NSF

STEAD: Smoothing Traffic via Energy-efficient Autonomous Driving
CPS TTP #1837244, Jan. 2019 – Jan. 2022
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Challenge:

Provide theoretical framework for mobile traffic control. Demonstrate on flow smoothing for an actual freeway

Broader Impact:

Disruptive advances to energy efficiency of traffic.

Migration to industry (Siemens/Aimsun) of software framework.

Scientific Impact:

Theoretical bounds on algorithms performance (both mean field PDE and Neural nets), provably efficients neural net formulation

Solution:

Control via integration of deep-RL, microsimulation and cloud computing

Mean field game formulation of Lagrangian control.
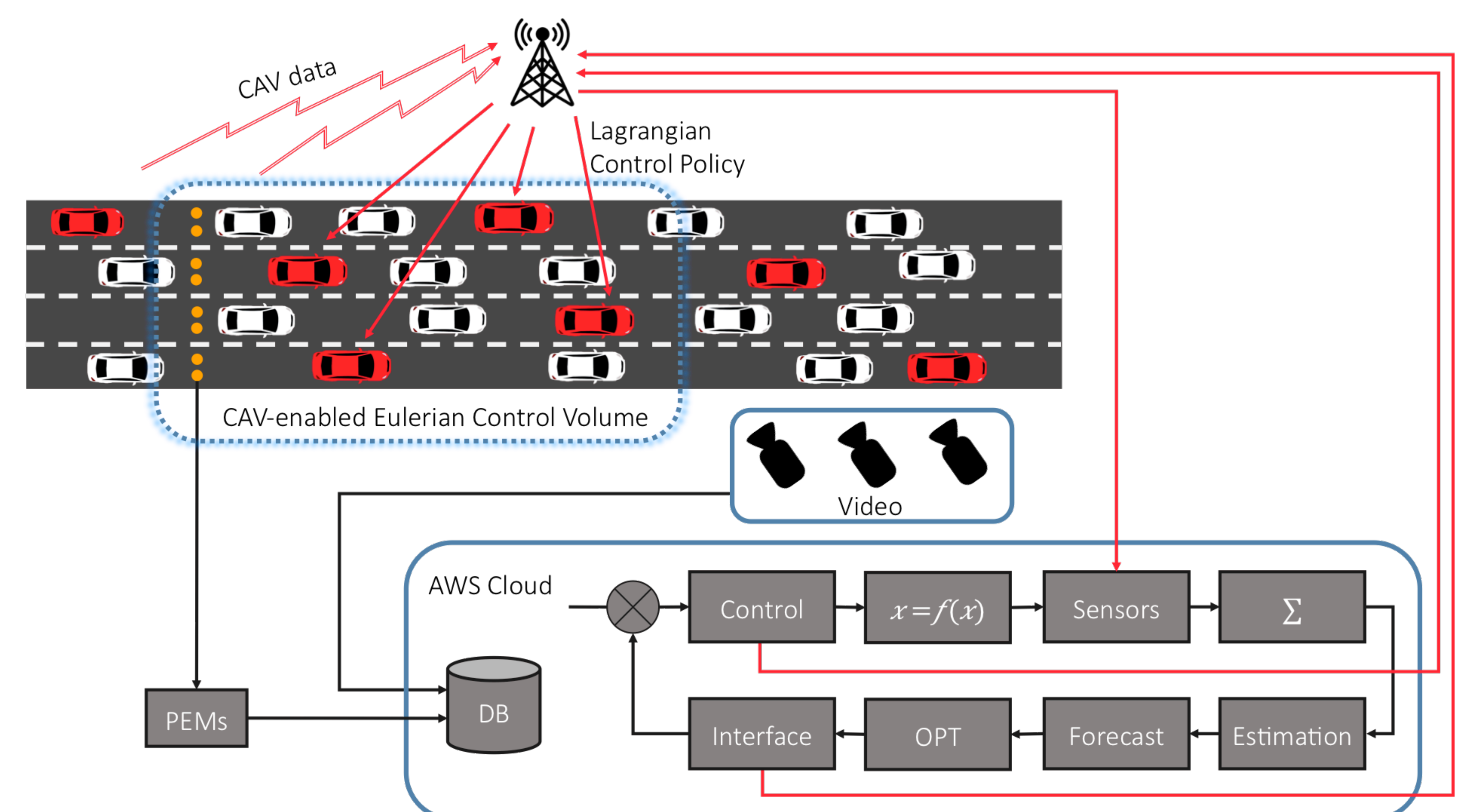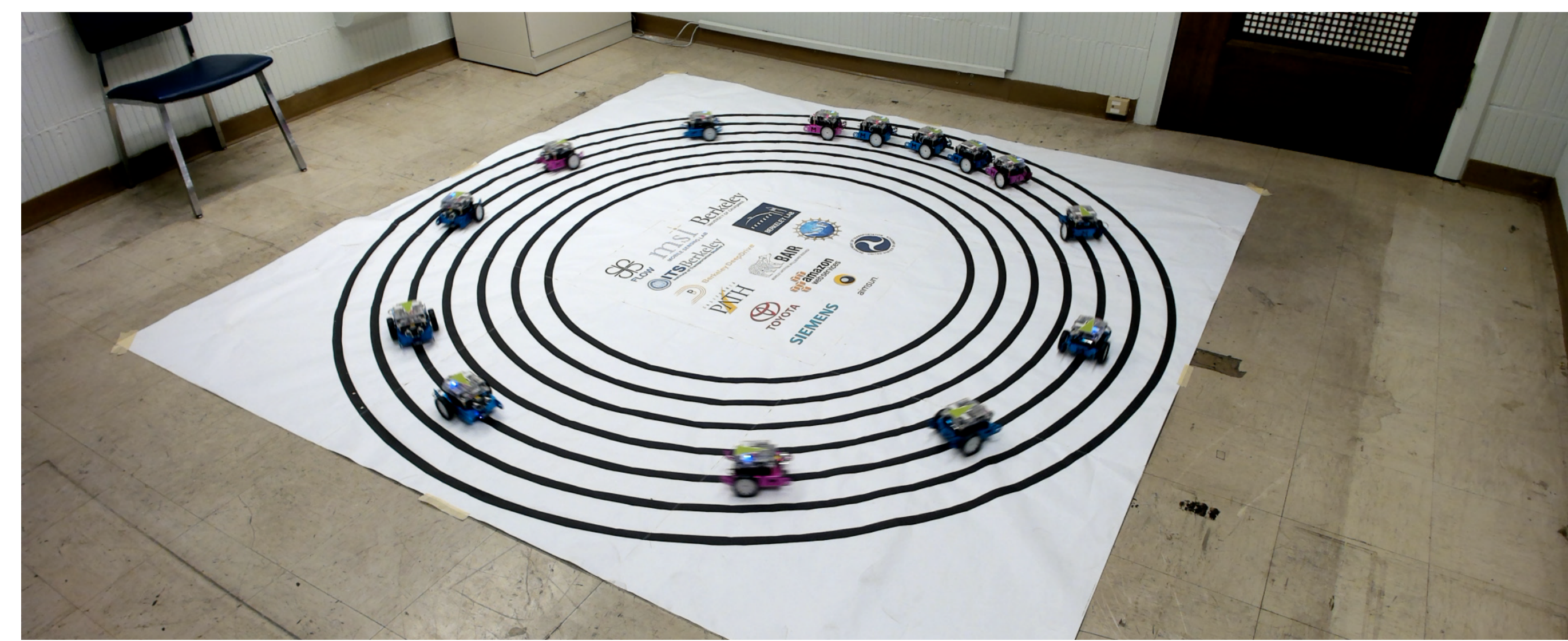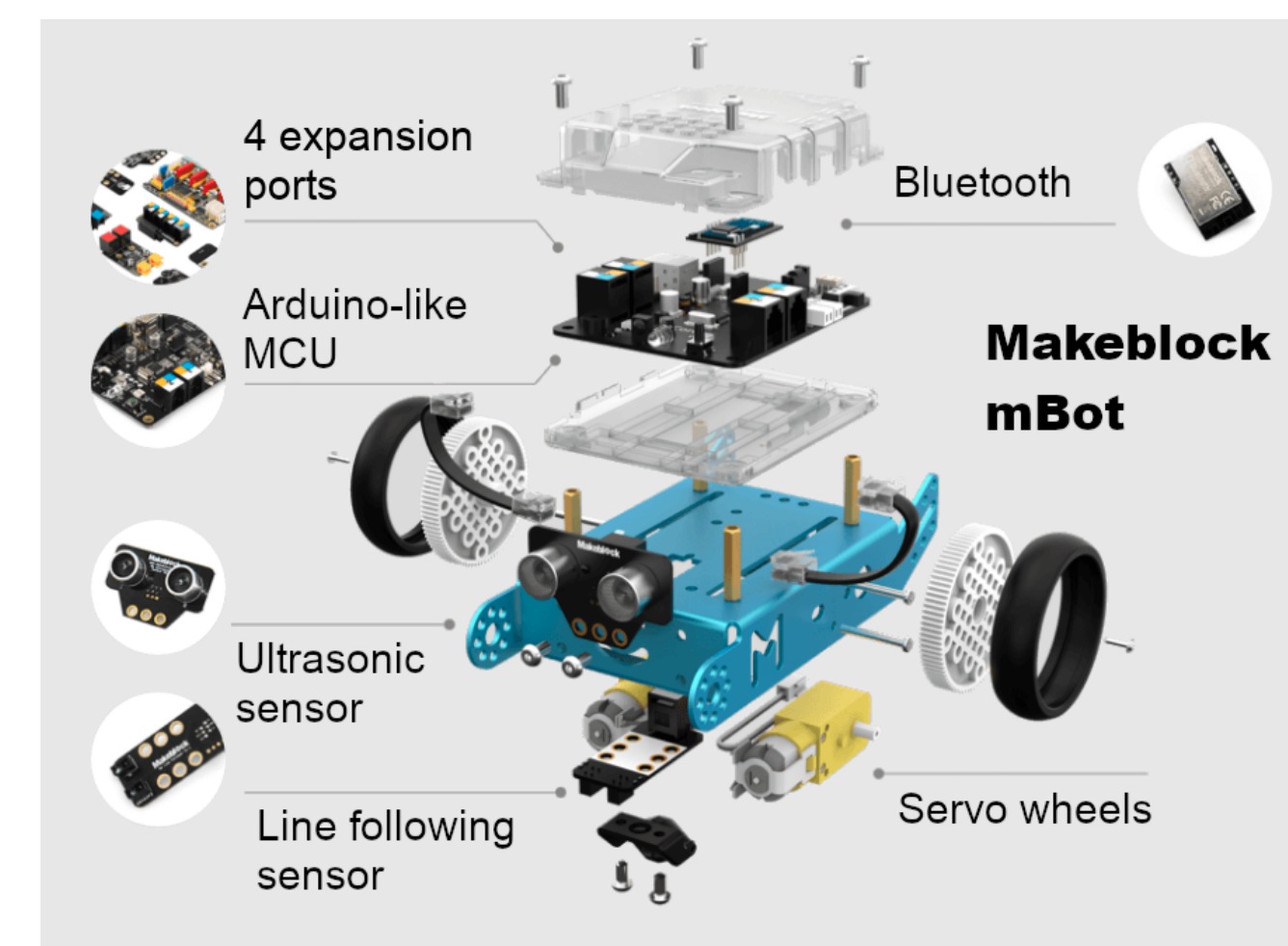