



DEPARTMENT OF MECHANICAL ENGINEERING Purdue School of Engineering and Technology

SPRING 2004 SEMINAR SERIES

Date: **Thursday, March 4, 2004**
Time: **11:00 am - 12:00 pm**
Room: **SL 165**

Reception at 10:45 am (cookies and refreshments served)
Everyone is invited

Visualization of CFD and Finite Element Results in Virtual Environments Dr. Tamer Wasfy

President and Founder, Advanced Science and Automation Corp., VA

Abstract. Deriving useful information from complex spatial flow fields generated by CFD codes requires an effective visualization strategy that can help users quickly and accurately extract the useful design information. Virtual environments (VEs) are computer-generated spatial environments that can be intuitively viewed and manipulated by human users in real-time. In this seminar, a strategy for effective visualization of CFD datasets in VEs is presented. The key elements of the visualization strategy are: (a) use of a hierarchal object-oriented VE architecture; (b) strategic use of global and local visualization objects; (c) effective use of multimodal interfaces including hierarchical GUIs and natural-language voice commands; (d) a general efficient point search algorithm that allows constructing the visualization objects at interactive frame rates. Global visualization objects include arrays of stream lines/ribbons/volumes, colored/contoured surfaces; volume arrows; iso-surfaces; vortex cores and boundary layer visualization objects (including surface-restricted streamlines and separation/attachment lines). Local visualization objects include: stream lines/ribbons/volumes probes; colored/contoured surfaces; elevation surfaces; surface arrows; local iso-surfaces, cross-section line probes, and 2D graphs.

In the last part of the seminar, examples of VE visualization of dynamic finite element simulations of flexible multibody systems will be presented.

About the Speaker. Dr. Tamer Wasfy is president and founder of Advanced Science and Automation Corp. He received a B.S. (1989) and an M.S. (1991) in mechanical engineering from the American University in Cairo, and a Ph.D. (1994) in mechanical engineering from Columbia University. Prior to his current position, he worked as a research scientist at Columbia University and at the University of Virginia/NASA Langley Research Center. Dr. Wasfy led the development of several software codes that are used by NASA and by automotive and aerospace companies. These include: a time-accurate finite element code for modeling flexible multibody systems and fluid flow and an object-oriented virtual-reality toolkit.

He has authored and co-authored over 45 conference and journal articles. His research interests include flexible multibody dynamics, belt-drive dynamics, CFD, the finite element method, visualization of large-scale datasets, virtual reality, and intelligent software agents. He is a member of the ASME, AIAA, and SAE.