

Bayes Filter

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Notation

η normalizing constant, to make probability distribution sum to 1.

$\text{bel}(t) = p(x_t | z_{1:t}, u_{1:t})$ posterior probabilities over state variables conditioned on available data

$\overline{\text{bel}}(t) = p(x_t | z_{1:t-1}, u_{1:t})$ belief taken *before* incorporating the measurement z_t

$\overline{\text{bel}}(t)$ often called the prediction in Bayes filtering. Computing $\text{bel}(t)$ from $\overline{\text{bel}}(t)$ is called *correction* or the *measurement update*.

Algorithm 1 Bayes Filtering

```
1: procedure BayesFilter( $\text{bel}(x_{t-1}), u_t, z_t$ )
2:   for all  $x_t$  do
3:      $\overline{\text{bel}}(t) = \int p(x_t | u_t, x_{t-1}) \text{bel}(x_{t-1}) dx$ 
4:      $\text{bel}(t) = \eta p(z_t | x_t) \overline{\text{bel}}(t)(x_t)$ 
5:   end for
6:   return  $\text{bel}(x_t)$ 
7: end procedure
```
