PhD THESIS AT MINES PARISTECH
CENTRE DES MATERIAUX

Simulation of crack bifurcation in single crystal nickel base superalloys under mixed mode conditions

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- **Description**: Recent progress in the simulation of crack propagation in single crystals makes it possible to envisage now more complex loading conditions (modes I and II) that are encountered in single crystal high pressure turbine blades in jet engines. The crystallographic character of plasticity and damage mechanisms play a major role in the propagation process. The proposed approach combines crystal plasticity, continuum damage and recent strain gradient models in finite-strain framework in order to compute the initiation and propagation of cracks along non-predefined paths. Accordingly, crack branching and bifurcation can be predicted during change of loading conditions based on large scale highly nonlinear finite element simulations, utilizing the full power afforded by parallel computation. Numerical predictions will be compared to experimental results obtained in a different PhD work on ARCAN specimens.
- **Contract**: Jet engine producer SNECMA, overall ONERA project (France)
- **Wanted skills**: Applicants should possess a degree in Mechanical Engineering, Materials Science or a related discipline and have an outstanding academic track record. The candidate should have a solid understanding of mechanics of materials and continuum mechanics and be prepared to work on a mostly numerical project using non-linear finite element techniques.
- **Contact**: Send a CV and a motivation letter to Samuel Forest (samuel.forest@ensmp.fr). For questions regarding the contents of the subject and research in Computational Material Science in France, contact Samuel.Forest@ensmp.fr.

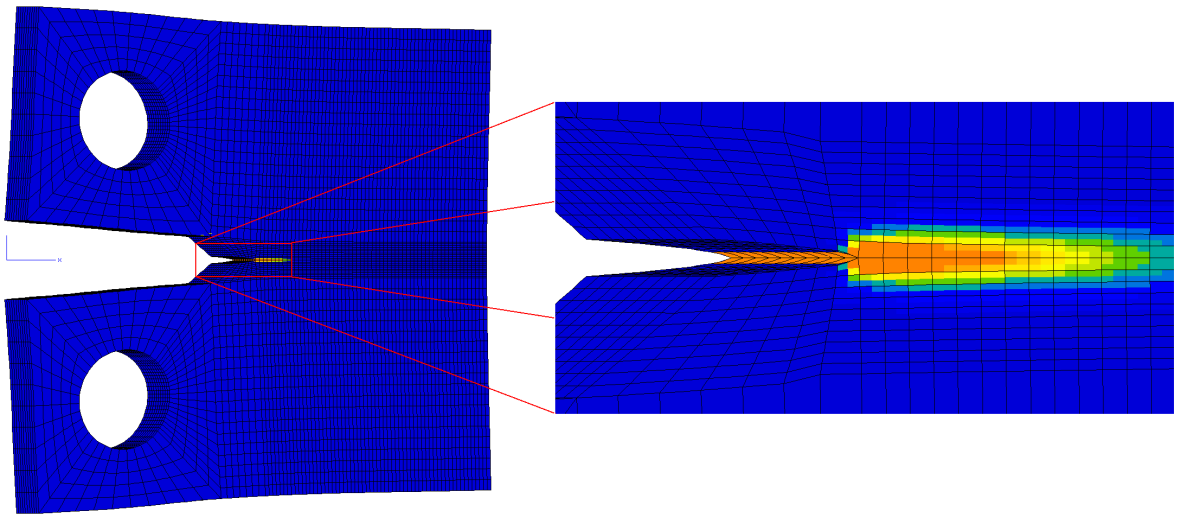

Figure 1: Crack growth in a 3D single crystal CT specimen under cyclic loading. Damage field.