Failure Criterion for Ductile Fracture

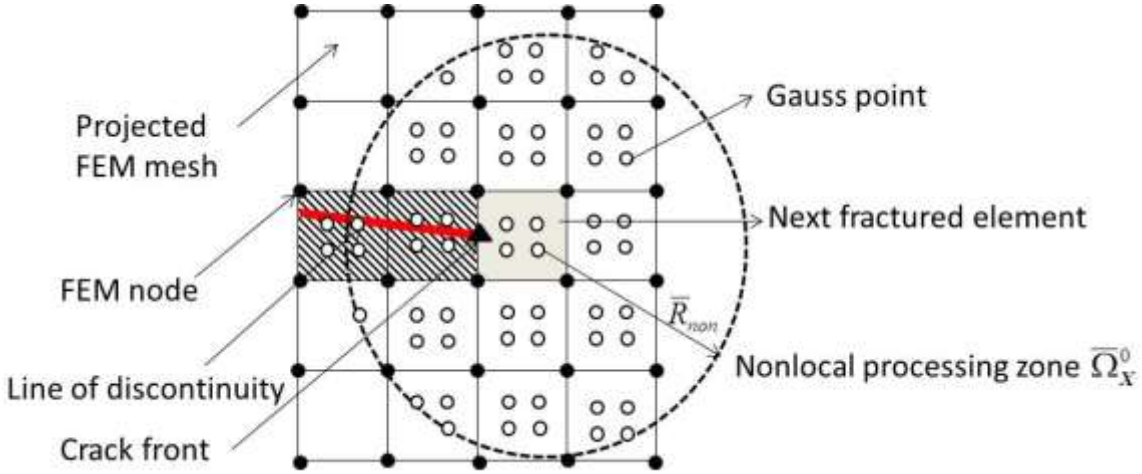
Ductile materials

- Nonlocal continuum damage model

$$\tilde{\varepsilon}^{ep}(\boldsymbol{X}) = \frac{1}{\int_{\Omega_X^0} \psi^{R_{non}}(\boldsymbol{Y};\boldsymbol{X})\, d\Omega} \int_{\Omega_X^0} \psi^{R_{non}}(\boldsymbol{Y};\boldsymbol{X})\, \varepsilon^{ep}(\boldsymbol{Y})\, d\Omega, \forall \boldsymbol{X} \in \Omega^0$$

$$d = f(\tilde{\varepsilon}^{ep})$$

Length scale R_{non} is a material constant



Nonlocal Strain Average

Failure criterion: $d \geq d_C$

Failure Criterion for Ductile Fracture

Ductile materials

- Local constitutive law + strain regularization + strain-based criterion + modified cohesive law

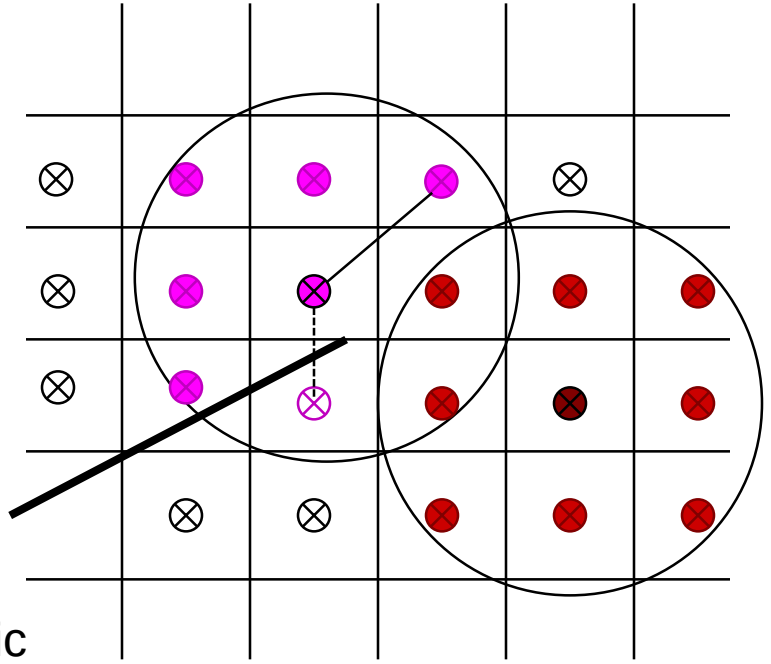
$$\bar{\varepsilon}^{p} = \sum_{i=1}^{NP} \phi_i^a \varepsilon_i^p$$

ϕ_i^a is the meshfree shape function with kernel size a, the length scale of the regularization zone, a material constant

Visibility criterion applies for integration points crossing the crack path

Modified cohesive law takes care of plastic work around the crack tip

Failure criterion: $\bar{\varepsilon}^p \geq \varepsilon_C^p$



Strain Regularization