

# Science of Design: Software-Intensive Systems

A National Science Foundation Invitational Workshop  
November 2-4, 2003, Airlie Center, Virginia

## Call for Position Papers

Submission Deadline: October 1, 2003

### Overview

The National Science Foundation's (NSF's) Directorate for Computer and Information Science and Engineering is sponsoring an invitational workshop on the topic of *Science of Design* with a particular emphasis on *Software-Intensive Systems*. The workshop will be held at Airlie Center, 30 miles from Dulles International Airport, November 2-4, 2003. The workshop objective is to help the NSF better define the field and its major open problems and to prioritize important research issues. This call seeks contributions from both U.S. and international participants. Invitations will be based on a short position statement, the author's likely contribution to workshop objectives, and factors such as diversity of views and backgrounds.

### Scope

Essentially every modern technological artifact, system, or process is based on a *design*—an idea, plan, or scheme for the structure, behavior, function, and value of that thing. A design is the product of a process of *designing* of that desired artifact, system, process. Moreover, the design itself is an artifact and is designed. A science of design, then, is an organized body of knowledge about the designs and designing of artifacts and the designs and designing of their designs. For example, the designing of a system driven by computational processes yields an overall design, including designs for its computational processes in the form of software artifacts. The system, its component computational processes, and the system and software designs are all subject to designing. A science of design thus pertains to both end products (e.g., safety, ease of use) and to their designs (e.g., modularity, analyzability). The scope of this workshop is broad enough to include all of these levels, with a particular emphasis on the role of computation and software in the context of software-intensive systems. The term *design* here is not meant to refer merely to an idealized stage of software development between specification and coding.

Past research investments in understanding the design of software-intensive systems have paid off handsomely in improved design capabilities. Nevertheless, software-intensive systems are creating tremendous possibilities, posing significant risks, and having great impacts on our society, and our knowledge of how to design them effectively—and our knowledge of the nature of design itself—still falls far short of what is needed. The goal of this workshop is to address this need by providing guidance to the National Science Foundation of the formulation of a science of design (subject, scope, methods, norms, etc.), major open problems, and important research priorities for a ten-year time frame.

Position papers may address issues to include but not limited to the following. While ideas are welcome from all fields where design is a focus, the emphasis is on fundamental issues for software and software-intensive systems.

- Representations and notations for designs and design tasks
- Role of problem formulation, value, and purpose in design
- Problem-solving techniques and processes involved in design
- Design, task, contract, and industry structures
- Complexity, fit, and adaptability between natural & software-intensive systems
- Implications of changing technology: networks, agents, wireless, sensors, etc.
- Automation of design for software-intensive systems
- Human and social issues in software and software-intensive system design
- The statistical nature of software designs and design processes
- Evaluation of software and software-intensive system designs
- Representing and addressing complexity in software-intensive systems
- Relationship of science, practice, and education in software-intensive systems
- The nature and limits of a science that could account for design and designing
- Broader impacts on society

## **Submitting**

*By submitting a paper you agree to attend the entire workshop should you be invited.* Papers, written in English, must be submitted by 12:00 noon EDT, on Wednesday, October 1, 2003. Papers must be formatted as PDF files in 11 point type and must not exceed two U.S. letter size pages. Longer papers will not be considered. Papers should state a position/perspective and also include author's background relevant to the workshop. Send position papers to [sod-submission@cs.virginia.edu](mailto:sod-submission@cs.virginia.edu). Responses will be sent out as soon as possible.

## **Schedule**

Work will begin on the evening of Sunday, November 2, giving most participants an option but not an obligation to fly in on Saturday, November 1. Work will end at 3:00 PM, Tuesday November 4, in time for most participants to return home that day.

## **Ethos**

The workshop will be organized for collaborative thinking and interaction. Position papers will not be presented in conference fashion, but they will be made available to all participants and all participants will be expected to read them prior to the workshop. Participants will be discouraged from advocating for their own research agendas and will encouraged to step back from current research topics and agendas, to think broadly and reflectively, and to move toward a new set of problem formulations and research priorities.

## **Funding**

The workshop budget is sufficient to cover most reasonable participant expenses, up to a defined limit, to include travel, accommodations, and meals.

## **Web Site**

The workshop web site is <http://www.cs.virginia.edu/~sullivan/sodsis.html>

## **Program Committee**

- Baldwin, Carliss Harvard Business School
- Brooks, Fred University of North Carolina, Chapel Hill, Computer Science
- Dym, Clive Harvey Mudd College Department of Engineering
- Green, Cordell Kestrel Institute
- Jackson, Michael Consultant
- Kay, Alan HP Labs; Viewpoint Research Institute; UCLA
- Kiczales, Gregor University of British Columbia Department of Computer Science
- Morrisett, Greg Cornell University Department of Computer Science
- Nielsen, Jakob Nielsen Norman Group
- Notkin, David University of Washington Computer Science and Engineering
- Shaw, Mary Carnegie Mellon University Computer Science Department
- Sullivan, Kevin University of Virginia Computer Science (Workshop Chair)
- Taylor, Richard University of California, Irvine, Information & Computer Science