Resolution of human eye

Angular resolution which is also called as spatial resolution, describes the ability of any device that form as image such as the eye and telescopes, to distinguish small details of an object. The eye which is an organ acts as an instrument in the human optical system.

The Angular Resolution of Human Eye

The angular resolution or spatial resolution of an optical system can be estimated by Rayleigh's Criterion.
When two point sources are resolved from each other, they are separated by at least the radius of the airy disk. When Θ = 1.22 (λ/D) rad , where Θ is the angular resolution, λ is the wavelength of light and D is the diameter of the eye. Remember that 360 degrees = 2π radians.

The eye pupil diameter changes during day and night, whereas the day the pupil size is between 3 mm to 4 mm and at night it is from 5 mm to 9 mm. In addition, the optimal sensitivity of the human eye is approximately 0.55 μm (V-band). So according to Rayleigh's Criterion, we can calculate the spatial resolution of human eye. Lets say that at day time the pupil size is 3 mm and the optimal sensitivity is 0.55 μm, we can apply the rule.

Θ = 1.22(λ/D)rad
=1.22(0.55 μm/3 mm)rad(180 deg/π rad)(1 mm/10^3 μm)
= 0.0128 deg(3600"/1 deg)
= 50" (day)

Moreover, at night the pupil diameter increases to 9 mm to increase the observation, we can do the same calculation to find the angular resolution of the eye at night.

In the other hand, we have the Refracting telescope which is used for observing the solar system has a higher spatial resolution. Refracting telescope has a 40 inch diameter lens which is the largest one and a normal one has a 60 mm diameter lens.So it has best image quality with higher angular resolution.

Links

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Bibliography

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