

Applied Geomorphology

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

Introduction

The pocket transit (i.e. Brunton Compass, Silva Ranger, etc.) contains a clinometer for measuring vertical angles to a precision of +/- one degree (better if using a tripod: see **Figure 2**). This capability may be used to calculate elevation changes with a few simple trig calculations. Consider **Figure 1** below:

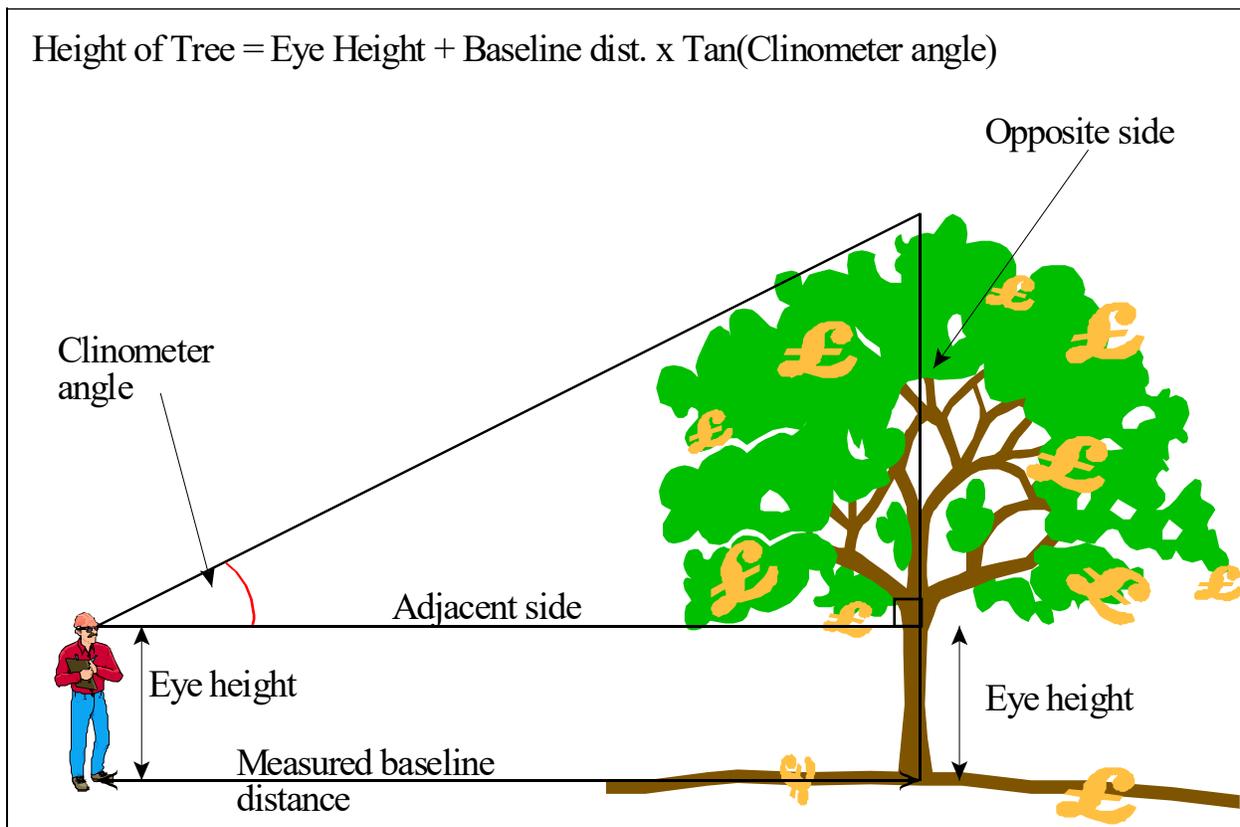


Figure 1: Geometry of a height measurement with a hand-held pocket transit.

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All that is needed to calculate the height of an object is 1) the baseline distance (adjacent side of the right triangle), 2) the clinometer angle as measured from the end of the adjacent side to the top of the target object, and 3) the eye height or instrument height of the clinometer. 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 (i.e. the scale that has a range of 0-90). For maximum accuracy your pace distance should be 1.5 to 2.5 times the estimated height of the target. Avoid very short or very long measured distances for the baseline (adjacent side). To complete the height calculation you will need to measure your eye height with a tape measure. If necessary, convert your eye height to decimal feet before using it in the following calculations. For example, if you measure your eye height at 5 feet 6 inches the decimal foot equivalent is 5.0 feet + 6 inches*(1 foot/12 inches) = 5.5 feet

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 measure the baseline distance (adjacent side) directly away from the corner on relatively level ground with a tape measure to the nearest 0.1 foot. The baseline distance should be approximately 1.5 to 2.5 times the height of the building. Fill in the below information showing all calculation steps. If you use a tripod to stabilize the pocket transit make sure the “eye height” is measured from the center of the clinometer down to the ground.

