

2. Operator Formulation

$$(36) \quad \text{Find } (u, \lambda) \in X \times \Delta_c: \begin{aligned} Au + B^* \lambda &= f \text{ in } X^* \\ Bu - t^2 C \lambda &= g \text{ in } \Lambda_c^* \end{aligned}$$



$$(37) \quad \text{Find } (u, \lambda) \in X \times \Delta_c: L \begin{pmatrix} u \\ \lambda \end{pmatrix} = \begin{pmatrix} f \\ g \end{pmatrix} \text{ in } X^* \times \Delta_c^*$$

with

$$L := \begin{bmatrix} A & B^* \\ B & -t^2 C \end{bmatrix}: X \times \Delta_c \mapsto X^* \times \Delta_c^* :$$

$$(38) \quad \langle L \begin{pmatrix} u \\ \lambda \end{pmatrix}, \begin{pmatrix} v \\ \mu \end{pmatrix} \rangle := A(u, \lambda; v, \mu) \quad \forall (u, \lambda), (v, \mu) \in X \times \Delta_c$$

Define semi-norm

$$(39) \quad |\mu|_c := \sqrt{c(\mu, \mu)} \quad \forall \mu \in \Delta_c$$

on Δ_c and the graph norm

$$(40) \quad \|(v, \mu)\| := \|v\|_X + \|\mu\|_{\Lambda} + t |\mu|_c$$

on $\Delta_c \times X$.