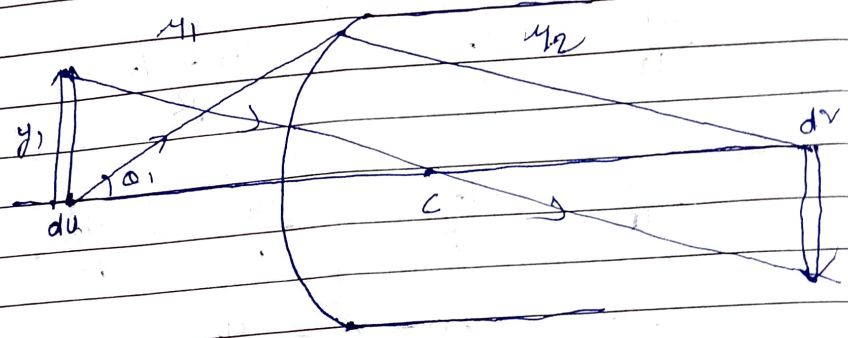
AXIAL OR LONGITUDINAL MAGNIFICATION

In general objects are not linear but distributed or Extended. Therefore in addition to lateral magnification longitudinal magnification also occurs.



$$\therefore L = \frac{dv}{du} = \frac{\text{Length of image along axis}}{\text{Length of object along axis}}$$

It is defined as the ratio of length of image along axis to length of object along axis.

From Refraction formula

$$\frac{\mu_1}{u} - \frac{\mu_2}{v} = \frac{\mu_1 - \mu_2}{R}$$

$$\mu_1 \left(\frac{-1}{u_2}\right) - \mu_2 \left(\frac{-1}{v^2}\right)\left(\frac{dv}{du}\right) = 0$$

$$-\frac{\mu_1}{u^2} + \frac{\mu_2}{v^2}\frac{dv}{du} = 0$$

$$\frac{m_2}{v^2}\frac{dv}{du} = \frac{m_1}{u^2}$$

$$\frac{dv}{du} = \frac{m_1}{m_2}\frac{v^2}{u^2}$$

$$\frac{dv}{du} = \frac{m_1^2}{m_2^2}\frac{v^2}{u^2} \times \frac{m_2}{m_1}$$

$$\frac{dv}{du} = m^2\frac{m_2}{m_1} \quad \left(\because m_1 = \frac{m_1}{m_2}\frac{v}{u}\right.$$

$$\boxed{L = m^2\frac{m_2}{m_1}}$$

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