Computational Non-Linear Mechanics

Université de Liège

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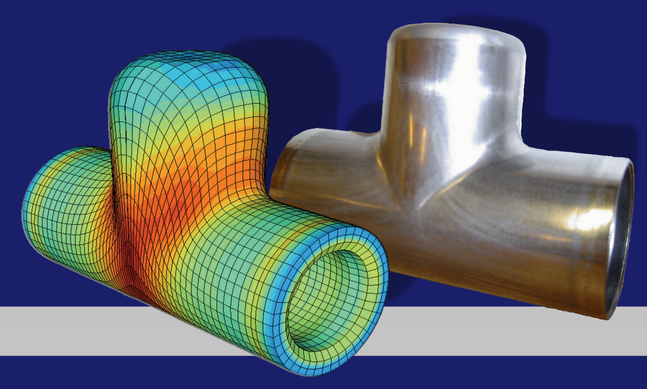
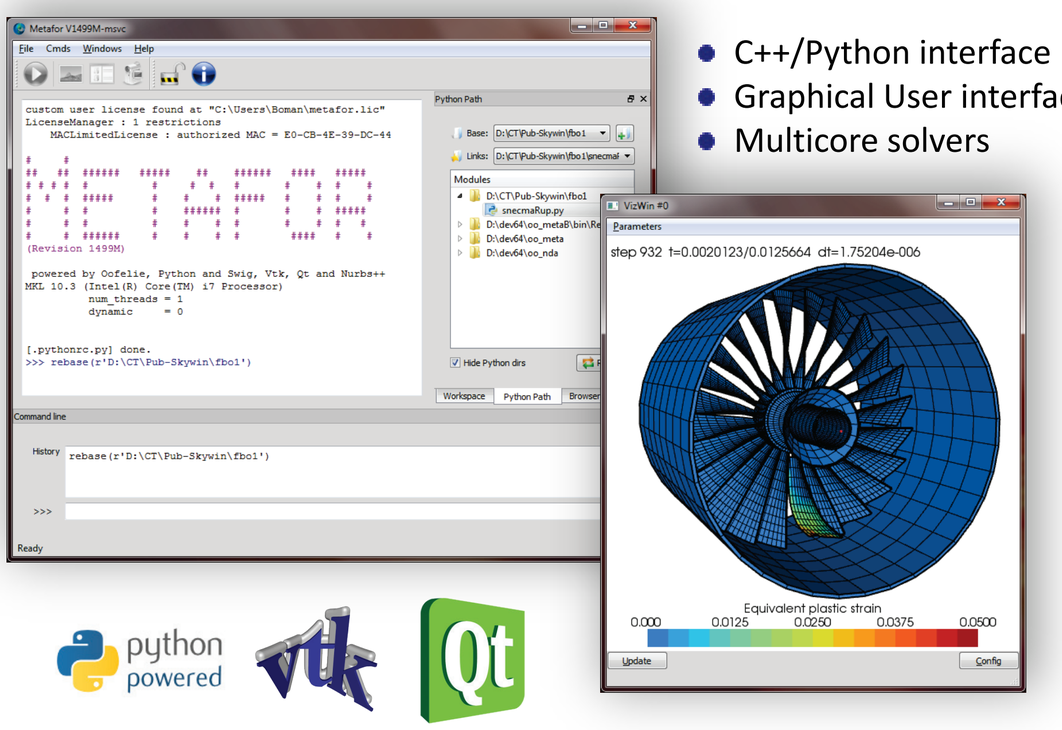


Software Development

METAFOR : an object-oriented Finite Element code for the simulation of solids submitted to large deformations

- 2D/3D elements (large strains).
- Implicit/explicit time integration (HHT, Chung Hulbert, …)
- Thermomechanical coupling (staggered or fully coupled schemes).
- Frictional contact between deformable bodies or analytical surfaces.
- Arbitrary Lagrangian Eulerian formalism.
- Meshing and remeshing procedures.
- Large set of constitutive laws (thermo-elasto-visco-plastic, damage, …)
- Crack propagation (erosion method).

