TP1 Software Development Tools and Methods : Practical session 41st week

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1 Stokes :

$$\begin{cases} -\Delta u + \nabla p = 0 \text{ in } \Omega \\ \nabla . u = 0 \text{ in } \Omega \\ u = 0 \text{ in } \delta\Omega \end{cases}$$

$\forall v \in C^{\infty}_{\text{supp C}} \int_{\Omega} \nabla u . \nabla v - \int_{\delta\Omega} \nabla u . v . \vec{n} + \int_{\Omega} p . \nabla v - \int_{\delta\Omega} p . v . \vec{n} = 0$

2 Navier-Stokes :

$$\begin{cases} \dfrac{\delta u}{\delta t} + u . \nabla u - \nu \Delta u + \dfrac{1}{\rho_f} \nabla p = F \text{ in } \Omega \\ \nabla . u = 0 \text{ in } \Omega \\ u = 0 \text{ in } \delta\Omega \end{cases}$$

$$\frac{1}{\delta t} \left(u^{n+1} - u^n \bigcirc X^n \right) - \nu \Delta u^{n+1} + \frac{1}{\rho_f} \nabla p^{n+1} = F^{n+1}$$

with

$$u^n \bigcirc X^n = u^n \left(x - u^n(x) \delta t \right)$$

3 Chaleur :

$$\rho C_i \left(\frac{\delta T}{\delta t} + v . \nabla T \right) - \nabla . \left(k_i \nabla T \right) = Q_i \text{ in } \Omega$$

$\forall u \in C^{\infty}_{\text{supp C}}$

$\rho C_i \left(\int_{\Omega} \frac{\delta T}{\delta t} . u + v \int_{\Omega} T . \nabla u - \int_{\delta\Omega} T . u . \vec{n} \right) - k_i \int_{\Omega} \nabla T . \nabla u + k_i \int_{\delta\Omega} \nabla T . u . \vec{n} = \int_{\Omega} Q_i . u$