July 2008

Penn State EOC Challenge

Search area calculation and detail

The Park Rangers had estimated that the hikers could be as far as 30 miles from when they were last seen in a parking lot.   This is a huge search area, a circle of radius 30 miles:

Search_Area = Pi * Radius^2.
Search_Area = Pi * (30 miles)^2 = 2,827 square miles.

To put this search problem into context, Manhattan Island in New York City is 34 square miles, with a length of 13.4 miles and a width of 2.3 miles, and contains 1.6 Million people.[1] Long Island, NY, is about 118 miles in length, approximately 20 miles in width, with a total area of 1,400 square miles for the counties of Nassau, Suffolk, Queen, and Kings (Brooklyn) Counties.[2] This search range is 83 times larger than Manhattan Island, and twice the size of Long Island. The park area is characterized by steep terrain and heavily wooded regions. Steep ravines and creek beds make it difficult for individuals to cross in certain areas. Roads, farms and rural villages may be within miles, but out of visual and audible range. As you can imagine, there is a lot of area to search and the potential for the hikers to be obscured by either terrain or foliage from the search team(s).

While this is a rural area with a small human population density, there are likely a thousand deer in this area, and thousands more of smaller mammals. We can define a 'confuser' as any other mammal (or natural object) that may look like the hiker to an imaging system. For this example, at night, there are likely to be several thousand more 'confusers' than the two hikers in this region. It would be advantageous to have a sensor that could verify if many of the 'potential hikers' are indeed wildlife, to save dispatching a human search team to each potential area.

With each hour that elapses, the hikers can travel further distances, increasing the difficulty of the problem. Quick deployments of a search team that can search wide areas quickly and efficiently are essential to finding the hikers before serious problems develop.

---

[1] "Manhattan", Wikipedia, http://en.wikipedia.org/wiki/Manhattan
[2] "Long Island 101", Facts and Figures about Long Island Counties, Towns, and Villages, http://longisland.about.com/cs/governement/a/li101.htm