FEA & Algor Analysis of 3-D Solid Models

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Introduction

- Finite Element Analysis (FEA) uses a mathematical model to represent an object or phenomenon
- Appropriate model must be chosen for system at hand
  - Theory of Elasticity
  - Deformation Theory of Plasticity

FEA

- Two main parts:
  - Mathematics to define a problem
  - Mathematics to solve a problem

FEA Uses

1. Structural Analysis
   - Linear
   - Contact
   - Fracture Mechanics
   - Nonlinear (geometric)
   - Nonlinear (material)

FEA Uses

2. Fluid
   - Laminar Flow
   - Turbulent Flow
3. Dynamic
   - Constrained
   - Free Response
   - Forced Response

FEA Uses

4. Thermal
   - Convection
   - Conduction
   - Radiation
   - Steady-State
   - Transient

Algor's Ability

- Analysis of 1D, 2D, & 3D Models
- 3D Models can be imported from other proprietary software

FEA & Algor's Limitations

- FEA (Algor) is not an alternative to learning
- Quality of a numerical simulation depends on the ability to define the physical problem
- Programs that attest to be the end-all solution generally have little versatility

FEA & Algor's Limitations

- Any finite-element solution corresponding to a particular mesh and polynomial elements will report finite stresses.
- Not all problems can be modeled as a linear problem

Considerations

- A well-defined mathematical model should be viewed as a special case of a more general mathematical model.

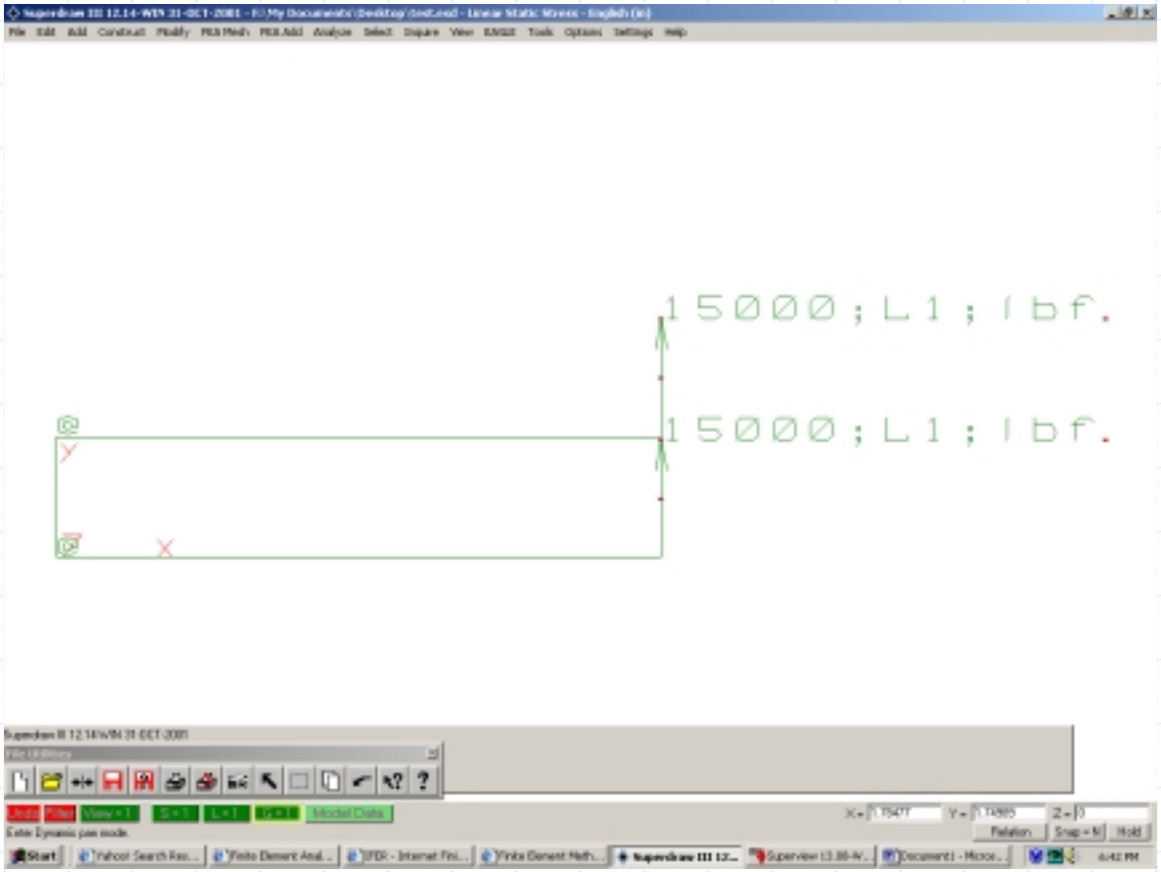
Considerations

- When the maximum von Mises stress turns out to be larger than the yield point to the material, then a model based on the linear theory of elasticity is inappropriate.
- Higher order models should be used to imitate the real world assurance

