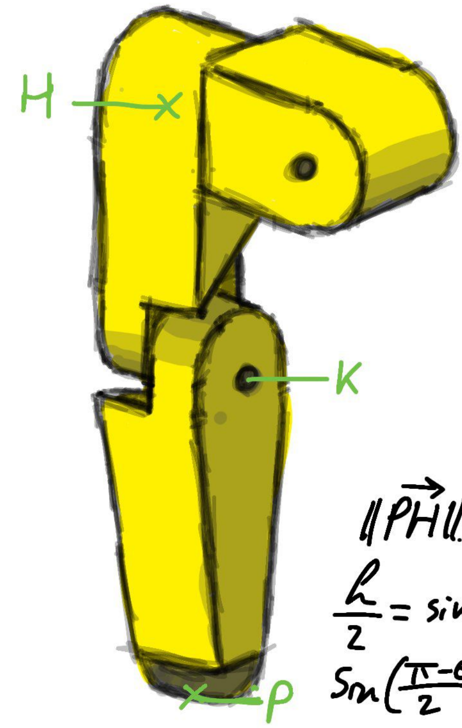
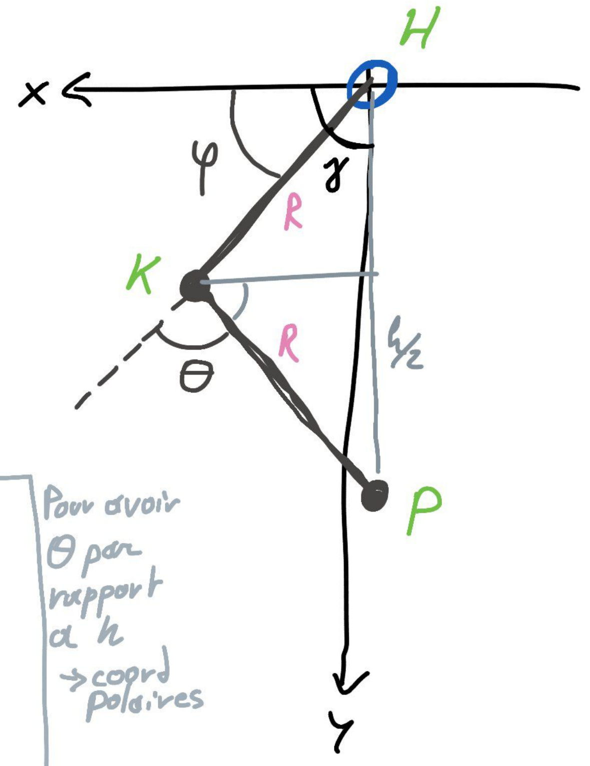




$\|\overrightarrow{PH}\| = h$

$\frac{h}{2} = \sin\left(\frac{\pi-\theta}{2}\right)R$

$\sin\left(\frac{\pi-\theta}{2}\right) = \frac{h}{2R}$

$\frac{\pi-\theta}{2} = A\sin\left(\frac{h}{2R}\right)$

$\theta = -2A\sin\left(\frac{h}{2R}\right) + \pi$

$= -2A\sin(h/2R) + 180$

Pour avoir θ par rapport à h → coord polaires

$\gamma = \pi - \left(\frac{\pi-\theta}{2}\right) + \varphi = \varphi + \frac{\pi}{2} + \frac{\theta}{2}$

pour coordonée polaires

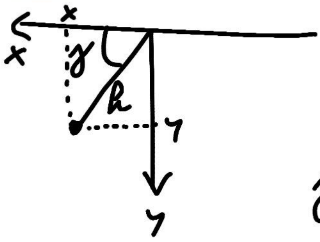
$\varphi = \gamma - \frac{\pi}{2} + \frac{\theta}{2}$

$P(x,y)$ $x = h \cdot \cos(\gamma)$ $y = h\sin(\gamma)$

$x = 2\sin\left(\frac{\pi-\theta}{2}\right)R\cos\left(\varphi+\frac{\pi}{2}+\frac{\theta}{2}\right) = 2\sin\left(\frac{\pi}{2}-\frac{\theta}{2}\right)R\sin\left(\varphi+\frac{\theta}{2}\right) = -2R\cos\left(-\frac{\theta}{2}\right)\sin\left(\varphi+\frac{\theta}{2}\right)$

$y = 2\sin\left(\frac{\pi-\theta}{2}\right)R\sin\left(\varphi+\frac{\pi}{2}+\frac{\theta}{2}\right) = -2R\cos\left(-\frac{\theta}{2}\right)\cos\left(\varphi+\frac{\theta}{2}\right)$

X and Y Knowing θ and φ



we look for $h(x,y)$ and $\gamma(x,y)$

$h = \sqrt{x^2+y^2} \longrightarrow \theta = -2A\sin\left(\frac{\sqrt{x^2+y^2}}{2R}\right)$ good!

$\gamma = A\tan\left(\frac{y}{x}\right) \rightarrow \varphi = A\tan\left(\frac{y}{x}\right) - \frac{\pi}{2} + \frac{\theta}{2}$ ← not so good but

$\varphi = A\tan\left(\frac{y}{x}\right) - \frac{\pi}{2} - A\sin\left(\frac{\sqrt{x^2+y^2}}{2R}\right)$ good!

we've got $\varphi(x,y)$ and $\theta(x,y)$

⚠ special points

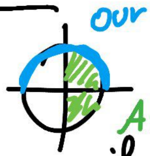
if $\left|\frac{\sqrt{x^2+y^2}}{2R}\right| > 1$, then Asin won't work! $\sqrt{x^2+y^2}$ will always be positive

So $\frac{\sqrt{x^2+y^2}}{2R} > 1$ means that $\|\overrightarrow{HP}\| > 2R$ → we will implement that in the code

if $x=0$, $A\tan\left(\frac{y}{x}\right)$ won't work. but we know that if $x=0$ then θ must be 180 or π.

⚠ for

our space



Asin returns

if $\frac{x}{y} < 0$ → return Asin + π

what about φ? it can be anything it wants but we don't want it to hit the floor: