Probabilistic Robotics
BAIPR6, Fall 2009
Book Assignment 2.8.4
Assigned: Monday September 7;
Due: Wednesday September 9, 11:00 in the morning

September 7, 2009

A robot uses a range sensor that can measure ranges from $0m$ to $3m$. For simplicity, assume that actual ranges are distributed uniformly in this interval. Unfortunatelly, the sensor can be faulty. When the sensor is faulty, it constantly outputs a range below $1m$, regardless of the actual range in the sensor's measurement cone. We know that the prior probability for a sensor to be faulty is $p = 0.01$.

Suppose the robot queried its sensor N times, and every single time the measurement value is below $1m$. What is the posterior probability of a sensor fault, for $N = 1, 2, \ldots, 10$? Formulate the corresponding probabilistic model.

Hint: Evidence is build up when the sensor is queried, so the normalizer in Bayes rule can't be ignored.

Hand-In

You do not have to hand-in this assignment. This assignment is intended to revitalize your understanding of conditional probabilities. The solution of this assignment is discussed in the classroom this Wednesday. You should have a MatLab diary or Mathematica notebook with you, with your calculations to find the posterior for $N = 1, 2, \ldots, 10$.