



The parallax method is a technique used to measure large distances, particularly in astronomy, by observing the apparent shift of an object against a distant background from two different points of view. This method relies on the principle of parallax, which is the apparent displacement of an object when viewed from two different lines of sight.

## Steps to Measure Distance Using the Parallax Method:

### 1. Choose a Baseline:

- Select two observation points that are a known distance apart. This distance is called the baseline. For astronomical measurements, the baseline is typically the diameter of the Earth's orbit around the Sun, known as the astronomical unit (AU).

### 2. Measure Angles:

- Observe the object from both points and measure the angles between the object and a fixed background. The angle difference between the two observations is called the parallax angle ( $\theta$ ).

### 3. Calculate Distance:

- Use the formula:

$$d = \frac{B}{\tan(\theta)}$$

where  $d$  is the distance to the object,  $B$  is the baseline, and  $\theta$  is the parallax angle.

## Example: Measuring the Distance to a Star

Let's say we want to measure the distance to a star using the Earth's orbit as the baseline.

### 1. Baseline (B):

- The baseline is the distance from the Earth to the Sun, which is approximately 1 astronomical unit (AU), or about 149.6 million kilometers.

### 2. Parallax Angle ( $\theta$ ):

- Assume we measure the parallax angle to be 0.5 arcseconds (an arcsecond is 1/3600th of a degree).

### 3. Distance Calculation:

- Convert the parallax angle to radians:

$$\theta = 0.5 \text{ arcseconds} \times \frac{\pi}{180 \times 3600} \text{ radians} \approx 2.42 \times 10^{-6} \text{ radians}$$

- Use the parallax formula:

$$d = \frac{1 \text{ AU}}{\tan(2.42 \times 10^{-6})} \approx \frac{1 \text{ AU}}{2.42 \times 10^{-6}} \approx 4.13 \times 10^5 \text{ AU}$$

- Therefore, the distance to the star is approximately 413,000 AU.

This method is widely used in astronomy to measure the distances to nearby stars and other celestial objects. The precision of the parallax method depends on the accuracy of the angle measurements and the baseline length. For very distant objects, the parallax angle becomes very small and difficult to measure accurately, so other methods, such as standard candles or redshift measurements, are used.