- **A *functional* model represents the geometry or physical relationship between the abstraction and that being represented. A topographic map is three-dimensional model which portrays both the planimetric location of features such as roads and buildings while the third dimension is depicted by contour lines of constant elevation. Other examples of functional models include defining horizontal distance as the right triangle component of a slope distance or using the coefficient of thermal expansion of the steel tape when computing taping corrections.**

- **The *stochastic* model represents the probabilistic characteristics of various elements of the functional model. Whether a quantity is fixed by statute, held by a previous survey, controlled by higher order instrumentation (calibration), determined by repeated measurements, or computed from a combination of known elements, the stochastic model represents the "totality of the assumptions on the statistical properties of the variables involved," (Mikhail, 1976). The standard deviation of any quantity is a statistical measure of its quality. A distance with a small standard deviation is known quite precisely while a distance with a large standard deviation is less reliable that one with a small standard deviation. Use of the stochastic model is governed by rules of variance/covariance propagation.**

Some functional models are more appropriate than others. To the extent one is willing to assume a flat earth, a plane triangle can be used to represent a triangular shaped tract on the earth's surface. However, as the size of the tract increases and/or as the level of required precision is increased, the plane triangle is no longer an appropriate mathematical model, but a spherical triangle must be used. Similarly, sometimes a horizontal distance is computed assuming the plumb lines at two ends of a slope distance are parallel when, in fact, they are not. If the slope distance is over 10,000 feet, the vertical angle is over 2° and a systematic model distortion of 1:100,000 can not be tolerated, a more refined (complex) horizontal distance model should be used (see Figure 6, Burkholder, 1991).

The choice of a mathematical model is driven by simplicity and integrity. A simple model is generally preferred to a complex one. In the examples just cited, a flat-earth model is simple and enjoys computational integrity so long as the precision of a measurement is significantly less than a systematic error distortion imposed by ones choice of a model. However, as the accuracy of modern measurement technology has increased and as the scope of application broadens, the selection of an appropriate functional model deserves careful attention. And, especially with regard to use of spatial data, the contribution of the stochastic model (positional tolerance) should be a part of that consideration.

