Project Proposal

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The team intends to use various sensors from the existing Autonomous Trolleys in the Unmanned Systems Lab to increase localization accuracy, which is currently limited by the precision of the GPS/INS module.

Fused sensors include wheel odometry, a VectorNav IMU/GPS, and steering angle measurements. The filters that will be compared are complementary filtering, a Kalman filter with a linearized vehicle model, and an extended Kalman filter with a Non-Linear vehicle model. We also intend to implement an error state formulation of the Kalman Filter and explore advanced variants like Multi State Constraint Kalman Filter (MSCKF).

For validation, the team plans on integrating a RTK GPS in order to produce ground truth data that has an error of down to 1.8 cm. This will allow the various models and methods to be compared to near-truth data for evaluation. It is hoped that this project will produce a better and more robust localization method compared to the current GPS/INS only method.