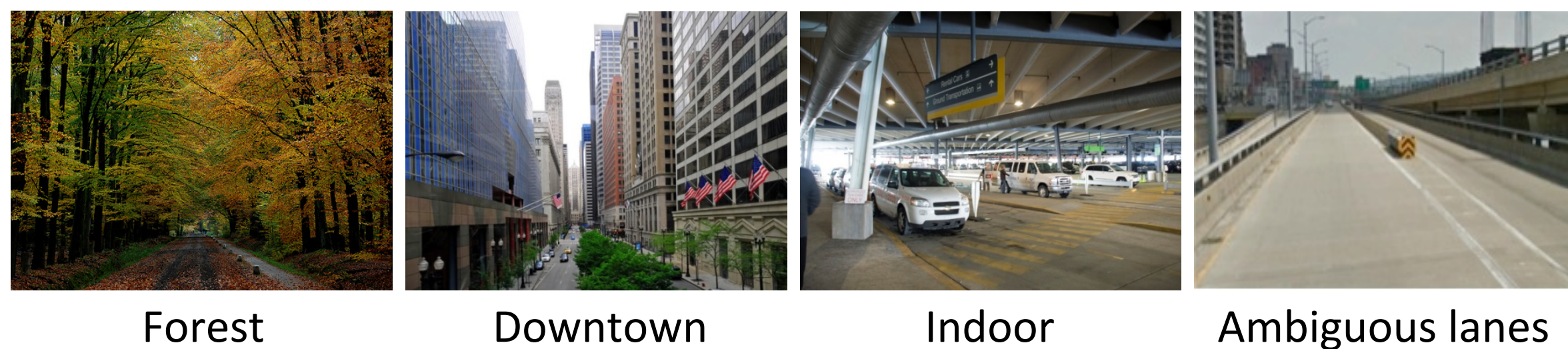


Objectives

Objectives: Long term visual localization on a large network of roads.

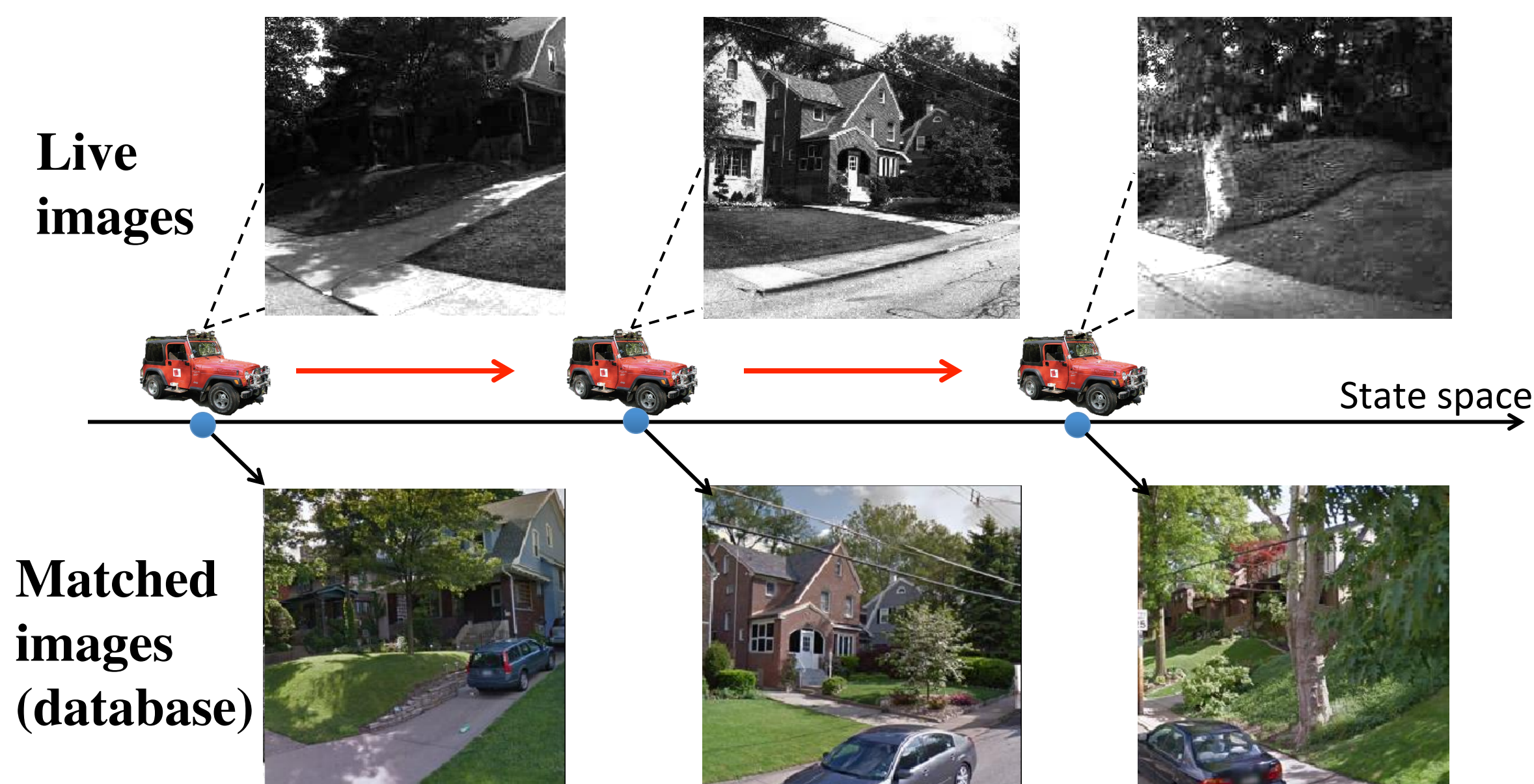
Why not just use GPS?

