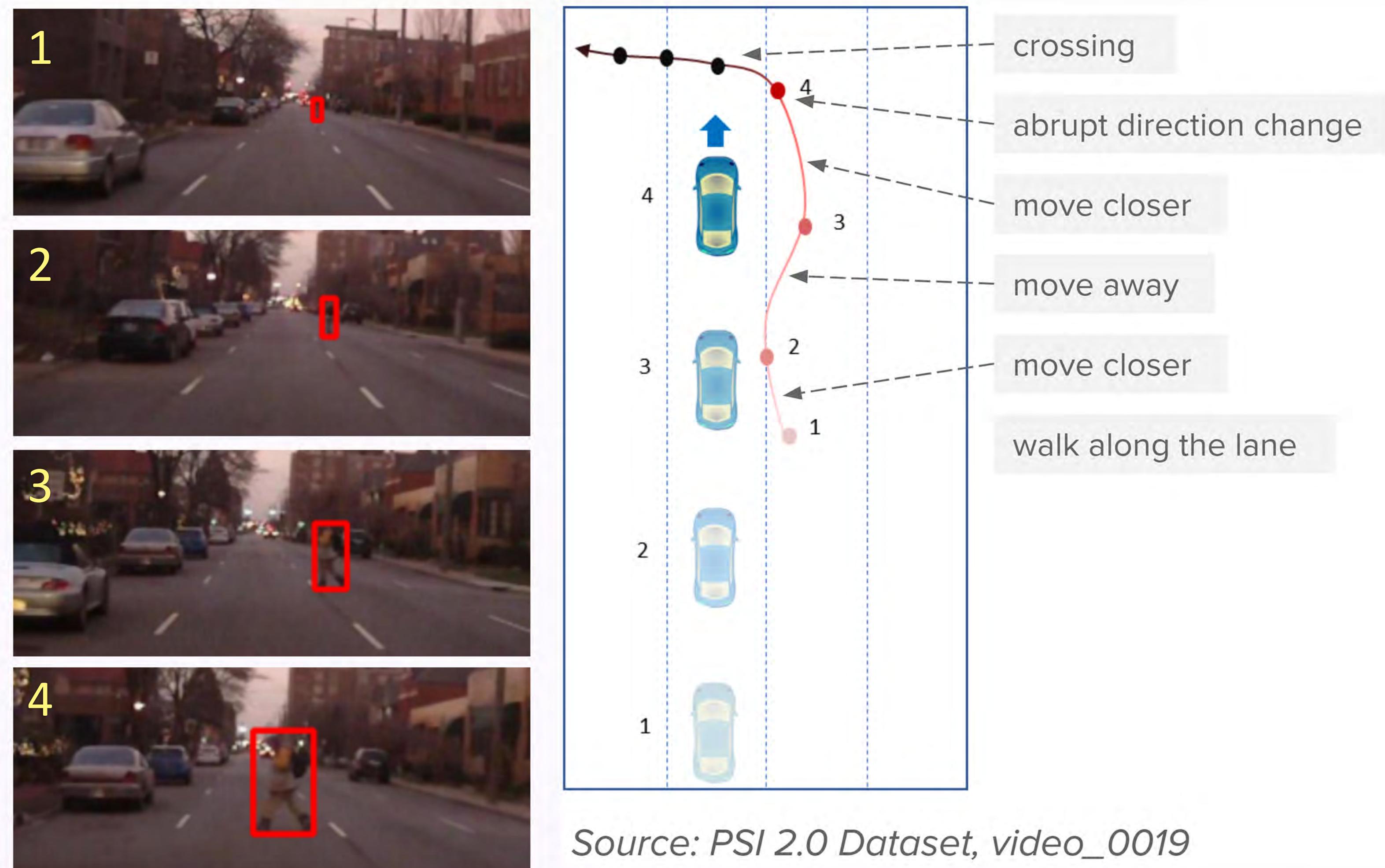
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Motivation

Utilizing **rare** real-world pedestrian crossing scenarios.

- diverse sources (dash-cam videos, images, human knowledge)
- difficult to search
- difficult to train

Rare crossings are **rich**.

