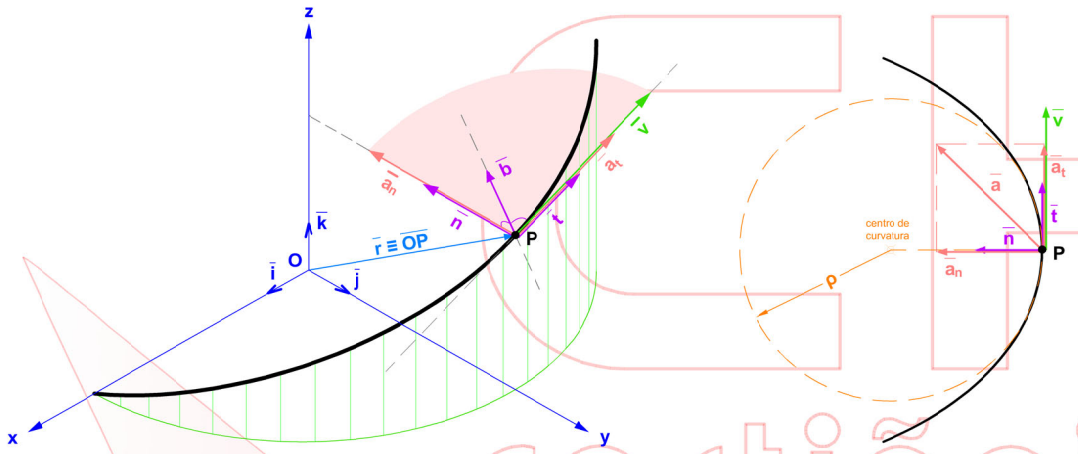
Cinemática



Coordenadas

Intrínsecas:

$$\bar{t} = \frac{d\bar{r}}{ds} = \frac{\bar{v}}{v}$$

$$\bar{n} = \frac{\bar{a}_n}{a_n} = \bar{b} \wedge \bar{t} = \frac{d\bar{t}/dt}{|d\bar{t}/dt|}$$

$$\bar{b} = \bar{t} \wedge \bar{n} = \frac{\bar{v} \wedge \bar{a}}{|\bar{v} \wedge \bar{a}|}$$

Frenet

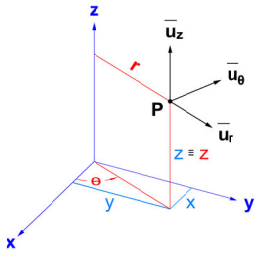
Cilíndricas
Esféricas

Cilíndricas:

$$\bar{u}_r = \cos\theta\,\bar{i} + \sin\theta\,\bar{j} \qquad d\bar{u}_r/d\theta = \bar{u}_\theta$$

$$\bar{u}_\theta = -\sin\theta\,\bar{i} + \cos\theta\,\bar{j} \qquad d\bar{u}_\theta/d\theta = -\bar{u}_r$$

$$\bar{u}_z = \bar{k} \qquad d\bar{u}_z/d\theta = \bar{0}$$



$$x = r\cos\theta$$

$$y = r\sin\theta$$

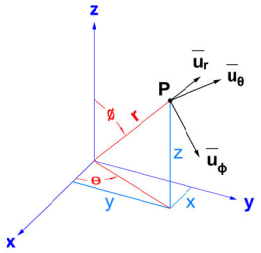
$$z = z$$

Esféricas:

$$\bar{u}_r = \sin\phi\cos\theta\,\bar{i} + \sin\phi\sin\theta\,\bar{j} + \cos\phi\,\bar{k}$$

$$\bar{u}_\theta = -\sin\theta\,\bar{i} + \cos\theta\,\bar{j}$$

$$\bar{u}_\phi = \bar{u}_\theta \times \bar{u}_r$$



$$x = r\sin\phi\cos\theta$$

$$y = r\sin\phi\sin\theta$$

$$z = r\cos\phi$$

Magnitudes Cinemáticas

Cartesianas:

$$\bar{r} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$$

$$\bar{v} = d\bar{r}/dt = \dot{x}\,\bar{i} + \dot{y}\,\bar{j} + \dot{z}\,\bar{k}$$

$$\bar{a} = d\bar{v}/dt = \ddot{x}\,\bar{i} + \ddot{y}\,\bar{j} + \ddot{z}\,\bar{k}$$

Triedro Intrínseco:

$$\bar{r} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$$

$$\bar{v} = d\bar{r}/dt = v\,\bar{t} = \frac{ds}{dt}\,\bar{t}$$

$$\bar{a} = d\bar{v}/dt = a_t\,\bar{t} + a_n\,\bar{n} = \frac{dv}{dt}\,\bar{t} + \frac{v^2}{\rho}\,\bar{n}$$

Cilíndricas:

$$\bar{r} = r\,\bar{u}_r + z\,\bar{u}_z$$

$$\bar{v} = d\bar{r}/dt = \dot{r}\,\bar{u}_r + \dot{\theta}\,r\,\bar{u}_\theta + \dot{z}\,\bar{u}_z$$

$$\bar{a} = d\bar{v}/dt = (\ddot{r} - r\,\dot{\theta}^2)\,\bar{u}_r + (r\,\ddot{\theta} + 2\,\dot{r}\,\dot{\theta})\,\bar{u}_\theta + \ddot{z}\,\bar{u}_z$$

Esféricas:

$$\bar{r} = r\,\bar{u}_r$$

$$\bar{v} = d\bar{r}/dt = \dot{r}\,\bar{u}_r + \dot{\theta}\,r\cos\phi\,\bar{u}_\theta + \dot{\phi}\,r\,\bar{u}_\phi$$

$$\bar{a} = d\bar{v}/dt = (\ddot{r} - r\,\dot{\theta}^2\sin^2\phi - r\,\dot{\phi}^2)\,\bar{u}_r + (r\,\ddot{\theta}\sin\phi + 2\,\dot{r}\,\dot{\theta}\sin\phi + 2\,r\,\dot{\phi}\,\dot{\theta}\cos\phi)\,\bar{u}_\theta + (r\,\ddot{\phi} + 2\,\dot{r}\,\dot{\phi} - r\,\dot{\theta}^2\cos\phi\sin\phi)\,\bar{u}_\phi$$