

Homework 010

c) Compare the performance of the three approaches. Were any anomalous points processed by mistake? Were any valid points rejected? How can each of these methods fail? **[1 point]**

KF doesn't handle the sudden variations in measurements due to external sources very well. If the data is not sufficient it may output wrong estimates. Also the velocity estimate can be seen to spike during external disturbance which may also affect the estimates in the case of insufficient data. KF usually fails in case of higher order systems or sudden external disturbances where the uncertainty shoots up to give unreliable estimates

KF with innovation covariance based rejection performs much better than conventional KF by neglecting the measurements exceeding the considered covariance band. The uncertainty increases as the number of consecutive points rejected increases. A limitation of this approach may be that deciding the acceptable covariance band adjusts the sensitivity of the rejection to the disturbances in the measurements. A narrower band may sometimes perform worse and lead to many unnecessary rejections. Whereas a broader band may fail to reject many disturbances.

KF with mixture model based rejection performs equivalent to innovation covariance based rejection in this case. But its performance highly depends on the integrity of the mixture model being considered. A well chosen and evaluated mixture model would lead to lesser false rejections and inclusions and hence may perform even better than innovation covariance based rejection. But the challenging bit is selection of appropriate components for the mixture and weighing these components using Expectation Maximization.