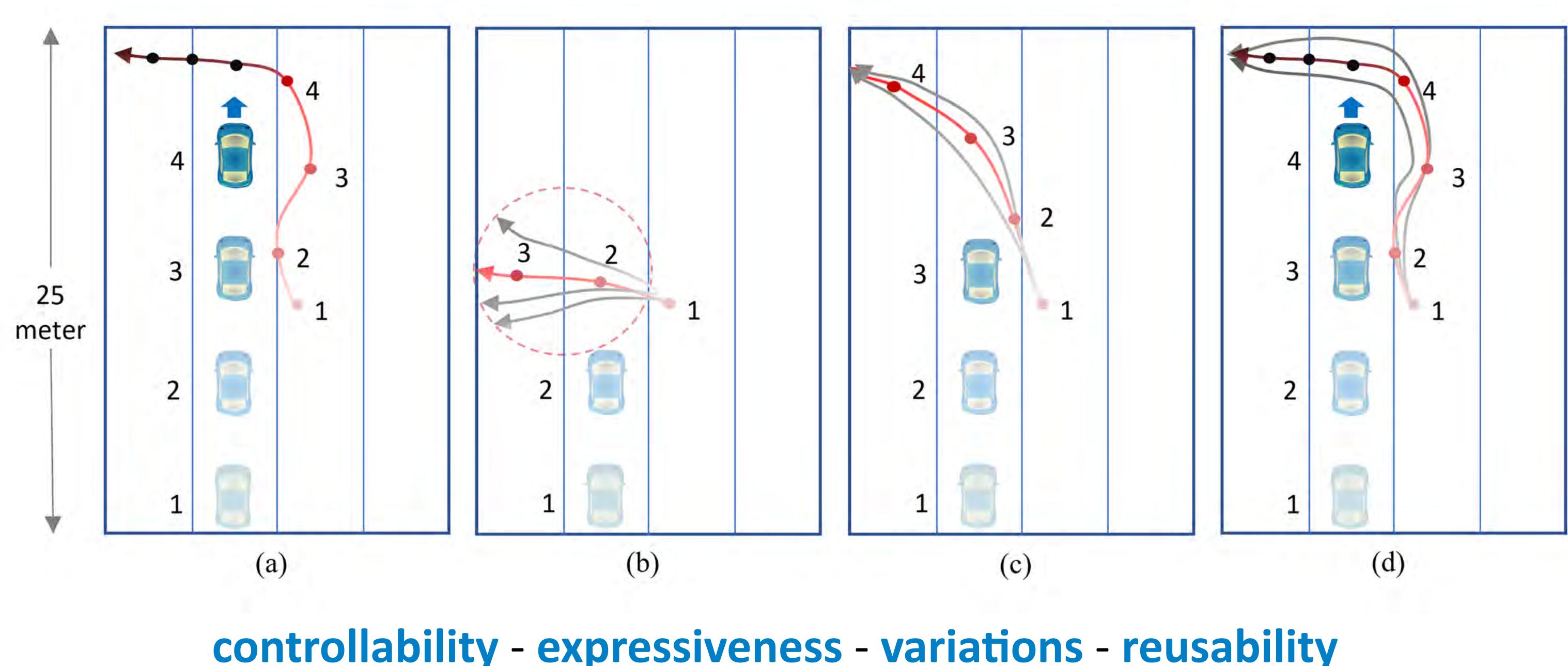


Source: PSI 2.0 Dataset, video_0019

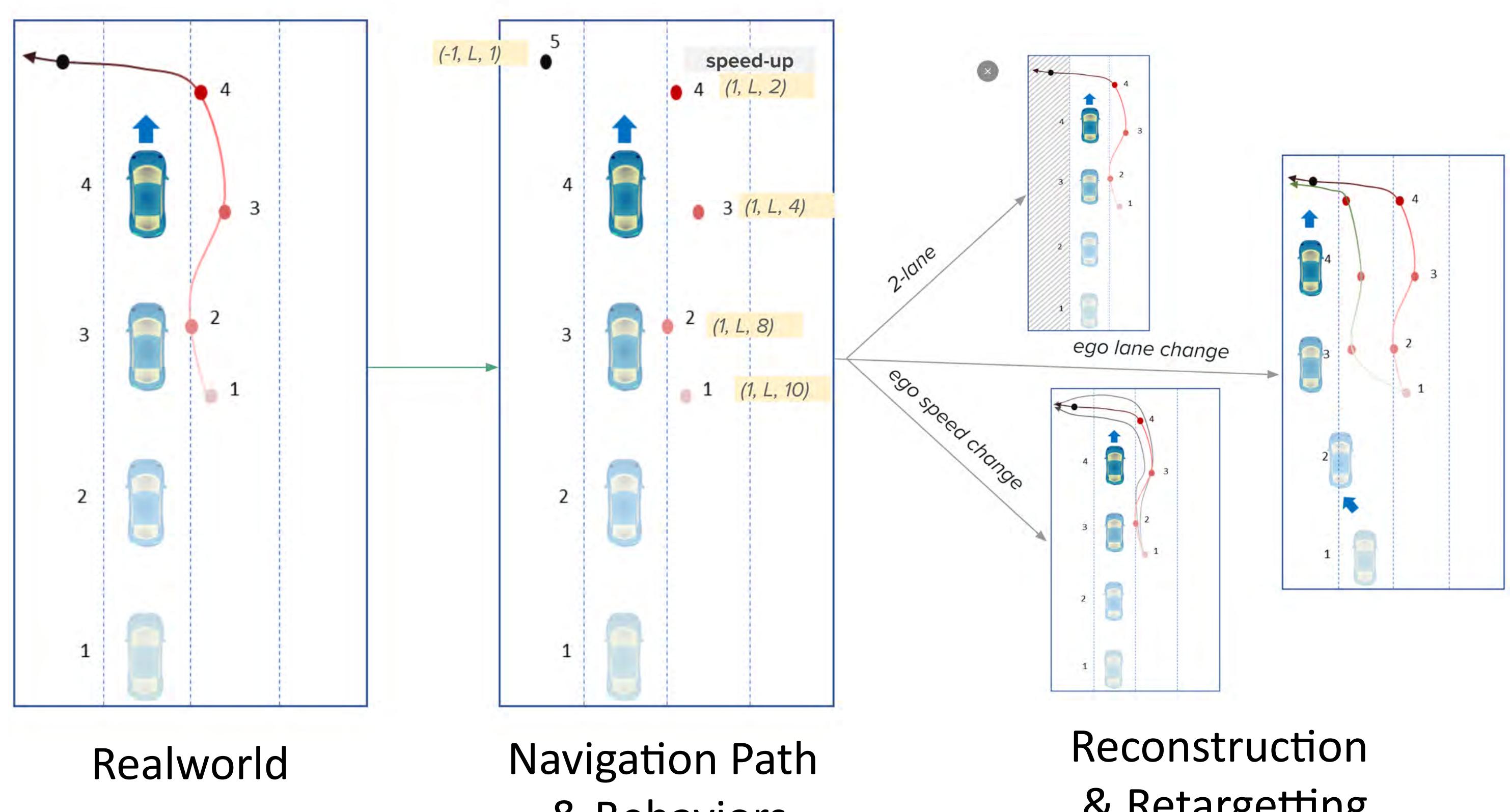
Objective - Retargeting

A rare pedestrian crossing scenario

- Adaptation in changing situations in simulation
- Augment with pedestrian behavior models from other sources



