APPENDIX C
UNATTENDED PHOTOGRAPHY

STEP 1: Specify the observing conditions; in this example, we will be using a location in southwest Denton, Texas:

Latitude: 33°09' N ; Longitude: 97° 07' W
Local Noon, based on Longitude, calculates as 12:28:30pm
(Add 1 hour if Daylight Savings Time is in effect)

The Observer desires to follow the shadow from the corner of a gutter. Returning to the Observing Site at Local Noon during the year is impractical for the Observer, so the Observer opts to photograph the area using a time-lapse camera, and make measurements off the images.

STEP 2: Determine the optical characteristics of the camera. Optical systems will introduce curvilinear perspective into images, which will distort the measurements; as wide-angle systems are particularly prone to this, they should not be used.

2.1 Generate a test grid consisting of a grid of straight lines at 1-inch spacing.
2.2 Place the test grid on a flat surface (may be horizontal or vertical).
2.3 Position the camera a measured distance perpendicular to the center of the test grid.
2.4 Photograph the test grid.
2.5 Examine the lines in the image for straightness and consistency of spacing.

STEP 3: Specify the suitability of the area. Participants should recognize the purpose of "starting with the answer" is *solely* to assure that the analemma will fit in the area; once the analemma is complete, the analysis of the analemma is to be completed with reference *only* to the analemma and measured dimensions of the observing apparatus.

3.1 Specify a coordinate system.
3.2 Specify the point directly below the tip of the gnomon (here, it is the point directly below the corner of the gutter); it will be referred to as P(0,0,-h).
3.3 Calculate the expected solar altitudes at both the Summer and Winter Solstices.
3.4 Specify the expected locations of both the Summer and Winter Solstices.
3.5 Install the camera in its observing position, and confirm the two Solstice points are within the Field of View. Observers should not attempt to use camera angles less than 60° (here, "camera angle" refers to the angle downward from horizontal that the camera is pointing.) … 0° denotes pointing horizontally, and 90° denotes pointing vertically downward.

STEP 4: Specify the measurement technique. Observers will find it least complicated to use one of the following methods:

- A measurement grid: here, a measured grid is photographed when the analemma is photographed; the spacings of the grid must be small enough so the measurement may be made by interpolation between grid lines without introducing significant error.

- A template: here, a grid with measured spacings is laid out in the Field of View and photographed; the grid lines are then converted to an overlay (may be virtual). After the analemma is photographed, the grid is superimposed on the analemma image and measurements are made. As above, the spacings of the grid must be small enough so the measurement may be made by interpolation between grid lines without introducing significant error.

  It should be noted that if the camera is moved, then a new template for the camera in its new position will have to be generated.

The four Activities of the Observing Program may now be started in their prescribed order using these calculated Local Noon readings.

Additional Links

Printable Version of this page
Return to Introduction page
Appendix A – Construction of an Enclosure
Appendix B – Overview of Non-Local Noon Observing
Appendix D – * * * Reserved for Future Use * * *
Appendix E – * * * Reserved for Future Use * * *
Appendix F – Activity #1 (Tilt of Earth's Axis and Observer's Latitude)
Appendix G – Activity #2 (Path of the Sun in the Sky)
Appendix H – Activity #3 (Equation of Time)
Appendix I – Activity #4 (Eccentricity of Orbit)