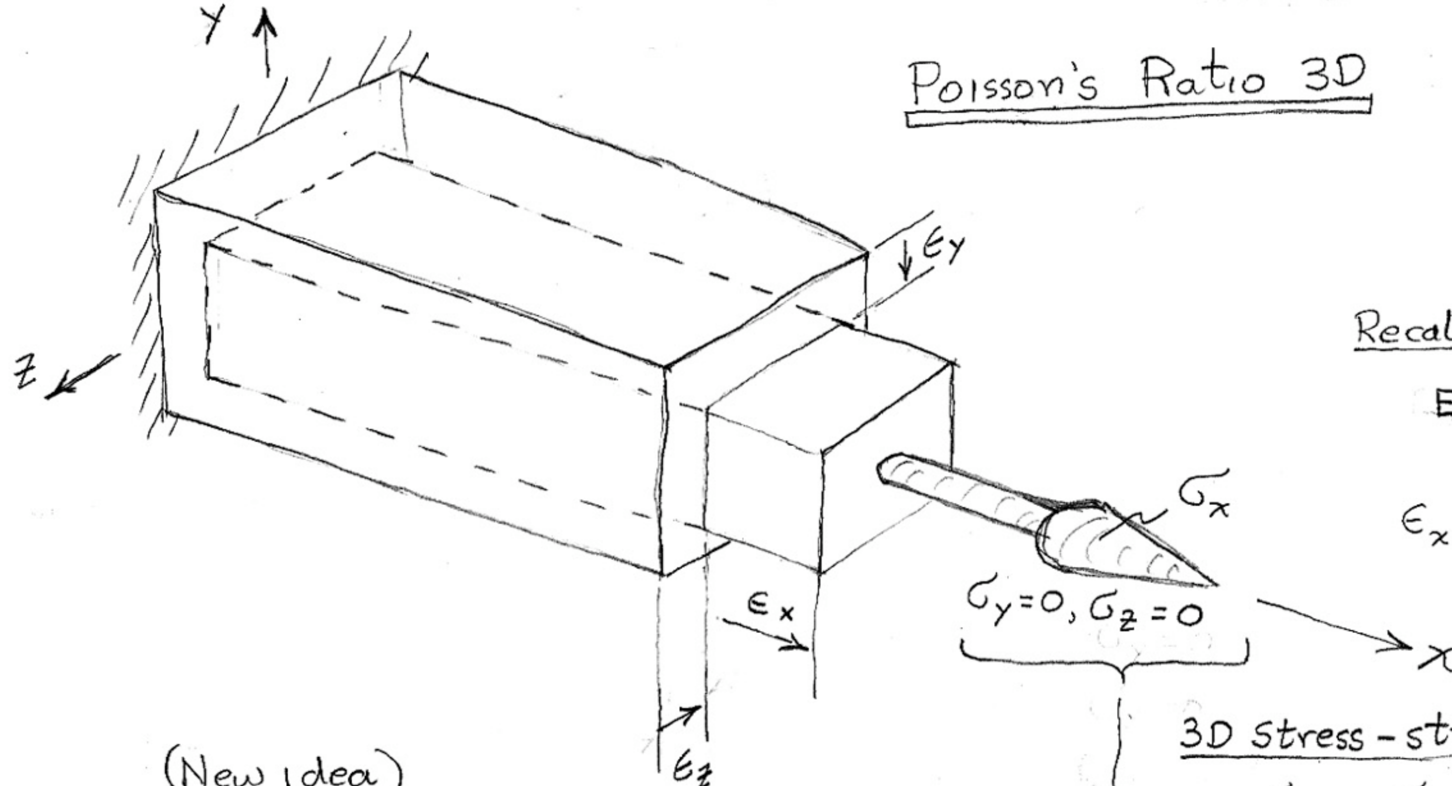

Poisson's Ratio 3D

Recall (Old idea)

$$E = \frac{\sigma_x}{\epsilon_x}$$

$$\epsilon_x = \frac{\sigma_x}{E}$$

(New idea)

Poisson's Ratio, ν

$$\nu \equiv - \frac{\epsilon \text{ transverse to load direction}}{\epsilon \text{ in Load direction}}$$

$$\nu = -\epsilon_y/\epsilon_x = -\epsilon_z/\epsilon_x$$

when $\sigma_x \neq 0$: $\epsilon_y = \epsilon_z = -\nu\epsilon_x = -\nu\, \sigma_x/E$

---

when $\sigma_y \neq 0$: $\epsilon_x = -\nu \frac{\sigma_y}{E}$; $\sigma_z \neq 0$: $\epsilon_x = -\nu \frac{\sigma_z}{E}$

3D Stress - strain equations

$$\epsilon_x = \frac{\sigma_x}{E} - \nu \frac{\sigma_y}{E} - \nu \frac{\sigma_z}{E}$$

$$\epsilon_y = -\nu \frac{\sigma_x}{E} + \frac{\sigma_y}{E} - \nu \frac{\sigma_z}{E}$$

$$\epsilon_z = -\nu \frac{\sigma_x}{E} - \nu \frac{\sigma_y}{E} + \frac{\sigma_z}{E}$$

Total Strain		$\sigma_x = P_x/A$, $\sigma_y = 0$, $\sigma_z = 0$		$\sigma_x = 0$, $\sigma_y = P_y/A$, $\sigma_z = 0$		$\sigma_x = 0$, $\sigma_y = 0$, $\sigma_z = P_z/A$
ϵ_x	=	$\frac{\sigma_x}{E}$	+	$-\nu \frac{\sigma_y}{E}$	+	$-\nu \frac{\sigma_z}{E}$