Project Note # 2: Search Strategy

Last week we discussed some of the limitations of the method inherent in a supernova search to determine large distances in observational cosmology. Type Ia supernovae are good indicators for distances (standard candle) for at least the following two reasons:
(a). they are intrinsic bright with $M_V = -18.6 + 5 \log_{10} h$ (where $H_o = 100h$ kms^{-1} / Mpc) at maximum (van den Berg, McClure, Evans, 1987. **ApJ 323**:44), and
(b). they occur in all galaxies.
We can estimate the uncertainty in distance measurement associated to the uncertainty in estimation of distance modulus $(m - M_V) = \delta (m - M_V)$. The percentage of uncertainty in distance is related by the following equation:

$$\text{Percentage Uncertainty in Distance} = [\ \delta (m - M_V) / 5\ ] \times 100\% \ .$$

The accuracy of distance measurements rely heavily on our certainty in the intrinsic brightness of Type Ia supernovae. (The uncertainty can be as large as 1.5 mag, implying distance uncertainty can be as high as 30%.)

This week we will concentrate on the "mechanics" in conducting a systematic search for supernovae. We need to consider the following items:

(1). What kind of instruments are needed? What are their properties?

(2). What is the optimum detection rate of supernovae?

(3). What is the limiting magnitude of the search?

(4). Design a search protocol.

(5). What is the total cost of the project?

The following popular magazines are good sources for pricing etc.:

Astronomy

Sky & Telescope

CCD Astronomy

This weeks reading assignment in Science, April 4, 1997 issue on supernovae.