Interaction Gestalt and the Design of Aesthetic Interactions

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Abstract. Although there has been a drastic increase in the research of aesthetics of interaction, we still lack well-defined practical knowledge of how to design aesthetic interactions. In order to develop such knowledge, we adapt three important ways of thinking in designing interactions influenced by traditional design disciplines, namely, 1) understanding what it is that is designed—i.e. interaction, 2) knowing what is possible to be manipulated when designing interactions—i.e. attributes of interaction, and 3) mastering how to manipulate the attributes to shape the interactions. We explain our approach by arguing from the somaesthetic perspective. We propose the concept of interaction gestalt, as a way to achieve those three ways of thinking in design. We then propose a set of interaction gestalt attributes that can be used in designing aesthetic interactions. We end with a discussion of the implications and benefits of this approach in interaction design.

ACM Classification Keywords: H.5.2 [User Interfaces]: Interaction styles, Theory and methods, User-centered design

Author Keywords: Aesthetics of interaction, aesthetic interactions, user experience, interaction design

1 Introduction

Recent trends in HCI design research have explored the role of aesthetics, but there is an observed lack of established design knowledge that may help designers thinking about designing aesthetic interactions. A fair amount of research attempts to explore the nature of aesthetics in the design of interactive artifacts [7,8,13,24,25,33]—e.g. showing that aesthetics are based not just on visual appearances of an artifact but more on the holistic experience of its use. Furthermore, there are also attempts trying to understand the relationships between users’ perceptions of aesthetics and usability [9,20,27,45,49]. Although these directions of research are crucial to understand the role of aesthetics in HCI design, it is still not clear how practical and useful such approaches are in terms of designing aesthetic interactions.

This paper is an attempt to develop an understanding of interaction as its own distinctive entity, something emerging between a user and an interactive artifact. We argue that any interaction takes on a gestalt, a composition of qualities that “creates a
unified concept, configuration or pattern which is greater than the sum of its parts" [47]. In this paper, we argue that this way of thinking about interaction as an interaction gestalt better invites designers to more concretely and explicitly explore the interaction design space to create aesthetic interactions, especially when comparing to current approaches that blur the relationships among user experience, interaction and an interactive artifact. In any interaction, the interaction gestalt is experienced by a user and evokes the user’s subjective experience of the quality of the interaction [23,43]. However, only thinking about the user experience cannot fully guide designers to explore a design space of possible aesthetic interactions in a concrete way. This means that designers should have knowledge of how to shape aesthetic interactions in a more visible, explicit, and designerly way. This is a kind of knowledge we are currently missing in HCI.

The importance of this way of viewing interaction is already emphasized in Hallnäs and Redström’s work [18]. They also emphasized the importance of understanding the “expressions of computational things” which is tightly relevant to our notion of interaction gestalt. They also emphasized the need of searching for “intrinsic properties of their expression-identities, that is, basic properties of computational expressions” (p. 116). The term, interaction gestalt, has also been used by Svanaes [43]. The approaches these researchers emphasize are closely related to what we pursue in this paper, but we further explore what those intrinsic properties are by closely analyzing and defining the shape of interactions, namely interaction gestalts, which has not yet been addressed in current research.

In this regard, the challenge here is to create a language that helps a designer understand which attributes are to be considered in order to create a certain gestalt that in turn will result in desired user experiences. The basic principle guiding our research is that we want to adopt and adapt certain ways of thinking through the use of a design language1, similar to what can be found in established design disciplines. This language includes: (1) a good sense of what it is that is designed—i.e. a design target—in our case the interaction itself which we call interaction gestalt, (2) a good sense of what is possible for a designer to manipulate when designing the design target—in our case, the attributes of the interaction gestalt, and (3) a good sense of how to manipulate these attributes in order to shape a specific design—the interaction gestalt. We will discuss how those attributes of the interaction gestalt can actually be used in designing aesthetic interactions.

In order to achieve this, we argue that we have to separate the user experience and the artifact properties from the interaction itself. In Fig. 1 we show this separation graphically. Interaction is an abstract entity that emerges between the other two entities. However, even if the interaction is an abstract entity, we see that it can be directly designed. A designer can, for instance, decide to make the interaction slow or fast, static or dynamic. Later on we will propose a number of such manipulative attributes that are in the control of a designer, and we will also explain why this approach is important and has potential to help designers create aesthetic interactions more effectively.

