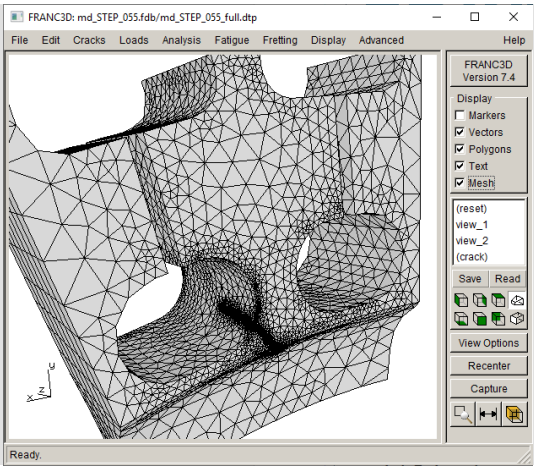
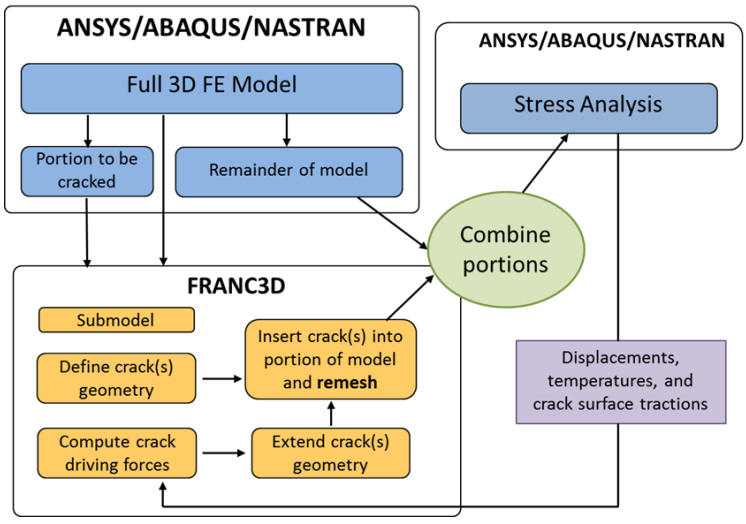
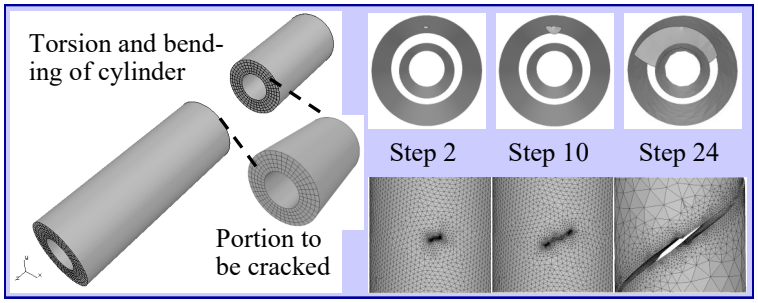
FRANC3D Version 9

FRANC3D:
- extracts portion of a 3D FE model,
- inserts one or more cracks,
- re-meshes around the cracks,
- runs a FE analysis program,
- computes fracture parameters,
- propagates the cracks,
- displays the SIF history, and
- computes fatigue cycles.



Version 9 supports the following finite element analysis programs: ANSYS[1], ABAQUS[2] and NASTRAN[3]. The fatigue life module supports combined low cycle (LC) and high cycle fatigue (HCF) loading. The crack insertion and meshing library supports symmetry surface cracks, embedded bi-material cracks, and cracks that cross bi-material interfaces. The current Python interface is based on Python 3.12, but has been tested with older versions of Python 3.





[1] ANSYS is a registered trademark of Ansys, Inc
[2] ABAQUS is a registered trademark of Dassault Systèmes Simulia Corp
[3] NASTRAN is a registered trademark of NASA

Features include:

- A simple graphical user interface
- Importing and exporting ANSYS[1], ABAQUS[2], NASTRAN[3] ASCII file formats
- Wizards and dialogs to aid crack insertion, crack growth, and analysis
- Finite-volume voids and zero-volume cracks
- Crack front template meshes include singular wedge elements or collapsed brick elements for elastoplastic materials
- Advancing-front tetrahedral meshing with pyramid transition elements, with optional ANSYS[1] or ABAQUS[2] volume meshing
- M-integral stress intensity factor (SIF) calculation supports anisotropic materials and accounts for temperature changes and crack face tractions or contact pressures
- User-controlled crack growth rules for kink angle and increment
- Fatigue models for relative crack extension
- Mapping and/or transferring initial and boundary conditions
- Multiple cracks, crack fronts, load steps, and substeps
- Command (batch) and Python interfaces
- 64-bit executables for Microsoft Windows™ and various Linux distributions