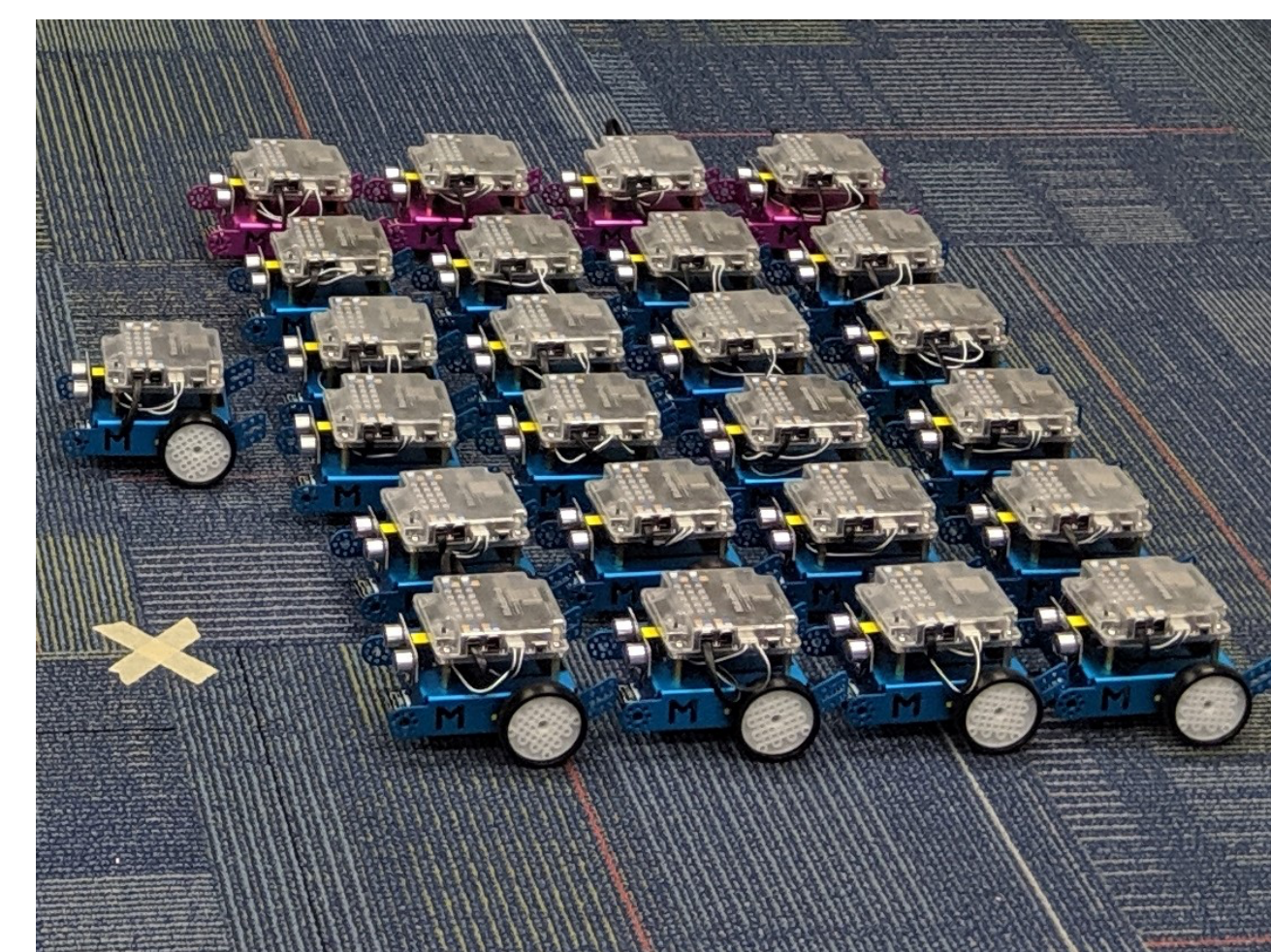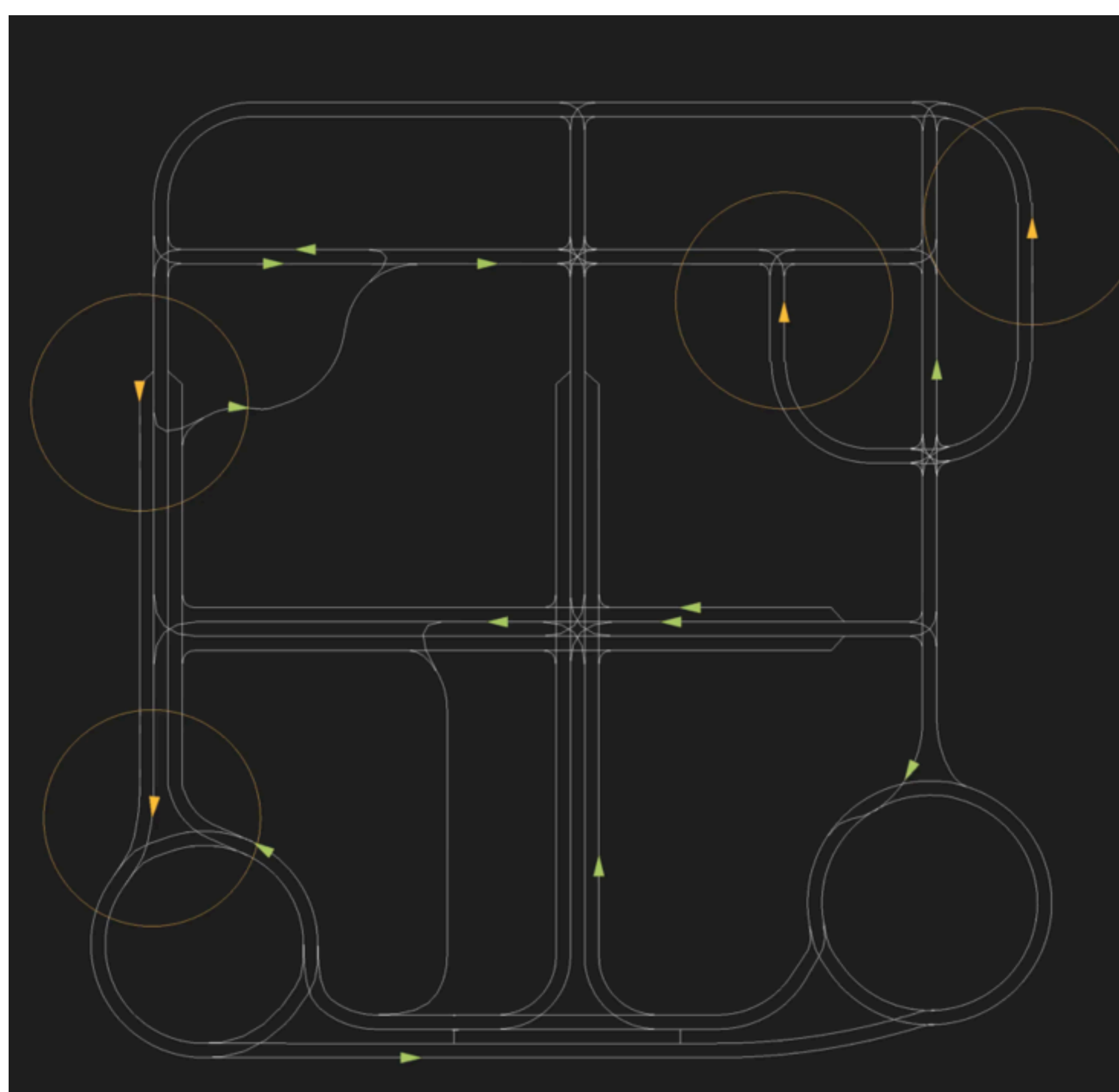
Lagrangian PDE control.
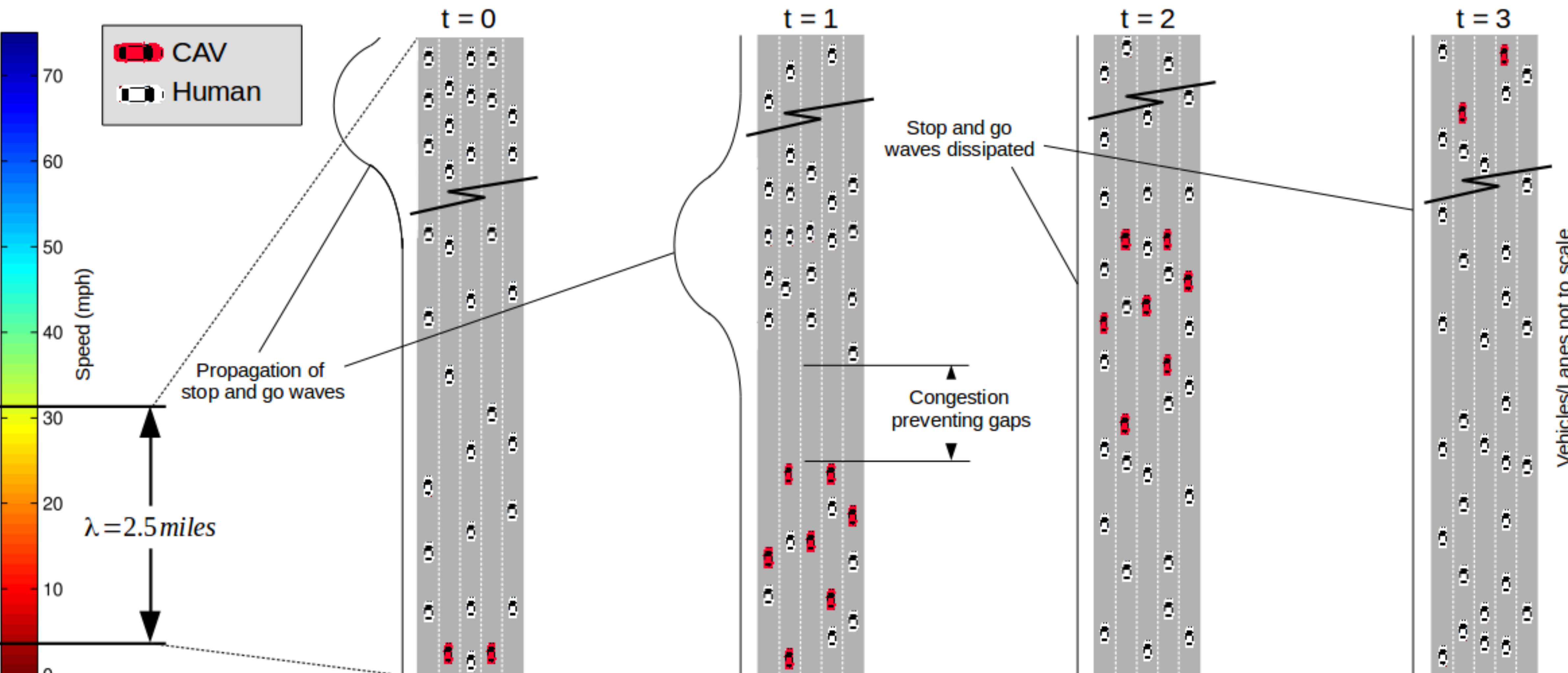

