ilmedia

TECHNISCHE UNIVERSITÄT ILMENAU

Kunert, Tibor :

An User Task and User Requirement Based Approach to Interaction Design Patterns

An User Task and User Requirement Based Approach to Interaction Design Patterns

Tibor Kunert

Technical University of Ilmenau, Institute of Media Technology,
P.O. Box 10 05 65, 98694 Ilmenau, Germany
`tibor.kunert@tu-ilmenau.de`
`http://www.tu-ilmenau.de/mt`

Abstract. Interaction Design Patterns are approached as an instrument to support the mapping of generic user tasks and user requirements with proven interaction design solutions. Generic user tasks and user requirements need to be valid across different applications within a specified context of use. User tasks and user requirements are integrated into interaction design patterns. Using an example from interactive television applications an user task and user requirement based interaction design pattern is presented.

1 Introduction

User centered design and application development includes the analysis of the user tasks and user requirements at the beginning of the development process [1]. Especially interaction design decisions are strongly based upon user tasks and user requirements. A task analysis "means understanding users' work or play" [2]. While user tasks are "the activities to achieve a goal" [3], user requirements refer to how users want to achieve their goal or tasks supported by an interactive application, e.g. effectively, efficiently and in a satisfying way.

However, the step from identified user tasks and user requirements ("problem space") to interaction design ("solution space") often is difficult. It has been suggested that design patterns can be a suitable description format to provide guidance for this problem [4] [5]. Due to their specific description format that includes a reference to the problem and context interaction design patterns have the potential to integrate a reference to the user task. As part of the "solution space" interaction design patterns can be a bridge to the "problem space" thus making it easier to map the two. Other formats of interaction design guidance, e.g. principles, guidelines or styleguides, do not have that potential because they do not include a reference to their motivation.

2 Generic User Tasks and User Requirements

Some user tasks and user requirements are recurring over and over again across different applications for one platform, e.g. for interactive television (TV). With the aim to discover generic and recurring user tasks for interactive TV applications an user task analysis has been carried out for a broad range of application types. Different focus groups with potential interactive TV users have been carried out regarding specific interactive TV application types, e.g. news or sports applications. Additionally, several existing interactive TV applications have been analysed regarding the user tasks they support. As result a number of generic user tasks for interactive TV applications have been identified. These user tasks can be hierarchically structured into user task categories, user tasks and user subtasks. An example is given in Table 1.

Table 1. User task category "Searching for specific content" with selected corresponding user tasks and user subtasks

User task category	User task	User subtask
Searching for specific content	Searching for content about a programme	Searching for content on the topic
		Searching for content on a specific participant
		Searching for content on the "Making of"
		Searching for content on the programme´s history
	Searching for help	Searching for help
		Searching for terms & conditions
	Searching for other specific content	Searching for content about the TV schedule
		Searching for contact information
		Searching for the explanation of difficult words
		Searching for order information

In the interactive TV context especially the user task category level has proven suitable to be mapped with interaction design solutions. User tasks and user subtasks are often too similar to each other to need specific interaction design solutions. In the following it is therefore only referred to user task categories.

Additionally, a user requirements analysis has been carried out using the same focus groups as for the user task analysis. Some of the user requirements for the specific application types can be abstracted into generic and content independent user requirements. The generic user requirements for interactive TV applications that directly relate to the generic user task category "Searching for specific content" are:

- Efficient access to specific content
- No distraction by irrelevant content
- Access to specific content without having to understand the application's information architecture
- Categorisation of available content
- Satisfaction of one's needs for those content items that are expected to be found in the application

In the following the user task category "Searching for specific content" and the above presented user requirements are taken to demonstrate how user tasks and user requirements can be integrated in an interaction design pattern guiding designers to map the "problem space" with the "solution space".

3 User Task and User Requirements Based Interaction Design Patterns

User task based approaches to interaction design patterns have been presented by Mahemoff and Johnston [4], by Granlund et al. [6], and by van Welie and van der Veer [7]. Especially Granlund et al. use interaction design patterns to map specific user tasks and user subtasks with proven design solutions. We found this approach very applicable and useful for interactive TV applications.

