Supercomputing Project for High School Students

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Outline

- Motivation
- Inspiration
- Product
- Technical summary
Motivation

- I have background in physics and computer science
  - B.S. in Physics
  - Ph.D. student in Computer Science
- Want to show students how these interests mesh
Motivation

- I have taken many courses applying numerical analysis to engineering physics
- I work in numerical analysis, a.k.a. scientific computing
- I use supercomputers in my research
Inspiration

- People think supercomputers are amazing and esoteric
- Supercomputer located at TRECC facility available for educational use
- TRECC and Hinsdale have tried working together but nothing happened yet
Inspiration

- Use TRECC supercomputer to perform engineering physics analysis for student-created structures!
- Find suitable GUI for students, and suitable finite element analysis program for supercomputer
Product

Contour Fill of Node Displacements, \(|\text{Node Displacements}|\)

6.0316
5.3616
4.6514
4.0212
3.351
-2.8808
-2.0106
1.3404
0.57015
0

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Technical Summary

- **Software used:**
  - GiD for drawing, meshing, and postprocessing
  - FEIt for finite element analysis
  - SSH for Windows for FTP and SSH access
  - Shell and Perl scripts for file parsing and translation and job execution

- **Hardware used:**
  - School laptops for GiD and SSH
  - TRECC computing cluster for file parsing and translation and job execution
GiD

- “The Personal pre- and post-processor”
- Produced by CIMNE in Spain
- Free academic version allows up to 700 2-D elements
- http://gid.cimne.upc.es/
FEIt

- Open-source software for finite element analysis
- Solves linear static structural analysis problems
- http://felt.sourceforge.net/
Secure Shell for Windows

- Most other OS have ssh built-in
- SSH Secure Shell client can transfer files in intuitive GUI
- Also has shell function so students can enter commands
- http://www.ssh.com/
Shell and Perl Scripts

- File format from GiD not compatible with FEIt
- I wrote perl scripts to translate back and forth
- Also wrote interactive shell script for students to enter filename, magnitude of load, and material
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