Center for e-Design Newsletter (April 2015)

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Welcome:

Welcome to the April Center for e-Design newsletter. This month the newsletter features the Brigham Young University (BYU) research site, and respective industry members Boeing and Pratt & Whitney. There is much to share from the BYU site, including a new site co-Director (Dr. John Salmon), a spinoff company, and more. The new company, CAD - Alliance, is based from technology developed by multi-user technology at BYU. Both members featured, Boeing and Pratt & Whitney, are large companies with revenues in the 50 -100 billions dollar range. They have equally been very engaged in research at the BYU site and the Center for e-Design as a whole. Also, in this newsletter other sites share current success stories and news. The upcoming DMDII submission date is May 15th.

Thank you to all who participated in the recent Industrial Advisory Board meeting in Portland, Oregon earlier this month. A special thank you to those at Oregon State University. It was a great success! We look forward to continued communication and engagement from both industry and university partners. Save the date for the next meeting hosted by UMass Amherst - October 6 - 8th.

Please enjoy this newsletter and continue to share your news for future editions.

Donald Deptowicz
Director of Technical Excellence
PCC Airfoils, LLC

Janis Terpenny Ph.D
Director
Center for e-Design

Contact:
edesign@iastate.edu
515.294.9095
fax: 515.294.2173

www.centerforedesign.org
Brigham Young University Site of the Center for e-Design

First, we thank all our industry members for their continuing support and the leadership provided by NSF, Center for e-Design and IAB as we explore new tools and theories for engineering applications collaboration. Our site began with a 2010 paper that proposed a research agenda for collaborative computer-aided applications, wherein several users could edit the same model simultaneously.

Our members allowed us to pool funds to address the important agenda objectives:

1) Understanding current collaboration methods used in industry (e-Handbook study Figures 1, 2)

2) Develop multi-user CAD client-server prototypes using mainstream applications like Siemens NX, Dassault CATIA, and AutoDesk Inventor

3) Demonstrate benefits (time reduction, eliminate design errors, etc.) from multi-user design architectures

4) Practical solutions to avoid client collisions when operating in the same design space (such as data consistency, multi-user undo/redo interactions)

5) Model decomposition constraints, such as feature blocking/locking, and model spatial decomposition with constraint planes; and

6) Collaborative layering where specialists from different disciplines (CAD, CAE, CAM) can simultaneously discover and rectify design mistakes early, eliminating costly “turn-backs”

Figure 1 - Worker type collaboration %’s
Figure 2 - Company collaboration %’s
Other advantages that surfaced are the flexibility of data representation in server databases, replacing the data file currently used to store application data. When product data is stored in servers, the data can be configured as Cloud data, stored behind corporate firewalls, or as openly accessible Cloud data given secure access methods.

![CATIA CONNECT](image)

![NX CONNECT](image)

Figure 3 - Multi-user CATIA and multi-user NX

Figure 3 provides examples of this new multi-user paradigm. The top row shows 3 clients designing the front frame of a turbine engine in a multi-user version of CATIA, whereas the second row engages 3 users in an NX multi-user session. Our research used creative network architectures to trick single user applications into performing as multi-user. A few limitations still exist because of API deficiencies, but our more mature versions capture most of the needed operations to make these methods quite viable.

We are also happy to announce that the multi-user technology architectures developed at BYU are now licensed to a new company under the name CAD Alliance. The name recognizes the importance of engaging our industry members in the commercialization activities. Figures 1 and 2 clearly show that technical personnel at our member companies spend about 50% of each day collaborating. Obviously, this motivates the need for engineering applications that encourage, rather than deter collaboration. Dr. Greg Jensen, director of the BYU Site, is retiring from BYU to assume a leadership position within CAD Alliance.

Over the last 4 years we have engaged annually 40 - 50 students, 10 faculty, and 10 industrial members in related R&D. Of our student population, approximately 2/3rds are undergraduate students. We have filed almost 30 patent disclosures, many now being formalized into registered patents, and published numerous papers on many multi-user topics. Some of our industrial members have supported external, but related projects to expedite the maturing and testing of the new multi-user prototypes.

