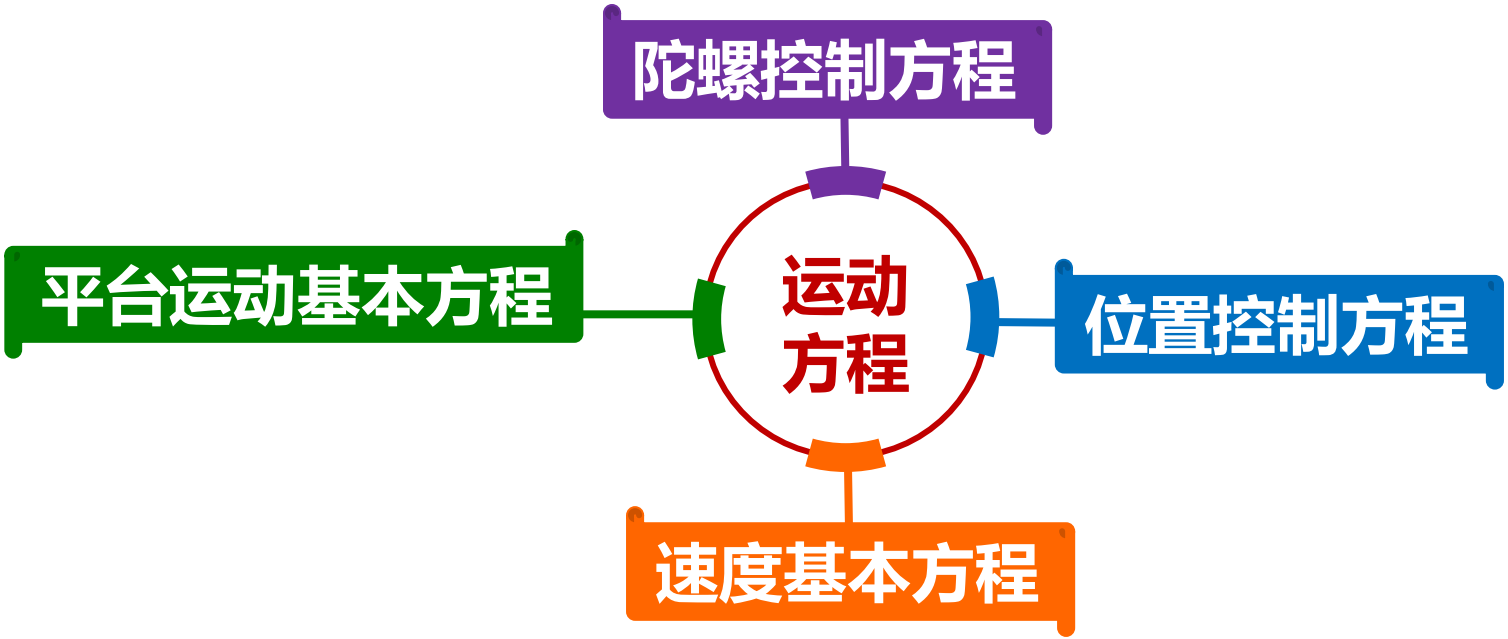
惯性导航系统运动方程



惯性导航系统运动方程

➢ 平台运动基本方程

$$\dot{\alpha} = \omega_{px} - \omega'_x \qquad \alpha(0) = \alpha_0$$
$$\dot{\beta} = \omega_{py} - \omega'_y \qquad \beta(0) = \beta_0$$
$$\dot{\gamma} = \omega_{pz} - \omega'_z \qquad \gamma(0) = \gamma_0$$

$$\omega_{px} = \omega_{cx} + \varepsilon_x$$
$$\omega_{py} = \omega_{cy} + \varepsilon_y$$
$$\omega_{pz} = \omega_{cz} + \varepsilon_z$$

$$\omega'_x = \omega_x + \gamma\omega_y - \beta\omega_z$$
$$\omega'_y = \omega_y + \alpha\omega_z - \gamma\omega_x$$
$$\omega'_z = \omega_z + \beta\omega_x - \alpha\omega_y$$

$$\begin{bmatrix} 1 & \gamma & -\beta \\ -\gamma & 1 & \alpha \\ \beta & -\alpha & 1 \end{bmatrix}$$

