

Dynamic Crowd Routing: RL-Driven Crowd Dynamics

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Method

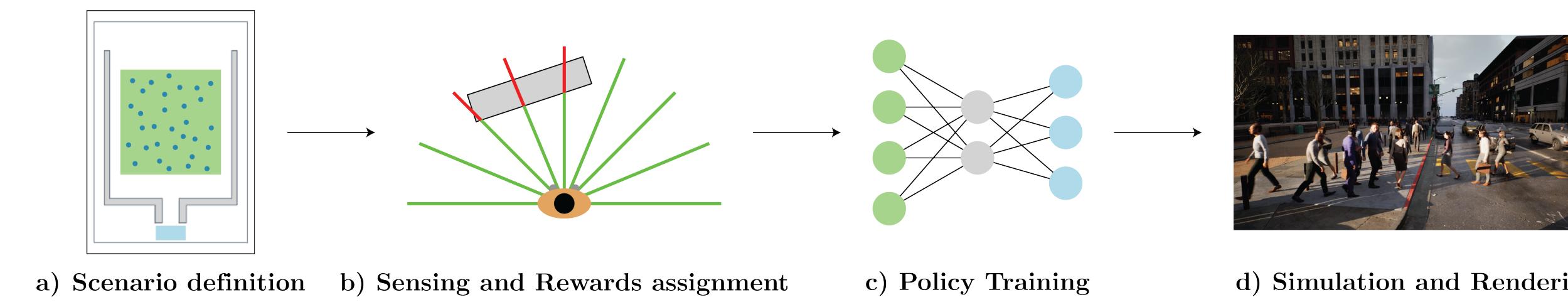


Figure 1: We present Dynamic Crowd Routing (DCR), a RL-based method for crowd dynamics. We (a) define a map for an arbitrarily large scenario. Each agent (b) is equipped with 180° sensing rays that capture observations from the nearby environment, including dynamic obstacles and pedestrians. *No goal information is given at any time to any of the agents*. We train (c) a very shallow neural network using the PPO algorithm. Finally, (d) we render a photorealistic simulation of the crowd during inference, in real-time.

