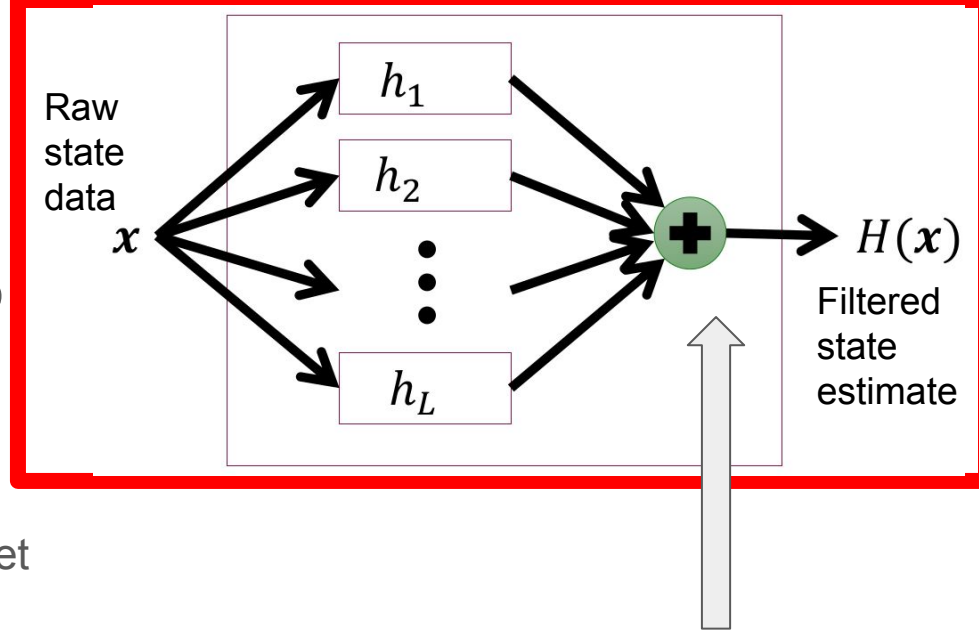


Ensemble Filtering

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Motivation

- Combine multiple filters together to get a better state estimate.
- Speed is critical on a real time system
 - Use multiple weak, but fast, filters to get a good, fast filter
- Filters can struggle in environments with high velocity and large, fast rotations
- For system with unknown dynamics, multiple filters can estimate more accurately

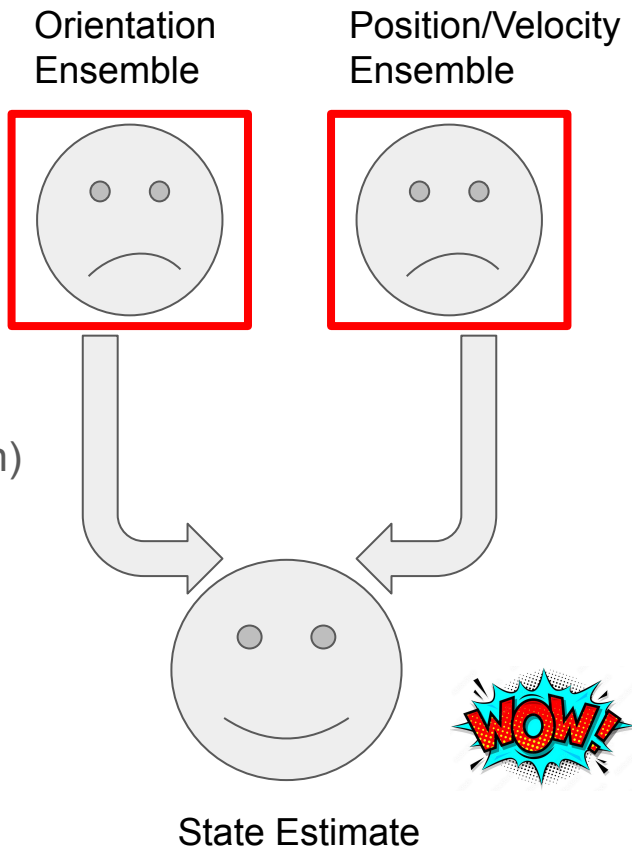


Combine:

- A) Simple Average
- B) Perceptron

Chosen Models

1. Error State Kalman Filter (Baseline)
 - a. Position, velocity, and orientation estimate
2. Unscented Kalman Filter
 - a. Orientation estimate (currently adapting for position)
3. Multistate Constraint Kalman Filter (MSCKF)
 - a. Position, velocity, and orientation estimate



