$\dot{X} \quad \dot{Y} \quad \dot{Z}$

$X, Y, Z, \dot{X}, \dot{Y}, \dot{Z}$

$\dot{\rho}, \dot{\theta}, \dot{\varphi},$

$$\begin{cases} X = \rho \cos\varphi \cos\theta \\ Y = \rho \cos\varphi \sin\theta \\ Z = \rho \sin\varphi \end{cases}$$

$$\begin{cases} \rho = \sqrt{X^2 + Y^2 + Z^2} \\ \theta = \arcsin \frac{Y}{X} \\ \varphi = \arctan \frac{Z}{\sqrt{X^2+Y^2+Z^2}} \end{cases}$$

$$\begin{cases} \rho \in [0, +\infty[\\ \theta \in [0, 2\pi[\\ \varphi \in [-\frac{\pi}{2}, \frac{\pi}{2}[\end{cases}$$

$$\begin{cases} \dot{X} = \cos\varphi\cos\theta\dot{\rho} + \rho\cos\varphi\sin\theta\dot{\theta} + \rho\sin\varphi\cos\theta\dot{\varphi} \\ \dot{Y} = \cos\varphi\sin\theta\dot{\rho} - \rho\cos\varphi\cos\theta\dot{\theta} + \rho\sin\varphi\sin\theta\dot{\varphi} \\ \dot{Z} = \sin\varphi\dot{\rho} - \rho\cos\varphi\dot{\varphi} \end{cases} \Longrightarrow \begin{cases} \dot{X} = \frac{X}{\rho}\dot{\rho} + Y\dot{\theta} + Z\cos\theta\dot{\varphi} \\ \dot{Y} = \frac{Y}{\rho}\dot{\rho} - X\dot{\theta} + Z\sin\theta\dot{\varphi} \\ \dot{Z} = \frac{Z}{\rho}\dot{\rho} - \rho\cos\varphi\dot{\varphi} \end{cases}$$

$\rho = \sqrt{X^2 + Y^2 + Z^2}$

$X^2 + Y^2 = \rho^2 cos^2\varphi \Rightarrow \rho\cos\varphi = \sqrt{X^2 + Y^2}$

$cos\theta = \frac{X}{\rho\cos\varphi} \Rightarrow cos\theta = \frac{X}{\sqrt{X^2+Y^2}}$

$sin\theta = \frac{Y}{\rho\cos\varphi} \Rightarrow sin\theta = \frac{Y}{\sqrt{X^2+Y^2}}$

$$\begin{cases} \dot{X} = \frac{X}{\sqrt{X^2+Y^2+Z^2}}\dot{\rho} + Y\dot{\theta} + \frac{ZX}{\sqrt{X^2+Y^2}}\dot{\varphi} \\ \dot{Y} = \frac{Y}{\sqrt{X^2+Y^2+Z^2}}\dot{\rho} - X\dot{\theta} + \frac{ZY}{\sqrt{X^2+Y^2}}\dot{\varphi} \\ \dot{Z} = \frac{Z}{\sqrt{X^2+Y^2+Z^2}}\dot{\rho} - \sqrt{X^2+Y^2}\dot{\varphi} \end{cases}$$

$$\begin{cases} \dot{\rho} = \frac{X\dot{X}+Y\dot{Y}+Z\dot{Z}}{\sqrt{X^2+Y^2+Z^2}} \\ \dot{\theta} = \frac{\dot{X}Y-X\dot{Y}}{X^2+Y^2} \\ \dot{\varphi} = \frac{Z(X\dot{X}+Y\dot{Y})-(X^2+Y^2)\dot{Z}}{(X^2+Y^2+Z^2)\sqrt{X^2+Y^2}} \end{cases}$$