

Applied Geomorphology

Laboratory 2: Using the Pocket Transit Clinometer to Measure Elevation Difference

Introduction

The pocket transit (i.e. Brunton Compass) contains a clinometer for measuring vertical angles to a precision of +/- one degree (better if using a tripod). This capability may be used to calculate elevation changes with a few simple trig calculations. Consider **Figure 1** below:

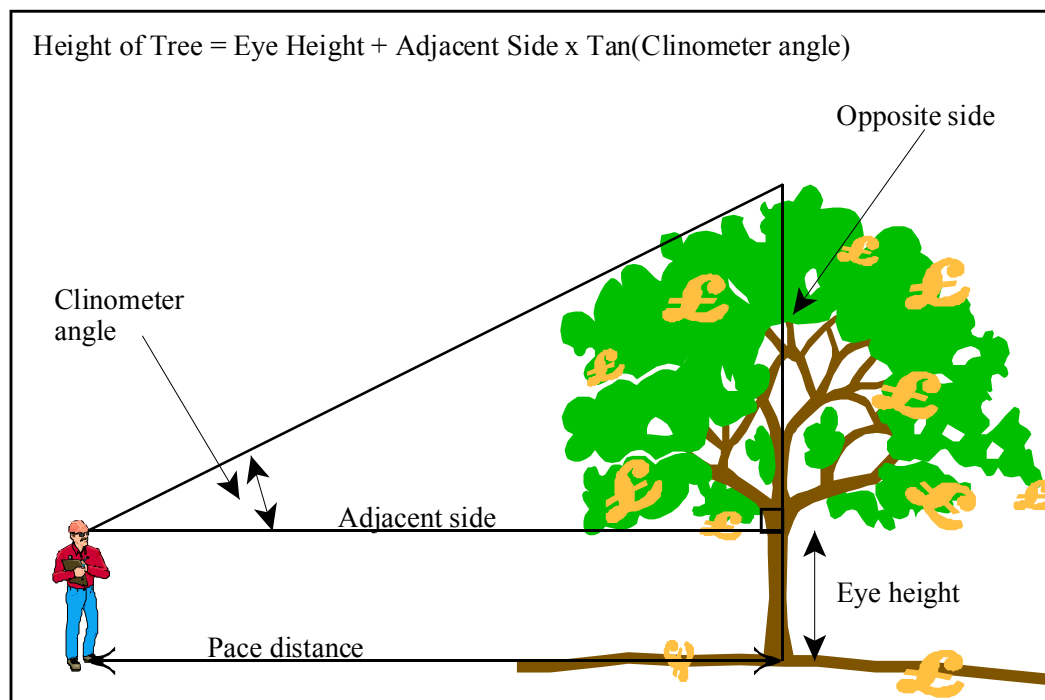


Figure 1: Geometry of a height measurement with the clinometer of a pocket transit.

All that is needed to calculate the height of an object is 1) the pace distance of the adjacent side of the right triangle, and 2) the clinometer angle as measured from the end of the adjacent side to the top of the target object. Hold the pocket transit body vertical and then sight the target through the peephole. Use the sighting arm and reference line on the mirror to align on the target. Adjust the clinometer while observing the level bubble in the mirror so that it is centered, and then read off the clinometer angle on the degree scale (the scale that has a range of 0-90). For maximum accuracy your pace distance should be approximately the same distance as the height of the target. Avoid very short pace distances for the adjacent side. To complete the height calculation you will need to measure your eye height with a tape measure. If necessary, convert your eye

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height to decimal feet before adding it to the opposite side height that will be in feet units.

Problem 1: Measure the height of the Life Sciences Building from the ground to the top of the building at all 4 corners. Remember to pace off the adjacent side directly away from the corner on relatively level ground. The pace distance should be approximately the same magnitude as the height of the building. Fill in the below information showing all calculation steps. Assume that all of the error is derived from the pace count distance (there should be very little error associated with a single clinometer measurement):

Name of Geologist: _____
 Pace count: _____ Pace count Standard % error: +/- _____ %
 Eye height: _____ inches _____ feet (decimal)

Northeast corner:

Pace distance (Adjacent Side): _____ paces x pace count (ft./pace) = _____ feet
 Clinometer angle: _____ degrees
 Height of corner = Eye height (feet) + adjacent side (feet) x Tan (clinometer angle deg.)
 Height of corner = _____ ft. + _____ ft. x Tan (_____) = _____ feet +/- _____

Southeast corner:

Pace distance (Adjacent Side): _____ paces x pace count (ft./pace) = _____ feet
 Clinometer angle: _____ degrees
 Height of corner = Eye height (feet) + adjacent side (feet) x Tan (clinometer angle deg.)
 Height of corner = _____ ft. + _____ ft. x Tan (_____) = _____ feet +/- _____

Southwest corner:

Pace distance (Adjacent Side): _____ paces x pace count (ft./pace) = _____ feet
 Clinometer angle: _____ degrees
 Height of corner = Eye height (feet) + adjacent side (feet) x Tan (clinometer angle deg.)
 Height of corner = _____ ft. + _____ ft. x Tan (_____) = _____ feet +/- _____

Northwest corner:

Pace distance (Adjacent Side): _____ paces x pace count (ft./pace) = _____ feet
 Clinometer angle: _____ degrees
 Height of corner = Eye height (feet) + adjacent side (feet) x Tan (clinometer angle deg.)
 Height of corner = _____ ft. + _____ ft. x Tan (_____) = _____ feet +/- _____

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Problem 2:

Measure the elevation difference between the northeast corner of the Life Sciences Building and the northwest corner of the Administration building. To do this you need to know your eye height, so make sure that is measured with a tape measure and converted to decimal feet. To make the measurement first set the clinometer angle on your pocket transit (Brunton) to "0". Holding the body of the compass vertical with your back against the corner of the building sight through the peep hole (aligning with the sighting arm) in the direction of the target. Adjust the vertical angle of the compass until you see the level bubble centered and move your partner to that point on the ground. The vertical elevation difference between where you are standing and the target you sighted is one eye height. Repeat this process as you work toward the target adding the number of eye heights. On your last shot you will have to subtract the number of inches shot above the corner of the building- measure this with a tape measure. Fill in the below information:

Name of Geologist: _____

Eye height: _____ inches _____ feet (decimal)

Number of Eye Height levels: _____

Last Shot Extra Height: _____ inches _____ feet

Elevation difference (inches) = No. of Eye Levels x Eye Height (inches) - Extra Height (inches)

Elevation difference (inches) = _____ x _____ (inches) - _____ (inches)

Elevation difference (feet) = Elevation difference (inches) x 1 foot/12 inches

Elevation difference (feet) = _____ inches x 1 foot/12 inches = _____ feet