

ALE3D Material Model Implementation Class

Preliminary Agenda

Wednesday, July 23, 2008

- 8:00 ALE3D Overview
- 8:15 Continuum mechanics applicable to constitutive modeling
 - kinematics, stress measures
 - objectivity, rate equations
 - basic thermodynamic considerations
- 9:00 Finite element context for constitutive models
 - weak form of the momentum equation and time derivative
 - shape functions and derivatives
 - connections between stress and strain rate and nodal forces and velocities
- 9:30 Basic plasticity
 - yield surfaces and flow potentials
 - J2-Flow, Tresca, Gurson yield functions
 - strain hardening and strain rate sensitivity
 - anisotropy
- 10:15 Break
- 10:30 Constitutive model integration schemes
 - explicit forward
 - rate tangent modulus for rate dependent materials
 - radial return – implicit and explicit techniques
 - consistent tangent modulus for implicit calculations
- 11:15 Requirement for multiphysics simulations
 - implicit, thermal, chemistry
 - advection
- 11:45 Lunch
- 1:15 Model implementation in the MS material “view”
 - logical layout for componentized material models
 - elasticity, EOS, strength, fracture
 - specifics of how to implement a model component
- 2:00 Hands on model implementation #1
 - insert a power-law strength model
 - compile and watch it run
- 5:00 Adjourn

Thursday, July 24, 2008

- 8:00 Material views in ALE3D
purpose and strategy
what is involved in creating a new material view (no hands on for this)
- 8:15 Including an existing material model file in the MS material view
show examples for Abaqus UMAT, Sandia GEOMODEL, LANL TEPLA
- 8:30 Hands on model implementation #2
wrap an existing Abaqus UMAT (FORTRAN 77 subroutine will be provided)
compile and execute
- 11:00 Discussion of possibilities and user desires
multiple program multiple data (MPMD) example
future possibilities for linking an external material library

Tell us what you would like to see
- 12:00 Adjourn