Playful Exploration Of Prototypes In Interaction Design

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Abstract

A card deck to explore and to formulate properties of prototypes in interaction design for fostering communication between interaction designers and software engineers is proposed.

Author Keywords

Prototype; Card Deck; Creativity; Interaction Design

Introduction

Interaction design theories are manifold. They tend to solely focus on human agency, often rendering the material properties of involved artifacts an afterthought. In my PhD thesis I applied Somatic-Marker-Hypothesis (SMT) from neuroscience and Actor-Network-Theory (ANT) from philosophy of technology and qualitative content analysis from social sciences to develop a taxonomy of prototypes in interaction design. This departure from current theories of prototyping in interaction design is inspired by similar attempts in product and engineering design. The first half of the following paper briefly introduces this thesis, including motivation, methodology, related work, and the main findings. The remaining half introduces a proposition for transforming the therein devised vocabulary into a card deck tool for supporting designers and engineers in conceiving and developing prototypes in interaction design.

Motivation: Prototypes In Interaction Design

Ongoing interest to describe what prototypes in interaction are and what they do slowly expands from an excellent body in other design disciplines to the specifics in interaction design. Design artifact centered research ranges from the discipline independent investigation of pivotal qualities of sketches to the very particularities of design artifacts in product and engineering design, where e.g., Pei [14] counts 37 different kinds of design representations. This growing and ongoing interest to describe what design artifacts are and what they do slowly expands to the specifics of prototypes in interaction design. Most remarkably and simultaneously singular is the recent approach from Lim et al. [10] to an anatomy of prototypes. Thus moving forward from an exhaustive body of literature, that exclusively describes the *utilization of prototypes* in software engineering and interaction design but not their inherent specifics. Consequently we share the view that current research is not sufficient because it deals only with »*what to do with prototypes without understanding what they actually are*« [10] However, Lim et al. approach to »*establish a fundamental definition of prototypes*« [10] is limited in at least two directions. First the methods they applied have not been clearly described, making it hard to replicate results. Second, their work lacks foundation in practice, consequently rendering the approach less applicable. We aim to address both issues with a taxonomy of prototypes in interaction design.

Methodology: ANT And Content Analysis

An appropriate theoretical framework is prerequisite for a legit definition of what interaction design prototypes are. Therefore our research is based on Actor-Network-Theory as a meta theory of fundamental artifact-subject relationships. In addition to its scientific contribution such a taxonomy shall also be of practical relevance, e.g., facilitating the communication between stakeholders in development processes. Hence analysis, feedback and best practice in software engineering and interaction design are a second cornerstone. The approach to form an exhaustive definition is building on four stages of analysis. First, this builds on Latour [8] who developed a cyclic view of how artifacts and subjects are forming interrelated networks, forming a framework for further steps of analysis. Following the tracks of socio and cultural research and protocol studies in design research, e.g., [6, 13] we applied Mayrings [11] qualitative content analysis method for the subsequent steps of analysis. This method is particularly qualified to establish a corpus of categories where none existed. It is also well suited to analyze both text, as in interviews and protocols, and image, as in sketches or prototypes. In the second step, the theoretical framework was used to categorize existing dimensions of prototypes in literature. This exhaustive literature review includes fidelity theories [12, 15], inscription theories [5, 7] and vocabularies of interaction properties [4, 9]. In a third step, the evolved categories are advanced with qualitative content analysis of protocol studies and prototypes used and developed within those discussions. The analyzed discussions took place between interaction designers and software engineers about the evolution of different mobile interaction applications. In the fourth and final step this taxonomy was refined with the help of expert interviews of professional designers and engineers.

BODY	
Functionality	anticipated by the user – provided by the artifact
Interactivity	users action or reaction – artifacts action or reaction
Appearance	visual, auditive, tactile, olfactory perceivable design of the artifact
Data/Information	users input of data – artifacts output of data
MATERIAL	
Depth of Details / Level of Abstraction	How abstract or how detailed is the corresponding property of the body elaborated?
Level of Completeness	How complete ist the corresponding property of the body?
Time	In which chronology are functions called, interactions carried out, elements embodied, data represented?
Space and Arrangement	How are functions, interactions, data and appearance spatially structured and related to each other?
MEDIUM	
analog, physical, digital: *Example: wood, paper, plastic,graphic, animation, programming language*	

Table 1. brief overview of taxonomy of prototypes in interaction design

Main Findings: Taxonomy Of Prototypes

The developed taxonomy consists of three layers: **Intention, Body** and **Material**. Each containing three levels of explanation as shown very briefly in Table 1. The first layer **Intention** describes progressive discussion segments that occur in varying succession during prototyping sessions, most notably when a designer and a software engineer discuss a draft or revise a design (not shown in Table 1). The second and third layer **Body** and **Material** are interconnected. **Body** describes which content a prototype comprises, while **Material** specifies how this content is characterized. The definition of three levels of explanation is guided by its generalizability. Thus making the taxonomy valid for describing prototypes on a general level without being too particular. Thus the first level is building on ANT as meta theory, forming a core definition. The second level outlines the findings from the content analysis. The third is not shown here due to space constrains, it expands the generalized levels with examples from practice. This is especially helpful for practitioners who wish to use the taxonomy, they can and shall adapt it to the specifics of their domain. If a search interface is being developed, the example at the intersection of **Functionality** and **Depth of Details** might read like: *search via command line with only one search term or expert search allowing the use of boolean operators*. For a more concise description of the taxonomy see [1-3]
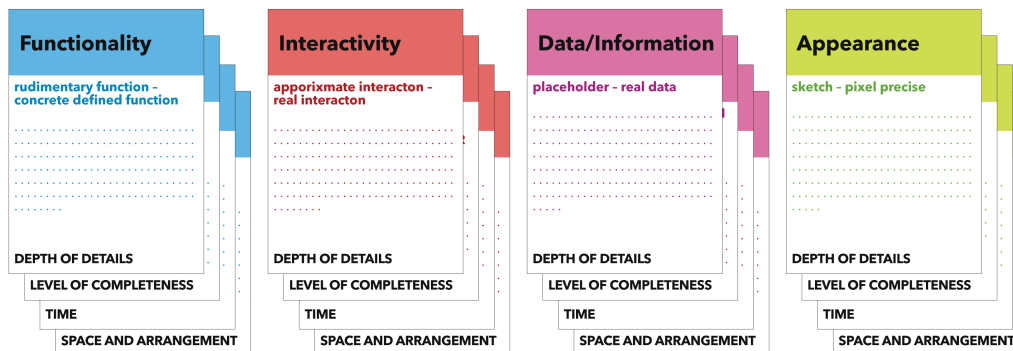
Card Decks

