

## Vision 9 - Kalman filter

1. What are the three elements of tracking?
2. What is the difference between the state of a system and the observations? Give an example.
3. What are the two typical steps in the filters we discussed? What do they do? (relation to time and to measurements)
4. What is the idea of the Bayesian filter? How do the equations look?
5. What is the implementation problem with the Bayesian filter?
6. What choices are made in the Kalman filter? (The Kalman filter is a specific version, with some restrictions, of the Bayesian filter)?
7. What are the two models used in the Kalman filter?
8. How does the Kalman filter deal with the fact that state space and measurement space are different?
9. There are two “external” uncertainties used in the Kalman filter. What do they represent/model? (What are they good for?)
10. What are the equations for the 1D Kalman filter?
11. What happens if you are very certain about your measurements? What does that mean for  $\sigma_m^2$  (the measurement variance)? What does follow from that (trace through the Kalman equations)?
12. If your measurements are 3D positions coming out of a stereo process, how can you estimate good measurement uncertainties that are adaptive to the specific situation?
13. Extended Kalman filter:
  - 13.1. Which of the Kalman restrictions does the Extended Kalman filter remove?
  - 13.2. How does the Extended Kalman filter do that? (What is different between the Kalman filter and the Extended Kalman filter?)
14. What are the steps of the Prediction step of the Unscented Kalman Filter?