MotionSolve와 OptiStruct를 연계한 기어의 응력 해석

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Agenda

1. Introduction
2. Solution Process
3. Case Study
1. Introduction

• Finite Element Analysis
  • Non-linear contact analysis (Finite sliding contact)
  • Weak point: Solving time, Convergence
1. Introduction

- Finite Element Analysis Coupled with Multi-Body Simulation
  - Solving time and convergence improved
  - Realistic system behavior easily considered
2. Solution Process

MBS

Loads Extraction

MD Plugin

Loads Assembly

Results

Digital twin

Design the Difference with Digital twin
2. Solution Process

- MD Plugin (Multi-Disciplinary Plugin for HyperWorks)
2. Solution Process

• MD Plugin: **Who is it for?**

• **MotionView Users**
  - To easily transfer nodes, lines, solids, and meshes from HyperMesh
  - To model compliant joint with friction and backlash
  - To model cam or gear contact with analytical forces
  - To model cable system wrapping

• **HyperWorks Users**
  - To interpolate AcuSolve fluid loads mappings on MotionSolve flexible bodies
  - To apply MotionSolve 3D contact loads or modal loads on OptiStruct models
  - To plot FRFs from MotionSolve linear results
3. Case Study: Rack and Pinion
3. Case Study: Rack and Pinion

Design the Difference with Digital twin
3. Case Study : Rack and Pinion

- [ run4fem ] Panel : User Inputs

1. Body selection : Up to 5 bodies
2. List output time steps in either format :
   - 0, output time steps
   - 1, begin, end, increment
3. Nodes merging tolerance
4. Nodes searching distance
5. Job submit
3. Case Study: Rack and Pinion

- [run4fem] Panel: Outputs
  - Solver input files: .xml
  - Simulation output files: .h3d, .abf, .mrf, etc.
  - CSV out files: floating loads only
  - FEA solution input files: .fem
  - HyperMesh import script: .tcl
3. Case Study: Rack and Pinion

- Multi-Body Simulation Result
3. Case Study: Rack and Pinion

- Loads Assembly

- Split page with HM for OptiStruct window
- HyperMesh processing steps:
  - Load OptiStruct model
  - Show only desired components
  - Load script files: Model-Rackpin steering-Pinion.tcl
  - Add 1 constraint (123456) at center of lumped load RBE2 in current load collector
  - Show only “TIME HISTORY (D)” load step
  - Submit OptiStruct job from displayed
3. Case Study: Rack and Pinion

- Loads Assembly
3. Case Study: Rack and Pinion

• Result Animation
3. Case Study: Planetary Gear

![Image of a planetary gear system with labeled joints and forces.]
3. Case Study : Planetary Gear

- Multi-Body Simulation Result
3. Case Study: Planetary Gear

- Loads Assembly

![Image of planetary gear simulation with time history data]

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3. Case Study: Planetary Gear

- Result Animation
3. Case Study: Differential

From global system analysis to local component assessment
Thank You!