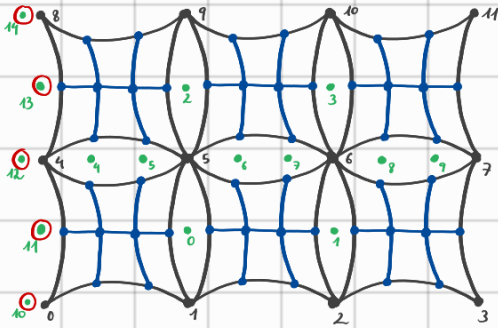


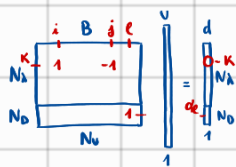
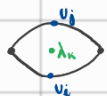
FETI DP SERIAL IMPLEMENTATION

- P: PRINCIPAL (N_P)
- R: REMAINING (N_R)
- λ : INTERFACE (N_λ)
- D: DIRICHLET (N_D)



$$(1) \begin{pmatrix} 0 & B \\ B^T & K \end{pmatrix} \begin{pmatrix} \lambda \\ u \end{pmatrix} = \begin{pmatrix} d \\ f \end{pmatrix}$$

$$(1.1) B u = d$$



$$(1.2) B^T \lambda + K u = f$$

$$u = \begin{pmatrix} u_P \\ u_R \end{pmatrix}$$

$$(2) \begin{pmatrix} 0 & B_P & B_R \\ B_P^T & K_{PP} & K_{PR} \\ B_R^T & K_{RP} & K_{RR} \end{pmatrix} \begin{pmatrix} \lambda \\ u_P \\ u_R \end{pmatrix} = \begin{pmatrix} d \\ f_P \\ f_R \end{pmatrix}$$

$$(3) B_P u_P + B_R u_R = d$$

$$(4) B_P^T \lambda + K_{PP} u_P + K_{PR} u_R = f_P$$

$$(5) B_R^T \lambda + K_{RP} u_P + K_{RR} u_R = f_R$$

$$(6) K_{PP} u_P = f_P - K_{PR} u_R - B_P^T \lambda$$

$$(7) u_R = K_{RR}^{-1} [f_R - K_{RP} u_P - B_R^T \lambda]$$

$$(8) K_{PP} u_P = f_P - K_{PR} K_{RR}^{-1} f_R + K_{PR} K_{RR}^{-1} K_{RP} u_P + K_{PR} K_{RR}^{-1} B_R^T \lambda - B_P^T \lambda \quad (7) \rightarrow (6)$$

$$u_P = \underbrace{[K_{PP} - K_{PR} K_{RR}^{-1} K_{RP}]}_{S_{PP}} \underbrace{\left(f_P - K_{PR} K_{RR}^{-1} f_R + K_{PR} K_{RR}^{-1} B_R^T \lambda - B_P^T \lambda \right)}_{\hat{f}_P}$$

$$(9) u_P = S_{PP}^{-1} \hat{f}_P + S_{PP}^{-1} K_{PR} K_{RR}^{-1} B_R^T \lambda - S_{PP}^{-1} B_P^T \lambda$$

$$(10) u_R = K_{RR}^{-1} f_R - K_{RR}^{-1} B_R^T \lambda - K_{RR}^{-1} K_{RP} S_{PP}^{-1} \hat{f}_P - K_{RR}^{-1} K_{RP} S_{PP}^{-1} K_{PR} K_{RR}^{-1} B_R^T \lambda + K_{RR}^{-1} K_{RP} S_{PP}^{-1} B_P^T \lambda \quad (9) \rightarrow (7)$$

$$(11) d = B_P (S_{PP}^{-1} \hat{f}_P + S_{PP}^{-1} K_{PR} K_{RR}^{-1} B_R^T \lambda - S_{PP}^{-1} B_P^T \lambda) + B_R (K_{RR}^{-1} f_R - K_{RR}^{-1} B_R^T \lambda - K_{RR}^{-1} K_{RP} S_{PP}^{-1} \hat{f}_P - K_{RR}^{-1} K_{RP} S_{PP}^{-1} K_{PR} K_{RR}^{-1} B_R^T \lambda + K_{RR}^{-1} K_{RP} S_{PP}^{-1} B_P^T \lambda)$$