GPS is not always available!



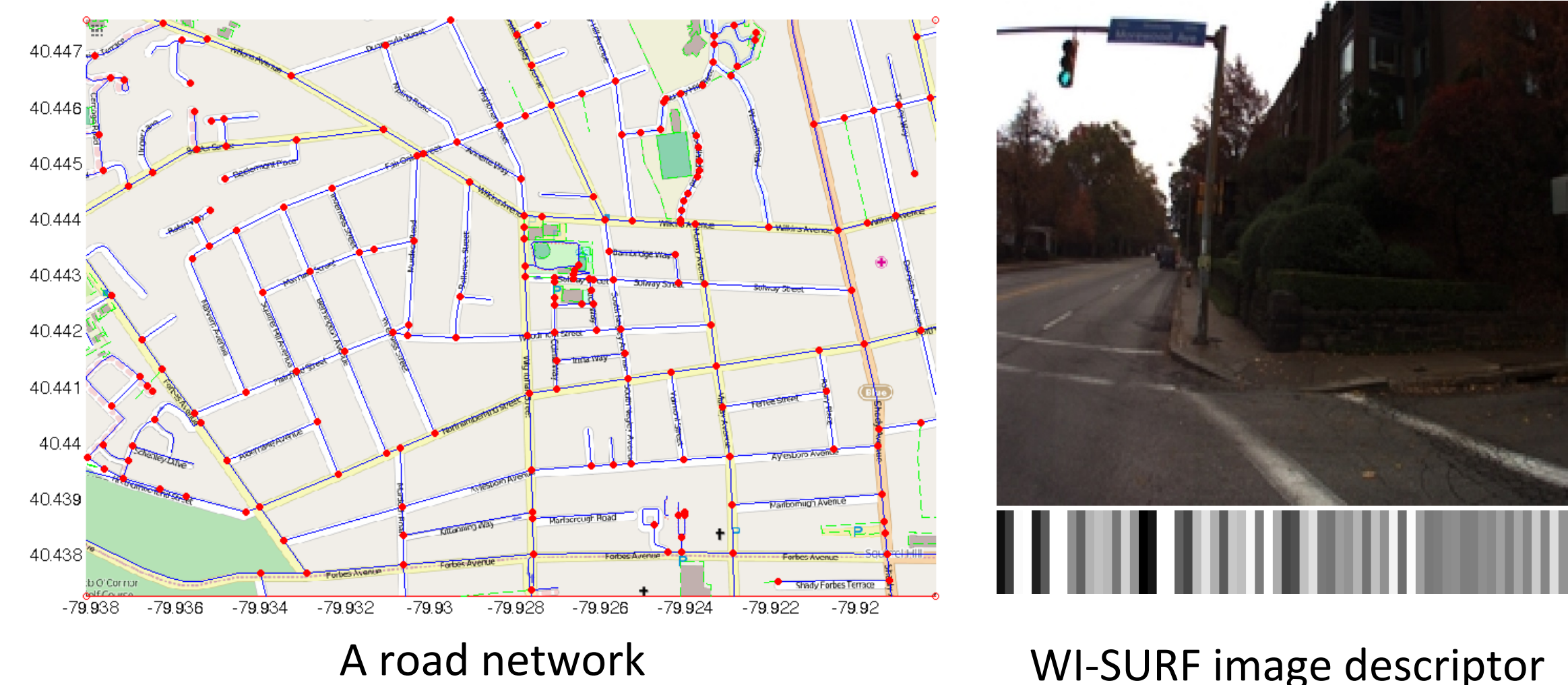
Background

Topometric visual localization using Bayes filter

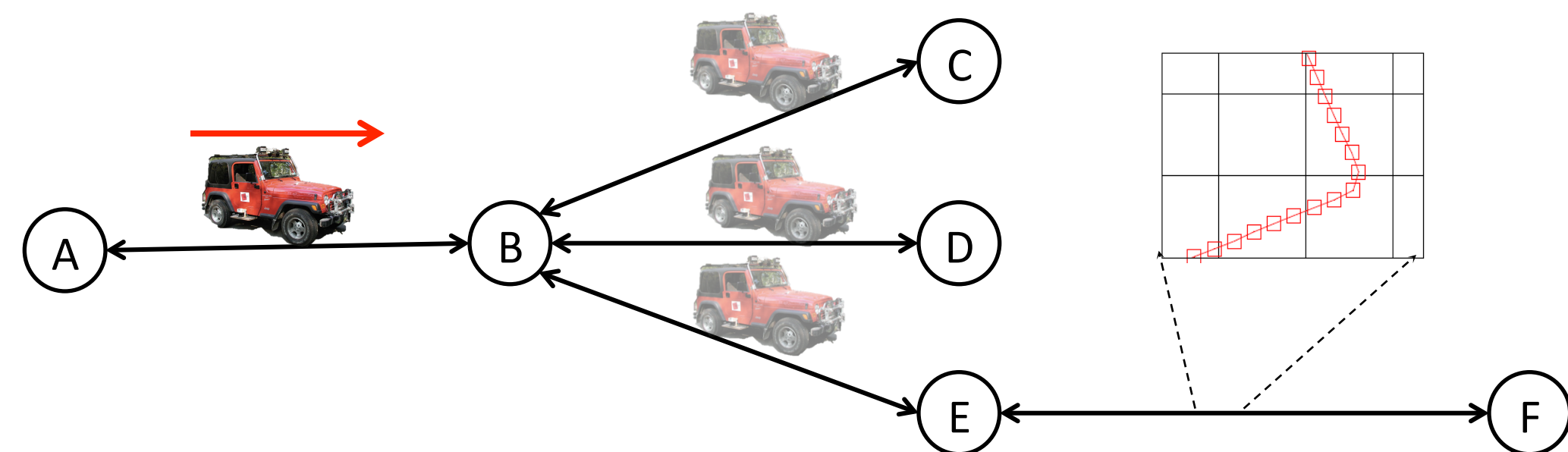


Bayes filter:

- Predict:** predict the current position of the vehicle based on its **motion model**, i.e., speed and distance traveled.
- Update:** update the posterior distribution (position estimate) with **image matching measurements**.



