Azimuth error as a function of the sun's elevation

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Let θ be the sun's elevation angle, R some arbitrary distance from the beetle to the sun, and ϵ the intrinsic angular error of the beetle when it estimates the azimuth of the sun.

$$\begin{aligned} r &= \frac{ab}{\sqrt{(b\cos\gamma)^2 + (a\sin\gamma)^2}} \\ a &= R\cos\theta \\ b &= R \\ h &= R\sin\frac{\epsilon}{2} \\ \sin\gamma &= \frac{h}{r} \end{aligned} \tag{1}$$

We can drive (2) from (1) and calculate the actual angular error of the beetle as a function of the sun's elevation.

$$\gamma = \arctan\frac{\tan\frac{\epsilon}{2}}{\cos\theta} \tag{2}$$

The following shows how these quantities relate to each other.