Exploring Usability Needs by Human-Computer Interaction Patterns 6th International Workshop on TAsk MOdels and DIAgrams (TaMoDia'07)

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How to make use of patterns for improving software quality?

- "ilities": software quality characteristics such as usability
- patterns: reuse of software development knowledge (best practices)
- design patterns: *solutions* to recurring design problems

Human-Computer Interaction (HCI) perspectives on patterns

- + inherent consideration of usability
 - informal patterns representation

Software Engineering (SE) perspectives on patterns

- + means for guided patterns application
 - holistic procedure for software quality

Motivation

Integrated SE and Usability Engineering by HCI patterns



Challenge: How to choose an appropriate design pattern?

- identify relevant pattern
- specify usability problem

How to classify patterns according to usability needs?

What are principles? [SW01, p. 241, 242, and 263]

- "are applicable during the early phases of software development"
- "help to identify design alternatives"
- patterns are "a realization of one or more principles"

Common	Software Engineering	Human-Comput	ter Interaction
Principles	design patterns	design patterns	
	[GHJV95]	[Tid05]	[Sch05]
user's activity	Command	-	Unit of Work
cancel activity	-	Cancelability	-
remember activity	Memento	Command History	Elephant's Brain
create list (of activi.)	Iterator	-	-
undo activities	-	Multi-level Undo	-

Table: Classification of design patterns by their underlying principles

How to classify patterns according to usability needs?

ISO 9241-110:2006	Usability Principles	
dialogue principles	taken from previous table	
suitability for the task	user's activity	
self-descriptiveness	see input hint, input prompt, and	
	progress indicator applied in	
	prior HCIFrames [WS06]	
suitability for learning	no match (n.m.)	
conformity with user expectations	n.m.	
controllability	cancel activity	
error tolerance	undo activities	
suitability for individualization	n.m.	

Table: Classifying usability principles according to ISO 9241-110:2006 [ISO06]

Usability Principles

Integrated SE and Usability Engineering by HCI patterns



Challenge: How to choose an appropriate design pattern?

☑ identify relevant pattern → usability principles
□ specify usability problem

Specker/Wentzlaff (C-LAB/UniDuE-SE) Exploring Usability by HCI Patterns

How to specify usablity problems with patterns?



Figure: Problem frame diagram for "Simple Workpieces"

- $\label{eq:R_CE} \begin{array}{l} : A <\!\! user\!\! >\!\! , \mbox{ who commands the machine <\!\! editing tool\!\! > to} \\ execute <\!\! E3_\! event\!\! >\!\! , \mbox{ expects to change the <\!\! workpieces\!\! > state} \\ to <\!\! Y4_\! status\!\! >\!\! . \end{array}$

How to specify usablity problems with patterns?

"A player wants to move Pac-Man to a new location"



Figure: Instantiated problem frame "Simple Workpieces" for a Pac-Man Game

- (R1) : A Player, who commands the machine <u>Game</u> to execute <u>move</u>, expects to change the <u>Pac-Man</u> state to <u>new location</u>.
- (S1) : On behalf of <u>Player</u> command <u>move</u> the machine <u>Game</u> manipulates the <u>Pac-Man</u> state <u>position</u> by <u>turn</u> to achieve the desired <u>Pac-Man</u> state <u>new location</u>.

How to specify usablity problems with patterns? Incorporating found **usability principles** to obtain an *HCI*Frame



Figure: HCIFrame for "Simple Workpieces"

- (R_CA) : A <user>, who commands the machine <editing tool> to execute <E3_event> for changing the <workpieces> state to <Y4_status> can stop the execution of this command immediately by issuing command <cancel_E3>.
- $(S_CA) : The <\!\! workpieces\!\!> state <\!\! Y4_status\!\!> remains untouched, if a <\!\! user\!\!> command <\!\! E3_event\!\!> is in process and canceled by a subsequent command <\!\! cancel_E3\!\!>. The machine <\!\! editing tool\!\!> ensures if necessary via <\!\! E1_cancel\!\!> commands that the <\!\! workpieces\!\!> state <\!\! Y2_state\!\!> is unchanged.$

Integrated SE and Usability Engineering by HCI patterns



Challenge: How to choose an appropriate design pattern?

alphi identify relevant pattern \longrightarrow usability principles alphi specify usability problem \longrightarrow *HCI*Frames

What have we learned?

- informal HCI design patterns can be applied systematically
 - in pattern-based software development
 - for *solving* specific usability problems
- software quality can be specified and established from the beginning
 - using HCIFrames for identifying and describing usability problems
 - Inking problem patterns of the software analysis phase and corresponding solution patterns applicable in software design by principles, which have to be investigated further ...

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