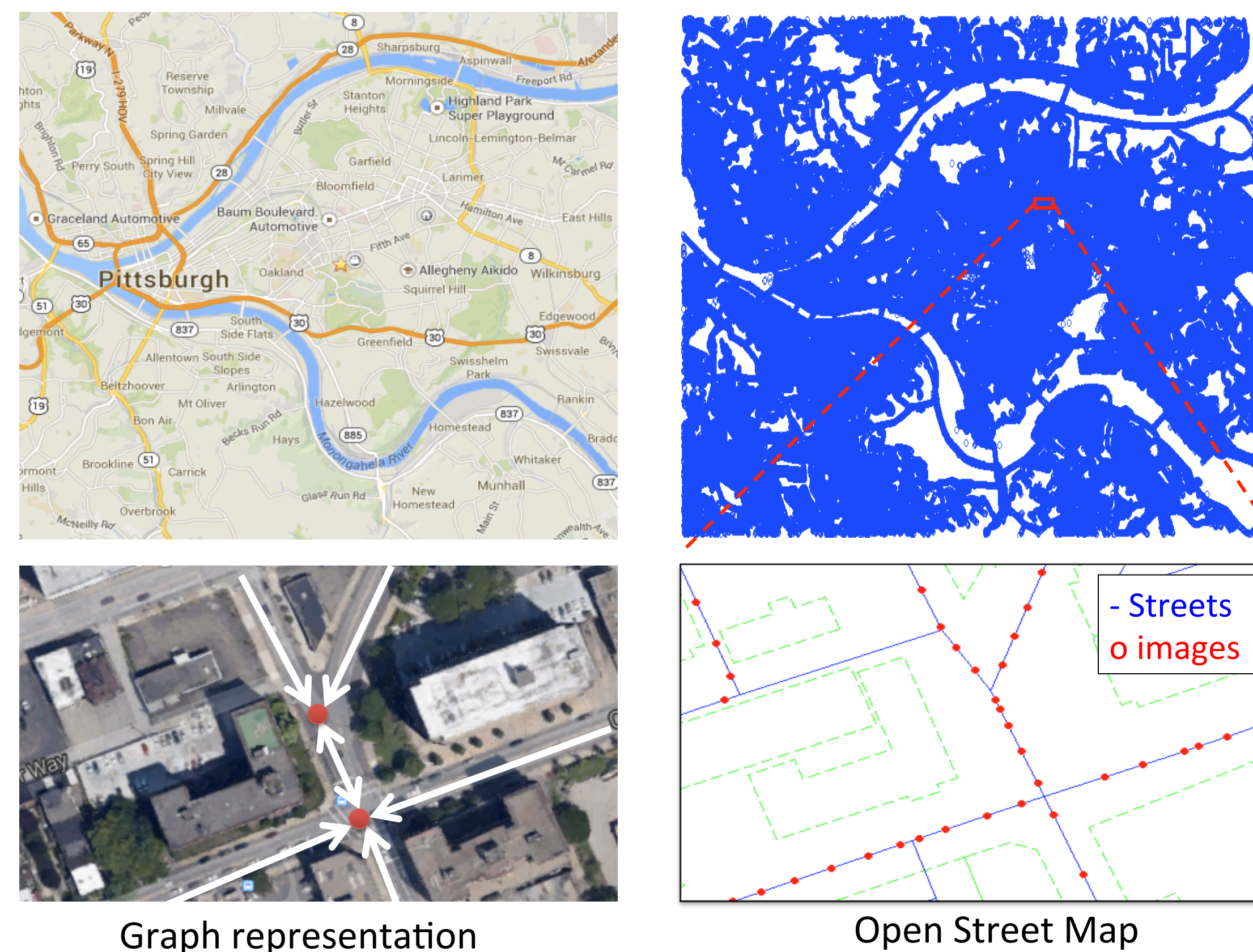
Topometric map as a road network:



