Automatically learning the noise parameters of the Kalman filter.

Abstract

Since the introduction of the Kalman filter in the 1960`s, it became the backbone of many tracking and data prediction applications. The performance of the Kalman filter depends on the selection of its modeling parameters, prominently the noise parameters which include the process (Q) and the measurement noise (R). Over the period of time researchers have invested a lot of efforts in improving the performance of the Kalman filter and its variants. Even after extensive research, the task of setting the noise parameters remains a tedious job for all the designers and is still done using trial and error methods.

In this thesis project we have proposed a method for tuning the noise parameters using discriminative training technique, which helps improve the performance of the Kalman filter. The basic idea of this method is, **tuning the noise parameters** covariance matrices (Q and R) using different learning techniques. The thesis work presents two learning techniques along with an optimization algorithm which help optimize the noise parameters of the Kalman filter:

1. Learning technique-Minimizing the residual error.
2. Learning technique-Maximizing the prediction likelihood.
3. Optimization algorithm-Coordinate Ascent Algorithm (CAA).

Further we have taken into consideration multiple test case scenarios to prove that the Kalman filter yields better performance by using the noise parameters values generated using the training process compared to hand-tuned values.