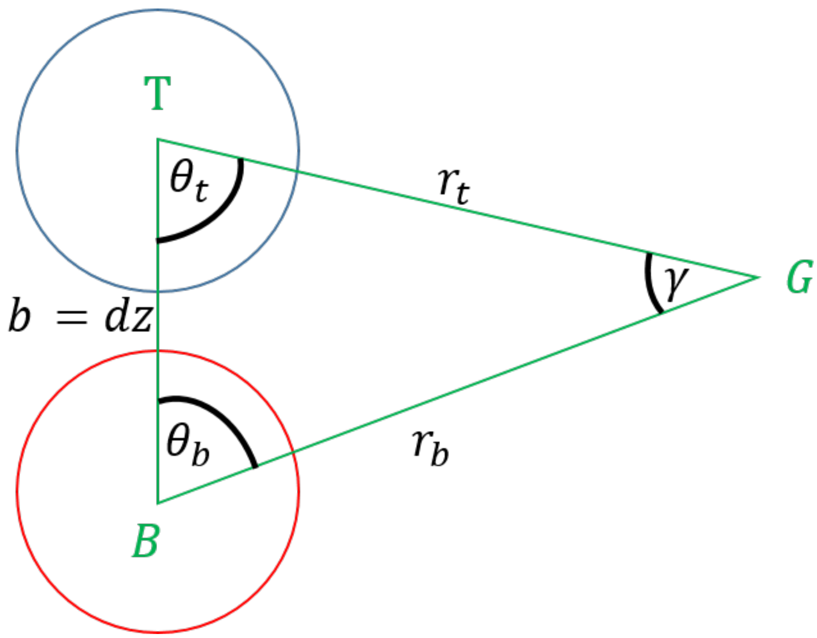
Law of Sines $\Longleftrightarrow$ Vertical Disparity




For two vertically displaced spherical cameras imaging the same point, a triangle is formed through the spheres centers and the imaged point $\triangle TB\Gamma$

*Proof.* The law of sines gives:

$$\frac{b}{\sin(\gamma)} = \frac{r_b}{\sin(\theta_t)} = \frac{r_t}{\sin(\theta_b)} \tag{1}$$

Taking the first part of these equalities:

$$r_b = b\frac{\sin(\theta_t)}{\sin(\gamma)} \tag{2}$$

But we need a formulation w.r.t a single one of the spherical imagers, and thus:

$$
\begin{aligned}
r_b &= b\frac{\sin(\pi - \theta_t)}{sin(\gamma)} && (3)\\
&= b\frac{\sin(\theta_b + \gamma)}{\sin(\gamma)} && (4)\\
&= b\frac{\sin(\theta_b)\cos(\gamma) + \sin(\gamma)\cos(\theta_b)}{\sin(\gamma)} && (5)\\
&= b\big(\frac{\sin(\theta_b)}{\tan(\gamma)} + \cos(\theta_b)\big) && (6)\\
&= dz\big(\frac{\sin(\theta_b)}{\tan(\gamma)} + \cos(\theta_b)\big) && (7)
\end{aligned}
$$

$\square$