

9. Traverse



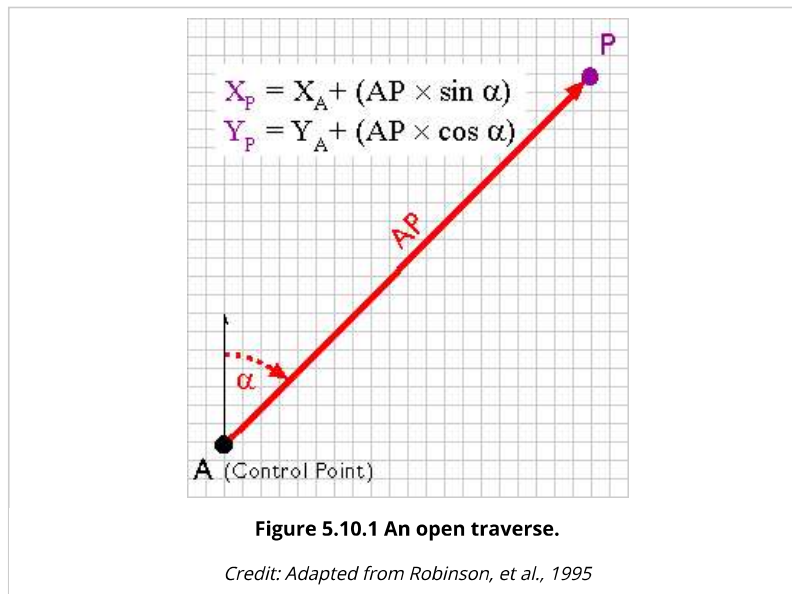
The Nature of
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Surveyors typically measure positions in series. Starting at control points, they measure angles and distances to new locations and use trigonometry to calculate positions in a plane coordinate system. Measuring a series of positions in this way is known as "running a traverse." A traverse that begins and ends at different locations is called an **open traverse**.



For example, say the UTM coordinates of point A in Figure 5.10.1 are 500,000.00 E and 5,000,000.00 N. The distance between points A and P, measured with a steel tape or an EDM, is 2,828.40 meters. The azimuth of the line AP, measured with a transit or theodolite, is 45°. Using these two measurements, the UTM coordinates of point P can be calculated as follows:

$$X_P = 500,000.00 + (2,828.40 \times \sin 45^\circ) = 501,999.98$$

$$Y_P = 5,000,000.00 + (2,828.40 \times \cos 45^\circ) = 5,001,999.98$$

A traverse that begins and ends at the same point, or at two different but known points, is called a **closed traverse**. Measurement errors in a closed traverse can be quantified by summing the interior angles of the polygon formed by the traverse. The accuracy of a single angle measurement cannot be known, but since the sum of the interior angles of a polygon is always $(n-2) \times 180$, it's possible to evaluate the traverse as a whole, and to distribute the accumulated errors among all the interior angles.

Errors produced in an **open traverse**, one that does not end where it started, cannot be assessed or corrected. The only way to assess the accuracy of an open traverse is to measure distances and angles repeatedly, forward and backward, and to average the results of calculations. Because repeated measurements are costly, other surveying techniques that enable surveyors to calculate and account for measurement error are preferred over open traverses for most applications.

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