City-sized Road Network Database

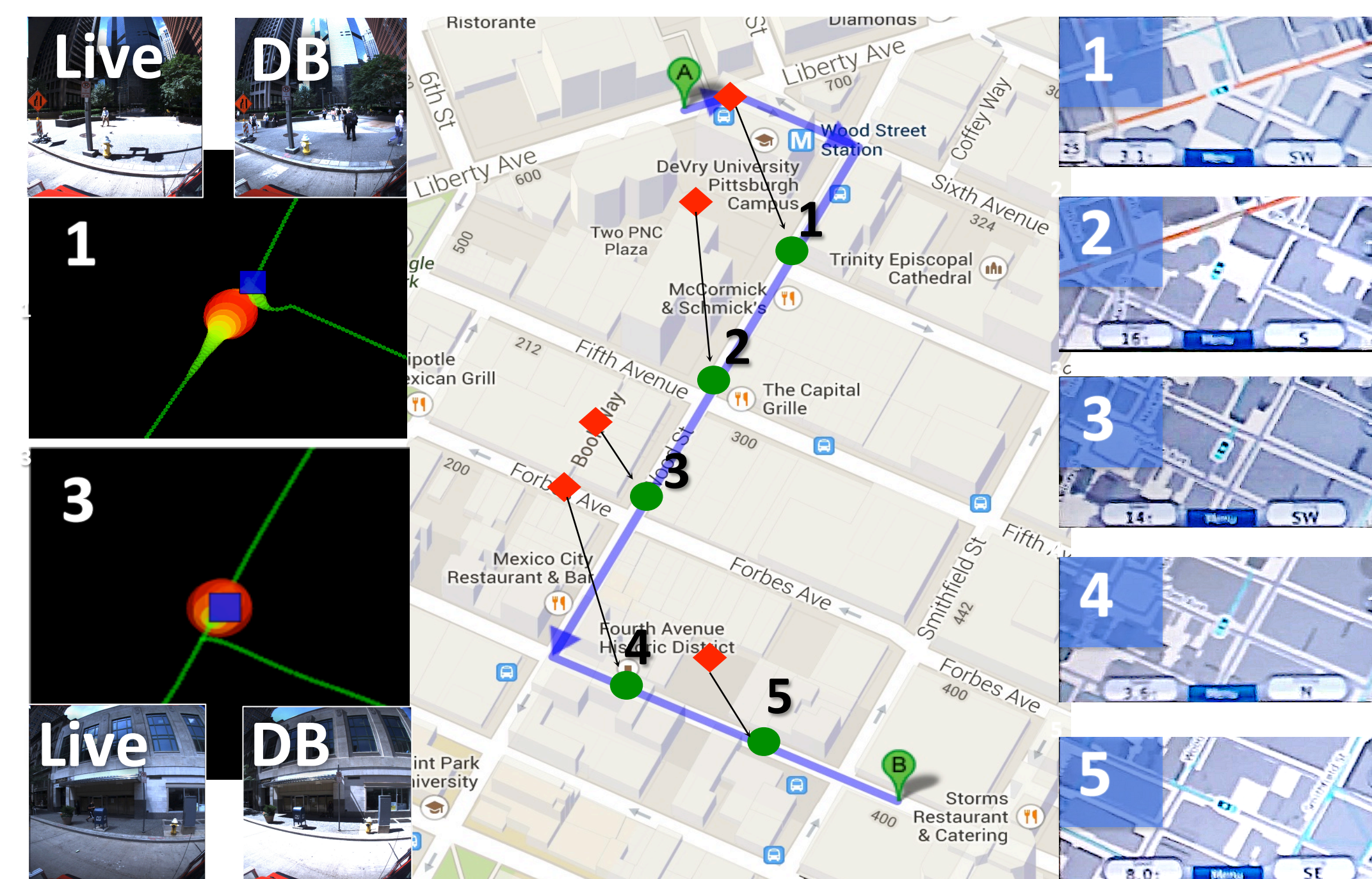
Road network of Pittsburgh metropolitan area:

- 6,500 km of drivable road. Waypoints locations and street connectivity information are extracted from OpenStreetMap.
- Side-view images on all drivable roads.**
- 500,000 side-view images within Pittsburgh metropolitan area