Name of Geologist: _____

Eye height: _____ feet (decimal)

Northeast corner:

Baseline distance: _____ feet

Clinometer angle: _____ degrees

Height of corner = Eye height (feet) + (baseline (feet) x Tan (clinometer angle deg.))

Height of corner = _____ ft. + (_____ ft. x Tan (_____)) = _____ feet

Southeast corner:

Baseline distance: _____ feet

Clinometer angle: _____ degrees

Height of corner = Eye height (feet) + (baseline (feet) x Tan (clinometer angle deg.))

Height of corner = _____ ft. + (_____ ft. x Tan (_____)) = _____ feet

Southwest corner:

Baseline distance: _____ feet

Clinometer angle: _____ degrees

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Height of corner = Eye height (feet) + (baseline (feet) x Tan (clinometer angle deg.))

Height of corner = _____ ft. + (_____ ft. x Tan (_____)) = _____ feet

Northwest corner:

Baseline distance: _____ feet

Clinometer angle: _____ degrees

Height of corner = Eye height (feet) + (baseline (feet) x Tan (clinometer angle deg.))

Height of corner = _____ ft. + (_____ ft. x Tan (_____)) = _____ feet

Problem 2:

Measure the elevation difference between the northeast corner of the Life Sciences Building and the northwest corner of the old 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 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. Mark the position with a flag. 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 extra height shot above the corner of the building- measure this with a tape measure. Note that you can take any convenient path that you like to move from the start to finishing point. Fill in the below information:

Name of Geologist: _____

Eye height: _____ feet (decimal)

Number of Eye Height levels: _____

Last Shot Extra Height: _____ feet (decimal)

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

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

Elevation difference (ft) = _____

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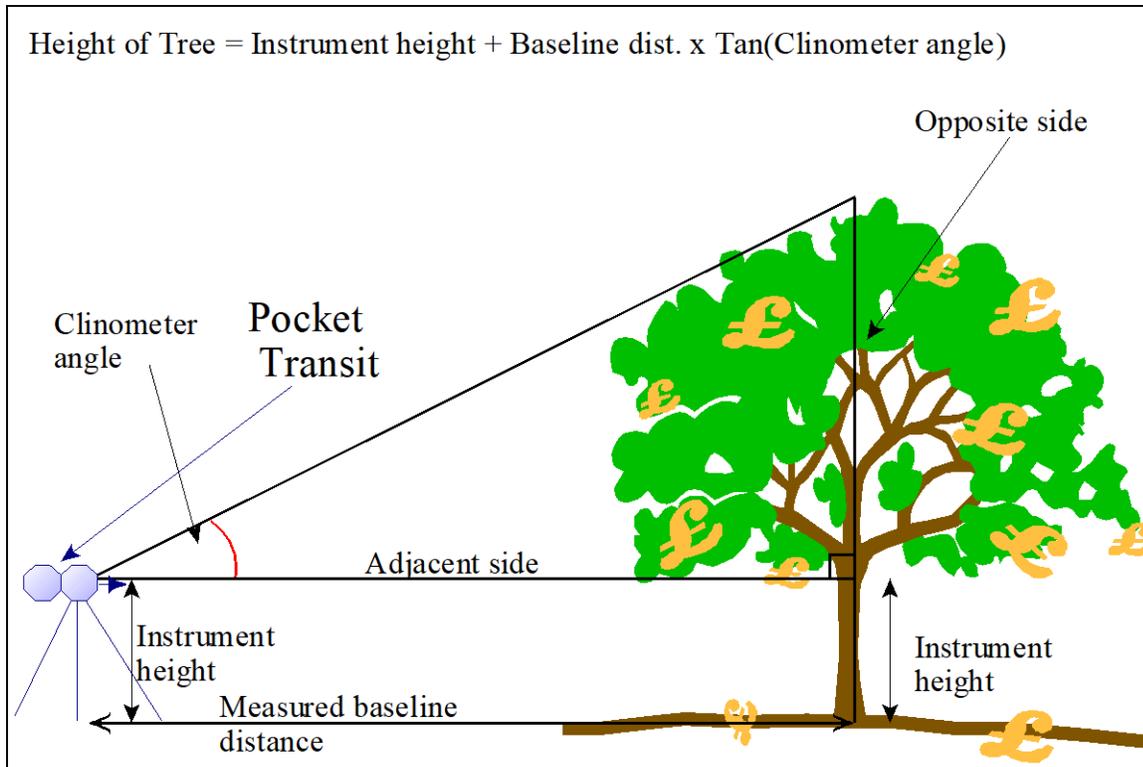


Figure 2: Geometry of height measurement with pocket transit mounted on a tripod.