Qualitative results

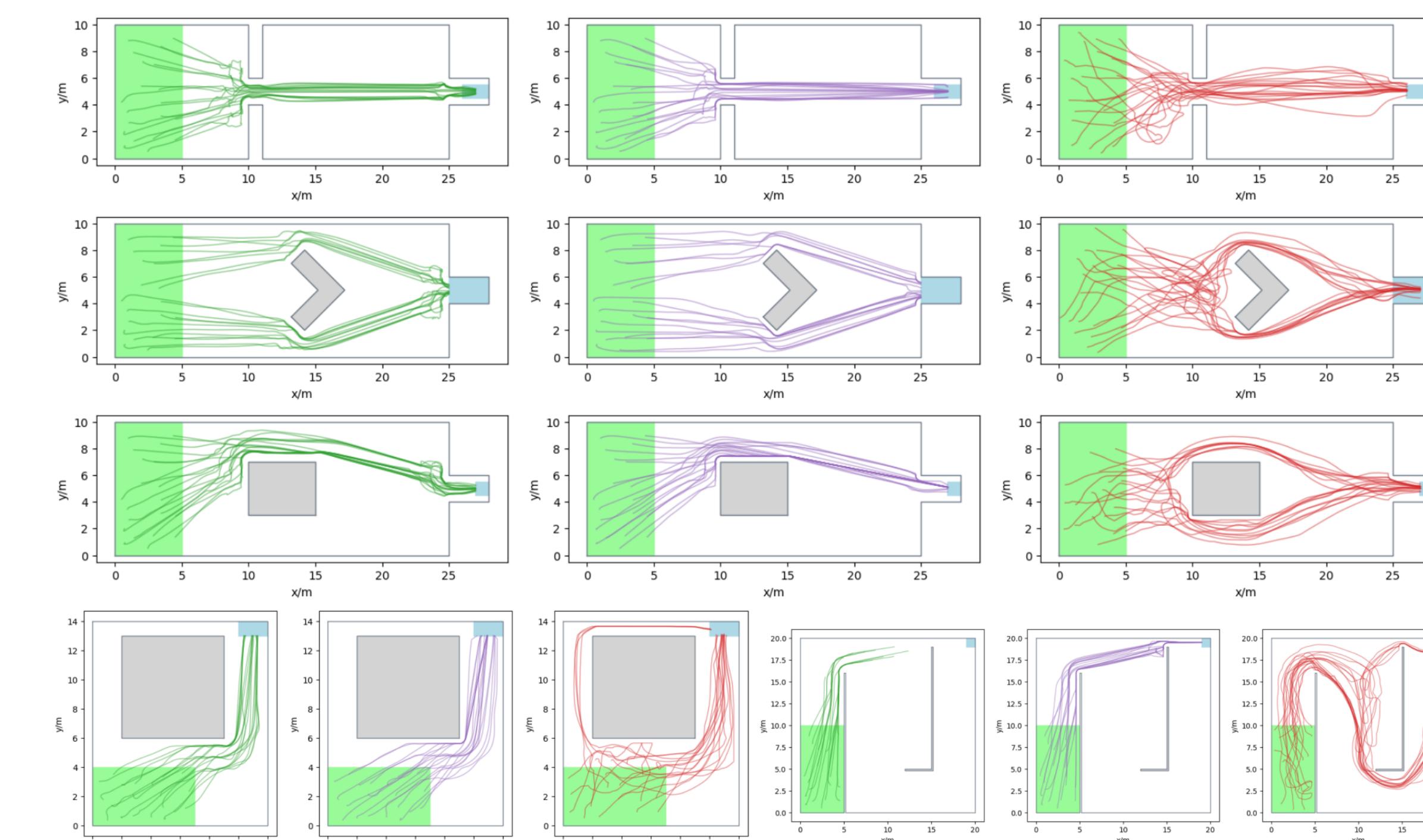


Figure 3: **Green:** R-SFM, **Purple:** CFSM, **Red:** Ours.

