Notazione

$$z_{ij} = f(\underline{p}_i, t_j) + \epsilon_{ij} \qquad i = 1, ...n \quad j = 1, ...m$$

$$J_\lambda = \sum_{i=1}^{n} \sum_{j=1}^{m} \big(z_{ij} - f(\underline{p}_i, t_j)\big)^2 + \lambda_T \int_\Omega \int_0^T \Big(\frac{\partial^2 f}{\partial t^2}\Big)^2 dt\ d\Omega + \lambda_S \int_0^T \int_\Omega \Big(\triangle f\Big)^2 d\Omega\ dt$$

$$f_S(\underline{p}) = \sum_{i=1}^{n} a_i\ \varphi_i(\underline{p}) \qquad f_T(t) = \sum_{j=1}^{n} b_j\ \psi_j(t)$$

$$f_S(\underline{p}) = \Phi_i(\underline{p})\ \underline{a} \qquad f_T(t) = \Psi_i(t)\ \underline{b}$$

$$a_i(t) = \sum_{j=1}^{m} c_{ij}\ \psi_j(t) \qquad b_j(\underline{p}) = \sum_{i=1}^{n} c_{ij}\ \varphi_i(\underline{p})$$

$$f(\underline{p}, t) = \sum_{i=1}^{n} \sum_{j=1}^{m} c_{ij}\ \varphi_i(\underline{p})\ \psi_j(t)$$

$$J_S = \int_\Omega \Big(\triangle f_S\Big)^2 d\Omega \qquad J_T = \int_0^T \Big(\frac{\partial^2 f_T}{\partial t^2}\Big)^2 dt$$

$$\lambda_S \sum_{j=1}^{m} J_S(b_j) + \lambda_T \sum_{i=1}^{n} J_T(a_i) = \lambda_S \sum_{j=1}^{m} \int_\Omega \Big(\triangle b_j\Big)^2 d\Omega + \lambda_T \sum_{i=1}^{n} \int_0^T \Big(\frac{\partial^2 a_i}{\partial t^2}\Big)^2 dt$$

$$\Pi = \Phi \otimes \Psi$$

$$J = (\underline{z} - \Pi\underline{c})^T (\underline{z} - \Pi\underline{c}) + \underline{c}^t S \underline{c}$$

$$\underline{z} = \begin{bmatrix} z_{11} \\ \vdots \\ z_{1m} \\ z_{21} \\ \vdots \\ z_{2m} \\ \vdots \\ z_{nm} \end{bmatrix}$$

$$\underline{c} = \begin{bmatrix} c_{11} \\ \vdots \\ c_{1m} \\ c_{21} \\ \vdots \\ c_{2m} \\ \vdots \\ c_{nm} \end{bmatrix}$$