Temporal Patterns for Complex Interaction Design

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Abstract. Patterns have emerged as a useful organising mechanism for component re-use in Software Engineering. There is, however, less agreement about how patterns might be used in the Human-Computer Interaction design process. In this paper we look at one way that patterns might be used to augment an existing user interface design notation. XUAN is a useful notation for expressing temporal problems in interaction. However, XUAN has showed its limitations in the design process, requiring the repeated description of common situations. This notation bureaucracy makes it hard to redesign during the UI development process. To overcome this limitation, we proposed the exploitation of the pattern technique. The combination of pattern language and XUAN is PUAN. The PUAN inherits most features of XUAN and also, like patterns, can be reused where tasks repeatedly occur in scenarios.

1 Introduction

Our overall aim is to deliver a set of validated design patterns of the eXecutable User Action Notation, which can be used by application and systems designers in a range of multi-media, virtual reality and mobile computing developments. The pattern-based User Action Notation is referred to as PUAN in this paper. Our work concentrates on the temporal specification of interaction. The issue of simple response time is generally dealt with in HCI texts, but more general issues of temporal relations and durations are usually ignored. The effects of this omission can be seen in numerous interactive systems that display unpredictable temporal behaviours. Such systems cause confusion and frustration to end-users. In order to fill this gap in design knowledge our work has three stages; firstly we have defined our temporal pattern notation, PUAN, which enables designers to reason about temporal issues, secondly we will write a pattern reader and engine to build interactive prototypes described in PUAN and finally we will validate a small range of patterns against actual usage of the prototypes. This paper describes the first stage of our work.

Historically, software engineers and programmers designed most of the user interface as part of the software in an interactive system. The result was that interfaces often varied in quality and usability. Much work in the field of human-computer interaction has been directed toward new approaches to user interface development in the hopes of improving quality and usability. With the advent
of the Web and mobile computing we have a new generation of designers and implementers who are faced with the challenges of user interface design. The challenge for HCI researchers is how to reach this new audience so that the lessons learned over the last 15-20 years can be re-used with the new presentation platforms.

One of these new concepts is the notion that the design of software to construct a user interface is different from design of the interface itself. Using software-engineering methods cannot necessarily produce user interfaces with high usability. Designers need behavioural specification tools to develop user-centred interface design. By the integration of behavioural techniques into the constructional method, they can create useful and usable user interfaces. One approach is based on notations such as the User Action Notation (UAN) [3]. UAN is a task and user-oriented notation for behavioural representation of temporal properties and asynchronous tasks, has been used to design direct manipulation interface designs.

In the UAN’s tabular task diagrams, one of the main problems is that the temporal relationships within and across tasks are not stated explicitly. The ordering of tasks, feedback and system operations are represented loosely. Hence, some important temporal relationships are often represented implicitly. Furthermore, temporal relationship within UAN concentrated primarily on user actions, thus neglecting the temporal aspects of task categories not considered user actions.

The eXecutable User Action Notation (XUAN) [3, 8] is a variant of the User Action Notation (UAN). It is mixed graphical and textual notation and introduced temporal relations and temporal constraints to capture descriptions of user interface with time-varying media. XUAN inherited most of the advantages and resolved some of the limitations of UAN, especially in temporal relations and ordering of the tasks. It adds more features on temporal relations by defining new constraints to assist in the evaluation of various hypotheses regarding the time dependence of usability [7].

XUAN represents tasks as tabular diagram table. The diagram table contains three categories (columns), which represent a set of the actions making up the task. The columns have been systematised in order to make clearer their roles and their relationship to one and another. The left / right / -top/down ordering of the table elements may be viewed as a partial representation of temporal ordering of actions and the columnar organisation as modelling the task agents. For example in table 1.1, the three columns represent the communications between those categories while the rows represent the temporal ordering of actions. We can use XUAN to help us deal with designs that involve notions of concurrency and time.

2 Patterns

The user interface (UI) design development process is a cycle of the design of the UI via some notation or scenario modeling, the development of a prototype,