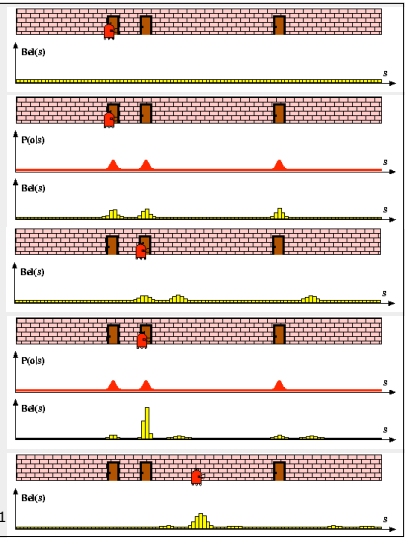
CSE-571
Probabilistic Robotics

Bayes Filter Implementations

Discrete filters

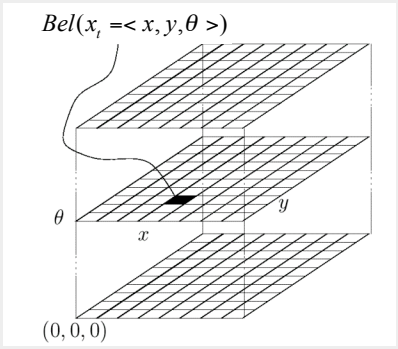
Piecewise Constant



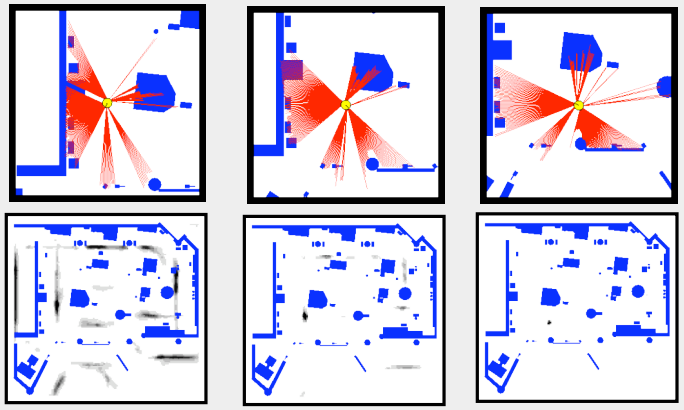
Discrete Bayes Filter Algorithm

1. Algorithm **Discrete_Bayes_filter**(*Bel(x),d*):
2. η=0
3. If *d* is a perceptual data item *z* then
4. For all *x* do
5. $Bel'(x) = P(z \mid x) Bel(x)$
6. $\eta = \eta + Bel'(x)$
7. For all *x* do
8. $Bel'(x) = \eta^{-1} Bel'(x)$
9. Else if *d* is an action data item *u* then
10. For all *x* do
11. $Bel'(x) = \sum_{x} P(x \mid u, x') \, Bel(x')$
12. Return *Bel'(x)*

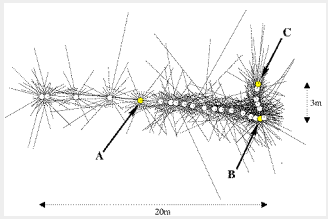
Piecewise Constant Representation

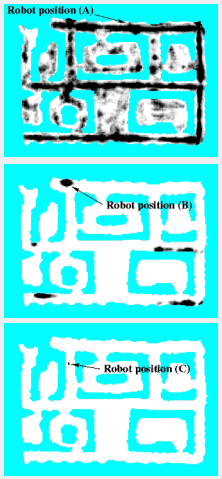


Grid-based Localization



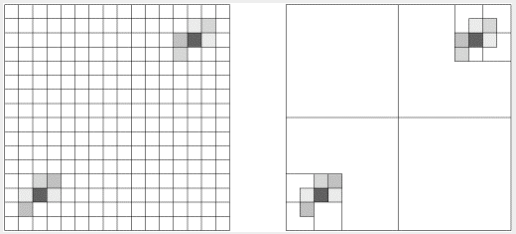
Sonars and Occupancy Grid Map





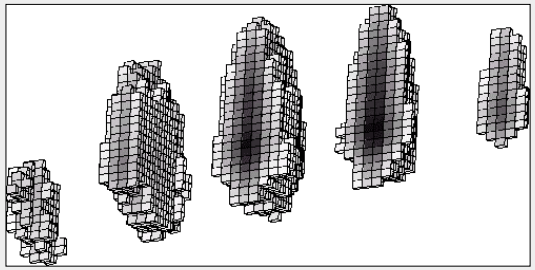
Tree-based Representation

Idea: Represent density using a variant of Octrees



Tree-based Representations

- Efficient in space and time
- Multi-resolution



Xavier:
Localization in a Topological Map