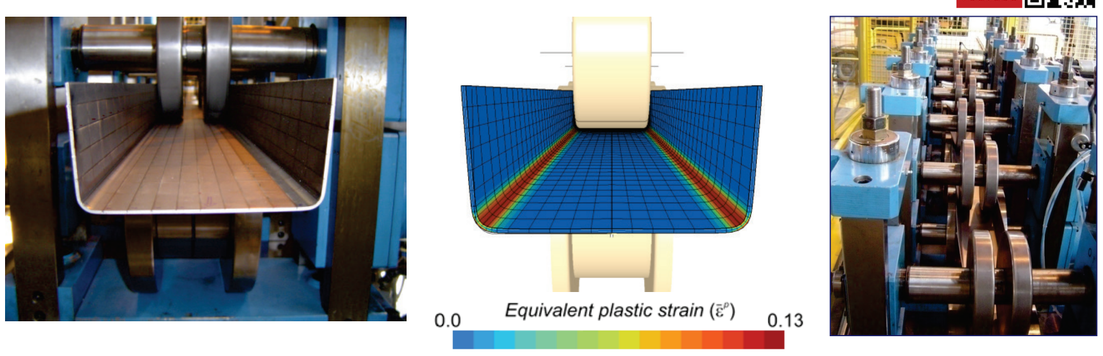


- C++/Python interface
- Graphical User interface
- Multicore solvers

Metal Forming Simulations

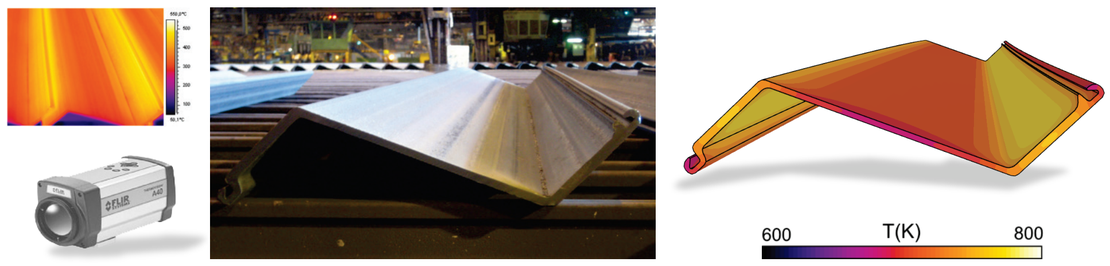
Springback Prediction in Roll Forming

- Development of a fast 3D model of industrial forming mills.



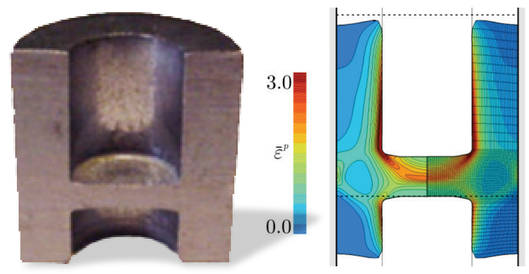
Cooling and Straightening of Sheet Piles

- Prediction of the final product shape and the residual stresses.



Other Processes

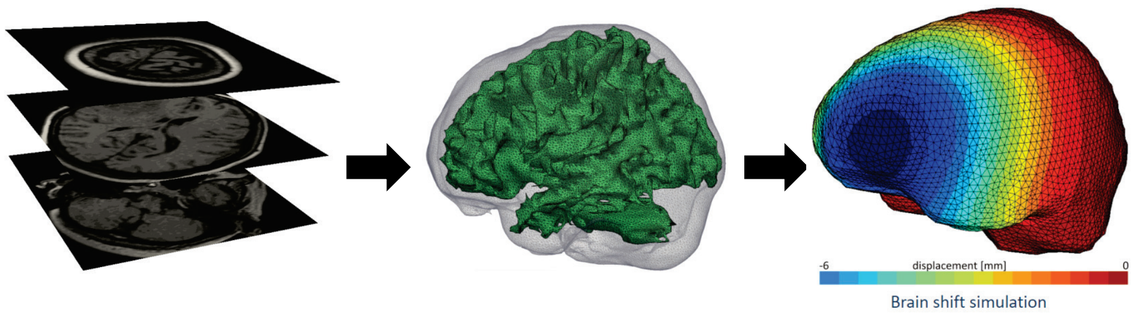
- Deep drawing - drawbeads
- Hot/cold rolling and lubrication.
- Forging - extrusion
- Hydroforming
- Thixoforming
- Superplastic forming



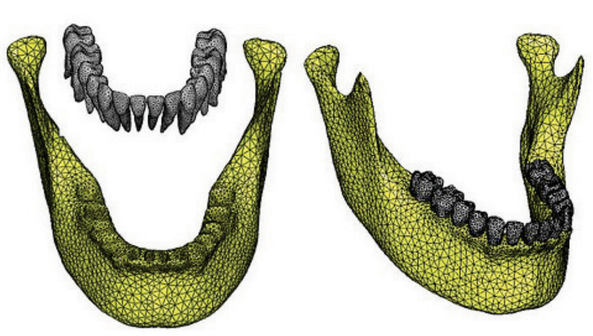
Biomechanics

Brain Model

- Unstructured FE mesh generation from medical images (MRI scans).
- Simulation of neurosurgery (brain shift / tumor resection).
- Simulation of injuries (head impact).



