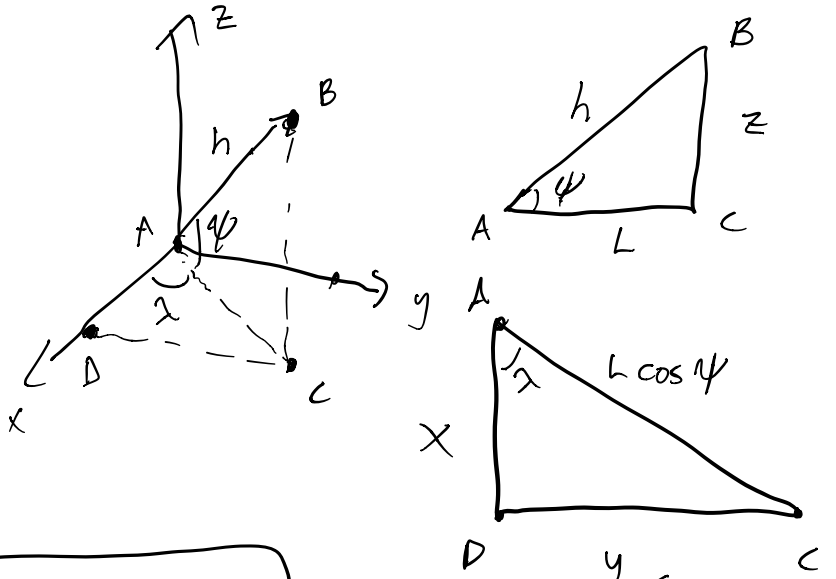


$$h = \sqrt{x^2+y^2+z^2}$$

$$\lambda = \tan^{-1}\left(\frac{y}{x}\right) \qquad EW = Sgn(\lambda)$$

$$\psi = \sin^{-1}\left(\frac{z}{\sqrt{x^2+y^2+z^2}}\right) \qquad NS = Sgn(\psi)$$

$$Sgn(x) = \begin{cases} -1 & \text{if } x<0 \\ 0 & \text{if } x=0 \\ 1 & \text{if } x>0 \end{cases}$$

$$x = h\cos\psi\cos\lambda$$
$$y = h\sin\lambda\cos\psi$$
$$z = h\sin\psi$$

$t_r, \psi_d, \psi_m, \psi_s, NS, \lambda_d, \lambda_m, \lambda_s, EW, h$

degrees to radians

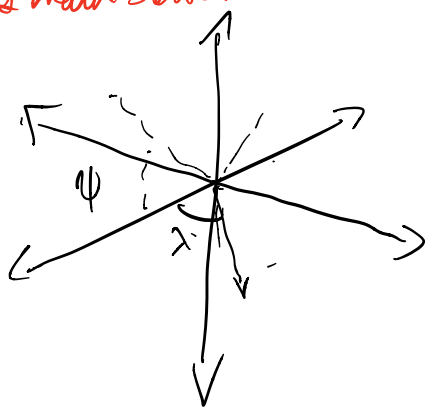
$$\psi = NS\,\pi\left(\frac{\psi_d}{180} + \frac{\psi_m}{10800} + \frac{\psi_s}{648000}\right) \qquad \psi \in \left[0, \frac{\pi}{2}\right]$$

$$\lambda = EW\,\pi\left(\frac{\lambda_d}{180} + \frac{\lambda_m}{10800} + \frac{\lambda_s}{648000}\right) \qquad \lambda \in [0, \pi]$$

$$x = h\cos\left[NS*\pi\left(\frac{\psi_d}{180}+\frac{\psi_m}{10800}+\frac{\psi_s}{648000}\right)\right]\cos\left[EW*\pi\left(\frac{\lambda_d}{180}+\frac{\lambda_m}{10800}+\frac{\lambda_s}{648000}\right)\right]$$

* Write $\psi(t)$ and $\lambda(t)$? $\psi_d(t_r) = \psi_d(t)$, $\lambda_d(t_r) = \lambda_d(t)$

* need to access math Server



$\psi \in [0, \frac{\pi}{2}]$ $\quad NS = \{+1, -1$

$\lambda \in [0, \hat{a}]$ $\quad EW = \{+1, -1$