Research Scope and Objective

- To develop gear mesh representations that will enable dynamic models to be formulated for simulating the vibration response of the driveline systems.
- To perform studies of the modal and dynamic characteristics controlling mesh force generation, vibration transmissibility, and gear whine.
- To develop an integrated gear mesh and dynamic modeling and analysis software package.
- To apply the software package for design, analysis and trouble-shooting.
- To develop a design roadmap for durable, quiet driveline structures.

Current Research & Development Activities

- Applying the coupled multi-body dynamics and vibration model to simulate the torque sweep, nonlinear dynamic response of driveline systems
- Studying the effect of propeller shaft bending modes on nonlinear dynamics in driveline systems
- Predicting the dynamic mesh stiffness of hypoid and bevel gears under operating conditions
- Analyzing the effect of impact damping on gear tooth clashing response

Next consortium meeting on March 19, 2012 at Ohio State Univ., Columbus, Ohio.

Fall consortium meeting on August 13, 2012.


**GRADUATE STUDENT PROFILES**

**Junyi Yang** (4th year PhD) joined the University of Cincinnati in August, 2008. He is actively seeking for full-time, permanent employment now, and is expected to graduate in Spring 2012. Junyi has extensive experience in performing automotive and off-highway vehicle driveline NVH, CAE simulation, noise and vibration measurement, and structure optimization. He has expertise in spiral bevel/hypoid gear design, vibration and acoustics, experimental modal analysis, sound localization methods, FEM, BEM, TPA, sub-structure technique, nonlinear dynamics, rotational system dynamics, signal processing and control.  junyi.seu@hotmail.com

**Yawen Wang** (2nd year PhD) was a research assistant in the State Key Lab of Mechanical Transmission at Chongqing University prior to joining the Hypoid and Bevel Gear Mesh and Dynamics Consortium research team at the University of Cincinnati. He has experience in CAE simulation, FEM, gear vibrations and gear noise, and hypoid and bevel gear mesh and dynamic modeling. His current research focuses on coupled multi-body dynamics and vibration of geared rotor systems. wang2y4@mail.uc.edu

**Zhenghong Shi** (1st year PhD) spent two years studying micro linear piezoelectric actuators in the Advanced Linear Actuation Laboratory at Shanghai University prior to joining the Hypoid and Bevel Gear Mesh and Dynamics Consortium research team at the University of Cincinnati in 2011. He has knowledge in mechanical vibrations, FEM, CAD/CAE and robotics. His current research project centers on modeling the dynamic stiffness of geared systems and tooth impact damping characteristics. shizg@mail.uc.edu

**Srikumar Gopalakrishnan** (1st year PhD) worked as a Finite Element Analyst for four years on static linear and nonlinear structural analysis and thermo-structural problems prior to joining the Hypoid and Bevel Gear Mesh and Dynamics Consortium research team at the University of Cincinnati in 2011. Currently, he is working on gear dynamics and gear noise for his dissertation research.

**FUTURE HGSIM FUNCTIONALITIES**

- **Units are shown for propeller shaft and mixed-EHL model:**
Eccentricity effect for coupled multi-body dynamics and vibration model with true mesh option. Default pinion eccentricity value is 0. To enter another value, check “Add eccentricity effect.”

Keys: ecc=0, no eccentricity; CA, LTCA based eccentricity model; TE, Transmission error based eccentricity model

Nastran cards can be created for both rotational directions in one run of mesh analysis. After selecting the option, click “Generate single-point mesh model for FEA” in the Post-processor.

Post-processor results

Nastran cards can be created for both rotational directions in one run of mesh analysis. After selecting the option, click “Generate single-point mesh model for FEA” in the Post-processor.

Eccentricity effect for coupled multi-body dynamics and vibration model with true mesh option. Default pinion eccentricity value is 0. To enter another value, check “Add eccentricity effect.”

Keys: ecc=0, no eccentricity; CA, LTCA based eccentricity model; TE, Transmission error based eccentricity model

Nastran cards can be created for both rotational directions in one run of mesh analysis. After selecting the option, click “Generate single-point mesh model for FEA” in the Post-processor.
- Upgrade Calyx reader to accommodate export file version 1.04

- New tool that can perform torque sweep calculation for nonlinear time-varying response cases
  
  (a) Dynamic transmission error
  
  (b) Dynamic mesh force
Post-processor for plotting unloaded TE (Angular, Translational and Fast Fourier Transform)
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