

Incremental Bayes

Incremental Bayes (details)

1st positive measurement

$$\begin{aligned}P(O|+) &= \frac{P(+|O) P(O)}{P(+|O) P(O) + P(+|\neg O) P(\neg O)} \\&= \frac{0.9 \times 0.1}{0.9 \times 0.1 + 0.05 \times 0.9} \\&= 0.67\end{aligned}$$

2nd positive measurement

$$\begin{aligned}P(O|+,+) &= \frac{P(+|O) P(O|+)}{P(+|O) P(O|+) + P(+|\neg O) P(\neg O|+)} \\&= \frac{0.9 \times 0.67}{0.9 \times 0.67 + 0.05 \times 0.33} \\&= 0.97\end{aligned}$$

Incremental Bayes (derivation)

$$\begin{aligned} P(H|M1, M2) &= \frac{P(M1, M2|H) P(H)}{P(M1, M2)} \\ &= \frac{P(M1, M2|H) P(H)}{P(M1, M2|H) P(H) + P(M1, M2|\neg H) P(\neg H)} \\ &= \frac{P(M2|H) P(M1|H) P(H)}{P(M2|H) P(M1|H) P(H) + P(M2|\neg H) P(M1|\neg H) P(\neg H)} \\ &= \frac{P(M2|H) [P(M1|H) P(H) / P(M1)]}{P(M2|H) [P(M1|H) P(H) / P(M1)] + P(M2|\neg H) [P(M1|\neg H) P(\neg H) / P(M1)]} \\ &= \frac{P(M2|H) P(H|M1)}{P(M2|H) P(H|M1) + P(M2|\neg H) P(\neg H|M1)} \end{aligned}$$

Examples of skills from Week 11

You should be able to demonstrate skills such as the following:

- Determine the number of **degrees of freedom** of a robot, and whether it is holonomic
- Characterise **sources of uncertainty** in a robot application scenario
- Explain the basic concepts of **localisation** and **mapping**
- Formulate an application problem using **incremental Bayes**
- Model the **configuration space** for a simple robot
- Compare different approaches to **motion planning** given a particular configuration space