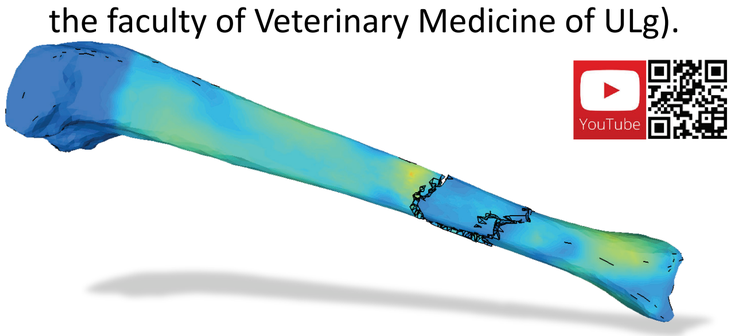
Orthodontics



- Development of complex constitutive models for bones and tissues.
- Simulation of teeth motion and jaw deformation.

Bone Fracture Simulation

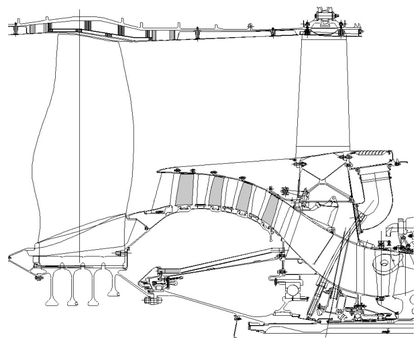
- Prediction of human and animal bone fractures (in collaboration with CHU Liège and the faculty of Veterinary Medicine of ULg).

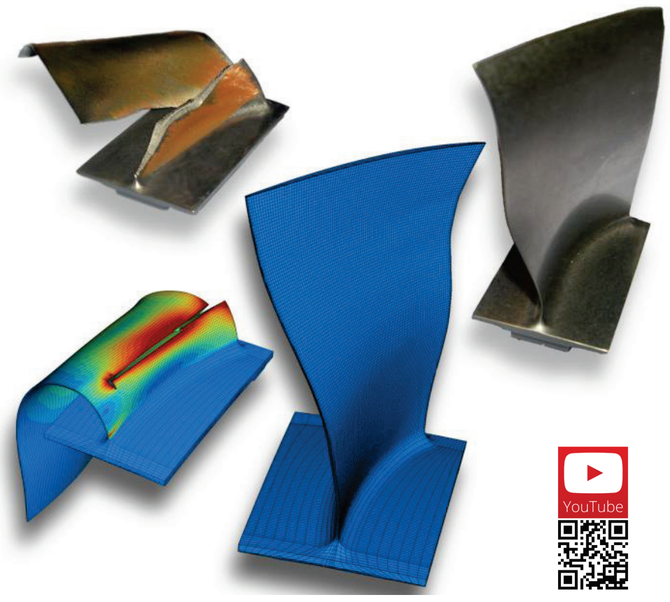


Crash, Impact & Fracture Simulations

Blade Impact on the Casing of an Aeroengine

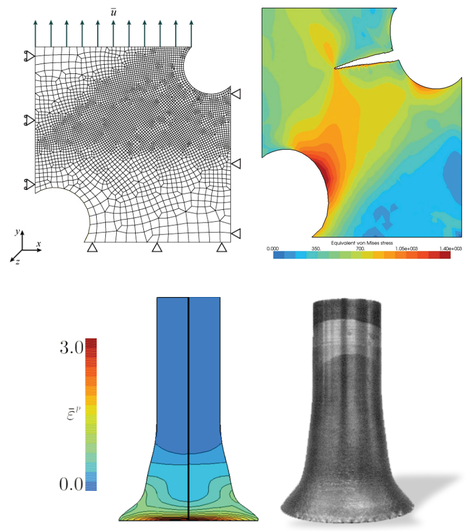
- Study of the behaviour of titanium alloys at very high strain rates.
- Composite casings.
- Fan Blade Out simulations.



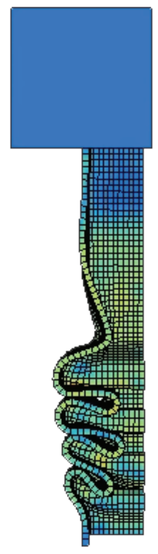


Damage & Fracture Tests

- Development of thermo-elasto-visco-plastic material models.
- Composite materials



Shock Absorber Devices



- Development of accurate numerical time-integration schemes and fast 3D contact algorithms.

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