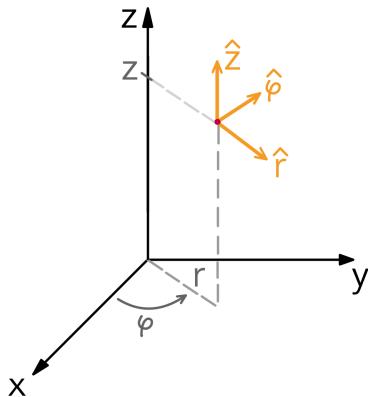


1 Coordenadas cilíndricas



Transformación de coordenadas

$$\begin{aligned} r &= \sqrt{x^2 + y^2} \\ \tan(\varphi) &= \frac{y}{x} \\ z &= z \end{aligned}$$

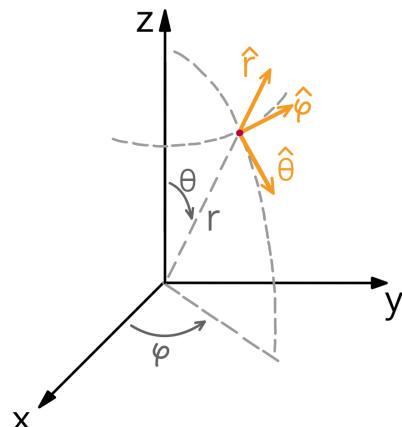
$$\begin{aligned} x &= r \cos(\varphi) \\ y &= r \sin(\varphi) \\ z &= z \end{aligned}$$

Relación entre versores

$$\begin{aligned} \hat{r} &= \cos(\varphi) \hat{x} + \sin(\varphi) \hat{y} \\ \hat{\varphi} &= -\sin(\varphi) \hat{x} + \cos(\varphi) \hat{y} \\ \hat{z} &= \hat{z} \end{aligned}$$

$$\begin{aligned} \hat{x} &= \cos(\varphi) \hat{r} - \sin(\varphi) \hat{\varphi} \\ \hat{y} &= \sin(\varphi) \hat{r} + \cos(\varphi) \hat{\varphi} \\ \hat{z} &= \hat{z} \end{aligned}$$

2 Coordenadas esféricas



Transformación de coordenadas

$$\begin{aligned} r &= \sqrt{x^2 + y^2 + z^2} \\ \tan(\theta) &= \frac{\sqrt{x^2 + y^2}}{z} \\ \tan(\varphi) &= \frac{y}{x} \end{aligned}$$

$$\begin{aligned} x &= r \cos(\varphi) \sin(\theta) \\ y &= r \sin(\varphi) \sin(\theta) \\ z &= r \cos(\theta) \end{aligned}$$

Relación entre versores

$$\begin{aligned} \hat{r} &= \cos(\varphi) \sin(\theta) \hat{x} + \sin(\varphi) \sin(\theta) \hat{y} + \cos(\theta) \hat{z} \\ \hat{\theta} &= \cos(\varphi) \cos(\theta) \hat{x} + \sin(\varphi) \cos(\theta) \hat{y} - \sin(\theta) \hat{z} \\ \hat{\varphi} &= -\sin(\varphi) \hat{x} + \cos(\varphi) \hat{y} \end{aligned}$$

$$\begin{aligned} \hat{x} &= \sin(\theta) \cos(\varphi) \hat{r} + \cos(\theta) \cos(\varphi) \hat{\theta} - \sin(\varphi) \hat{\varphi} \\ \hat{y} &= \sin(\theta) \sin(\varphi) \hat{r} + \cos(\theta) \sin(\varphi) \hat{\theta} + \cos(\varphi) \hat{\varphi} \\ \hat{z} &= \cos(\theta) \hat{r} - \sin(\theta) \hat{\theta} \end{aligned}$$