Computer Aided Engineering Design and Virtual Prototyping

Faculty:
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Research Interest:
CAD/CAM/CAE, Product Design, Virtual Prototyping, Virtual Reality

Facilities at Virtual Prototyping Lab:
Virtual Reality Facilities:
- Hardware
  - PowerWall large scale Virtual Reality system
  - Two PHANToM Omini Haptic Devices
  - Six High-end HP workstations
  - One ZPrinter 450 3D printer
  - One Microscribe MLX system (Coordinate Measurement Machine)
- Software
  - OpenHaptics Toolkit
  - Freeform Modeling system

Collaborative Engineering Design Facilities:
- Hardware
  - Two High-end Sun servers (x2100)
  - Twenty Five High-end HP engineering workstations
  - Tandberg Video conference system
- Software
  - Unigraphics NX5 (CAD)
  - Teamcenter Community 5.2 (Collaboration)
  - MAC. ADAMS, Altair. Hperworks, and ANSYS (CAE)
  - Video and audio conferencing software

Research Activities:

Acquisition of a PowerWall Virtual Reality System for Enabling Research/Teaching in Virtual Prototyping

This is a NSF funded project. The goal of this project is to acquire a PowerWall-Based Virtual Reality (VR) system to enable the research and teaching in virtual prototyping at Prairie View A&M University (PVAMU). The VR system will be capable of providing life-size 3-D visualization of virtual object enhanced by nonvisual display modalities, such as haptic feedback and motion tracker. The major component of the VR system is the PowerWall which is a flat, large-scale (10 ft by 7.5 ft) stereoscopic visualization system. The PowerWall VR system will be utilized in four core research projects and three secondary research projects. The core research projects that will be enabled by the VR facility are: (1) Development of virtual sculpting system; (2) Heterogeneous material modeling; (3) Avatars’ impact on people’s behavior; and (4) Molecular modeling of the ligand interaction. The secondary research projects include: (1) Design optimization for propulsion components; (2) Development of carbon Nanotubes
composites; and (3) Robust control of flexible arm robot. The VR system will also be integrated in the graduate and undergraduate curricula in Mechanical Engineering and Computer Science.

**Virtual Sculpting with Haptic Interface**

The goal of this system is to enable interactive modeling in a virtual environment such that the user can focus on the design intent. An interactive modeling method as shown in Fig. 1 is implemented with VR hardware and software to allow the user creating and modifying 3D free-form object in an advanced virtual environment. The system’s stereo viewing, motion tracking and haptic interface capabilities provide a friendly environment where the user can create free-form objects in an intuitive manner similar to sculpting in a physical environment.

**Development of Nanomaterial Computer Simulation Modules**

This project is funded by Department of Education. The project is to develop haptics-augmented simulations for students to explore the basic concepts and properties of nanomaterials and nanostructures. The visual and tactile senses will be the main media used in the module to improve the teaching and learning of nanotechnology. Students will play an active role in the virtual environment featured with the haptics interface. Haptics involves active touch such as a student manipulating an object during hands-on nanotechnology explorations.