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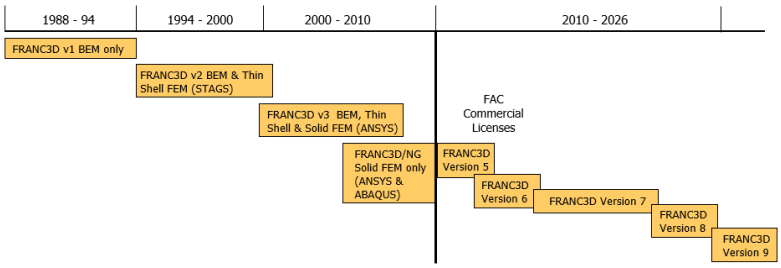
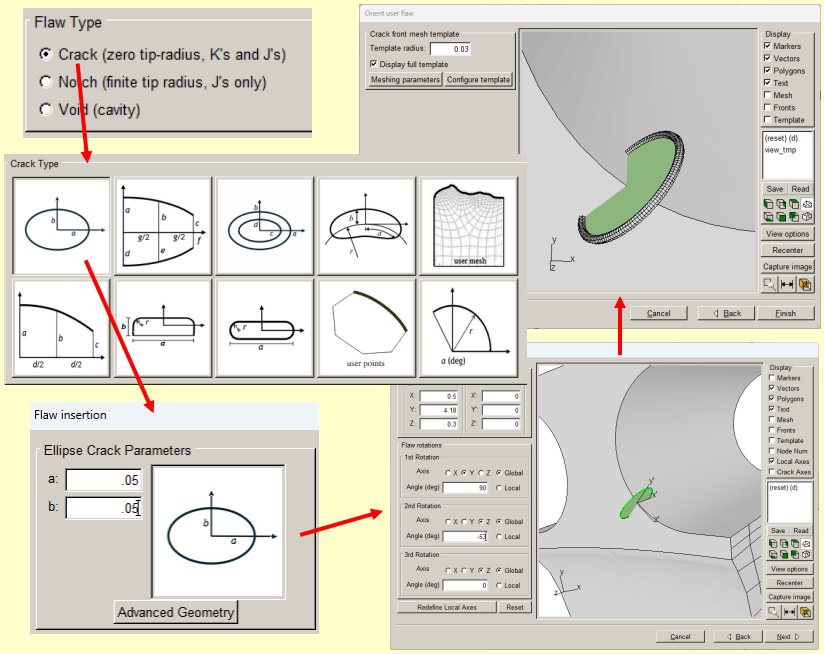
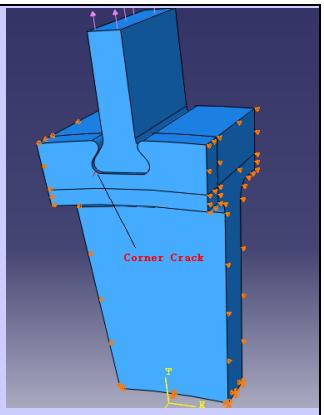
FRANC3D Development History

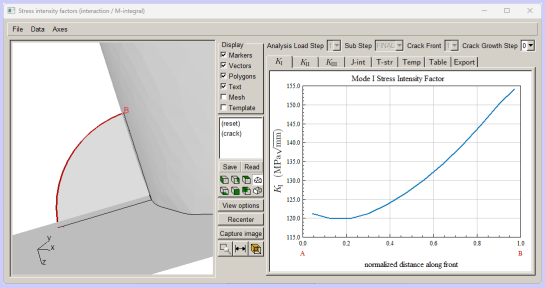


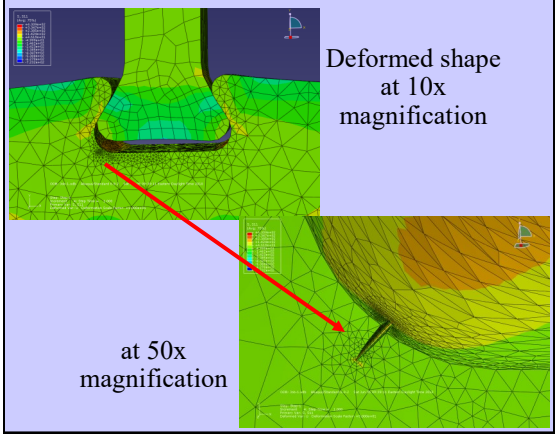
Wizard panels aid crack insertion by guiding the user through each step. A library of parameterized crack shapes is supplemented by user-defined crack (or void) options.



Blade & disk assembly in ABAQUS with contact between the two parts



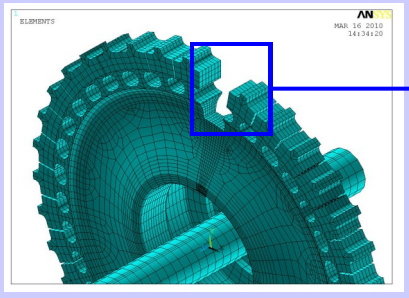


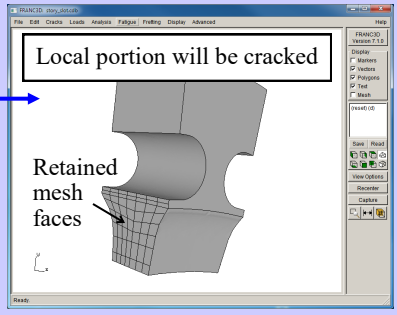


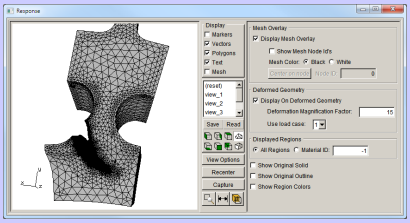
Deformed shape at 10x magnification

at 50x magnification

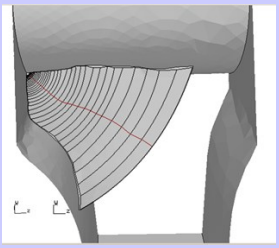
Rotating minidisk in ANSYS







Deformed shape at 40 steps of crack growth



SIF history along path through fronts

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