

第 1 章 质点动力学公式体系

位矢/运动方程

速度

加速度

直角坐标系

$$\begin{array}{c} \vec{v} = \frac{d\vec{r}}{dt} \\ \hline \vec{r}(t) \xrightarrow{\quad} \\ \hline \vec{r} = \int \vec{v} dt \end{array}$$

$\vec{v}(t)$

$$\begin{array}{c} \vec{a} = \frac{d\vec{v}}{dt} = \frac{d^2\vec{r}}{dt^2} \\ \hline \vec{v}(t) \xrightarrow{\quad} \\ \hline \vec{v} = \int \vec{a} dt \end{array}$$

$\vec{a}(t)$

自然坐标系

$$\begin{array}{c} \vec{v} = v\vec{\tau} = \frac{ds}{dt}\vec{\tau} \\ \hline s(t) \xrightarrow{\quad} \\ \hline s = \int v dt \end{array}$$

$\vec{v}(t)$

$$\begin{array}{c} \vec{a} = a_\tau\vec{\tau} + a_n\vec{n} = \frac{dv}{dt}\vec{\tau} + \frac{v^2}{r}\vec{n} \\ \hline \vec{v}(t) \xrightarrow{\quad} \\ \hline \vec{v} = \int \vec{a}_\tau dt \end{array}$$

$\vec{a}(t)$

$$a_\tau = r\alpha$$

$$a_n = r\omega^2$$

$$v = r\omega$$

角量描述

$$\begin{array}{c} \omega = \frac{d\theta}{dt} \\ \hline \theta(t) \xrightarrow{\quad} \\ \hline \theta = \int \omega dt \end{array}$$

$\omega(t)$

$$\begin{array}{c} \alpha = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2} \\ \hline \omega(t) \xrightarrow{\quad} \\ \hline \omega = \int \alpha dt \end{array}$$

$\alpha(t)$

注：蓝色量只适用于圆周运动