Two card decks have been developed, with the goal to transform those high level research findings into creativity methods for fostering prototype based design processes. The first deck is independent from the second, while the second can only be used in conjunction with the first. In the following chapter the first deck will be described in detail. The second deck is outside the scope of this very short paper.

Use 1: Exploration Of An Existing Prototype
This decks front pages are shown in image 1, their back in excerpts in image 2. The deck is used to completely identify all bodily and material properties of an existing prototype. It is a precondition that the prototype is on hand and two or more designers/engineers seek to find consensus which properties a prototype inhibits and to document those directly on the front pages of the cards. There are 16 cards consisting of every possible combination of the four categories of **Body** and the four categories of **Material**. In addition each card shows a short illustrative example of the combination of the two categories. E.g. **Data/Information & Depth of Details:** *placeholder – real data*. Each card has enough room for annotating the prototypes properties for this specific combination. The deck is used like this: One card is drawn from the deck and is used to determine the corresponding properties of the prototype. It fosters the discussion between the involved stakeholders, helps to form a shared knowledge base about the corresponding prototype and establishes a synchronized vocabulary. All of which is documented at the same time on the corresponding card.

Functionality

rudimentary function –
concrete defined function

DEPTH OF DETAILS
LEVEL OF COMPLETENESS
TIME
SPACE AND ARRANGEMENT

Interactivity

apporixmate interacton –
real interacton

DEPTH OF DETAILS
LEVEL OF COMPLETENESS
TIME
SPACE AND ARRANGEMENT

Data/Information

placeholder – real data

DEPTH OF DETAILS
LEVEL OF COMPLETENESS
TIME
SPACE AND ARRANGEMENT

Appearance

sketch – pixel precise

DEPTH OF DETAILS
LEVEL OF COMPLETENESS
TIME
SPACE AND ARRANGEMENT

Image 1: Frontside of deck depicting Body-Material combination and space for freeform annotation

Use 2: Manifestation Of A Future Design
The flip-side of the deck is used in the opposite direction from the previously discussed application. It does not focus on exploring a prototype but rather on defining properties of a prototype in the cause of its inception. Each flip-side depicts a **Body-Material** combination with illustrative examples. These illustrations can be utilized to precisely verbalize one and subsequently all necessary dimensions of a future design. Image 2 shows two examples for this illustration. In addition this example needs a second deck of cards reading **Medium**. For the planning of a new prototype, cards are drawn from the deck to discuss all future features and their mplementation in the prototype. In this way all properties and their necessary execution can be developed. The second deck can be used to document the proposed combination. It has not been decided yet whether these illustrations shall be visual or verbal. We see a risk that their depiction may be too narrow, thus constraining the creativity of the decks users. In a second permutation of this deck the examples are to be left blank for users to discover examples on their own. This application could be of help in teaching the various properties of prototypes in interaction design. Students could draw a random card from the deck and search for a variety of applications in different domains to demonstrate this very combination. The goal of both applications is to sketch out the course of a prototypes execution with cornerstones of relevant or proposed properties.
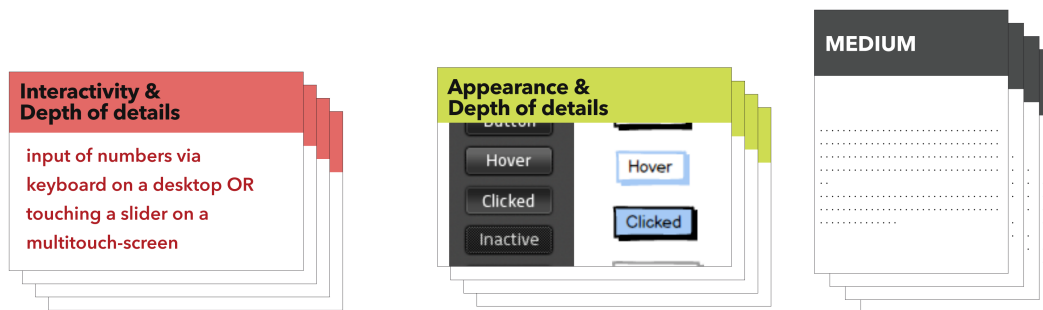
Future Work
While the main work of the PhD thesis was to develop the taxonomy, the card decks for creative application in design processes have not been formally evaluated. However both decks have been used within interdisciplinary teams at our department. In depth evaluation and additional iterations are needed for its refinement. I hope to gain inspirations from the development of other creativity methods and I hope for valuable criticism of my approach.

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Interactivity & Depth of details
input of numbers via keyboard on a desktop OR touching a slider on a multitouch-screen

Appearance & Depth of details
Hover
Clicked
Inactive
Hover
Clicked

MEDIUM

Image 2: Backside of Deck showing examples of combinations; freeform cards for Medium