The user task and user requirements based approach to interaction design patterns presented in this paper offers guidance on how to support specific user tasks and user requirements with specific application elements. The designer's problem of how to support a specific user task can be solved by using specific user interface or application elements. Often different alternatives to support an user task exist. Because one problem can have many solutions and vice versa Mahemoff and Johnston find referring from a specific user task to specific user interface elements that can be used to support the user task not to be very promising [4]. However, we see the greatest value of interaction design patterns in the presentation of these alternatives and the discussion of their advantages and disadvantages to support an informed design decision.
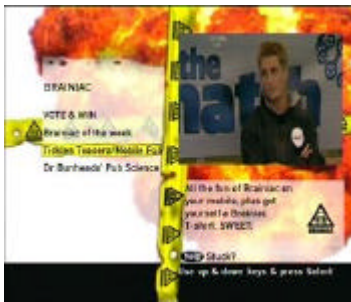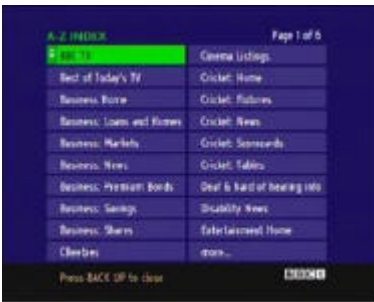
To deal with the described individual solution alternatives in greater detail it is referred to corresponding sub-patterns. On this level problems that are encountered using a specific application element are discussed and solutions for them are offered. These sub-patterns are not on the user task category level but on the application element level. However, they include a reference to the user task category that they support. Also, one application element can support different user task categories.

For patterns on the user task category level the pattern's name is the specific user task category (e.g. "Searching for specific content"). For patterns on the application element level the pattern's name is the name of the specific application element (e.g. "Index", "Menu" or "Multiscreen"). For these patterns the "Context" section described in the Pattern Language Markup Language (PLML) as "pattern applicability" [8] is well suited to hold a reference to the user task category to be supported by the application element. Thus the designer looking for an interaction design solution can quickly decide if an interaction design pattern is relevant for the specific application he is working on by reading the pattern's "Context" section. To include user requirements in interaction design patterns the pattern's "Forces" section is most suitable. Usually a compromise between different types of requirements, e.g. user requirements, design requirements, content requirements or technical requirements, needs to be found to solve an interaction design problem.

User task and user requirements based interaction design patterns are intended to be used within a user-centered application development process. After user tasks and user requirements have been analysed they can be mapped with proven design solutions applying user task based interaction design patterns more easily. An example for an interaction design pattern on the user task category level with reference to the corresponding user requirements described in the pattern's "Forces" section is shown in Table 2. The pattern "Searching for specific content" presents and evaluates three application elements ("Menu", "Index" and "Multiscreen") that can

serve to support the user task "Searching for specific content". The applied pattern format follows the Pattern Language Markup Language (PLML) [8]. Due to space limitation the pattern's meta information as suggested by the PLML could not be included in this paper.

Table 2. The user task and user requirements based interaction design pattern "Searching for specific content" for interactive TV applications

Name	Searching for specific content
Confidence	**
Alias	Searching for specific information, Searching for content, Searching for information
Synopsis	To support the user finding specific content a direct access is useful, especially for applications offering a large amount of content. There are three alternatives to offer direct access to specific content: menu, index and multiscreen.
Context	User task category: *Searching for specific content*
Problem	Users looking for specific content can have a hard time finding the desired content because usually not all content can be displayed on one screen. Offering a large amount of content means confronting the user with content that he is not interested in in the moment. Especially for inexperienced users of interactive TV and users that are not familiar with the application a solution is needed.
Forces	User requirements: • Efficient access to specific content • No distraction by irrelevant content • Access to specific content without having to understand the application's information architecture • Categorisation of available content • Satisfaction of the users' needs for content that is expected to be found in the application Content requirements: • Large amount of content to satisfy diverse user needs and requirements • Each content item should be assigned to a certain content category that most users understand and agree with. Design requirements: • Access to content should be designed enabling the user to use the application efficiently, effectively and satisfactory • Alternative accesses to specific content
Examples	 Menu of Sky One's "Brainiac" (UK, 09/2004) Index of BBCi News (UK, 09/2004)

Multiscreen of BBCi News (UK, 10/2004)

Link to: Video example "Searching for specific content"

Solution	

To offer easy access to large amounts of content for diverse users different accesses to specific content should be provided. Access to content can be offered by three different application elements:

- Menu
- Index
- Multiscreen/ video mosaic

All three application elements can be combined with each other, thus offering alternative accesses for diverse users.