Approach



Conclusions

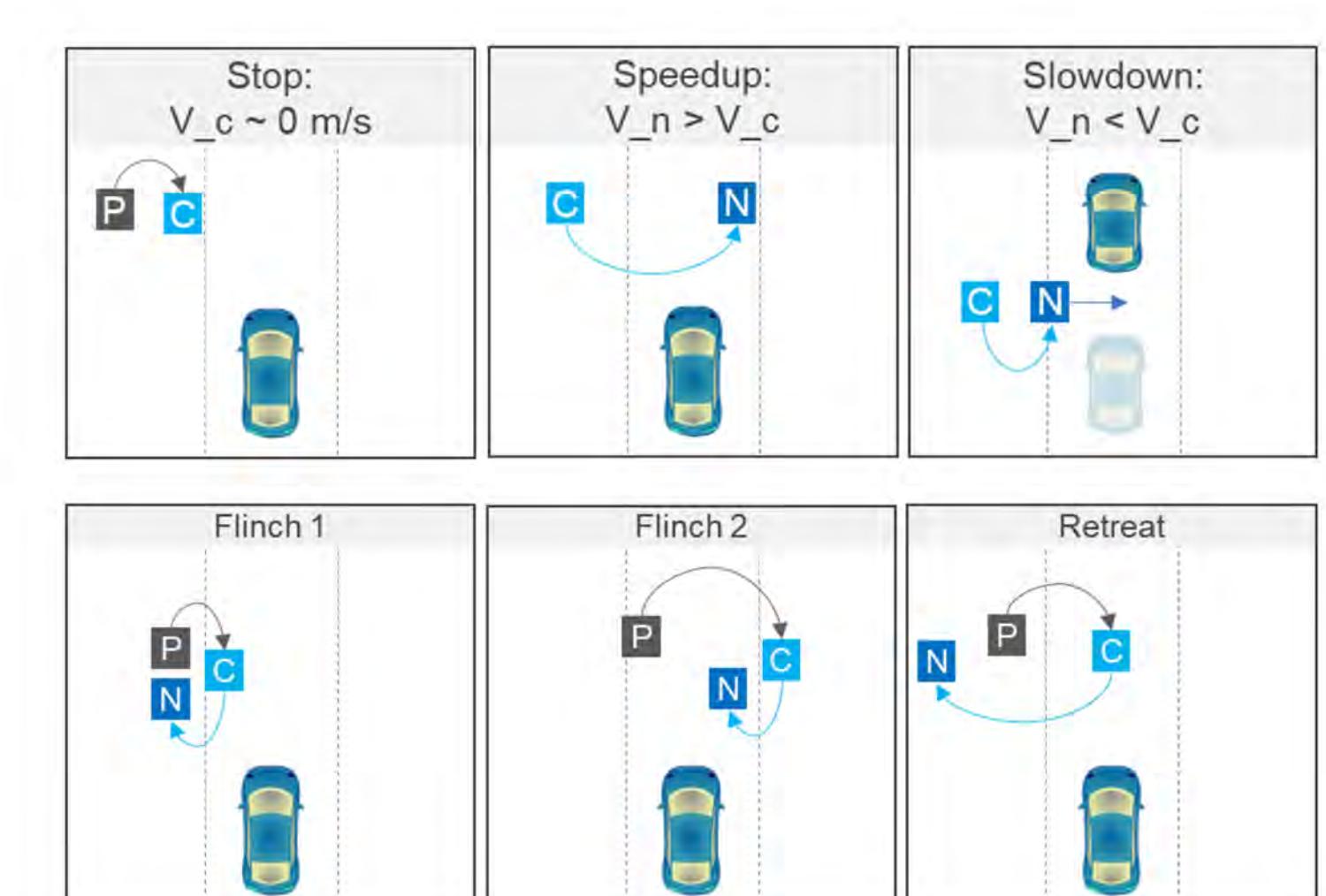
A novel hybrid model that

- utilizes rare world scenarios from diverse data sources
- integrates existing pedestrian micro behavior models
- facilitates controllability, adaptability, and reproducibility of scenarios
- is highly expressive and allows rich but plausible variations in trajectories.