Motion definition and rewards

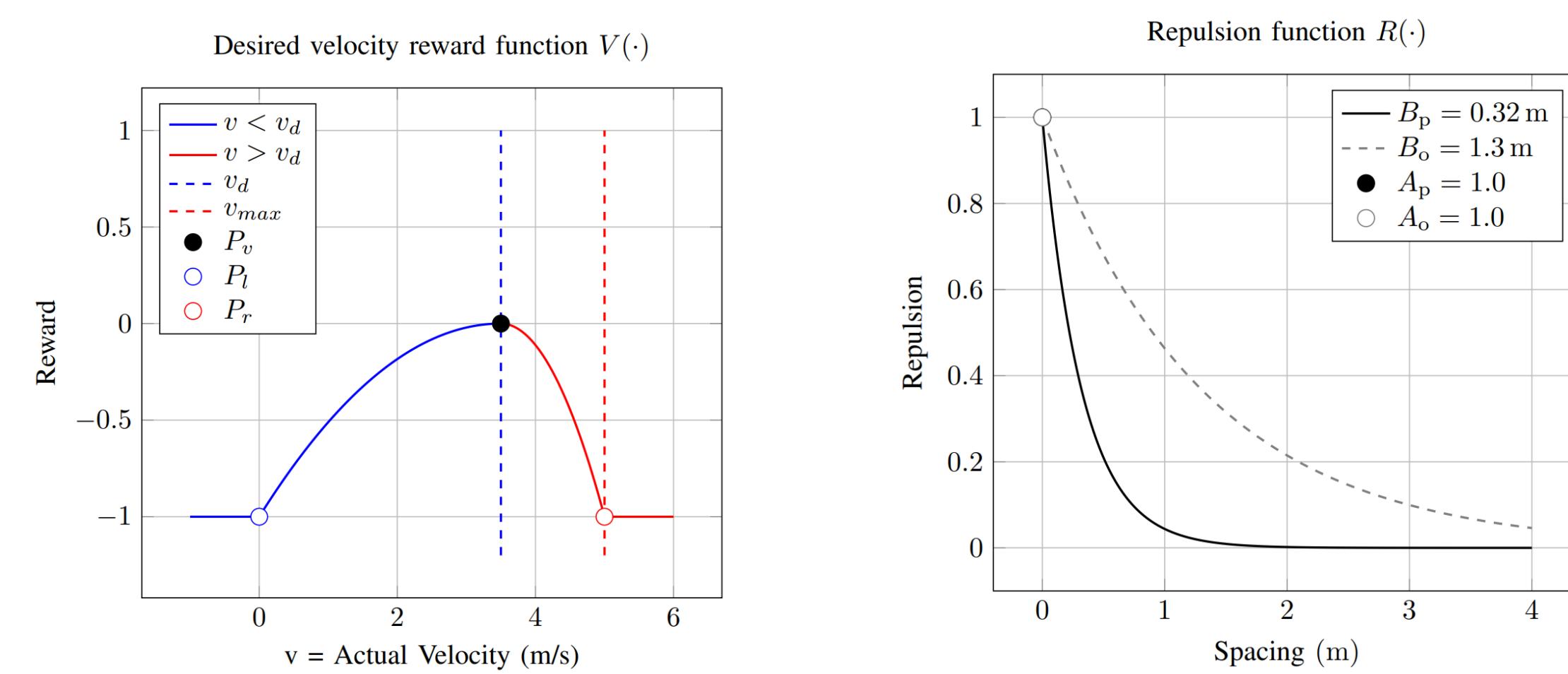


Figure 2: The overall reward for each agent at time t is given by:

$$r^t = \lambda_g r_g^t + \lambda_v r_v^t + \lambda_c r_c^t + \lambda_d r_d^t$$

Real-world results

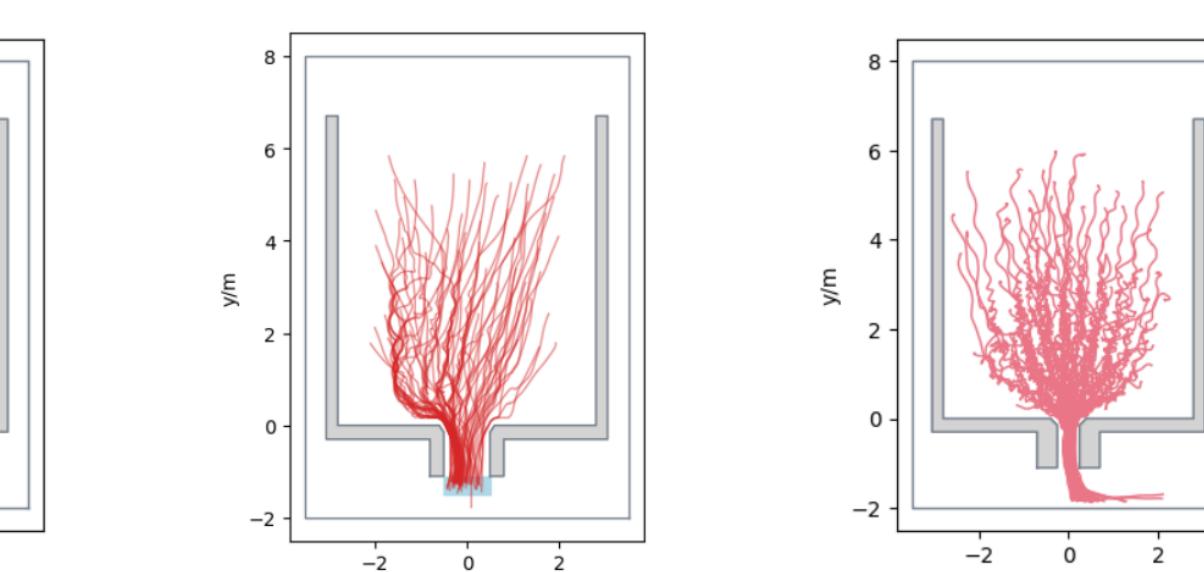


Figure 4: **Green:** R-SFM, **Purple:** CFSM, **Red:** Ours, **Pink:** Ground truth.

Trajectories distribution

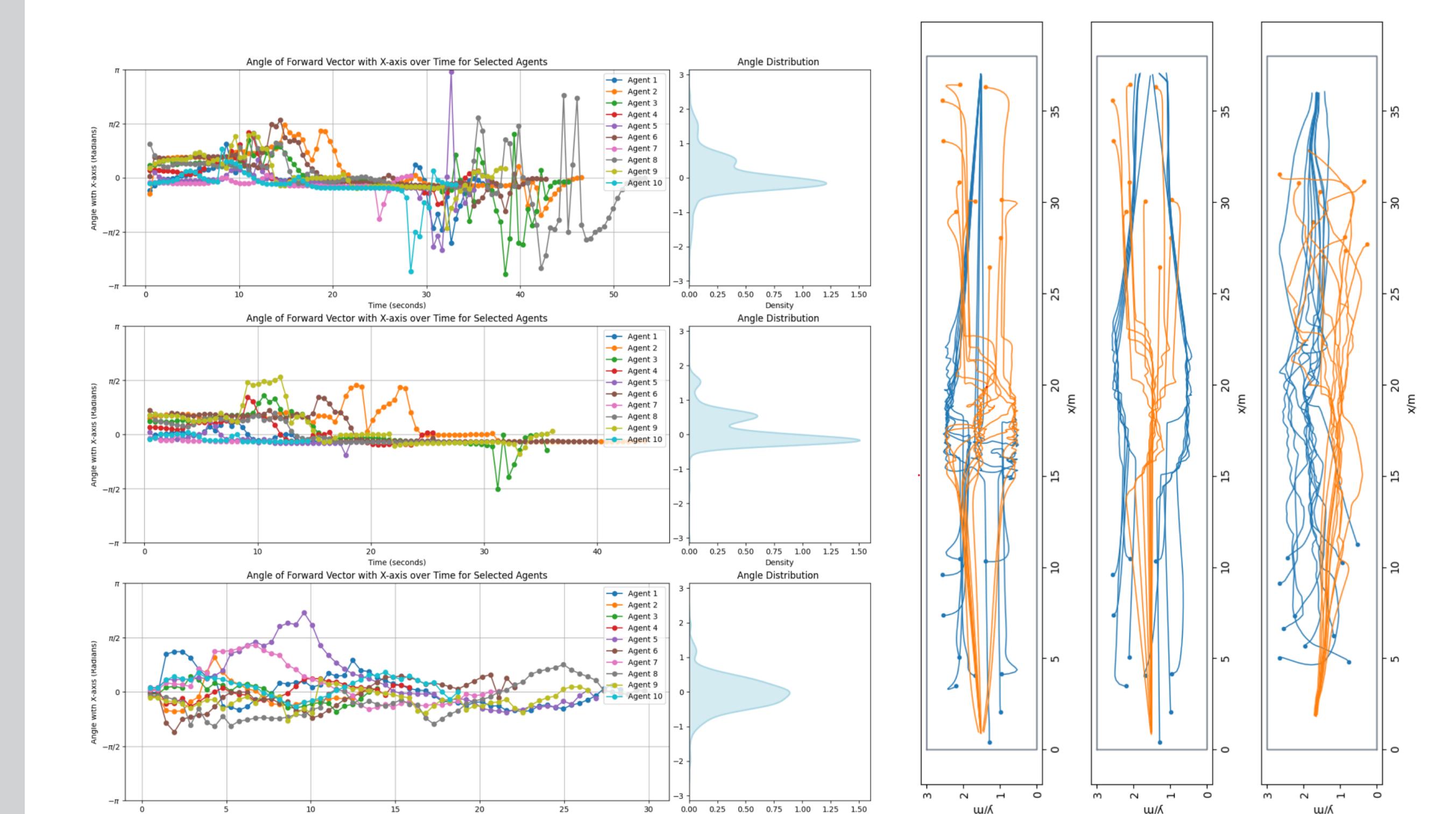


Figure 5: **Left**, top to bottom: R-SFM, CFSM, Ours. Changing of the forward vector direction over time and the corresponding distributions (right). **Right**, left to right: R-SFM, CFSM, Ours. Emergent lane formation.

Acknowledgements

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