Our goal has always been to assist U.S. companies to be more competitive, by reducing product development time. We anticipate the multi-user engineering applications will ultimately meet that goal.
Boeing and Pratt & Whitney (P&W)

Boeing and P&W (member company, United Technologies) have provided critical resources to expedite the maturing of the NX Connect multi-user prototype to near commercial status. The leaders in this effort are Mike Richey and Matt Symmonds of Boeing, and Bill Sowa of P&W. Boeing and P&W/UTC are giants in U.S. industry, with revenues in the range of $50 B - $100 B annually, but grouped here for their collaborative stimulation to the BYU Site and the NSF Center for e-Design.

Boeing is the world’s largest aerospace company and the leading manufacturer of commercial jetliners and military aircraft combined. Additionally, Boeing designs and manufactures rotorcraft, electronic and defense systems, missiles, satellites, launch vehicles and advanced information and communication systems. Boeing has a long tradition of aerospace leadership and innovation. We continue to expand our product line and services to meet emerging customer needs. Our broad range of capabilities includes creating new, more efficient members of our commercial airplane family; integrating military platforms, defense systems and the warfighter through network-centric operations; creating advanced technology solutions that reach across business units. For more information visit: www.boeing.com

Today, Pratt & Whitney develops game-changing technologies for the future, such as the PurePower® PW1000G engine, with patented Geared Turbofan engine technology. The company’s worldwide large commercial engine maintenance, repair and overhaul network provides innovative services that add value and delight customers around the globe. Pratt & Whitney’s large commercial engines power more than 25 percent of the world’s mainline passenger fleet. The company continues to develop new engines and work with its partners in International Aero Engines and the Engine Alliance to meet airline customers’ future needs. Pratt & Whitney has built a long and distinguished record of providing top-of-the-line military engines to 29 armed forces around the world. For more information visit: www.pw.utc.com

Both companies have:
1) Provided challenging test cases for BYU’s multi-user prototypes
2) Engaged in training sessions, both at BYU and at company facilities
3) Tested prototypes in virtual client-server modeling sessions between engineering students at several universities (e.g., Boeing’s highly awarded AerosPACE consortium)
4) Sponsored cooperative research to expand the capabilities of NX Connect
Welcome New Site Co-Director at BYU Site
Dr. John Salmon has recently taken on the role of Site Co-Director at the BYU site as Greg Jensen recently retired.

$5 Million Investment at UB
The University at Buffalo - SUNY is key participant in new university Community of Excellence in Sustainable Manufacturing and Advanced Robotic Technologies. SMART is a $5 million investment over 5 years.

Research Site Receives $2 Million Robot
At Wayne State University the College of Engineering received a DaVinci robot ($2M) and is planning a user centered design for robotic surgery with the Veterans Administration within the e-Design Center site.

OSU has a new degree program related to the Center for e-Design
Oregon State University Robotics is now a degree program. It has a new dedicated space at the university.

Iowa State University has a new Ph.D. program under development
ISU has a new Ph.D. program in Integrated Design and Innovation underway. This interdisciplinary Ph.D. program will prepare graduates for research careers in innovative product design, both in industry and academia. The overall goal is to create a graduate program that will become a national model for interdisciplinary design education and research. Site Director Seda Yilmaz, Center Director Janis Terpenny, and prior Site Director Judy Vance are among the founding faculty members.

Iowa State University has a new Ph.D. program under development

UMass Amherst Activities Related to 3D Printing
Research in collaboration with UMass Lowell regarding next generation materials in 3D printing is under review. Also, collaboration with NIST related 3D printing research is under review.

e-Design’s Growing Engagement in DMDII
Upcoming submission date is May 15, 2015 for project calls related to:

1. Systems Design
2. Cyberphysical Manufacturing
3. Virtually Guided Certification

Interested in collaborating? Let us know!
Upcoming Events

DMDII Project Call Deadline May 15, 2015

ISERC during IEE Annual Conference,
May 30 - June 2, 2015 in Nashville, Tennessee

ASME IDETC 35th CIE Conference,
August 2-5, 2015 in Boston, Massachusetts

Featured in the next issue: