Development of a Multi Rigid and Flexible Body Analysis Program

Friday, March 26, 2010  |  2:00 pm  |  DeWALT Seminar Room, 2164 Martin Hall

Abstract: A parametric coordinate system for multi-rigid and flexible bodies is presented. Equations of motion and kinematic constraints are developed, using the parametric generalized coordinates. The number of the generalized coordinates is increased slightly, while the number of nonzero entries of the resulting sparse matrix is dramatically reduced. The number of arithmetic operations for revolute, translational, and spring elements, which are most frequently used in mechanical system modeling, are compared with this of the conventional Cartesian formulation. The formulation is then extended for the flexible body dynamic analysis. The equations of motion for flexible body are presented. A virtual rigid body concept is used to connect a flexible body using a joint or force element. Multifrontal solver is used to maximize the Gaussian elimination of the large sparse matrix resulting from the proposed formulation. Graphic user interface (GUI) of the dynamic analysis is very important for easy modeling of a complicated system. Concept of the GUI is presented. Many examples including tracked vehicles, electronic systems, and machineries are presented to demonstrate the efficiency of the proposed method.

Biography: Daesung Bae received the BS degree from Hanyang University, Seoul, Korea in 1982 and MS and Ph. D from University of Iowa, Iowa city, in 1983 and 1986, majoring in mechanical engineering. He was a senior researcher for two years at University of Iowa. He became an assistant professor at University of Kansas during 1988 -1991. He served as a design engineer for one year at BAE systems. He is currently a professor at Hanyang University, Seoul, Korea since 1993. His research interests include formulation of multibody rigid dynamics, finite element development for large deformation, plasticity, nonlinear material modeling, numerical analysis for linear systems, and parallel processing. He founded a CAE company VirtualMotion and is developing Daful software, which analyzes multi flexible and rigid body behavior on the time domain.

Dr. Bae will be hosted by Professor Avram Bar-Cohen (abc@umd.edu) of Mechanical Engineering.