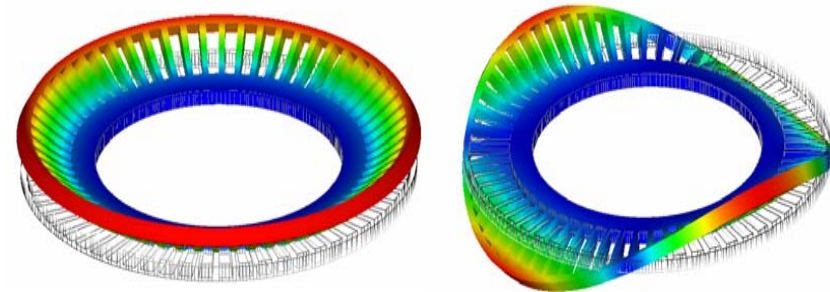


R&D field: Engineering

# Structural Calculation by Finite Element Method (FEM)

- Program name: FrontSTR
- Developer
  - RSS21 and HEC-MW teams, Institute of Industrial Science of The Univ. of Tokyo
- Abstract
  - Structural analysis with the finite element method (static analysis, nonlinear analysis, dynamic analysis, and heat transfer analysis).
  - Suited for middleware to bring out performance of hardware platform (and for parallel computation with Windows machines).
  - Parallel visualization function.
- Algorithm
  - Three-dimensional shells, solid elements, first- and second-order elements.
  - Linear equation methods (iterative and direct methods).
  - Domain decomposition (graph partitioning by Metis).
- Current computation size
  - Linear static analysis (30 million vertices, 64 CPUs, 5 hours).
  - Eigenvalues (0.3 million vertices, 4 CPUs, 6 hours).
- Future computation size in 2010
  - Model size of 0.1 billion vertices or more.
  - Linear static analysis, eigenvalue analysis, and nonlinear analysis.
  - Large-scale analysis of optimization and coupled analysis.



Eigenvalue analysis of a turbine rotor

- Expected results
  - Identification of unknown phenomena based on precise analysis (about 10 times more precise than the current analysis in each direction of the three dimensions).
  - A substantial reduction of computation time in iterative calculations of optimization and coupled analysis with large-scale and precise models.
- Reference
  - <http://www.rss21.iis.u-tokyo.ac.jp/theme/multi/heckernel/index.html>