3.9: The Telescope

A telescope enlarges the retinal image of a distant object. Like a compound microscope, it is also composed of an objective and an eyepiece as seen in Figure 3.9.1. The object in this figure is at a large but finite distance; therefore, an image is formed by the objective just after its second focal point. The eyepiece makes a virtual magnified image, to be viewed with a relaxed eye. Therefore, the intermediary image of the objective must be within the focal length f_i^e from the eyepiece. The final image is inverted.

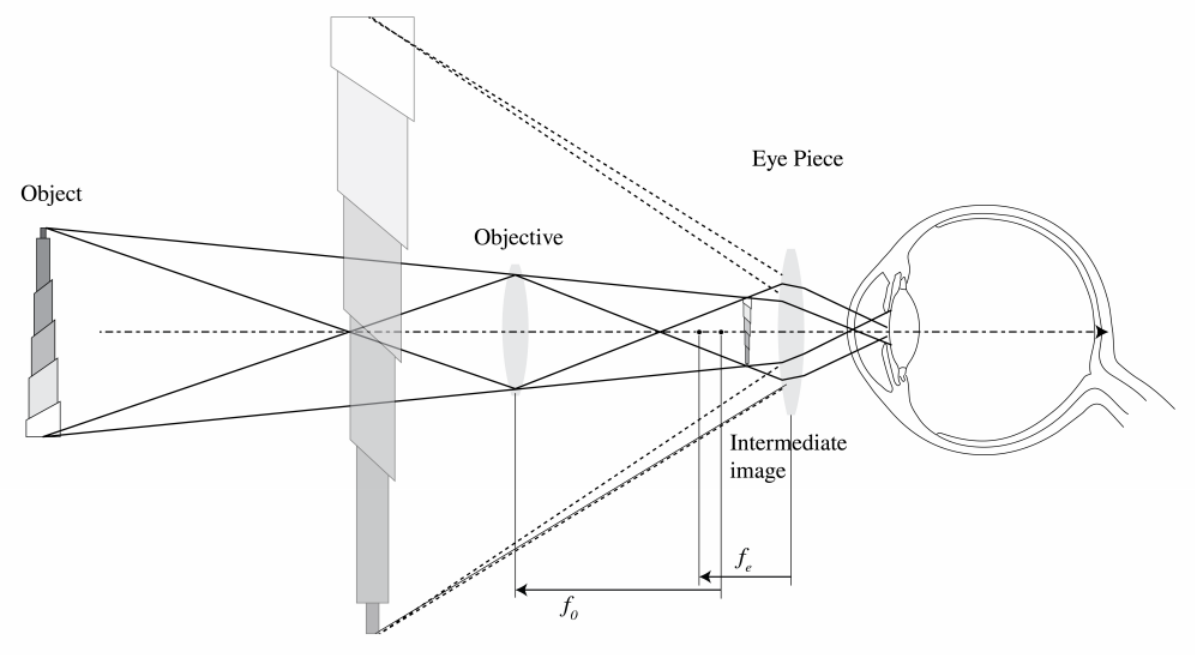

Figure 3.9.1: Keplerian astronomical telescope.

As seen earlier, the angular magnification is: $\mathrm{MP} = \alpha_a / \alpha_u$ where α_u is the half angle of the cone of light that would be collected without telescope and α_a is the half angle of the apparent cone of rays coming from the virtual image of the eye piece. From triangles $F_o^{obj} BC$ and $F_i^e DE$ in Figure 3.9.1 we see that

$$\mathrm{MP} = -\frac{f_i^{obj}|}{f_i^e}$$

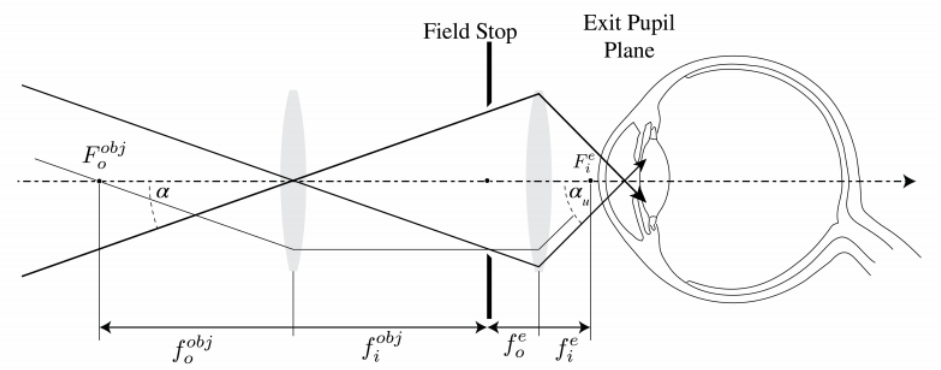

Figure 3.9.2: Ray angles for a telescope