Applied Estimation

EL2320 Lab 2

Authors:
Weiqi Xu, weiqi@kth.se

November 18, 2020

1 Part I

1. The particles are a set of random state samples (particles) to describe the posterior.

2. importance weight: $w_t = p(z_t|x_t)$ is the probability of the measurement z_t under the particle x_t.
target distribution f: the distribution based on the measurements, corresponds to the target belief $bel(x_t)$.
proposal distribution g: distribution based on prediction from previous state x_t
The relationship: We can calculate importance weights for each sample x based on data fusion between f and g.

3. Particle deprivation can occur when the number of particles is too small to cover relevant regions with high likelihood. The danger is to generate incorrect estimation or unobtainable correct estimation

4. By resampling, we get rid of particles that otherwise would end up in regions of low posterior probability. Therefore, the algorithm needs less particles, which is more computational efficient.

5. If the distribution is of the donut shape, the average of the particle set will be in the center of donut, whose likelihood is really low.

6. Particles need to be extended to continuous density using several different ways: 1) Gaussian approximation, 2) k-means clustering, 3) histogram bins, etc.

7. A high sample variance means our particle distribution is inaccurate. The remedies are using more particles or adding random particles.

8. The pose uncertainty will decrease with an increase in particles