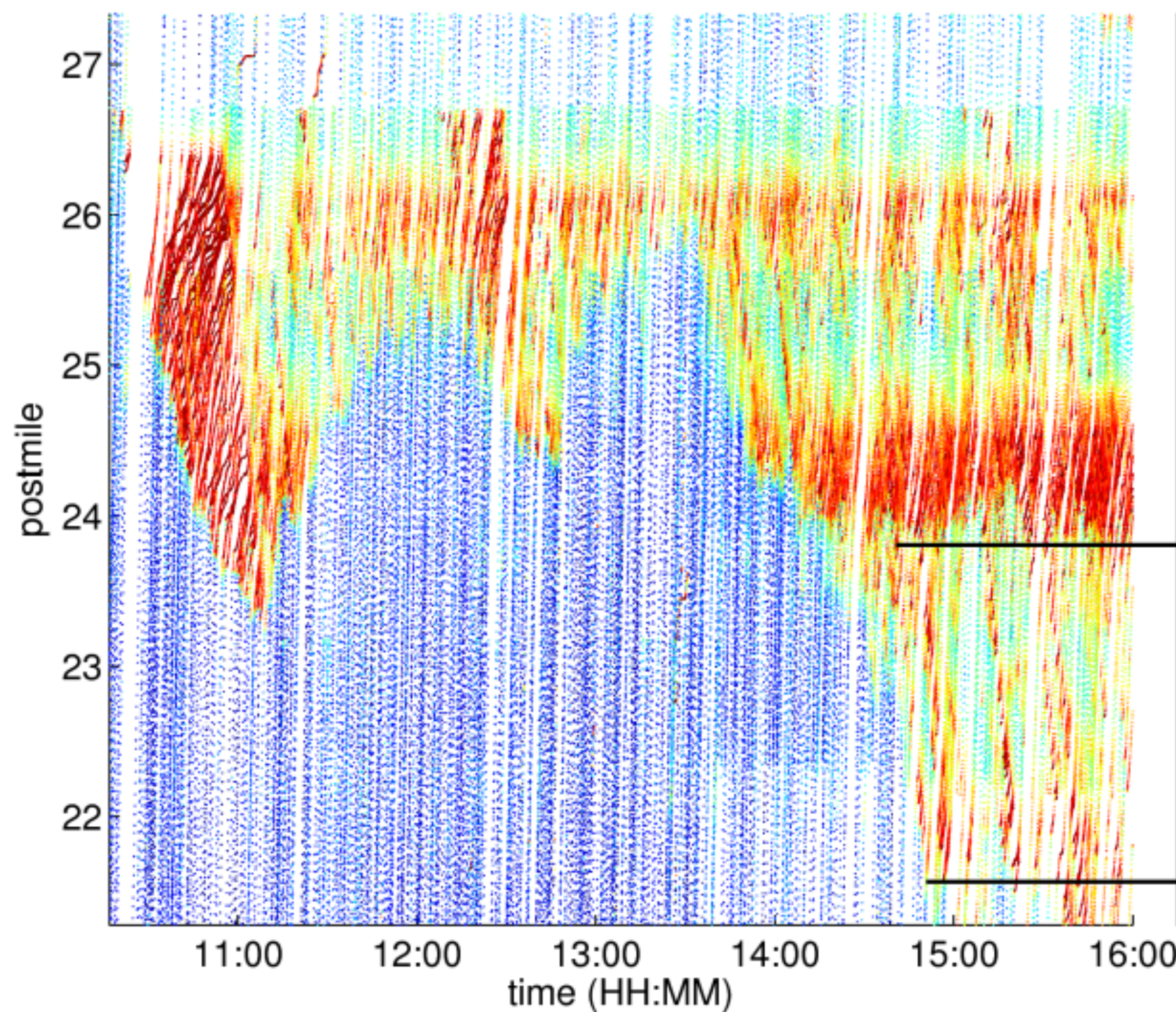
Diagram courtesy Prof. Cathy Wu, MIT

Jan. 2019
Simulation models
Theoretical results

Sep. 2019
Successful policy transfer
Migration of algorithms to hardware

2020-2021
Field experiments
Field operational test

End of project
Large scale freeway deployment