

MECHANICS

瞬心法在船舶旋回运动中的应用

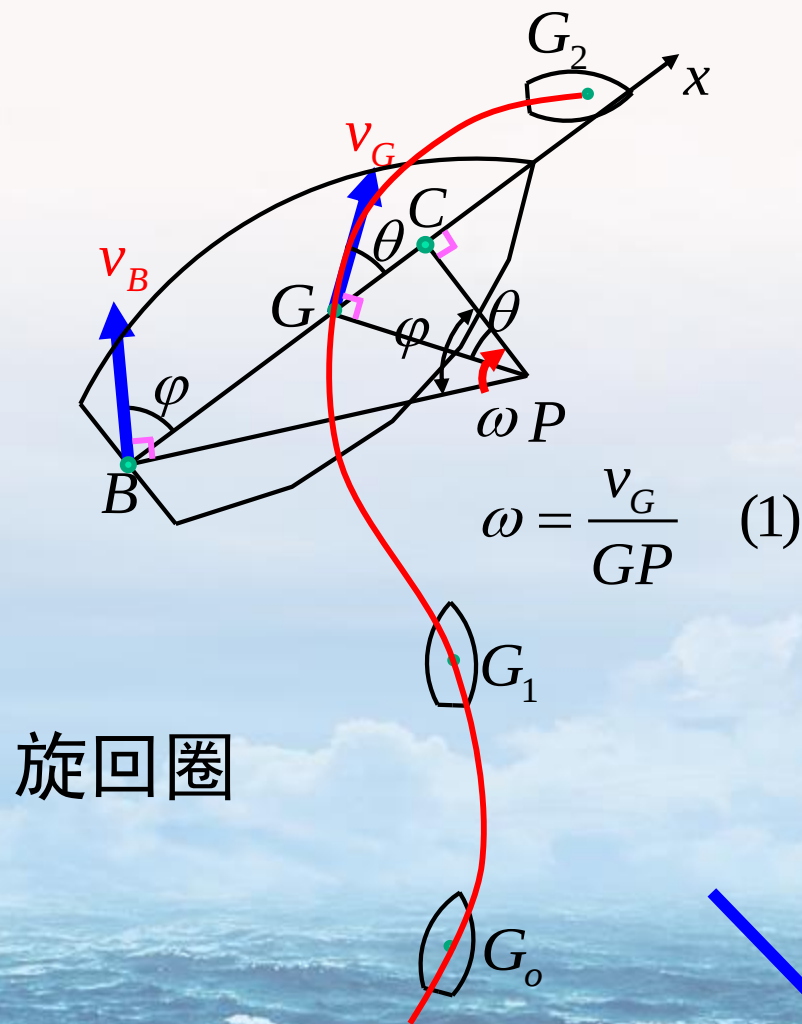
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瞬心法在船舶旋回运动中应用

旋回圈的概念



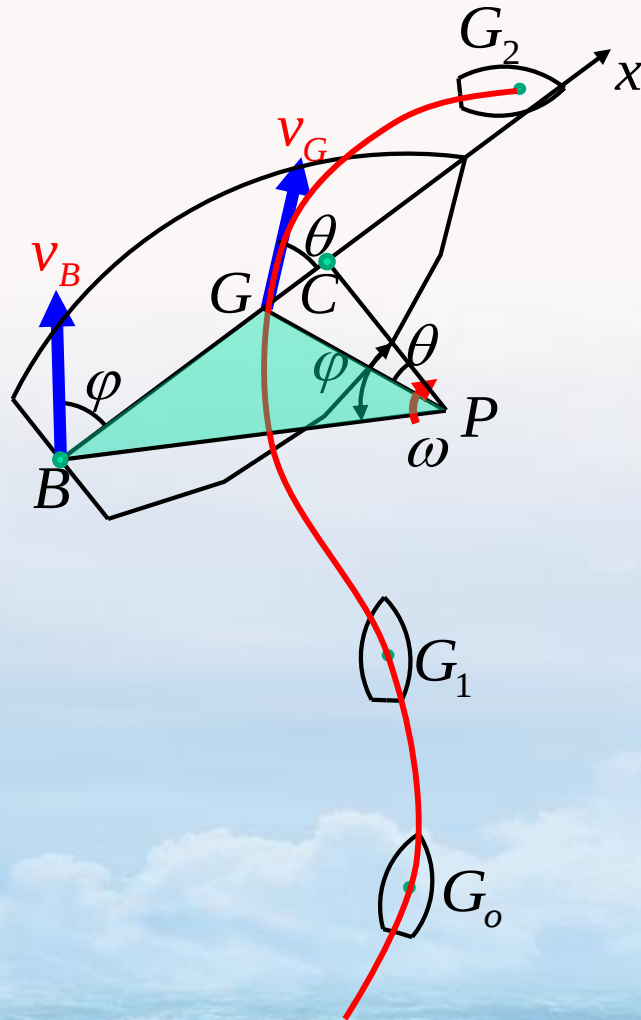
1) 该船此时瞬心的位置及转动角速度

2) 船在该瞬时首尾线上各点沿首尾线方向的速度

3) 船首尾线上各点的横向速度



瞬心法在船舶旋回运动中应用



$$BG = L / 2$$

$$\angle BPG = \varphi - \theta$$

$$GP = \frac{L}{2} \cdot \frac{\sin(90^\circ - \varphi)}{\sin(\varphi - \theta)} = \frac{L}{2} \cdot \frac{\cos \varphi}{\sin(\varphi - \theta)} \quad (2)$$

