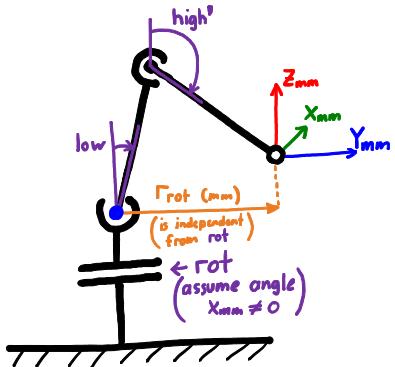


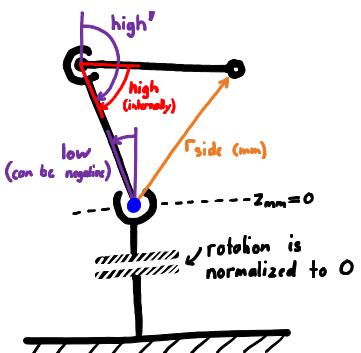
Robot Geometry

Florin Tabler 2016
See file "RobotGeometry.cpp"

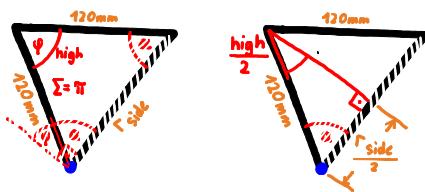
3-Dimensional Cartesian System



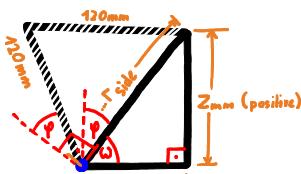
2-Dimensional Side View



Geometry for high



Geometry for low



$$r_{\text{rot}} = \sqrt{X_{\text{mm}}^2 + Y_{\text{mm}}^2}$$

$$r_{\text{side}} = \sqrt{r_{\text{rot}}^2 + Z_{\text{mm}}^2}$$

$$\text{rot} = \sin^{-1}\left(\frac{X_{\text{mm}}}{r_{\text{rot}}}\right)$$

$$\text{high} = 2 \cdot \sin^{-1}\left(\frac{r_{\text{side}}}{2 \cdot 120\text{mm}}\right) \cdot \frac{1}{2} + \frac{\pi}{4}$$

$$\text{low} = \begin{cases} \frac{\pi}{4} + \omega + \varphi & (Z_{\text{mm}} > 0) \\ \frac{\pi}{4} - \omega + \varphi & (Z_{\text{mm}} < 0) \end{cases}$$

$$\text{high}'' = \text{high} + \text{low}$$

\cos^{-1} if $\cos^{-1}(\cdot)$ in formula

$$\omega = \cos^{-1}\left(\frac{r_{\text{rot}}}{r_{\text{side}}}\right)$$

$$\varphi = \alpha - \frac{\pi}{2}$$

$$\alpha = \frac{\pi - \text{high}}{2}$$

* Please Note that these factors do depend on the Motors rotational direction they are inverted in the software

** Please Note that these offsets can be left out.

Due to a mistake \cos^{-1} and \sin^{-1} where swapped in previous versions. No one did notice this, because all angles are relative and Motor directions can be re-wired. Thanks AaronHuang for the hint.