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Preface
Interface Design in a Period of Consensus or Chaos?

The relative longevity of the Design, Specification and Verification of Interactive Systems (DSV-IS) workshop series raises a number of questions. After eight meetings, it is important to ask whether our previous work has established any degree of consensus about the core topics and techniques that should be the focus of research in formal and semi-formal aspects of interface design? The reviewing process revealed considerable debate and disagreement about particular papers. Such conflicts were, as usual, resolved by additional reviewing. These disagreements can be interpreted in a number of ways:

1. We have failed to achieve any general agreement about the formal and semi-formal tools and techniques that might support interface design. There may be consensus within specific areas of the DSV-IS community, for example over the benefits of particular temporal modeling notations or constraint-based techniques. However, individuals whose work lies outside those particular areas may still have fundamental concerns about the utility of these approaches.
2. Alternatively, we have achieved some agreement about approaches that support the design of previous generations of interactive systems. However, the changing nature of human computer interaction, including the development of mobile and context aware applications, poses new challenges that these existing techniques cannot easily address.
3. Finally, it can be argued that the lack of concensus is symptomatic of a vibrant research area. Academics continue to question the most basic assumptions of the field in which they work. This spirit of enquiry helps to reveal new insights from future workshops.

The final interpretation in this list could equally be rephrased as 'disagreements reflect the natural tendency of academics to argue at every available opportunity'. Rather than accept this cynical perspective, the following pages provide a brief critical review of the papers in this volume. The intention is to provide the reader with an introduction to some of the themes that will be re-iterated in several papers. The intention is also to determine whether or not this workshop series is creating a consensus or whether disagreements stem from the challenges posed by new forms of human-computer interaction.

There is certainly evidence that this workshop series has helped to build consensus. Many papers explicitly use tools and techniques that were proposed at previous meetings in the DSV-IS series. For instance, de Turnell, Scaico, de Sousa, and Perkusich's paper builds on the work of Palanque and Bastide. The paper in this volume shows how coloured Petri Nets can be used to analyze the navigation facilities that are provided by an industrial control system. The use of coloured nets enables de Turnell et al. to model the undo facilities that have proven to be problematic to previous attempts to use Petri Nets in this area. It is ironic, however, that the concept of 'undo' has only a limited application in the industrial context that they describe. It can be difficult to reverse the chemical reactions that lie at the heart of the process control system they have studied.

Navarre, Palanque, Paternó, Santoro, and Bastide provide further evidence of consensus through the development of techniques that have been proposed in previous workshops. Like de Turnell et al., this work exploits a variant of the Petri Net notation. However, Navarre et al. also use the ConcurTaskTree (CTT) notation to guide the analysis of their interface. This task analysis technique can be used to derive scenarios or sequences of interaction that can help to validate the system model. If a task sequence is not supported then the system model must be refined. Many of the ideas in this paper have been presented at previous meetings. The innovative element here is that Navarre et al. present them in an integrated way and apply them to a range of complex Air Traffic Management case studies.

The issue of consensus is most explicitly addressed in the work of Limbourg, Pribeanu, and Vanderdonckt. They describe the development of the DOLPHIN software architecture that provides a bridge between a vast array of task models. The diversity of these models together with the difficulty of anticipating their potential utility and the problems of moving between different notations can all dissuade designers from exploiting these, typically, semi-formal techniques. Limbourg et al. develop a meta-level model of particular task analytic concepts. This helps to explicitly represent key differences between alternative techniques. It also provides a means of translating between the products of these different approaches. We may not be able to achieve consensus over which task analysis techniques should be used for a particular system. It may, however, be possible to demonstrate consistency between task models developed using rival notations.

Du and England address the weaknesses of previous task analysis techniques in a slightly different manner. They extend the work of Hix and Hartson and of Gray and Johnson that focuses on temporal properties of interaction. Du and England argue that the application of techniques such as XUAN has been hindered by the way in which designers must exhaustively re-specify common interface solutions to similar problems. Du and England, therefore, introduce PUAN, Pattern-based User Action Notation, to capture similar temporal features across many different forms of user interface. The ultimate aim is to "cut down user interface bureaucracy". Of course, it could be argued that Du and England reflect a lack of coherence in the field by deliberately addressing an area that has not been explicitly considered by previous papers in the workshop series. Such an interpretation would, however, contradict the authors' expressed intention to extend rather than contradict previous work in this area.