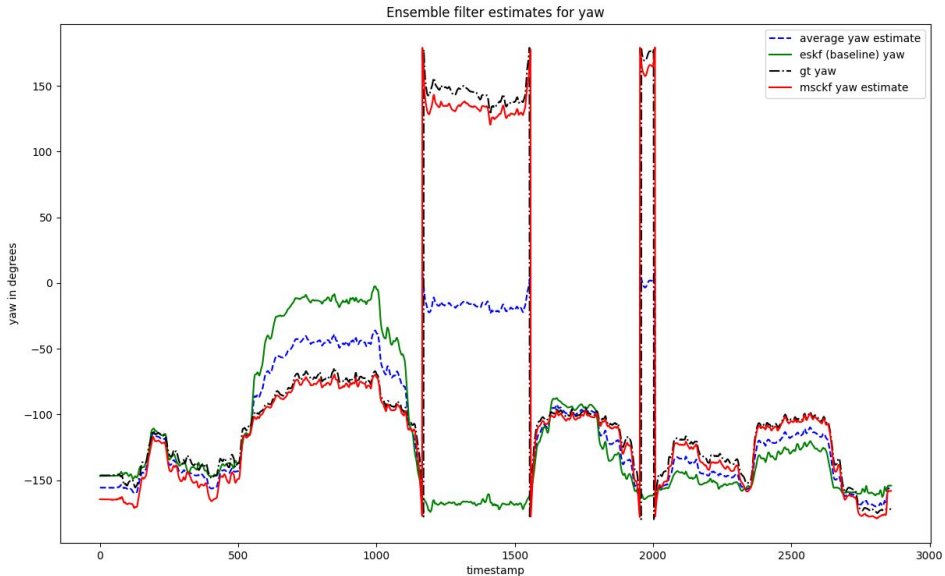
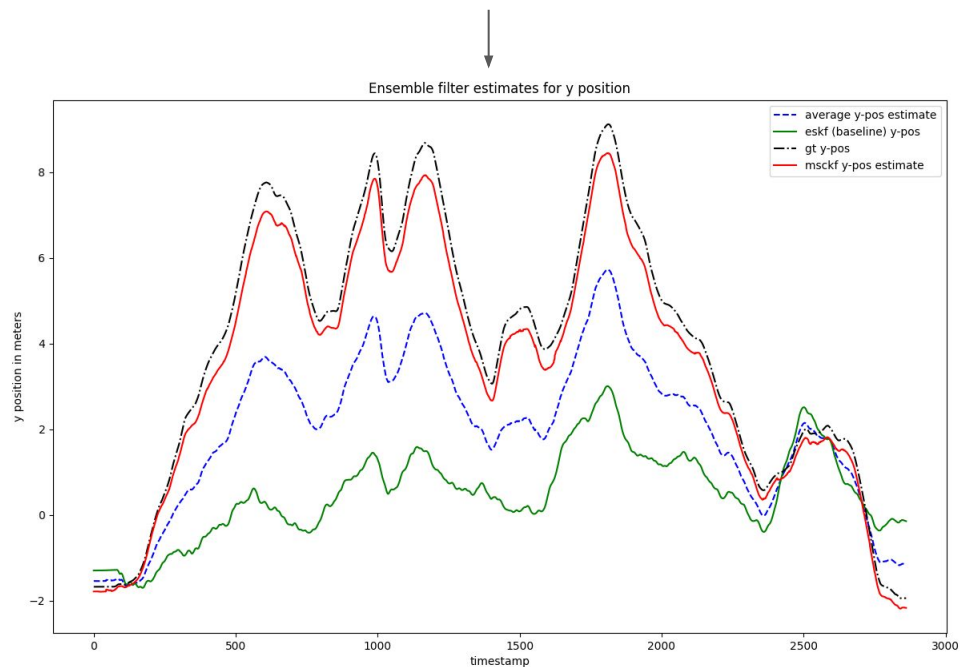
Current Progress

Position Estimates (y axis)

Solid Lines = Individual filter estimates

Dashed Lines = Ensemble estimate (simple avg)

Dashed-Dot Lines = Ground truth



Orientation Estimates (yaw)

Solid Lines = Individual filter estimates

Dashed Lines = Ensemble estimate (simple avg)

Dashed-Dot Lines = Ground truth

Future Work

1. Incorporate Unscented Kalman filter into the ensemble.
2. Combine various models using a perceptron network. Models will be initialized with different initializations.
3. Perform analysis and tests on other parts of the Euroc dataset.
4. Time permitting: Implement and incorporate complementary filter into the ensemble.

