National Science Foundation Industry/University Cooperative Research Center for e-Design

Center for e-Design

Janis Terpenny, Director
Motivation

- $1 trillion in U.S. annual revenues in discrete manufactured products
- Need for reduced time to market
  - e.g., Automotive design cycle now 36-48 months, needs to be 18-24 months, eventually 12 months
- Need for lower cost, yet higher quality products
- 70% of product costs committed at design phase
Impact of Design Decisions

Product Development Cycle (Time)

-- COST, PERFORMANCE, and QUALITY GET LOCKED IN EARLY --
Goal: Efficient, Effective, Competitive

Design of products and systems considering a variety of stakeholders and life-cycle stages

- Designers
- Suppliers
- Customers
- System Integrators
- Manufacturers
Industry Technology Needs

- Remote and distributed design via Internet
- Collaboration among all stakeholders
- Customer-oriented and supplier communication
- Interoperability among heterogeneous systems
- Multidisciplinary constraints
  - Technology-limited, market-driven, regulatory,…
- Scalable, flexible and efficient platform
- Virtual product prototyping
  - Physically realistic
Primary Missions

1. Enable the design and realization of high quality products and systems at reduced cost and reduced time to market through research and development of methods and tools for:
   - Improved design process and methods
   - Knowledge/information capture and reuse
   - Integration environments that support collaboration and decision making

2. To nurture and cultivate a new breed of engineers, scientists, and business leaders through a synergistic university/industry collaborative model
Design Issues in New Paradigm

Virtual Product Design and Realization

- Product Attributes
- Design for X Tools (e.g., DfE)
- Predictive Reliability Models
- Corporate Mfg. Memory
- E-Operations & Supply Chain Optimization
- Supplier Mfg. Capabilities and Constraints
- Model-based Produc-ability Evaluation Tools

Partners

Web
Research Thrust Areas

- Enabling Information Infrastructure
- New Design Paradigms and Processes
- Design Optimization
- Visualization and Virtual Prototyping
- Design Education
Enabling Information Infrastructure

- Integrate distributed design objects and tools
- Support collaboration among design stakeholders
- Interoperability of remote and heterogeneous systems
- Scalability, extensibility, and portability of tools
New Design Paradigms & Processes
Design Optimization

- Multi-disciplinary multi-criteria optimization
- Methods and representation for optimal design performance AND life-cycle issues
  - e.g., manufacture, service, usability, aesthetics, supply chain
Visualization & Virtual Prototyping
Design Education

- Development of engineering design studio and collaboration centers for educating and testing/validating research

- Mechatronics
- Sustainable Energy Design
- Straw Tower Team Building & Design
Sample Current Projects

- Instituting a retroactive KBE philosophy for transition to lean production
- Towards standardizing simulators in teen driver training
- Resolution ontology development for product obsolescence management
- System analysis & optimization design for manufacturing supply chain
- Integration of e-Design ontologies & methods into commercial design processes
- v-Cax security review
- Augmented reality customer collaborator
Sample Completed Projects

- Knowledge representation, capture, and reuse
- Effective communication in interdisciplinary design teams
- Collaboration of distributed stakeholders/tools
- Sustainable design
- Multidisciplinary constraints and optimization
- Design of product families and platforms
- Design of supply chain
- Adaptive design
- IP protection in collaborative design
Sample Industrial Members

[Image of various company logos including CAT, John Deere, NASA, Sauer Danfoss, Belcan, Lockheed Martin, Boeing, Raytheon, PTC, Vistagy, Pratt & Whitney, SPIRIT AEROSYSTEMS, CAMERON, Dresser-Rand, Siemens, ICTAS, MOOG, Cisco, PCC Airfoils, LLC, and CD-adapco]
Membership

- $30,000 annual membership
- Reduced (10% max) or no indirect
- Membership on joint Industrial Advisory Board
- Attend semi-annual IAB meetings
- Board membership to influence research priorities, select projects and collaborate with diverse stakeholders who may be your customers, suppliers, and/or technology providers
Benefits of Membership

- Leveraged investment in strategic research for competitive advantage (access to $1M for $30K)
- First right to developments (tools, methods, prototypes, publications, etc.)
- Participation in research and/or education projects
- Student pipeline to outstanding well prepared graduates
Organizational Structure
Growth and Productivity

- 6 university research sites (Oregon State = 7)
- 26 industrial members (21 current and 5 in process with addition of Wayne State)
- 40 research faculty
- 18 graduate students, 30 undergraduate students
- Funding:
  - $690,000 annually in membership fees
  - $397,050 in-kind
  - $639,055 in NSF I/UCRC awards & supplements
  - $599,994 NSF I/UCRC innovative managing director model
  - Significant funding in related grants from NSF & other sources for faculty working in the Center
Additional Information

- Center for e-Design website – www.center4edesign.org
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