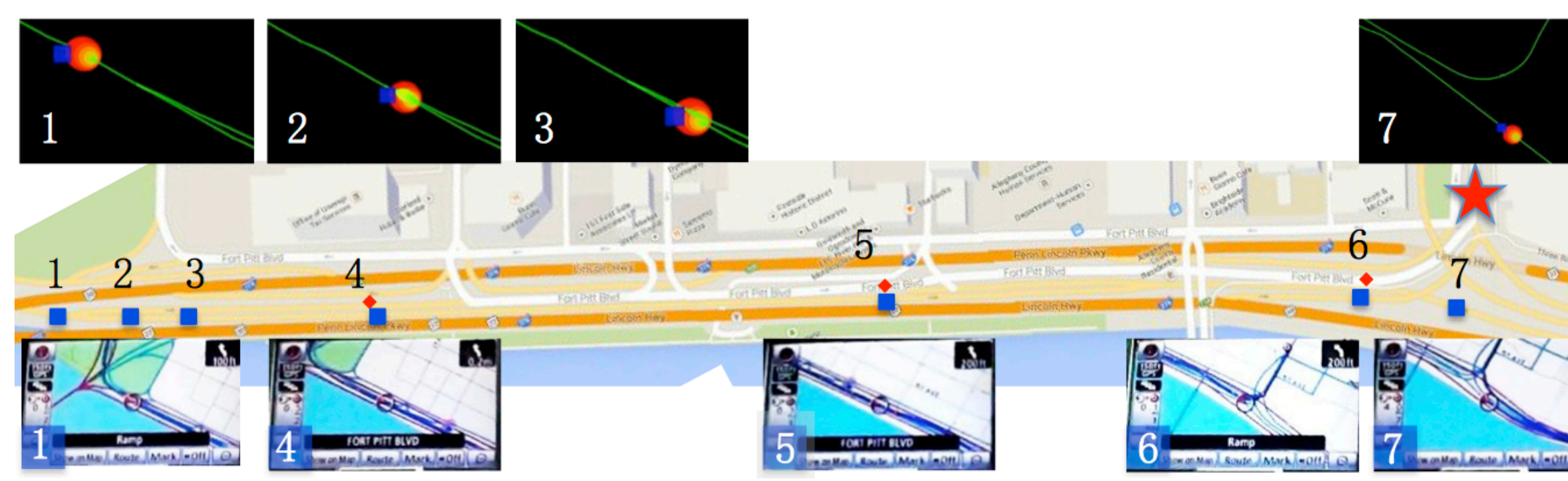


Localization in GPS-denied scenarios

Downtown:

