

Drift Timing

ANGULAR MEASUREMENTS FROM DRAWINGS

Introduction

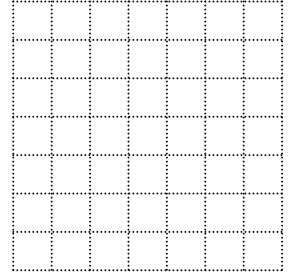
As mentioned on page **Error! Bookmark not defined.**, one method of measuring angles using a telescope is via the drift timing method. However, that method will not always be appropriate. (Can you think of when?) Usually, astronomers measure angles using photographs, digital images, or (less than a century ago) hand-made drawings. The angular measurement technique is the same no matter what kind of image you have to measure (digital, photograph, or hand drawn). The idea is to create a scale, like those you see on maps.

Method – a direct analogy

Before introducing the technique as applied in astronomy, let's recall how you measure distances on maps. If the grid to the right were a street map, you would want to know something about the size of the boxes. On maps, typically this is done by drawing a scale, such as this one: _____

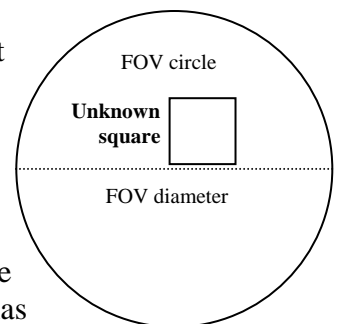
400 ft

That solid horizontal line tells you that any line segment on the map that is the same length (0.35 inches) corresponds to a distance of 400 ft. Since 4 of the solid lines can fit across the grid above (which is 1.4 inches across), you know that from one side of the grid to the other corresponds to $4 \times 400 \text{ ft} = 1600 \text{ ft}$. Another way to think about this: the 400 ft line is 0.35 inches. So 1 inch would be $400 \text{ ft} / 0.35 = 1143 \text{ ft}$. Hence, 1.4 inches is $1.4 * 1143 \text{ ft} = 1600 \text{ ft}$.



Astronomical method

In a scaled drawing, like those you will be doing in class, we need to create a drawing scale, like the 400 ft line in the example above. Usually, this reference line will be the diameter of the field of view of the eyepiece. In the circle to the right, you know the circle corresponds to the entire field of view. (The size of your FOV will be measured in a lab.) Let's assume the **FOV is 1800 arcseconds**. The circle's **diameter is 1.65 inches** across (check that with your ruler) and you know that the diameter line corresponds to 1800". **Your image scale would be: 1800 arcsecs per 1.65 inches.** (Notice that I'm not using quotes for either arcseconds or inches, to avoid confusion.) Another way to say this: **1 inch = 1800arcsec/1.65 = 1091 arcsec** in this drawing, and this drawing only!



Example calculation: If you were to be asked how many arcseconds fit along one side of the "unknown square" in the circle above, you would measure the length of the square using a ruler, and convert using the scale. My measurements indicate the square's side has a length of 0.34 inches. Using the scale computed above, the length (size) of the square is $0.34 \text{ inches} * 1091 \text{ arcsec per inch} = 371 \text{ arcsec}$. According to the measurements and the drawing, that square's side is 371 arcsecs long.

You will be making several measurements like this, where you use the FOV as a scale, and will make angular measurements directly from your drawings. If you need help understanding this method, don't hesitate to ask for it.