Z-sim | Material simulation

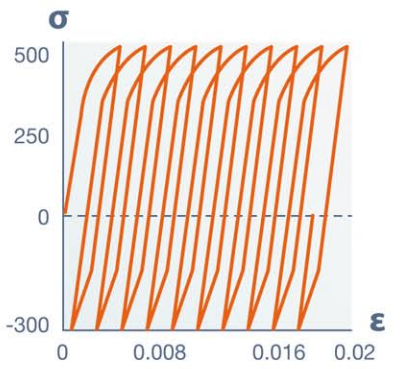
- Fast simulation of experimental tests
- 100% compliant with FE material models
- Powerful tool for User material model analysis

Z-sim has been developed to compute the response of all constitutive laws available in Z-mat under either stress or strain control loading instead of forces and displacements. **The simulator runs 50 times faster than the equivalent FEM calculation on a single element**

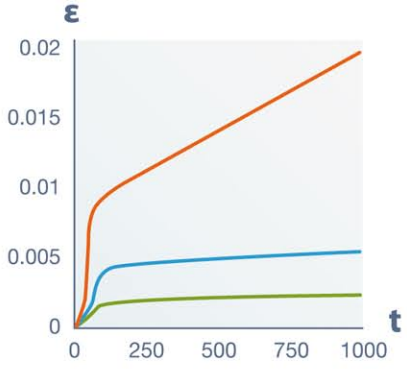
Z-sim is the perfect partner of Z-mat for rapid material comprehension and simulation

The very simple structure of Z-sim's input includes the following :

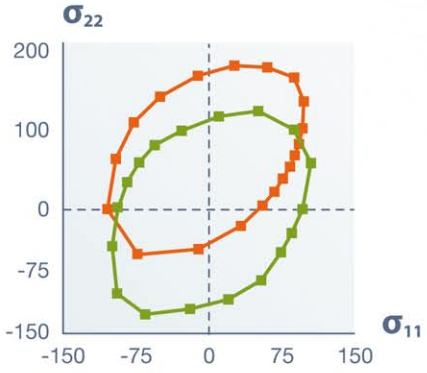
- the description of the loading history in terms of stresses, strains and external parameters (e.g. temperature). Loading history can be directly written in the input file or taken from an external data file. In case of finite strains, loading history can be introduced in terms of transformation gradient directly. For cyclic loading, the user only describes the first cycle, followed by the **cycle** keyword and the number of desired cycles;
- the definition of the constitutive law in a Z-mat input file;
- the choice of the integration method (explicit, implicit or mixed);
- the output management.



Cyclic test with ratcheting effects



Creep test on a viscoplastic law with a static recovery term

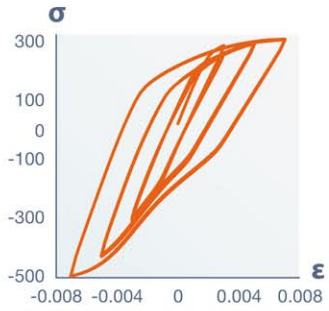


Translation of the yield surface (kinematic hardening model)

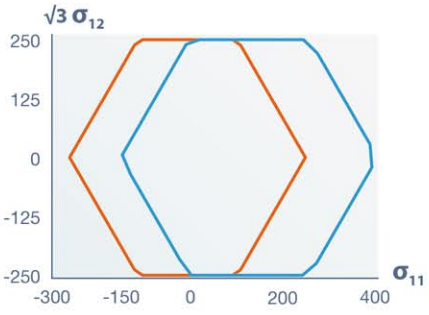
```
****simulate
 ***test foo
  **load
   *segment 10
  time   eto11   sig22   sig33   sig12   param:temperature
  0.0    0.0     0.0     0.0     0.0     20.
  2.0    0.01    100.    0.0     0.0     600.
  6.0   -0.01    400.    0.0     0.0     600.

  **model
   *file steel.mat

   *integration  runge_kutta 1.e-3

  **output time eto11 sig11 eto22 sig22
****return
```

- Beginning of the simulation. Output file name: foo.test
- Each simulation step is divided in 10 substeps. 10 points are stored in the output file for each line of the table
- Loading table
- Material behavior is described in the file steel.mat
- Integration method and convergence parameters
- Contents of the output file

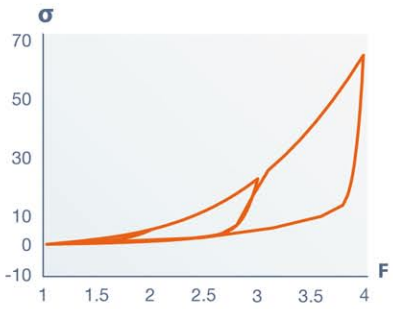
Material models are 100% shared between Z-sim and Z-mat. User models implemented in Z-mat by means of the ZebFront preprocessor are also available in Z-sim. Other functionalities are provided to plot yield or damage surfaces (actually any potential) in the stress space at different points of the loading history.



Cast Iron material model



Single crystal model (FCC) with kinematic hardening. Yield surface



Finite strain plasticity. Mullins effect due to Ogden approach