Discrete and Continuous Search Problems

DISCRETE CASE

Feasible Effort Allocation:

$$(t_1, \ldots, t_n) \text{ s.t. } \sum_i t_i \leq t \text{ and } t_i \geq 0$$

Target Location Distribution:

$$p_i = P\{\text{target in cell i}\}$$

Exponential Detection Function:

$$1 - \exp\left[\frac{-vwt_i}{A_i}\right]$$

Optimization Problem: Find an effort allocation $(t_1, \ldots, t_n)$ to

$$\max \sum_i \left(1 - \exp\left[\frac{-vwt_i}{A_i}\right]\right) p_i$$

$$\text{s.t. } \sum_i t_i \leq t \text{ and } t_i \geq 0$$

CONTINUOUS CASE

Feasible Effort Allocation:

$$d(x,y) \text{ s.t. } \int\int_{\forall x,y} d(x,y)\, dx\, dy \leq t \text{ and } d(x,y) \geq 0$$

Target Location Distribution:

$$f_{X,Y}(x,y) = \text{target density at } (x,y)$$

Exponential Detection Function:

$$1 - \exp[-vwd(x,y)]$$

Optimization Problem: Find an effort allocation $d(x,y)$ to

$$\max \int\int_{\forall x,y} (1 - \exp[-vwd(x,y)])\, f_{X,Y}(x,y)\, dx\, dy$$

$$\text{s.t.} \int\int_{\forall x,y} d(x,y)\, dx\, dy \leq t \text{ and } d(x,y) \geq 0$$