惯性导航系统运动方程

➢ 速度基本方程

$$A_{px} = A_x + \gamma A_y - \beta g + \Delta A_x$$
$$A_{py} = A_y - \gamma A_x + \alpha g + \Delta A_y$$

$$\dot{V}_{cx} = A_x^p + (2\Omega \sin\varphi_c + \frac{V_{cx}}{R_N}\tan\varphi_c)\cdot V_{cy}$$
$$\dot{V}_{cy} = A_y^p - (2\Omega \sin\varphi_c + \frac{V_{cx}}{R_N}\tan\varphi_c)\cdot V_{cx}$$

速度控制方程

速度基本方程

$$\dot{V}_{cx} = A_x + (2\Omega \sin\varphi_c + \frac{V_{cx}}{R_N}\tan\varphi_c)\cdot V_{cy} + \gamma A_y - \beta g + \Delta A_x$$
$$\dot{V}_{cy} = A_y - (2\Omega \sin\varphi_c + \frac{V_{cx}}{R_N}\tan\varphi_c)\cdot V_{cx} - \gamma A_x + \alpha g + \Delta A_y$$

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➢ 位置控制方程和平台控制方程

- **位置控制方程：**

$$\begin{cases} \dot{\varphi}_c = \dfrac{V_{cy}}{R_M} \\ \dot{\lambda}_c = \dfrac{V_{cx}}{R_N \cos\varphi_c} = \dfrac{V_{cx}}{R_N}\sec\varphi_c \end{cases}$$

- **平台控制方程：**

$$\begin{bmatrix} \omega_{cx} \\ \omega_{cy} \\ \omega_{cz} \end{bmatrix} = \begin{bmatrix} -\dfrac{V_{cy}}{R_M} \\ \Omega\cos\varphi_c + \dfrac{V_{cx}}{R_N} \\ \Omega\sin\varphi_c + \dfrac{V_{cx}}{R_N}\tan\varphi_c \end{bmatrix}$$

惯性导航系统运动方程

运动方程

平台控制方程

$$\begin{bmatrix}\omega_{cx}\\ \omega_{cy}\\ \omega_{cz}\end{bmatrix}=\begin{bmatrix}-\dfrac{V_{cy}}{R_M}\\ \Omega\cos\varphi_c+\dfrac{V_{cx}}{R_N}\\ \Omega\sin\varphi_c+\dfrac{V_{cx}}{R_N}\tan\varphi_c\end{bmatrix}$$

平台运动基本方程

$$\dot{\alpha}=\omega_{px}-\omega'_x \quad \alpha(0)=\alpha_0$$
$$\dot{\beta}=\omega_{py}-\omega'_y \quad \beta(0)=\beta_0$$
$$\dot{\gamma}=\omega_{pz}-\omega'_z \quad \gamma(0)=\gamma_0$$

位置控制方程

$$\dot{\varphi}_c=\frac{V_{cy}}{R_M}$$
$$\dot{\lambda}_c=\frac{V_{cx}}{R_N\cos\varphi_c}=\frac{V_{cx}}{R_N}\sec\varphi_c$$

速度基本方程

$$\dot{V}_{cx}=A_x+(2\Omega\sin\varphi_c+\frac{V_{cx}}{R_N}\tan\varphi_c)\cdot V_{cy}+\gamma A_y-\beta g+\Delta A_x$$
$$\dot{V}_{cy}=A_y-(2\Omega\sin\varphi_c+\frac{V_{cx}}{R_N}\tan\varphi_c)\cdot V_{cx}-\gamma A_x+\alpha g+\Delta A_y$$