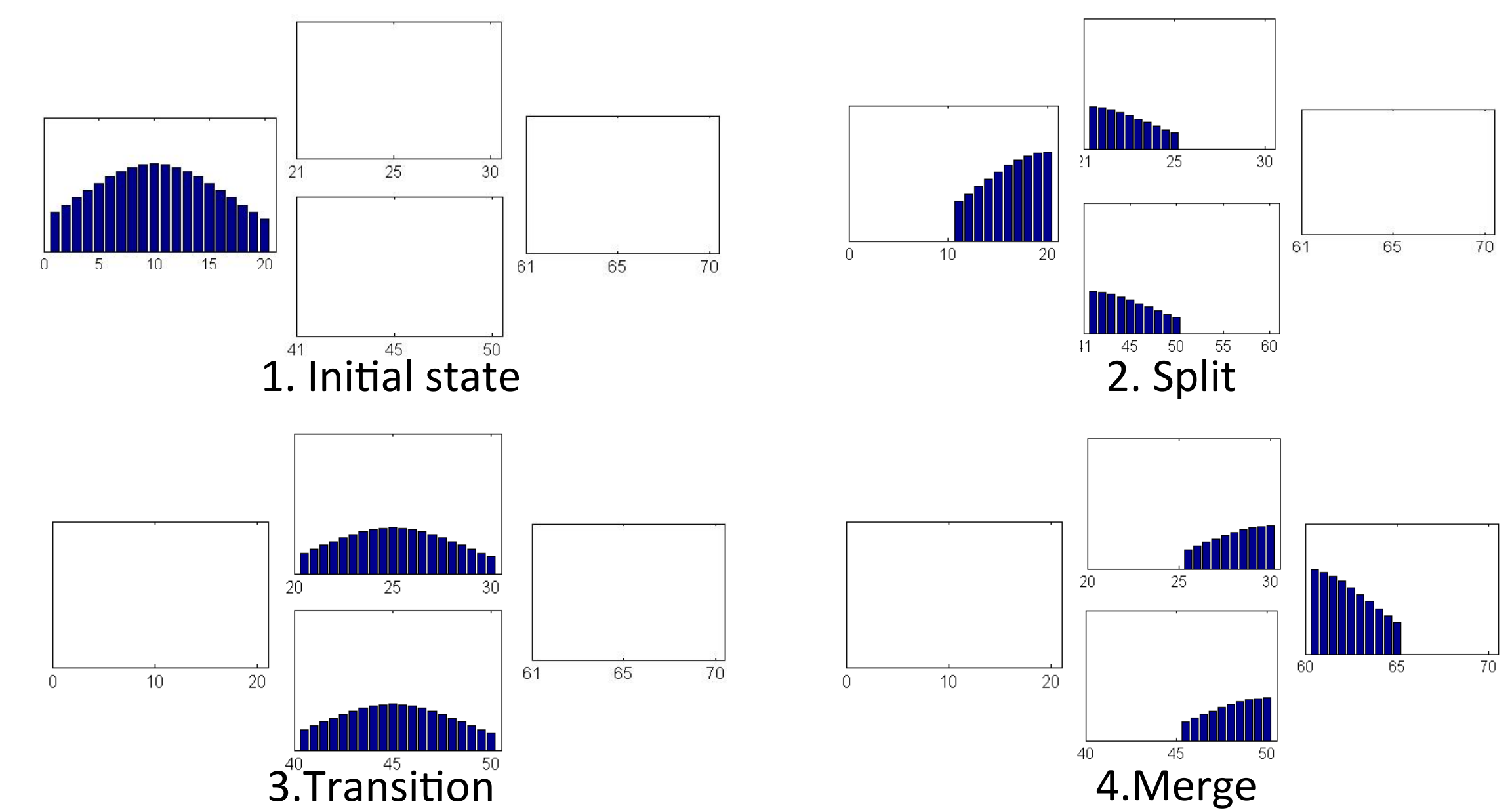


Parallel Lanes:

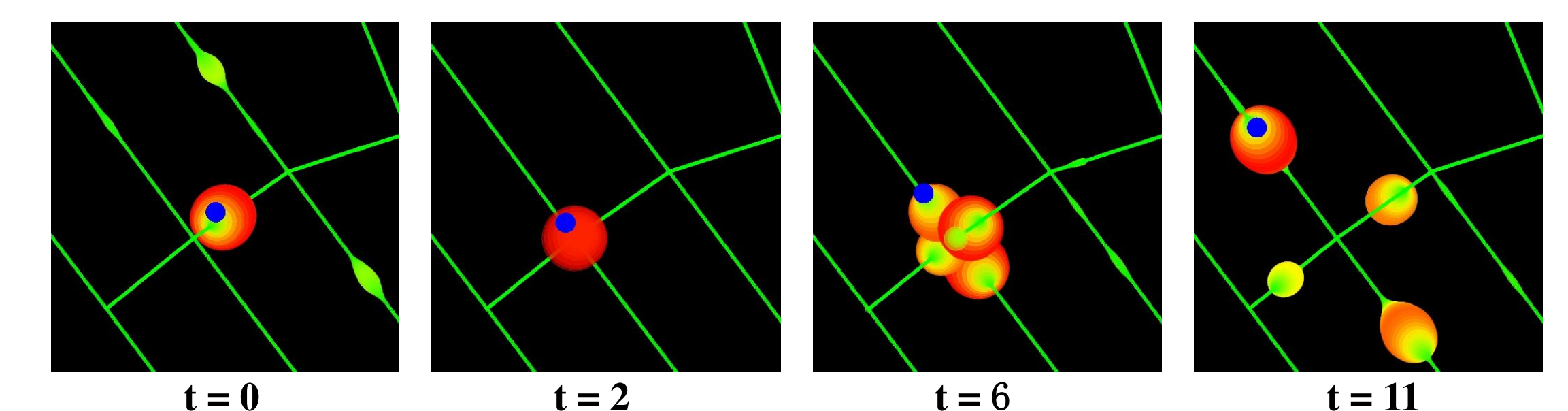


Improved Prediction at Intersections

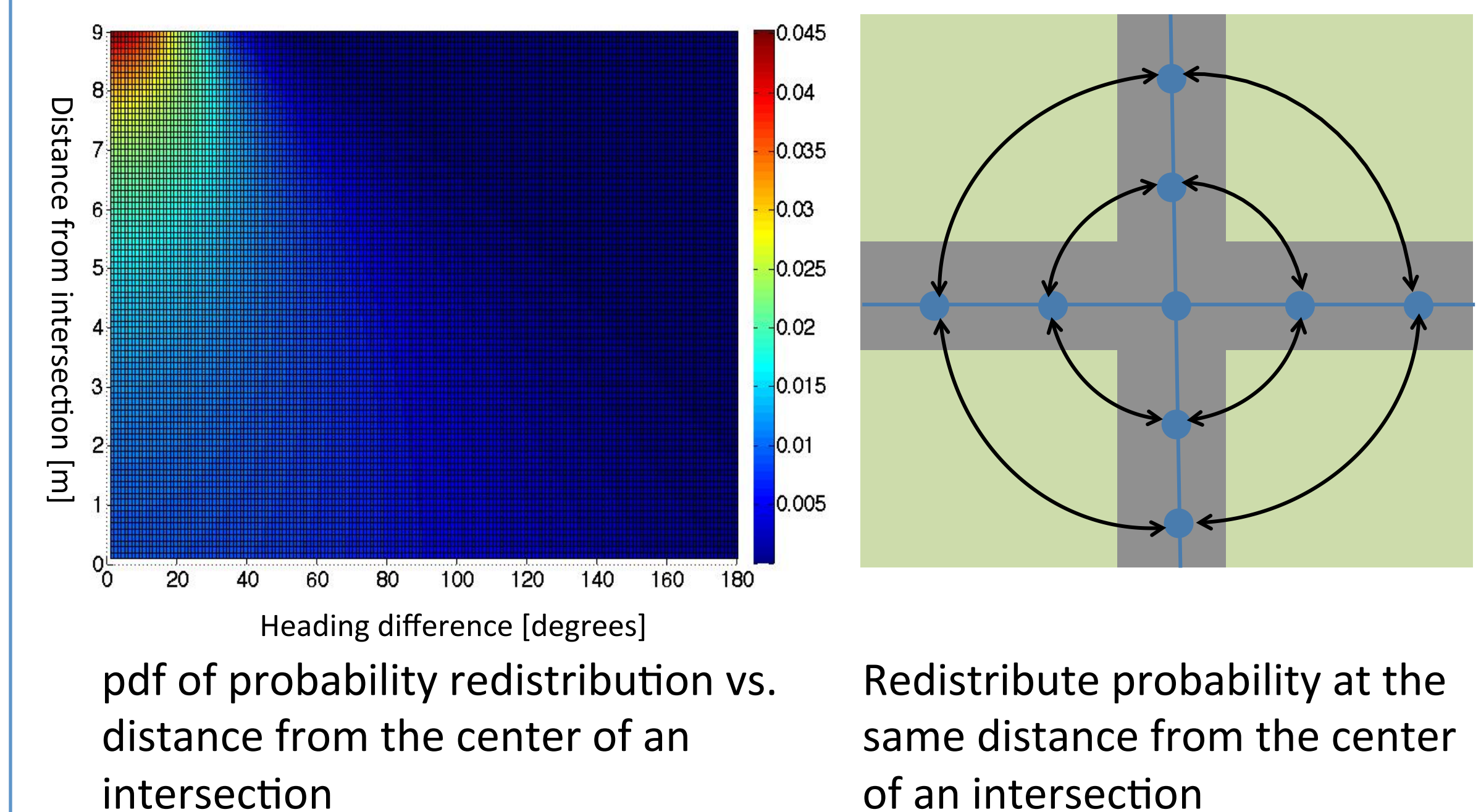
Problem: Slow convergence after transiting through intersections due to infrequent measurements



Localization across intersection:



Solution: Redistribute posterior distribution based on vehicle's current global heading.



With intersection probability redistribution:

