Research Recap

Mobility21
A USDOT NATIONAL UNIVERSITY TRANSPORTATION CENTER

Understanding and Guiding Pedestrian and Crowd Motion

Purpose: To observe pedestrian behavior and their interactions with automated vehicles in areas with limited space to find ways to improve the reaction time of automated vehicles and improve pedestrian safety.

Approach: The team considered areas where first-mile and last-mile transportation could be deployed, and where there are a lot of pedestrians.

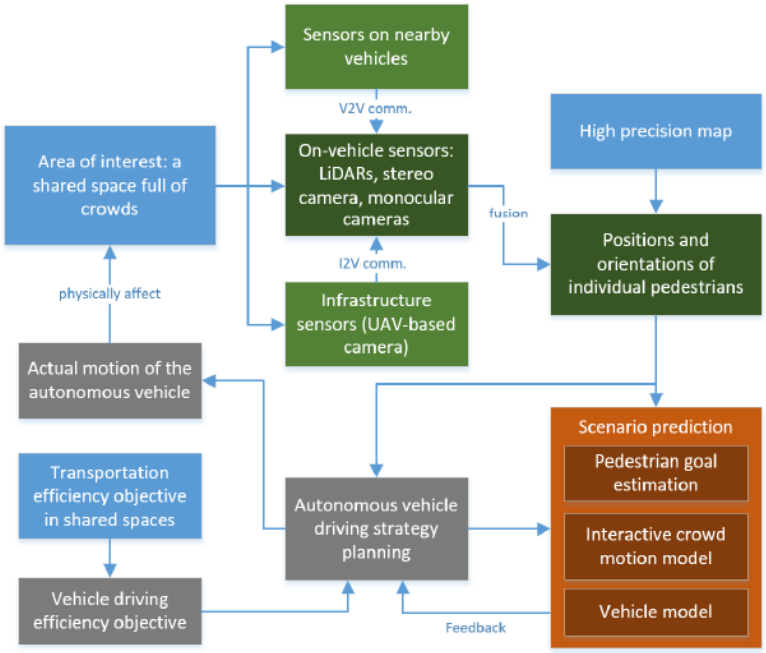
Key Findings:

Social Force Model: By using the social force model that was designed for crowd motion analysis, the team was able to first observe pedestrian-pedestrian interactions and their patterns and behaviors. The team then introduced a low speed vehicle to observe how the patterns of pedestrians changed in response to the vehicle.

Constraints: The team took into consideration that pedestrians have certain constraints that play a role in their reactions – when an area becomes more populated with pedestrians, they will slow down; when a car dangerously approaches a pedestrian, they will immediately move out of the way; when there are no constraints, pedestrians will walk at a comfortable pace. These constraints helped guide the researchers in generating better decisions for autonomous vehicles in crowded areas.

Dataset: The team created a dataset that provides real pedestrian behaviors in crowded shared space areas to support the study of interactions.

Pedestrian Detection: By utilizing a combination of sensors (monocular camera, LiDAR, and stereo camera), the team was able to measure the pedestrian movement around the vehicle.



Conclusion: The researchers proposed a framework that combines the pedestrian behavior modeling with pedestrian detection, scenario prediction, and driving efficiency improvement in pedestrian-dense scenarios (*diagram to the right*). In a subsequent project, they will explore and develop these approaches and examine case studies that will demonstrate how to apply the proposed model into driving safety applications.

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Project Record:

- https://ppms.cit.cmu.edu/projects/detail/78

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