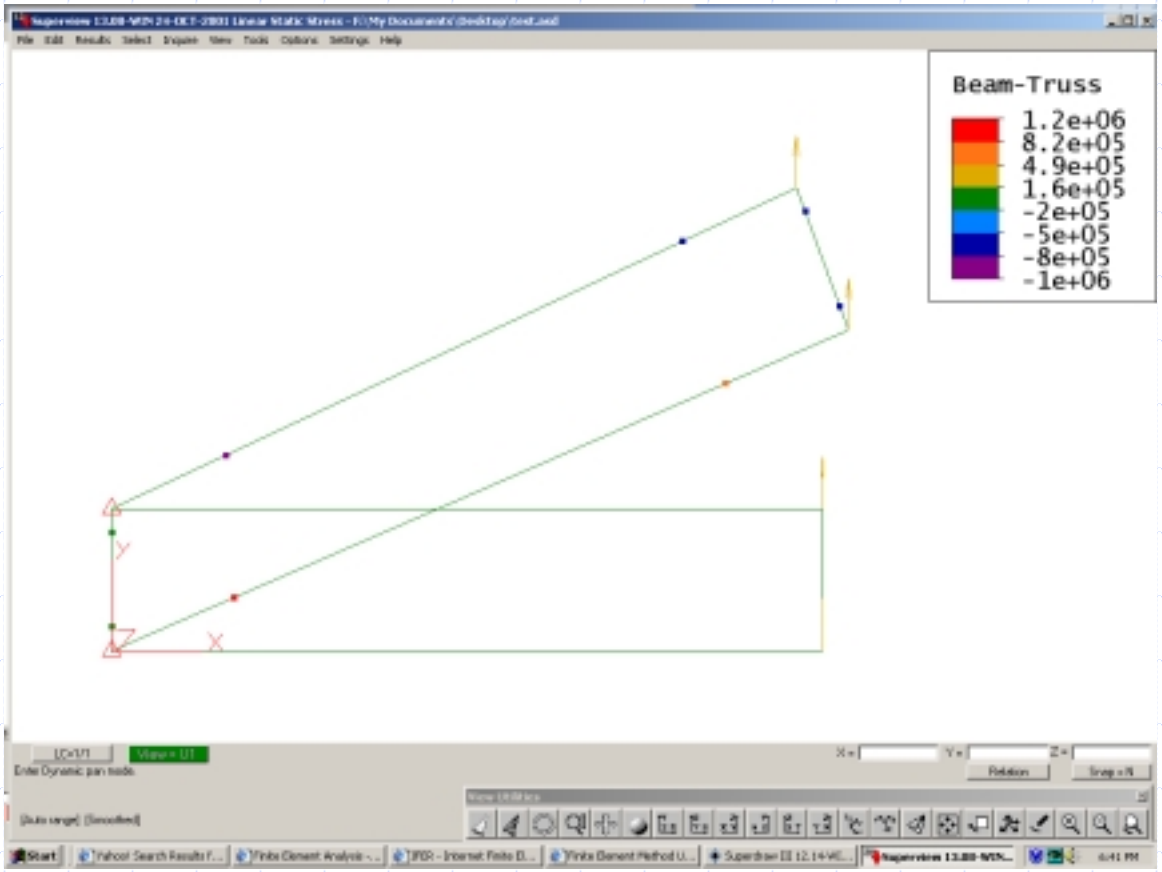
Considerations

- A linear model should be used as a first step in solving a non-linear problem

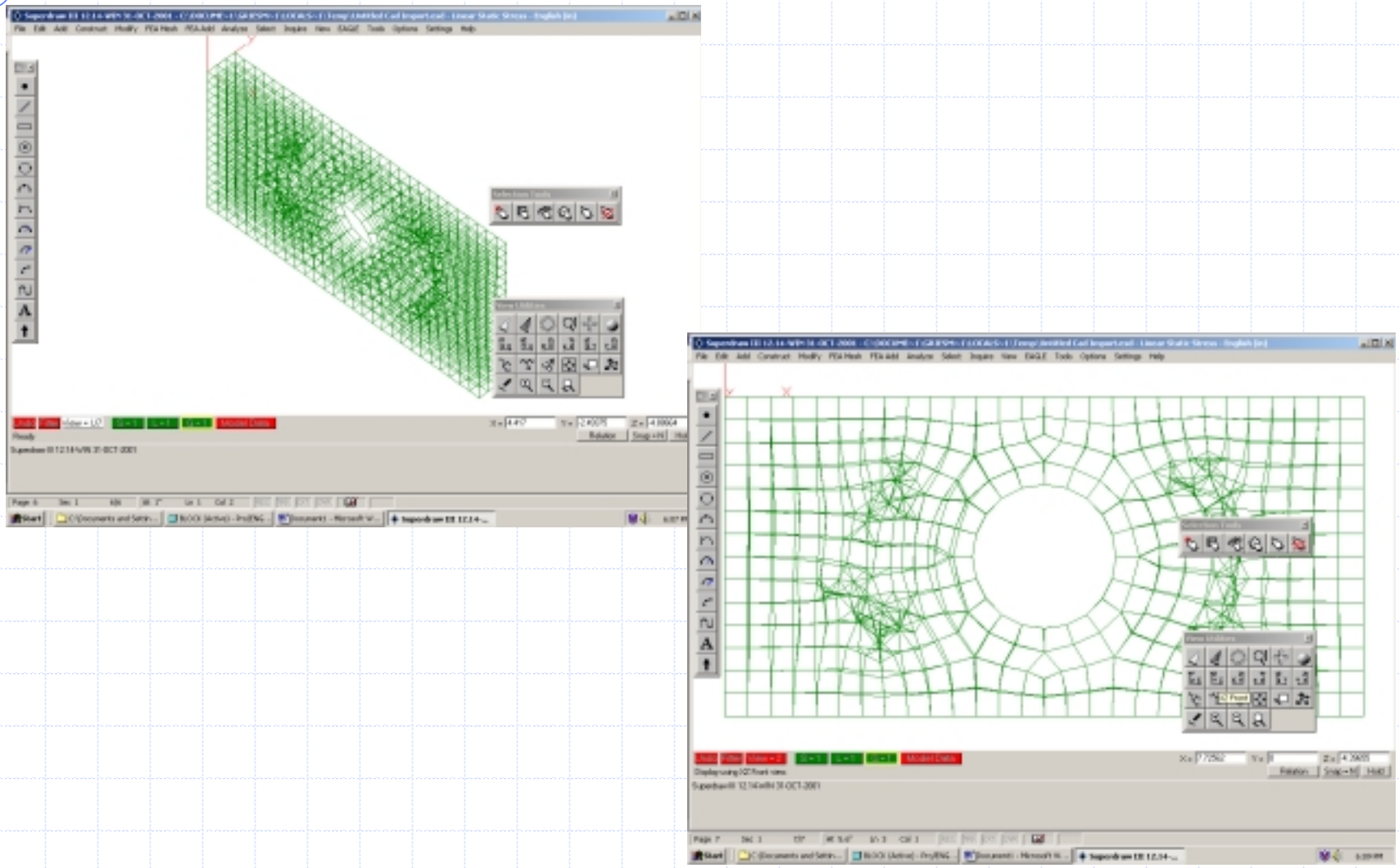
