

Objective of Unscented Kalman Filter Highway Project

This project aims to apply unscented kamlman filter to archieve more accurated result of the state estimation of the highway robot cars. The reason to choose unscented kalman filter is because of the nolinearation of radar model. In addition, unscented kalman filter is straitforward to implement. At the end of the project, the RMSE(Root Mean Squared Error) has been used to evaluate the performance of the sensor fusion method.

Process of UKF

In general the UKF folows the following steps:

- Step 1: Initialize the noise deviation, state variables, those could be treated as posterior for step 1, but prior for step2
- Step 2: Predict meean and covariance based on the prior.
- Step 3: Update the state with measurement, the result is posterior for step 3, but prior for step 1.
- Step 4: Jump into step 1 and repeat the whole steps

Prediction

- Generate Sigma Points
- Predict Sigma Points
- Predict Mean and Covariance

Update

- Predict Measurements
- Update State

Comparison between Lidar, Radar and Sensor Fusion on Lidar & Radar

In general, we could see from sensor fusion could achriev best result in comparion of only radar and lidar measurment.

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Result Evaluation of the average result in 5 frames

Type	X	Y	Vx	Vy
Radar	0.0578036	0.0890602	0.382172	0.4935578
Lidar	0.054848	0.091428	0.36972	0.5223
Radar&Lidar Fusion	0.046688	0.080228	0.29262	0.49144