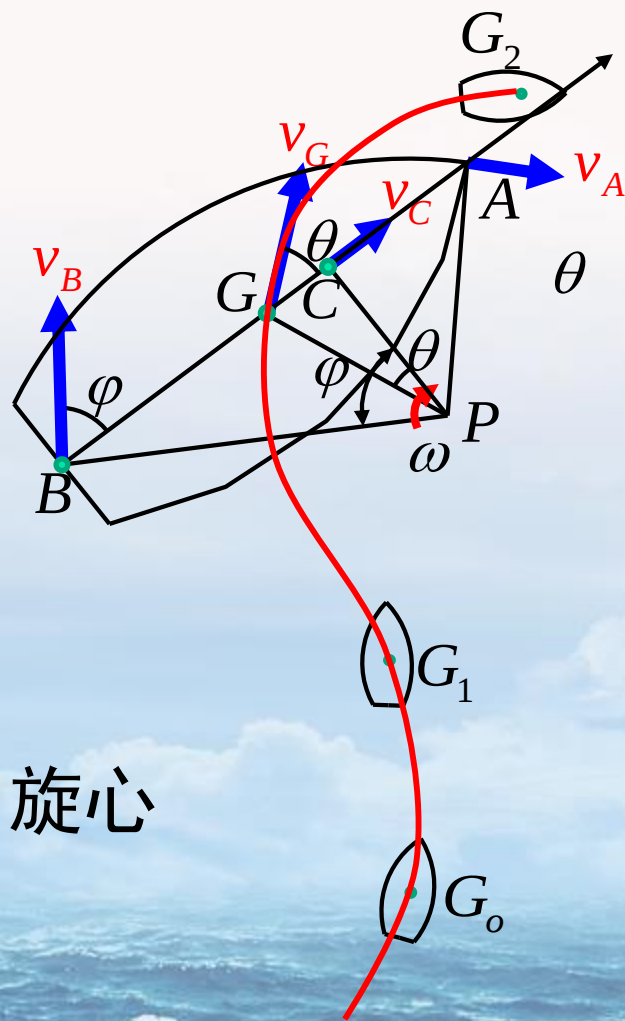
$$\omega = \frac{v_G}{GP} \quad (1)$$

$$\omega = \frac{2 \sin(\varphi - \theta)}{L \cos \varphi} \cdot v_G \quad (3)$$



瞬心法在船舶旋回运动中应用

旋心的概念



瞬心

$$AC = L / 3$$

$$CG = L / 2 - L / 3 = L / 6$$

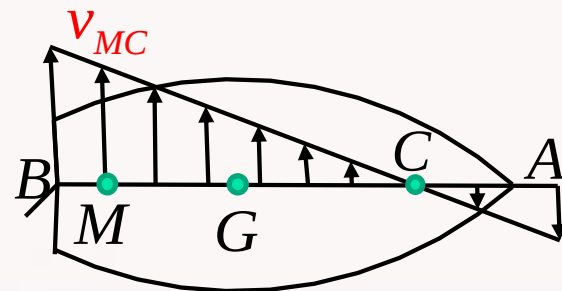
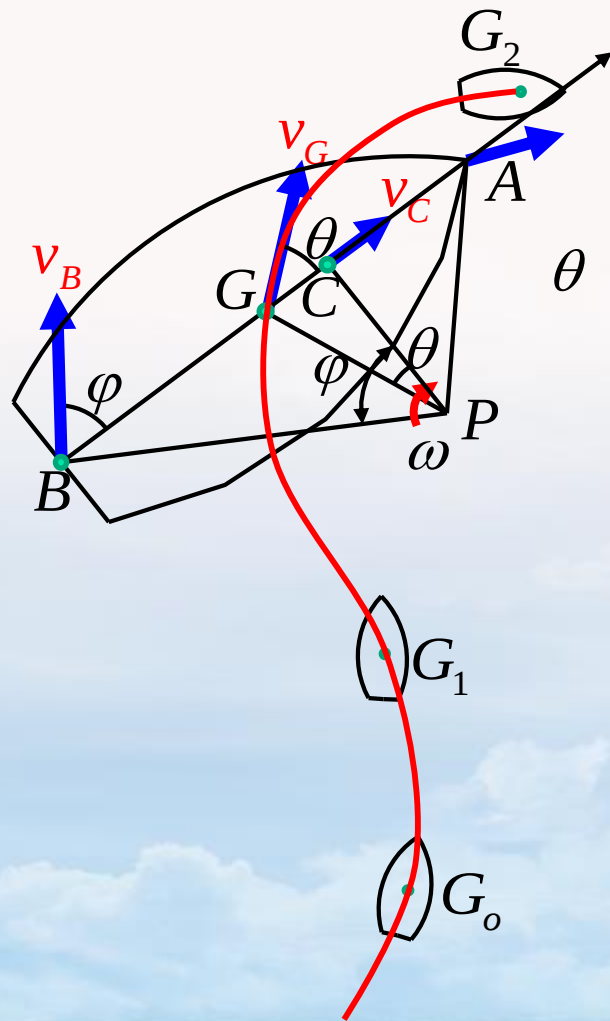
$$\sin \theta = \frac{L}{6GP}$$

$$\omega = \frac{v_G}{GP} = \frac{6 \sin \theta}{L} v_G \quad (4)$$

$$v_x = v_G \cos \theta \quad \text{或} \quad v_x = v_B \cos \varphi$$



瞬心法在船舶旋回运动中应用



$$v_M = v_C + v_{MC}$$

$$v_{MC} = \omega \cdot CM$$