$$(12) \underbrace{-d + B_P S_{PP}^{-1} \hat{f}_P + B_R K_{RR}^{-1} f_R - B_R K_{RR}^{-1} K_{RP} S_{PP}^{-1} \hat{f}_P - (B_P S_{PP}^{-1} K_{PR} K_{RR}^{-1} B_R^T + B_P S_{PP}^{-1} B_P^T + B_R K_{RR}^{-1} K_{RP} S_{PP}^{-1} K_{PR} K_{RR}^{-1} B_R^T - B_R K_{RR}^{-1} K_{RP} S_{PP}^{-1} B_P^T + B_R K_{RR}^{-1}) \lambda}_{F} = \bar{d}$$

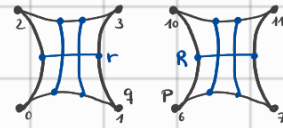
$$(13) F \lambda = \bar{d}$$

$$K_{RR}$$



$$K_{PP}$$

LOCAL \rightarrow GLOBAL



$$A_{Pq}^S = \begin{pmatrix} 0 & 1 & 2 & 3 \\ 6 & -1 & 1 & 1 \\ 7 & -1 & 1 & 1 \\ 10 & -1 & 1 & 1 \\ 11 & -1 & 1 & 1 \end{pmatrix} \quad K_{PP} = \sum_S A_{Pq}^S K_{qq}^S A_{Pq}^{S^T}$$

$$u^S = \begin{pmatrix} u_q^S \\ u_r^S \end{pmatrix} \quad K^S = \begin{pmatrix} K_{qq}^S & K_{qr}^S \\ K_{rq}^S & K_{rr}^S \end{pmatrix} \quad A_{Pq}^S K_{qq}^S A_{Pq}^{S^T}$$

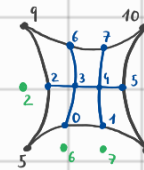


$$K_{PR}$$

$$K_{RP}^S = K_{Rq}^S A_{Pq}^{S^T}$$

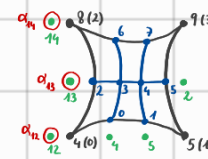
$$K_{RP} = \sum_S A_{Rr}^S \underbrace{K_{Rq}^S}_{K_{RP}^S} A_{Pq}^{S^T}$$

$$B_\lambda$$



$$B_{\lambda r}^S = \begin{pmatrix} 0 & 1 & 2 & 3 \\ 2 & 3 & -1 & 1 \\ 6 & -1 & 1 & 1 \\ 7 & -1 & 1 & 1 \end{pmatrix} \quad B_\lambda = \sum_S B_{\lambda r}^S A_{Rr}^{S^T}$$

$$B$$



$$B_{PD} = \sum_S B_{\lambda q}^S A_{Pq}^{S^T} \quad B_{RD} = \sum_S B_{\lambda r}^S A_{Rr}^{S^T}$$

$$B_{PD} = \begin{pmatrix} 0 & 1 & 2 & 3 \\ 12 & -1 & 1 & 1 \\ 13 & -1 & 1 & 1 \\ 14 & -1 & 1 & 1 \end{pmatrix} \quad B_{RD} = \begin{pmatrix} 3 & 1 \\ 12 & -1 & 1 & 1 \\ 13 & -1 & 1 & 1 \\ 14 & -1 & 1 & 1 \end{pmatrix}$$

$$B_R = \sum_S B_{\lambda D}^S A_{Rr}^{S^T} + B_{\lambda R}^S A_{Rr}^{S^T} = \sum_S (B_{\lambda D}^S + B_{\lambda R}^S) A_{Rr}^{S^T}$$