Incorrect Analysis



Incorrect Analysis



A Simple 3D Example



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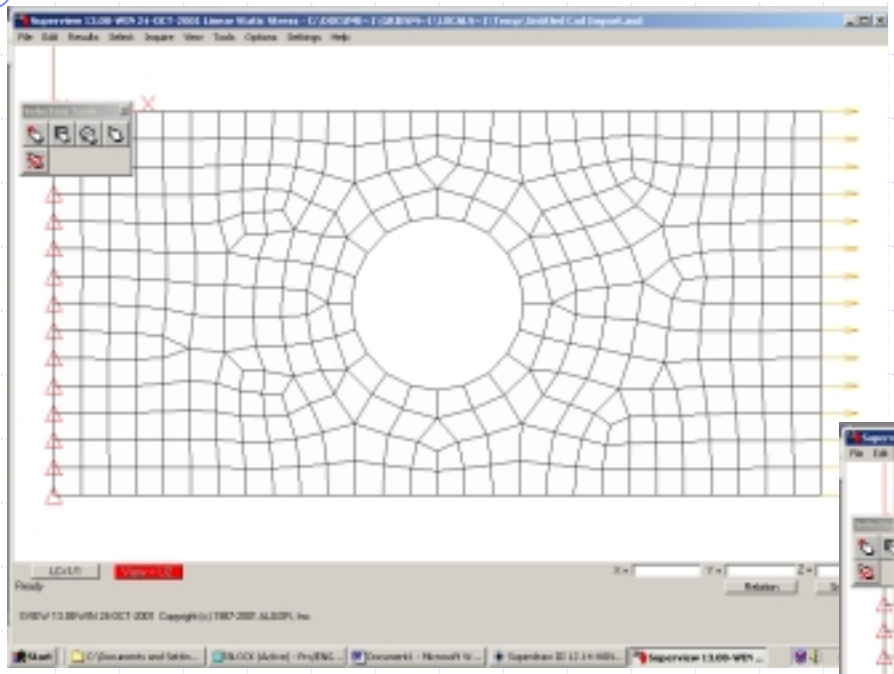