Behavior Primitives

- Existing models in literature
- New models for flinch, retreat, stop

P, C, and N are previous, current, and next pedestrian nav points, respectively. C tagged with behavior primitive

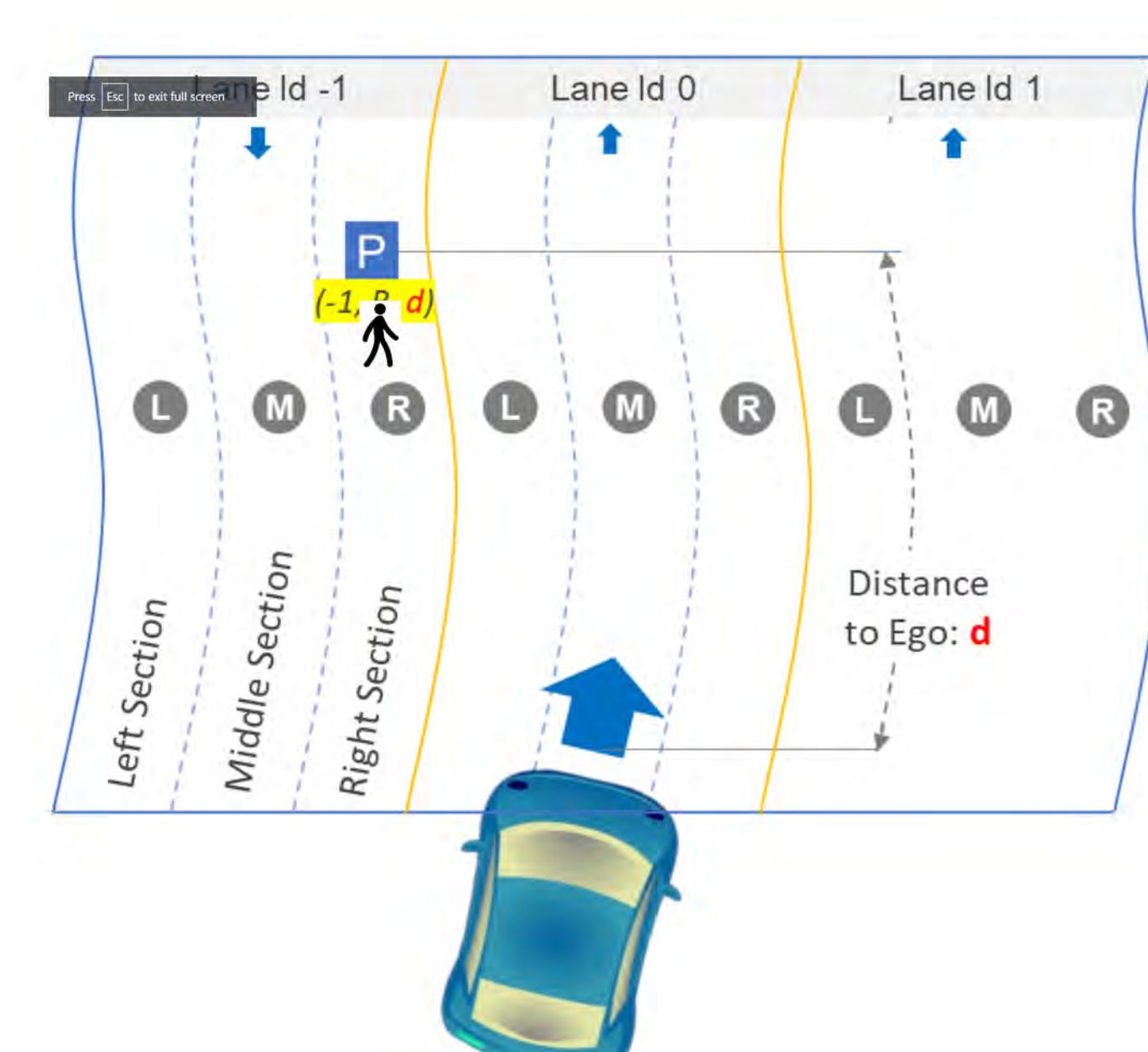


Navigation Point

Position in **Vehicle coordinate system**: (lane_id, lane_section, distance)

A Lane broken into 3 discrete **sections**: Left, Middle, Right

Captures spatial relationship between the vehicle and others. Temporal relationship is indirectly captured by the Navigation Path



Results

Simulated in CARLA with a scenario where the pedestrian makes a stop in the middle of the road.

Retargeting adapts to ego speed, lane changes, and road structures.

Stop model correctly reconstructs and produces new scenarios based on situation changes.