Du and England's use of 'patterns' reflects the way in which several authors have sought to increase links between work in Human Computer Interaction

(HCI) and Software Engineering. Garrido and Gea provide a further example in their use of UML to describe features of CSCW and cooperative work. UML state diagrams are used to model how actors dynamically change their behavior and influence the behavior of groups of other actors. Doherty, Massink, and Faconti also show how techniques from other areas of Software Engineering can be recruited to represent and reason about particular aspects of interaction. They focus on the use of stochastic process algebras to model the non-determinism that characterizes human interaction with complex systems. There is, however, a strong contract between the work of Garrido and Gea and that of Doherty, Massink, and Faconti. These differences arguably illustrate some of the doubts that arise when attempting to argue for any consensus. For instance, Garrido and Gea aim to model interaction at an extremely high level of abstraction. They focus on the role of individuals and groups within particular working environments. In contrast, Doherty, Massink, and Faconti focus on the motor skill component of particular tracking tasks. It is difficult to envisage how the results from one paper might be used to inform the future work of the other research group. There are also deeper philosophical differences that exist between the use of stochastic and deterministic models to represent and reason about human behavior. It is interesting to note that by modeling low-level tracking behaviors, Doherty, Massink, and Faconti avoid raising many of the more fundamental differences that might have been exposed if they had argued for non-determinism at higher-levels of abstraction.

Philosophical differences about the use of stochastic or deterministic methods is one of several areas in which this year's DSV-IS has raised new challenges to any consensus that may have existed in this area of research. Technological innovation and market change are creating new problems for interface designers. New mobile and context aware devices are creating challenges for task modeling techniques that previously might have assumed a single context of use within an office or home. Luyten and Coninx's paper opens the collection with a proposal for an XML-based runtime user interface description language. The look and feel of an application can be updated using wireless communications. Designers can tailor the interface so that it responds to changes in the user's context or working environment. Mueller, Forbrig, and Cap propose a similar approach. In this case, XML is used to support interface design for mobile applications. The scope of this paper is slightly broader. It presents the TADEUS approach which integrates user, task, and business object models. These models provide important contextual information that can be used to tailor the presentation of information as a user moves within an environment. In contrast, Luytens and Coninx focus more narrowly on user profiling for the layout management of downloadable interfaces.

The impact of technological change can also be seen in Schneider and Cook's Abstract User Interface model and notation. These are intended to help designers improve the plasticity of an interface. The term 'plasticity' refers to the ease with which a particular system might be ported between a range of different devices. This does not simply relate to different renderings for particular widgets on a PC, Apple Macintosh, or other desktop environment. A highly-plastic interface will adapt to the particular device that a user is operating by actively substituting *different* interface components. On a mobile device, there is often insufficient screen area for a pull-down menu and so an implementation will substitute a scrollable list etc.

The first DSV-IS workshop was held in 1994. At that time, it was difficult to conceive that users might download novel interfaces from remote servers as they move between different locations. Given such technological innovation, it is hardly surprising that the tools and techniques which were proposed in previous meetings might now have to be substantially revised to reflect new and changing technological possibilities. Pribeanu, Limbourg, and Vanderdonckt provide a good illustration of the impact of technological change on previous tools and techniques. They look beyond some of the implementation ideas of Schneider and Cook to explore the problems that arise when attempting to model user tasks for context sensitive applications. This is important because device and communication constraints may prevent users from performing particular tasks in certain environments. They show how the ConcurTaskTree notation might be used to represent different contexts as separate branches of a single, larger task model. Alternatively, separate graphs might be used to model the possible tasks that are available in different contexts. Complexity arises when higher-level tasks are composed of both context sensitive and non-context sensitive sub-tasks. This is an important paper not simply for its technical contribution. It, arguably, provides the best example of how new generations of interactive applications are testing the previous consensus over the utility of particular techniques such as the ConcurTaskTree notation.

Technological innovation is not the only factor that challenges the consensus of previous DSV-IS workshops. There is an increasing awareness of particular social aspects of computing that have, arguably, not been adequately addressed in previous research. Sutcliffe investigates the characteristics that users/customers perceive to influence the success or failure of web pages. His motivation is to derive a set of heuristics that might inform the formative evaluation of a potential design. His analysis is driven not simply by usability but also by elements of marketing and of affective computing. Many of his proposed heuristics, therefore, focus on aspects of the design that arguably affect the subjective experience offered by a particular interface. This is an entirely novel area for DSV-IS. It also challenges some of the traditional attributes, such as consistency, that have been the center for much of the previous work in this series. Aesthetic heuristics, such as the use of 'people and personality' to project a particular image, cannot easily be represented in any of the formal or semi-formal techniques that have been presented at previous workshops. Thimbleby's paper shows how elements of Sutcliffe's analysis might be related to fundamental psychological properties. Rather than simply assessing the surface appeal of an interface, Thimbleby examines whether subjective judgements might be derived from universal concepts such as symmetry. His analysis also suggests that the notion of affordance can be defined in terms of the symmetries that apply under actions that are relevant to the particular tasks that are performed by an object. In this sense, symmetry is not simply related to subjective appeal but also to more basic properties that relate to the context in which the artifact is used. It is a difficult and challenging paper. It only provides an initial sketch of the relationship between generic concepts and their realization within particular interfaces. In contrast to Pribeanu, Limbourg, and Vanderdonckt's paper, relatively little is said about constructive ways of using information about particular tasks in particular contexts. It remains to be seen whether future workshops will be able to forge more coherent links between such diverse contributions.

August 2001 Chris Johnson

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