
User Interface Description Languages for Next Generation User Interfaces

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Abstract

In recent years HCI researchers have developed a broad range of new interfaces that diverge from the "window, icon, menu, pointing device" (WIMP) paradigm, employing a variety of novel interaction techniques and devices. Developers of these next generation user interfaces face challenges that are currently not addressed by state of the art user interface software tools. As part of the user interface software community's effort to address these challenges, the concept of a User Interface Description Language (UIDL), reemerge as a promising approach. To date, the UIDL research area has demonstrated extensive development, mainly targeting multi-platform and multi-modal user interfaces. However, many open questions remain regarding the usefulness and effectiveness of UIDLs in supporting the development of next generation interfaces.

The aim of this workshop is to bring together both developers of next generation user interfaces and UIDL researchers in an effort to identify key challenges facing this community, to jointly develop new approaches aimed at solving these challenges and finally to consider future spaces for UIDL research.

Keywords

User Interface Description Language (UIDL), User Interface Management System (UIMS). Next Generation User interfaces.

ACM Classification Keywords

H5.m. Information interfaces and presentation

Motivation

In the last decade, new classes of devices for accessing information have emerged along with an increased connectivity. In parallel to the proliferation of these devices, new interaction styles have been explored. Among these new styles are virtual reality, mixed reality, 3D interaction, tangible user interfaces, context-aware interfaces and recognition-based interfaces. As a result of this increasing diversity of devices and interaction styles, developers of next-generation interfaces experience difficulties such as the lack of appropriate interaction abstractions, the need to create different design variations of a single user interface and the integration of novel hardware. As part of the user interface software research community effort to address these difficulties, the concept of UIDL, which has its foundations in user interface management systems and model-based authoring, has reemerged as a promising approach. UIDLs allow user interface designers to specify a user interface, using high-level constructs, which abstract away implementation details. UIDL specifications can then be automatically or semi automatically converted into concrete user interfaces or user interface implementations. Several UIDLs,, mostly using XML as the general language, have been developed in recent years in order to simplify the development of next generation interfaces. However, despite the advancements demonstrated by the UIDL research community (see workshop on developing user interfaces with XML at AVI 2004 [6], and the adoption of this approach in commercial-level applications), many questions regarding the usefulness and effectiveness of UIDLs for next generation user

interfaces remain open: What models are required for specifying the dynamic behavior of next generation interfaces that are characterized by continuous, physical and multi-user interactions? How can UIDLs be made understandable and useful to user interface developers from different disciplinary backgrounds? How should UIDL's be evaluated? What UIDL approaches will result in powerful design and run time services? And finally how the result of collaboration between user interface developers and UIDL researchers will affect the UI architectural framework of the next generation of user interfaces?

Workshop Goals

The first objective of this workshop is to *reach a common understanding of the UIDL approach*, its potential and shortcomings. The second objective is to *identify a set of common challenges* that impact emerging and future UIDL research by understanding the perspectives of both user interface developers from different disciplines and UIDL researchers. During the workshop, user-interface developers and UIDL researchers will work together in teams. Each team will collaborate around an emerging interaction style, leveraging the members various perspectives, with the goal of forming requirements for a UIDL that support this interaction style, and proposing a solution that satisfies these requirements. The strengths and weaknesses of the various solutions will then be compared. Together, this research community will identify common challenges and propose new concepts to solve them. Our last objective is to *consider future spaces for UIDL research*. This will help the UIDL research community to focus its attention on supporting the CHI community in its effort to develop the next generation of user interfaces as well as

recognize opportunities for collaboration.

Participants and Expected Community Interest

A key goal of this workshop is to foster collaboration between developers of the next generation of user interfaces and user interface software researchers. In particular, the workshop will welcome both participants working in areas such as: virtual and augmented reality, ubiquitous pervasive and handheld interaction, as well as tangible user interfaces, and participants that are or were involved in an effort to develop, use and evaluate UIDLs.

A number of workshops were held in recent years on topics relevant to sub groups of this community: an AVI 2004 workshop on XML-based User Interface Description Languages [6]. A CHI 2005 workshop, The Future of User Interface Design Tools [9] and finally a CHI 2006 workshop, What is the Next Generation of Human Computer Interaction? [3]. We believe that the time is ripe to connect researchers from these areas in order to identify key challenges facing this community at the large, to jointly develop new approaches aimed at solving these challenges and consider future spaces for UIDL research.

Background Historical Roots

In the early 1980's, the concept of a *user interface management system* (UIMS) was an important focus area for the then-forming user interface software research community [8]. A UIMS allows designers to specify interactive behavior in a high-level *user interface description language* (UIDL) that abstracts the details of input and output devices. This specification

would be automatically translated into an executable program or interpreted at run time to generate a standard implementation of the user interface. The choice of a UIDL model and methods is a key ingredient in the design and implementation of a UIMS. The goal of user interface management systems was not only to simplify the development of user interfaces but also to promote consistency across applications as well as the separation of user interface code from application logic. However, the standardization of user interface elements in the late 1980's on the desktop paradigm made the need for abstractions from input and output devices mostly unnecessary. In addition, user interface developers were seeking control of the user interface look and feel. Thus, although a promising concept, the UIMS approach has been challenged in practice [8]. Subsequently, in the last decade, as a result of the proliferation of new devices and interaction techniques, some of the challenges facing the developers on next generation user interfaces are similar to those that faced GUI developers in the early 1980's. Thus, as part of the user interface software research community effort to address these difficulties, the concept of UIDL reemerged as a promising approach.

Emerging UIDLs

Several UIDLs have been developed in recent years. Most of them are XML-based. As described in [6] the goals of these emerging UIDLs are:

- To capture the requirements for a user interface as an abstract definition that remains stable across a variety of platforms.
- To enable the creation of a single user interface design for multiple devices and platforms.
- To improve the reusability of a user interface.
- To support evolution, extensibility and adaptability of a user interface.

- To enable automated generation of user interface code.

To date, we have witnessed an extensive development of UIDLs and frameworks that address the development of user interfaces for multiple platforms, contexts and user profiles. Examples include Plastic User Interfaces [12], UIML[1], XIIML[10], UsiXML[5] and the TERESA XML [7]. However, only few UIDLs currently address the development of next generation user interfaces, supporting interaction styles such as virtual reality (VR), mixed reality, ambient intelligence and tangible user interfaces (TUIs): InTML [2] describes VR applications in a platform-independent and toolkit-independent manner. PMIW [4] describes the structure of non-WIMP user interfaces while directly capturing continuous relationships. TUIML [11], draws upon the PMIW approach, and aims at supporting the development of TUIs while explicitly describing continuous and parallel interactions.

In this workshop we aim to harness the potential demonstrated by UIDL research area in supporting the development of multi-platform and multi-modal interfaces to address the challenges facing the developers of the next generation of user interfaces.

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