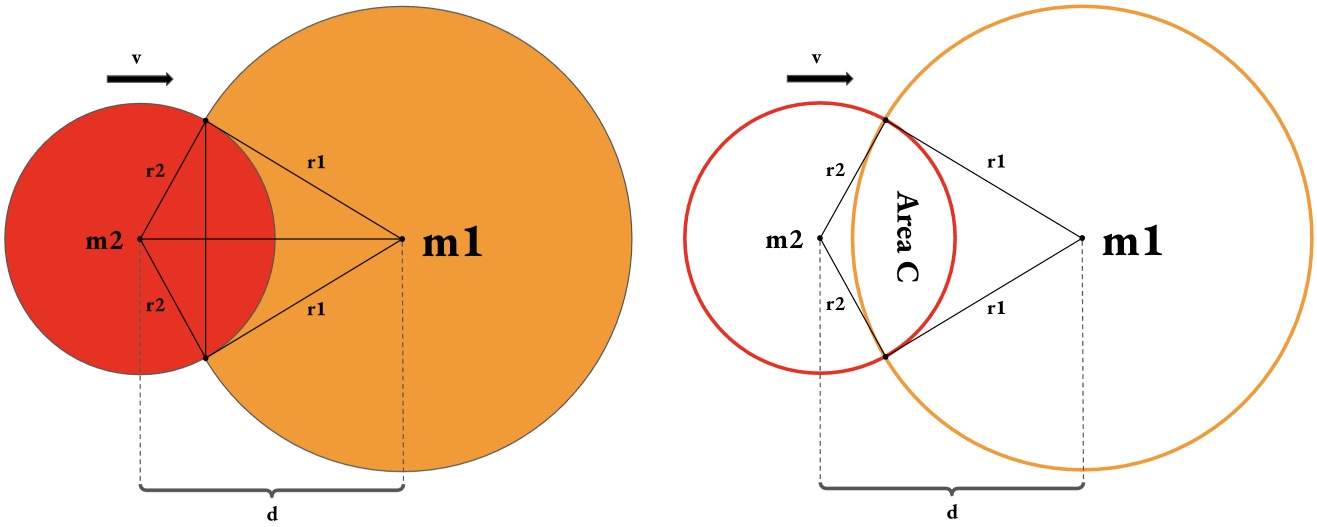
Major Assumptions:

- Uniform Luminosity Distribution (No limb darkening, luminosity/projected area = const)
- Circular Orbit (e = 0)
- Orbital Inclination is 90 deg
- Transit Velocity $v = \sqrt{\frac{G(m_1+m_2)}{a}}$ (or tangential velocity) is constant
- Distance to System >> Orbital Radii
- Celestial bodies m1 and m2 is perfectly spherical with projected areas being perfect circles



DESMOS SIMULATOR

Measure	Unit
Mass / $M_\odot$	$M_\odot$
Radius / $R_\odot$	$R_\odot$
Luminosity / $L_\odot$	$L_\odot$
Period / Days	Days
Projected Area / $R_\odot^{\ 2}$	$R_\odot^{\ 2}$
v	$R_\odot s^{-1}$

The area bounded by a circle-circle intersection is:

$$A = r_1^2 \arccos\left(\frac{d^2+r_1^2-r_2^2}{2dr_1}\right) + r_2^2 \arccos\left(\frac{d^2+r_2^2-r_1^2}{2dr_2}\right) - \frac{1}{2}\sqrt{(-d+r_2+r_1)(d+r_2-r_1)(d-r_2+r_1)(d+r_2+r_1)}$$

$$A_C = r_1^2 \arccos\left(\frac{d^2+r_1^2-r_2^2}{2dr_1}\right) + r_2^2 \arccos\left(\frac{d^2+r_2^2-r_1^2}{2dr_2}\right) - \frac{1}{2}\sqrt{\left(d^2-(r_2-r_1)^2\right)\left((r_1+r_2)^2-d^2\right)}$$

Relative velocity between m_1 and m_2 is $v = \sqrt{\frac{G(m_1+m_2)}{a}}$, assuming a completely circular orbit (e = 0)

$d(t) = (r_1 + r_2) - vt$, where eclipse begins at t = 0

$$L_{Eclipse} = \frac{A_{Projected2}}{A_2}L_2 + \frac{A_{Projected1}}{A_1}L_1 \Rightarrow L_2 + \frac{\pi r_1^2 - A_C(t)}{\pi r_1^2}L_1$$

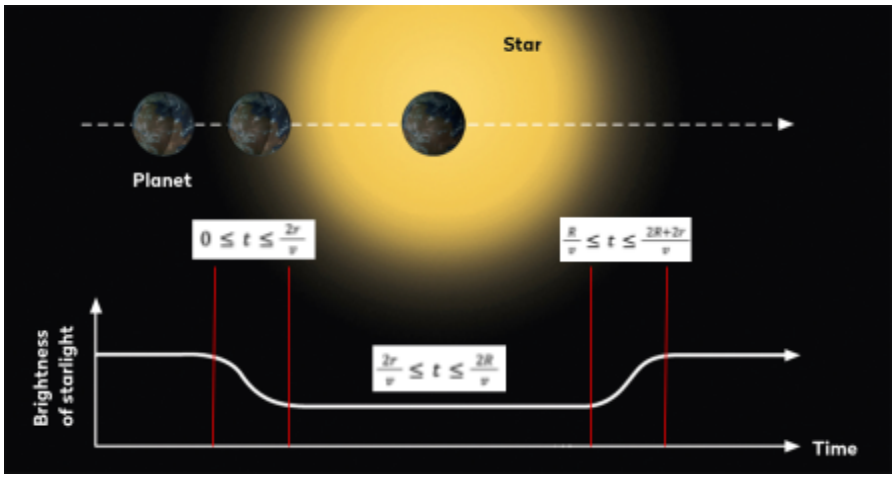
$$A_C(t) = r_1^2 \arccos\left(\frac{d(t)^2+r_1^2-r_2^2}{2d(t)r_1}\right) + r_2^2 \arccos\left(\frac{d(t)^2+r_2^2-r_1^2}{2d(t)r_2}\right) - \frac{1}{2}\sqrt{\left(d(t)^2-(r_2-r_1)^2\right)\left((r_1+r_2)^2-d(t)^2\right)}$$

For m_2 eclipsing m_1

$$L_{Eclipse1}(t) = L_2 + \left(1 - \frac{A_C(t)}{\pi r_1^2}\right)L_1, \qquad 0 \le t \le \frac{2r_2}{v}$$

$$L_{Eclipse2}(t) = \left(1 - \frac{r^2}{R^2}\right)L_1 + L_2, \qquad \frac{2r_2}{v} \le t \le \frac{2r_1}{v}$$

$$L_{Eclipse3}(t) = L_{Eclipse1}\left(\frac{2r_1+2r_2}{v} - t\right), \qquad \frac{2r_1}{v} \le t \le \frac{2r_1+2r_2}{v}$$



Limitations:

- Works for $r_1 \approx r_2$, but fails at minimum period/separation