

Probability Calculations

Initially target can be anywhere in the landscape.

$$\text{belief} = \frac{1}{\# \text{ of cells}}$$

To find the $P(\text{Target in cell}_i | \text{Observations } n \text{ failure in cell}_j)$

initially $j=0, i=0$.

So $P(\text{target in cell}_0 | \text{failure in cell}_0)$

Now false negative is given by

$P(\text{failure in finding cell} | \text{target is in the cell})$

By bayes theorem

$$P(A/B) = \frac{P(A) \cdot P(B/A)}{P(B)}$$

So
$$\frac{P(\text{target in cell}_0) \times P(\text{failure in cell}_0 | \text{target in cell}_0)}{\text{failure in cell}_0}$$

Now we add all the probability & get the following

$$P(\text{target in cello}) \times P(\text{failure in cello} / \text{target in cello})$$

$$+ \frac{P(\text{target in cello} / \text{failure in cello})}{P(\text{failure in cello})} \left(\frac{\text{belief in cello}}{\text{failure in cello}} \right)$$

+ ... P(target in cell_n / failure in cello)
[Sum of all other probabilities is 1] = 1

$$\text{failure in cello} = \text{belief}(\text{cello}) \times \text{false positive}(\text{cello})$$

$$+ \dots \text{belief}(\text{cell}_n) \times \text{false positive}(\text{cell}_n)$$

∴ for any cell:

$$\text{belief}(\text{cell}_i) = \text{current belief in cell}_i$$

$$\text{current belief} \Rightarrow \text{false positive} \times \text{belief of cell}_i \text{ previously}$$

2) $P(\text{target found in cell}_i / \text{observations})$
initial belief is $= \frac{1}{\# \text{ of cells}}$

belief 2 is $P(\text{finding the target in cell} / \text{target is in cell})$

so belief 2 $\Rightarrow (1 - \text{false positive rate})$
(initially ϵ_i are assigned based on the terrain type)

So the belief₂ i.e. finding target
in a cell is belief of target in
that cell times belief₂ of finding the
target for

$$\text{belief}_2 = \text{belief} \times (1 - \text{false positive})$$

we update this continuously &
search a cell where the probability
of finding a cell is maximum.