# 2. The Peridynamics in LS-DYNA (6)

- **Relationship between elastic modulus E and c**

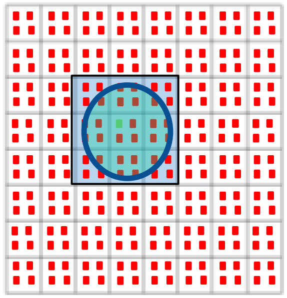
$$f = cs\frac{\eta+\xi}{|\eta+\xi|}, \quad s = \frac{|\xi+\eta|-|\xi|}{|\xi|}$$

- Classic elastic energy density (small deformation)

$$U = \frac{1}{2}\boldsymbol{\sigma}:\boldsymbol{\epsilon}$$

- Micro elastic energy in one stretched bond

$$U = 3E\varepsilon^2$$



- Classic energy and collective micro elastic energy are equivalent

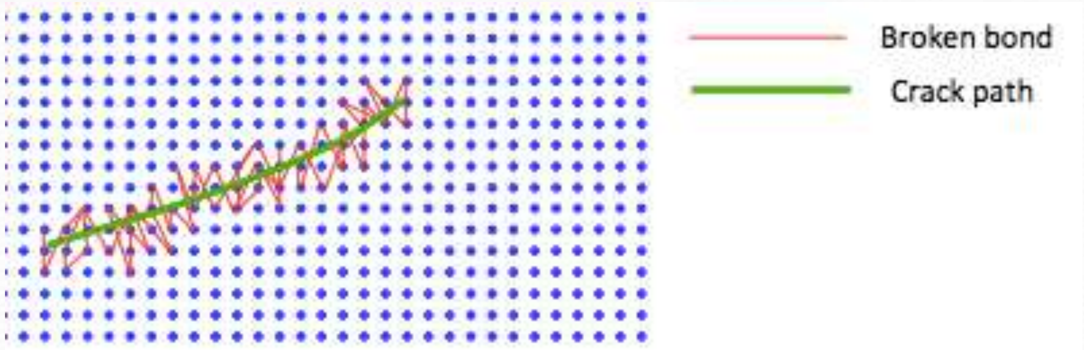
$$w(|\boldsymbol{\eta}|,|\boldsymbol{\xi}|) = \frac{1}{2}cs^2|\boldsymbol{\xi}|$$

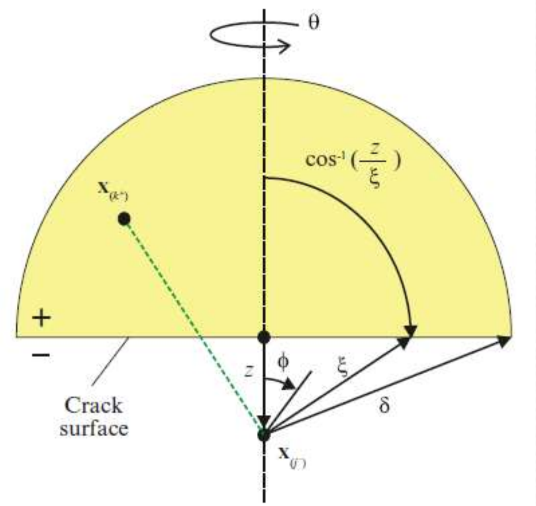
$$3E = \sum_{\xi}\frac{1}{2}c_x|\xi|\Delta V_{x'}$$

- **varies from bond to bond**
- **boundary correction**

# 2. The Peridynamics in LS-DYNA (7)

- **Relationship between fracture energy release rate $G_c$ and $S_c$**




$$G_c = \int_0^{\delta} \left\{ \int_0^{2\pi} \int_0^{\delta} \int_0^{cos^{-1} z/\xi} \left( \frac{1}{2} c \xi s_c^2 \xi^2 \right) sin\phi d\phi d\xi d\theta \right\} dz = \frac{1}{2} c s_c^2 \left( \frac{\delta^5 \pi}{5} \right)$$

$$s_c = \sqrt{\frac{10 G_c}{\pi c \delta^5}}$$

- varies from bond to bond

*Madenci, et. al., 2014*
*Wu, et. al., 2014*