Material Probe: Exploring Materiality of Digital Artifacts

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Abstract  
In this paper we present an approach for exploring materiality of digital artifacts by suggesting a study method—material probe. The purpose with the method is to understand how people perceive material qualities of artifacts and to discuss how designers could intentionally and methodologically include such non-functional user desires related to material qualities in the design of digital artifacts. The study procedure and results from preliminary studies are described with their implications for future work.

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Materiality, digital artifacts, design method

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H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

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Materiality of Digital Artifacts  
As computational technology becomes more tangible, it pervades into everyday life in various forms such as interactive furniture, responsive architecture, or electronic clothing. No longer constrained to a particular type of digital devices, computers now tend to be considered as a material for interaction design [2,
Accordingly, exploration of materiality of computational technology is in demand in terms of how to seamlessly combine physical and digital materials in forms of artifacts and how to create new forms and aesthetic qualities (i.e., affective, embodied, experiential values) of digital artifacts. However, forms and material qualities of digital artifacts have been rarely considered compared to their functionality in HCI and interaction design research [2, 6]. Recently design of digital artifacts has become minimal and their materiality seems like disappearing by merging physical and digital design elements as in touch screen devices. These new designs have brought significant functional benefits including intuitive interaction from direct manipulation and portability from compact design. But, the potentials of rich sensory feelings of physical materials and active user engagement with them have not been fully explored. In this study, we attempt to explore materiality of digital artifacts by questioning how well material qualities of physical artifacts are adopted to digital artifacts.

Traditionally materiality has been an essential element of design. Material selection—based on the understanding of physical properties of a variety of materials—is crucial in forming aesthetic and functional qualities of an object, for instance, in product design and architecture [1, 8]. At the same time, unique symbolic meanings of a certain material based on its social or economic values are also something designers need to consider beyond functional qualities of a design—as in fashion design (Fig.1 & 2). Moreover, materials are not just a given to be incorporated in the designer’s calculation, but are a part of the design problem [4]. Designers of digital artifacts are facing a particular challenge regarding design material due to its complicate composite of physical and digital qualities. The notion of material without qualities [8] indicates its unlimited design potentials—both in terms of aesthetic and functional qualities that designers can realize with digital technology. Based on previous studies that conceptualized digital technology as a design material [2, 11, 12], we attempt to explore a study method to investigate user desire related to materiality and to apply the insights to design of digital artifacts.

Our Approach: Material Probe
We present our approach—material probe—that explores conceptual dimensions of materiality. Inspired by the approach of cultural probe [5], we aim to understand how people perceive materiality qualities of artifacts and to discuss how designers could intentionally and methodologically include such non-functional user desires related to material qualities in the design of digital artifacts. Specifically, we examine materiality of artifacts by comparing and contrasting the material qualities of digital and physical artifacts. To do this, we consider artifacts as a whole, as a combination of individual design variables (i.e., shape, color, texture, historical/cultural reference) that are perceived, experienced, and interpreted holistically by a user. In this sense, artifacts are used in our study as catalysts to develop personal stories or preferences of materiality. This exploratory motivation is distinguished from other approaches that use artifacts to evaluate affective qualities of specific design variables as in [7].

Our study consists of three parts, where participants are asked 1) to talk about stories of physical artifacts based on their memories, 2) to play with material samples while speculating on their material
preferences, and 3) to compare and contrast the material qualities of physical artifacts to their experiences with digital artifacts. Followed are specific questions that we asked for each part:

1) Stories about material qualities
   - Do you have any object that you like/dislike because of its material qualities?
   - Could you describe specific experiences or memories about that object and its materiality?

2) Play with material samples (Fig.3)
   - From these material samples, could you select 2-3 ones that you like/dislike?
   - Could you explain why you like/dislike them specifically in terms of their material qualities?

3) Compare and contrast to digital artifacts
   - Which digital device do you use most frequently? Please describe its features and context of use.
   - Could you compare the experiential qualities of the digital device to the material qualities that you picked out as your favorable/unfavorable ones?
   - Could you imagine how current digital devices would be transformed if your favorable material qualities would be incorporated into their forms?

Findings and Insights
We conducted three sessions of material probe studies with 10 participants in three group sessions, each lasting about an hour. Followed are the main findings of the study from each part:

1) In the first part, participants described materiality mainly in terms of their tactile and visual perception. For example, as their favorite objects, they picked out microfiber t-shirt (because of its soft texture that invites touching), buttery turkey (because of the feeling of organic skin that makes cooking enjoyable), bubble wrap, cat (because of its silky fur), memory foam pillow (because of its squeezable and responsive shape), bear doll (because of the memory of childhood and soft feeling), herbal leaf (because it feels like a life that needs my care), sharp pen (that writes smooth), etc. For unfavorable ones, they mentioned new clothes or towels (because of their hard and rigid textures), chalkboard (because of its rough surface that makes disturbing sound when scratched with nails), rubbery frame around the sink at kitchen (because of its slimy, unhygienic look and feel), forks and knives (because of their metallic coldness and sound), etc.

2) In the second part, playing with a set of material samples, participants talked about materiality more specifically in terms of economic values, design process, aesthetic qualities, and practical applications of certain samples. Many people picked out soft and rubbery pieces from toy balls, pieces of knits or papers with delicately crafted textures, soft cotton, and shiny and silky fabric pieces as their favorite ones. On the contrary, plastic or fake leather pieces were chosen as unfavorable because of their flat textures and cheap connotations. What was noticeable in this study is not which types of materials people liked or disliked in general, but that people are very sensitive at perceiving subtle differences of material characteristics and easily determine their preferences among them based on a broad range of functional or aesthetic reasons.

3) In the last session, the focus shifted from physical artifacts to digital ones. At first, participants mentioned...
that they had never thought of digital artifacts having other forms and materials than the current ones. However, by comparing and contrasting their experiences with physical and digital artifacts, they furthered the conversation about their discontents and expectations in the use of digital devices. Some talked about how they care about the sound when typing a keyboard (as a feedback to the amount of their work), how they are worried about dropping their phones or making scratches on them, etc. Moreover, they suggested imaginative design concepts that merge physical material qualities to digital devices in a way to solve their problems—not just to decorate them with nice look and feel. The concepts include a bouncy phone that is made of soft, protective case and safe even when dropped, a smelly phone that generates sweat odors if used too much, an encouraging keyboard that gives pleasant sound and spring touch, etc.

Discussion and Implications

In our preliminary study of material probe, it was clear that people do perceive the materiality of artifacts critically and that there is a gap between how they experience physical and digital artifacts in terms of their material qualities. The approach showed its potential in provoking interesting design concepts by adopting physical material qualities to interaction and functional aspects of digital devices beyond decorative purposes. The results imply that designers of digital artifacts need to consider material qualities as playing a significant role in user experience [3, 10].

We also saw some limitations of our approach; user responses tended to be influenced by the group discussions and the actual selection of the material samples prepared for the study. For instance, many participants commented that most of material samples reminded them of toys, which are fun to play but hard to associate to broader contexts or purposes of use. In our future study, we plan to develop this exploratory study into a practical design method by complementing those limitations.

Citations