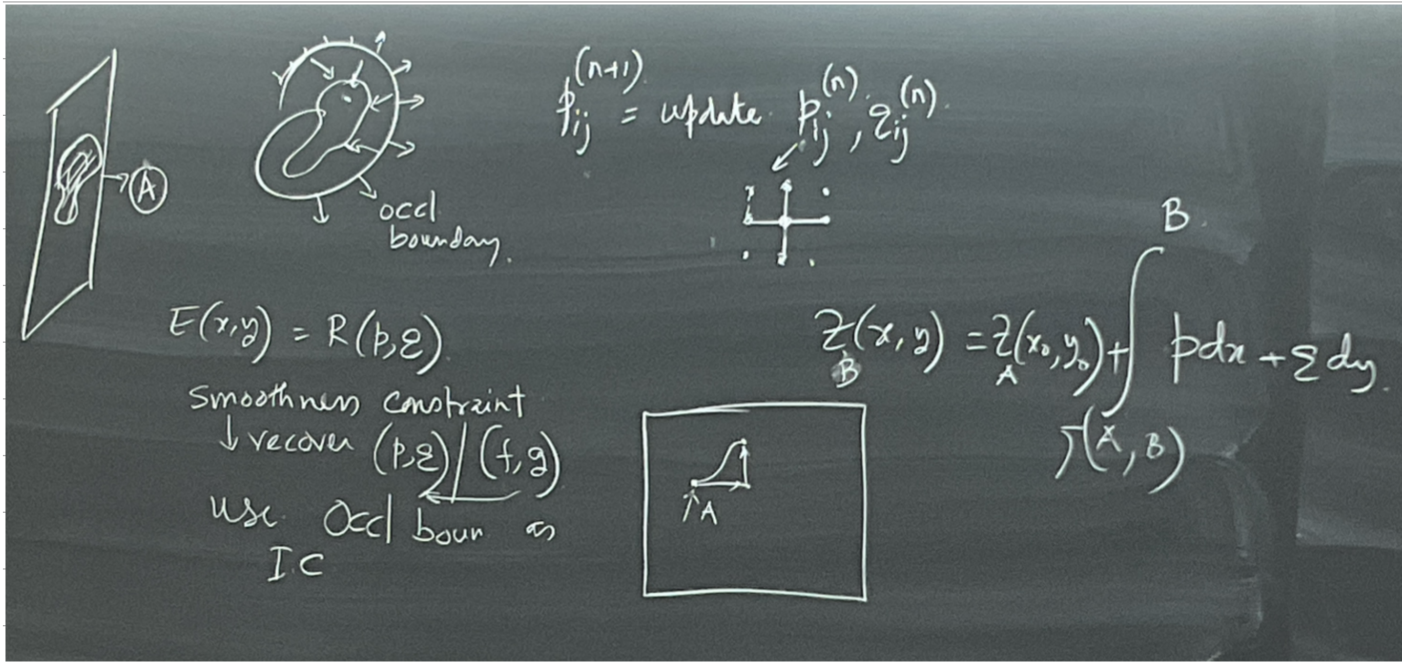
EE702: Lec-7 (31 Jan)



$$\min_{Z} \iint_A \left[(Z_x - p)^2 + (Z_y - q)^2\right] dx\,dy$$

$$Sol^n: \quad \underbrace{F_Z}_{0} - \frac{\partial}{\partial x}\underbrace{F_{Zx}}_{2(Z_{xx} - p_x)} - \frac{\partial}{\partial y}\underbrace{F_{Zy}}_{2(Z_{yy} - q_y)} = 0$$

$$2(Z_{yy} - q_y) = 0$$

$$\Rightarrow \boxed{\nabla^2 Z = \underbrace{p_x + q_y}_{\text{computed Laplacian}}}$$

NOTE: $\oint_c p\,dx + q\,dy = 0 \;\forall c \xrightarrow{\text{Green's Theorem}} \iint_{R(C)} (q_x - p_y)\,dx\,dy = 0 \;\forall R(C)$

$$\Downarrow$$

$$\boxed{Z_{yx} = Z_{xy}} \Leftarrow \boxed{q_x = p_y}$$

"Integrability Constraint"

$$\iint_{R(C)} \underbrace{\left[\lambda_2(q_x - p_y) + \lambda_1(p_x^2 + p_y^2 + q_x^2 + q_y^2) + (E-R)^2\right]}_{F} dx\,dy$$

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