斜截面上的扭转切应力推导

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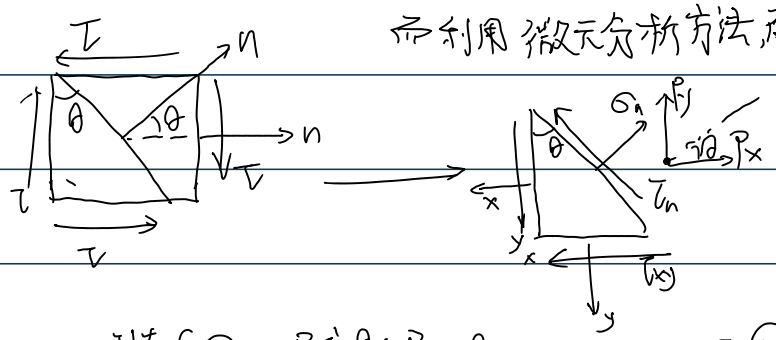
由扭转切应力公式 $\tau = \frac{T\rho}{I_p}$

对于斜截面上的扭转切应力，可设斜截面的角度为θ，而

而利用微元分析方法有：



设截面积为1

则有 $P_x = \tau_{xy}\sin\theta$

$P_y = \tau_{xy}\cos\theta$

则有：$\begin{cases} \sigma_n = P_y\sin\theta + P_x\cos\theta \\ \tau_n = -P_x\sin\theta + P_y\cos\theta \end{cases}$，此时：$\begin{cases} \sigma_n = \tau_{xy}\sin\theta\cos\theta + \tau_{xy}\sin\theta\cos\theta \\ \tau_n = -\tau_{xy}\sin^2\theta + \tau_{xy}\cos^2\theta \end{cases}$

即有：$\begin{cases} \sigma_n = 2\tau_{xy}\sin\theta\cos\theta = \tau_{xy}\sin 2\theta \\ \tau_n = \tau_{xy}(\sin^2\theta - \cos^2\theta) = \tau_{xy}\cos 2\theta \end{cases}$ ⟶ 有：在 $\theta = 45°$ 时，截面正应力最大：$\sigma_n|_{max} = \tau$

附注：在上述分析时，使用的是弹性力学正负规定：