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THE CONCORDIA INSTITUTE FOR INFORMATION SYSTEMS ENGINEERING IS PLEASED TO PRESENT THE FOLLOWING GUEST LECTURE IN OUR CIISE SEMINAR SERIES

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Concordia Institute for Information Systems Engineering

A Systematic Framework for Product Design Innovation

Abstract: Design is a general intellectual activity that goes into every part of human life. Designers play an important and critical role in developing innovative product, which is a key for a company to excel in the highly competitive market. However, how designers think, reason, judge, and make decisions has not yet been studied well. In this seminar, two experimental approaches will be presented for understanding designers' cognitive activities to explore product innovation in the early design stages: protocol analysis and virtual experiment.

Protocol analysis is to transform the unstructured data collected from designers' narration into structured data. Existing protocol analysis methods have their limitations on specific design problems, specific domains and the persons who analyze the protocol data. A new protocol analysis method is developed based on the concept of state of design, which reflects the nature and characteristics of a design process. It can be easily applied to other design problems and other domains. Some guidelines and recommendations for assisting designers to deliver an innovative design are summarized based on the experimental results.

Virtual experiment is used to simulate the design process through a computer simulation model of design. This model can be used to simulate designer's design process and examine design activities. In order to develop the computer simulation model, finite element mesh design is used as a design example. Three routes leading designers to innovative design are examined through this virtual experiment. Based on the three routes, an Artificial Neural Network-based element extraction method for finite element mesh design is developed to illustrate the feasibility of the three routes for changing design solutions.

The guidelines and routes observed and summarized from the experimental results can be used to assist designers to deliver innovative design solutions. The two experimental approaches can be used for studying human system interaction in ergonomics, robotics, command and control. Some future research directions and plans in exploring product design innovation will also be presented.

Biography: Shengji Yao is a postdoctoral fellow at Concordia Institute for Information Systems Engineering, Concordia University. Her research interests include design creativity and innovation, human factors in engineering design, computer-aided product design, and artificial intelligence in design. She received her bachelor degree (1998) from Jiangxi University of Science and Technology, master degree (2001) from Dalian University of Technology and doctoral degree (2007) from Concordia University.

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