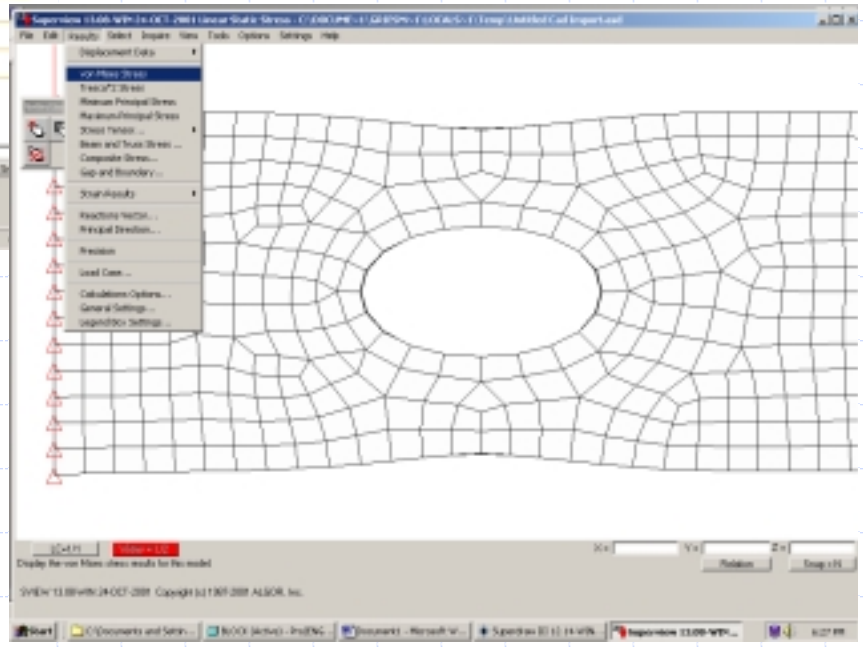

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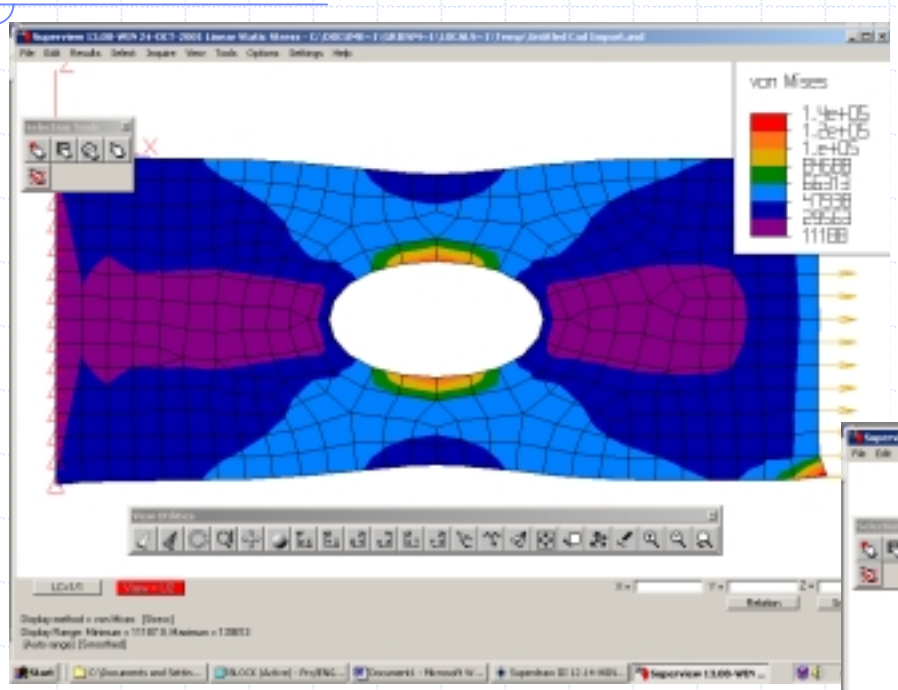
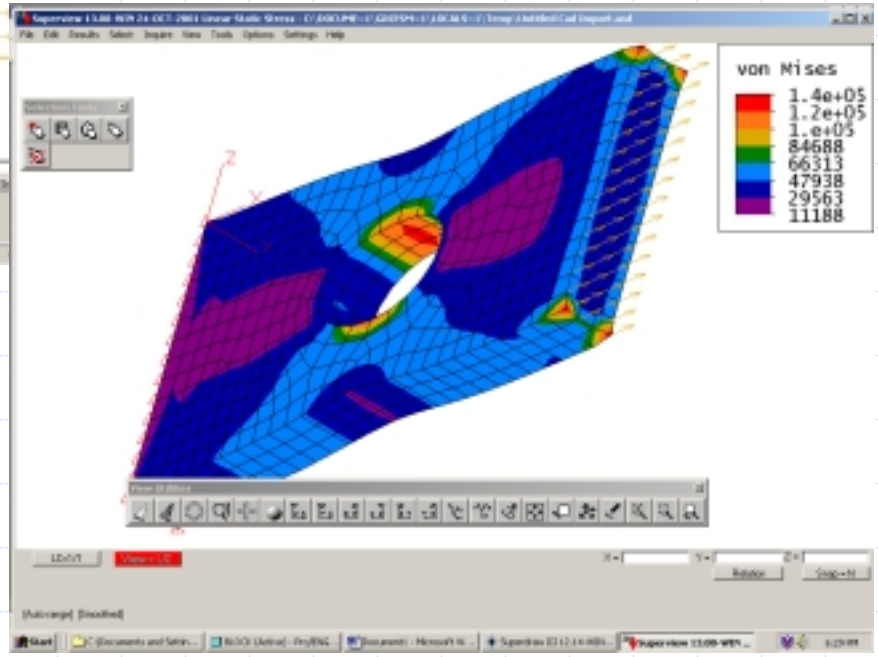
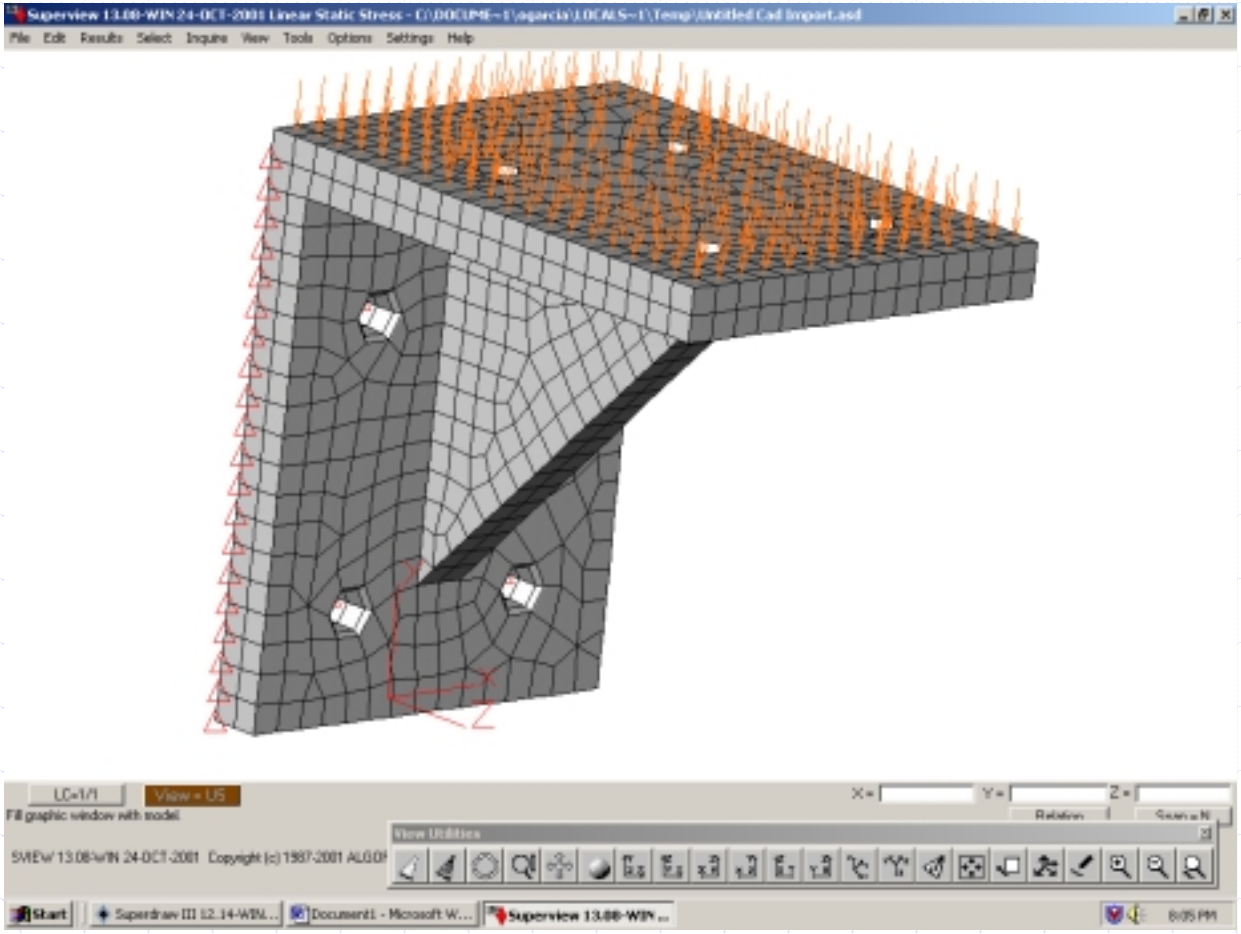




A More Complex Example



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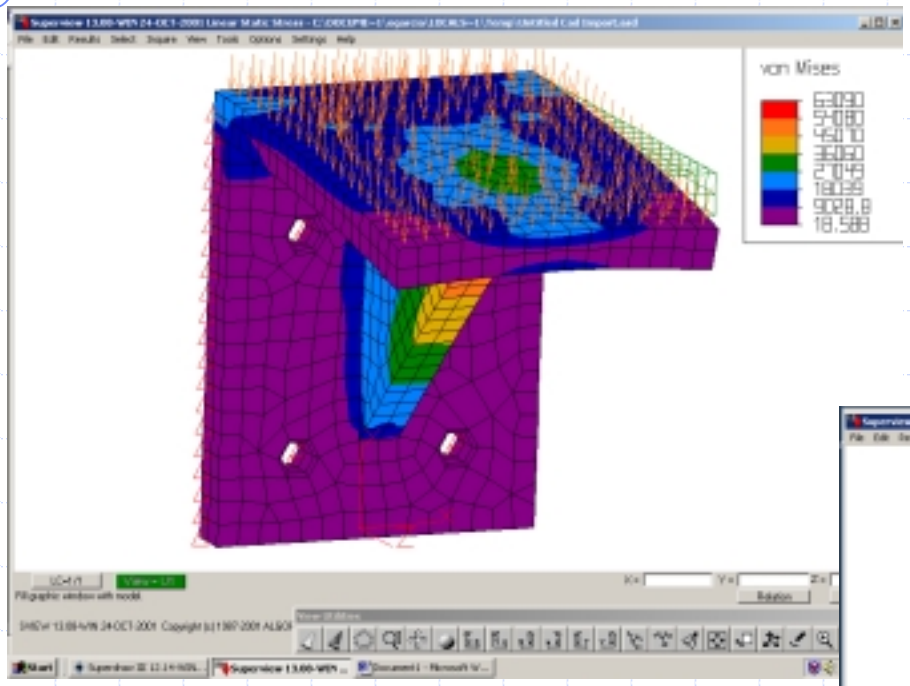

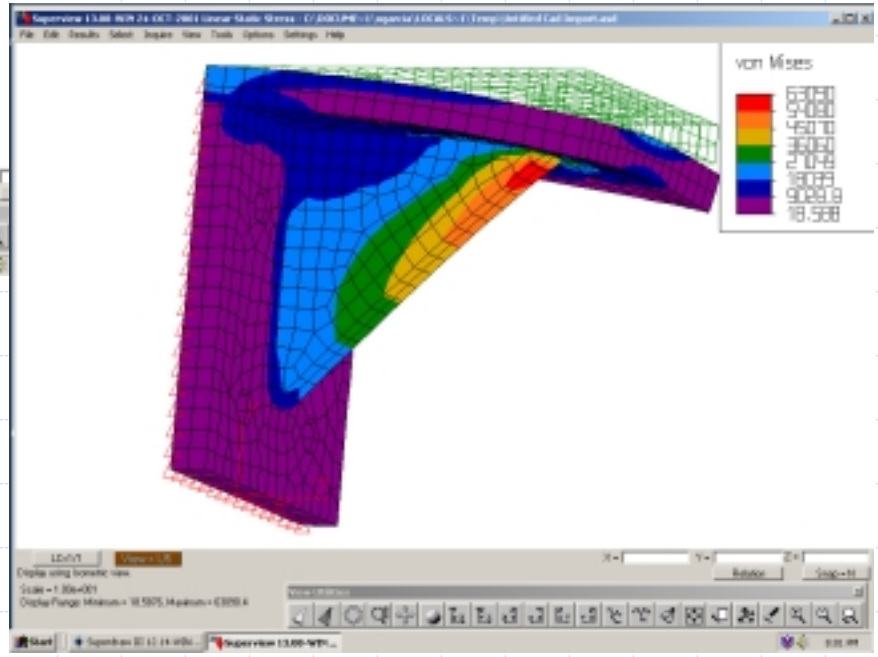

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