Application element	Advantages	Disadvantages	Particularly suitable for
Menu	• Theme or category specific access to content • Hierarchical structure of content categories and subcategories • Provides direct access to submenu	• Number of categories/ menu items is limited by available screen space and human cognitive abilities. • Wording of categories may not be understandable by all users	<u>Application type:</u> • Applications with few content categories <u>User group:</u> • All users Users that are interested in specific content categories
Index	• Direct access to specific content items (few user actions necessary) • Gives the user quickly an impression of the type of items to be found there • No problems with categorisation of content items	<u>For large indices:</u> • Not all index items may be displayed on one screen • Paging, scrolling or selection of subcategories may be necessary	<u>Application type:</u> • Applications with large amounts of content <u>User group:</u> • iTV experienced users • Technology affine users • Users that are interested in specific content item
Multiscreen	• Shows content categories as small video streams • Familiar, because TV-like, overview of available content categories • Possibility to add textual content category names • Current program of the single content categories can be easily compared • Fast and easy to use navigation element	• Number of offered video streams is limited due to limited screen space and human cognitive abilities • Presented video stream of each content category is pre-selected by the broadcaster (usually only one video stream per content category available)	<u>Application type :</u> • Applications with multiple video streams <u>User group:</u> • iTV inexperienced users • Users that are interested in specific content categories

Multiscreen of BBCi News (UK, 10/2004) combines access to content via multiscreen, index and main menu.	Multiscreen of Sky News (UK, 10/2004) combines access to content via multiscreen and text menu.

Evidence	Usability tests showed that specific user groups favoured different application elements (menu, index and multiscreen) to access specific content as stated in the table above. The usability tests were carried out in the interactive TV usability lab of the University of Brighton, UK, between September 1st and October 8th, 2004. Seven interactive TV applications were tested by six test persons each. The test persons have been technology affine and interested in the specific TV programme.
Implemen-tation	BBCi News (UK, 10/2004), Sky News Active (UK, 09/2004), Sky One "Brainiac" (UK, 09/2004)
Related patterns	Menu, Index, Multiscreen

References

1. Mayhew, D.: The Usability Engineering Lifecycle. Morgan Kaufman. San Francisco (1999)
2. Redish, J., Wixon, D.: Task Analysis. In: Jacko, IA., Sears, A (eds.): The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications. Lawrence Erlbaum Associates. Mahwah, New Jersey (2003) 922-940
3. ISO 9241-11 "Ergonomic requirements for office work with visual displays terminals (VDTs) – Part 11: Guidance on usability" (1998)
4. Mahemoff, M.J.; Johnston, L.J.: Pattern Languages for Usability: An Investigation of Alternative Approaches. In: Proceedings of the Australian Computer Human Interaction Conference OZCHI '98, IEEE Computer Society. Adelaide, Australia (1998) 132-139
5. Borchers, J.: A Pattern Approach to Interaction Design. Wiley. Chichester, England (2001)
6. Granlund, A. et al.: A Pattern-Supported Approach to the User Interface Design Process. In: Smith, M.J. et al. (eds.): Usability, Evaluation and Interface Design: Cognitive Engineering, Intelligent Agents and Virtual Reality. Proceedings of HCI International 2001, Vol. 1, Lawrence Baum Associates. Mahwah, New Jersey (2001) 282-286
7. van Welie, M. et al.: Pattern Languages in Interaction Design. In: Rauterberg, M. et al. (eds.): INTERACT '03. IFIP. IOS Press (2003) 527-534
8. Fincher, S.: Perspectives on HCI Patterns: Concepts and Tools (introducing PLML). In: Interfaces, Vol. 56 (2003) 26-28. URL: http://www.bcs-hci.org.uk/interfaces.html