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1 Our notion of design language is different from the term used by Rheinfrank and Evenson [37]. Their emphasis is on communicating designs with potential users, but our emphasis is on the use of design language for designers themselves for shaping design concepts.
We also claim that the separation of the concept of interaction—i.e. the interaction gestalt—from the user experience and the interactive artifact (Fig. 1) enables designers to examine the mechanism of manifesting the interaction gestalt through the interactive artifact. It also enables the designer to project possible user experience outcomes that can be engendered by the design of a certain interaction gestalt. In other words, shaping the gestalt involves both imaging how the gestalt should be manifested in an interactive artifact as well as anticipating how users will experience the gestalt.

Fig. 1. The relationship of interaction gestalt with user experience and interactive artifact.

Before we move on, we would like to say some words on what this paper is not about. When we discuss aesthetic aspects of interactions, we are not concerned with the aesthetics of everything. We focus solely on interaction, and how aesthetics can be understood in relation to that. To that end, our research is not about arguing the importance of aesthetics. What we are proposing is a conceptual tool that can practically guide and inspire designers in their design of interactions. This is a tool that will help designers appreciate which aspects of an interaction are discernible and possible to manipulate, and how to think about it in relation to potential users and their experiences.

When we look at traditional design disciplines—e.g. product design, visual design, interior design, and architecture, the knowledge similar to what we are proposing has been established, educated, and discussed for a long time. For example, visual designers know that they should be able to manipulate key attributes of visual products such as margins, shapes, typefaces, and spatial layouts in order to design the gestalt of the visual product. In a similar way, a skilled carpenter has intimate knowledge of his material and how to manipulate that material. However, the carpenter usually has no theoretical knowledge of use experience in any research manner. The carpenter trusts his or her deep internalized knowledge of what can be done and how it can be done with the material at hand in order to create something that is both beautiful and functional. The knowledge about materials for design has been a core part of training and education in traditional design fields [2].

We claim in our research that we need this kind of (internalized or internalizable) knowledge for interaction design as well. However, interactive artifacts are not the same kind of artifacts that are primarily tackled in traditional design disciplines. The dynamics, flexibility, and intelligence enabled by computing technologies embedded in interactive artifacts make the characteristics of such artifacts distinctive from other types of non-computing technology artifacts. Interactive artifacts are powered by computing technologies, and can actively respond to people’s interaction to them. On accepting this definition of interactive artifacts, we first need a good understanding of what the attributes of interaction might be, specifically those inherent to interactive artifacts, and we need to know how those attributes affect the creation of an interaction gestalt and through that, the user’s aesthetic experiences. We will propose a set of
interaction attributes that define a shape of a particular interaction, that is, the interaction gestalt. Examples of such attributes include connectivity, continuity, directness, movement, orderliness, pace, proximity, resolution, speed, state, and time-depth. We will present examples of interaction gestalts based on each attribute we propose here.

The structure of the paper is as follows. First we discuss possible definitions of the concept of the aesthetics in relation to interaction. We do this in relation to relevant and contemporary HCI research. We then introduce our reasoning around the notion of the interaction gestalt, that is, the shape and form of interaction as a “thing” that goes on between a designed artifact and a user. We explore and propose a number of core interaction attributes in the following section, and we end the paper with a discussion on how these concepts can be used in interaction design.

2 Aesthetics of Interaction

In traditional design fields such as visual design, product design, interior design, and architecture, the notion of aesthetics has always been at the center of discussions [32,34]. In HCI, it is only recently that people have started to recognize that this aspect—aesthetics—of design is crucial. Research efforts related to this issue have, however, gradually increased, and for the last few years quite drastically. Here we will briefly discuss what major areas researchers in HCI have worked on, and then explain what we emphasize as an important issue to address in order to advance the design knowledge of aesthetics of interaction.

2.1 Aesthetics versus Usability

One of the major research themes regarding aesthetics in HCI has been the discussion on how, from a psychological perspective, humans perceive aesthetics and how aesthetics-perception is related to usability-perception [20,29,45,49]. In the special section on aesthetics in HCI in Human-Computer Interaction (HCI) Journal, Volume 19(4) published in 2004 [30], Norman started the introduction to the section by describing the significant contrast between psychologists’ view and art historians’ view on aesthetics—beauty. The psychological perspective views and analyzes aesthetics through the objective and scientific account of how people perceive it—i.e. through which mechanisms people perceive beauty, or think that they perceive beauty. For example, Norman suggested three levels of perceiving beauty including visceral which is the most “surface” level that is tightly related to human sensory perceptions, behavioral which is the second level where people perceive aesthetics through operation- and action-based perceptions, and reflective which is the deepest level in which people go beyond their immediate perceptions of beauty and form their own meaning of beauty through intellectual judgment [29].

In many cases of psychological approaches aimed at understanding aesthetics in HCI, the important issue has been to understand the relationships between people’s perceptions on usability and beauty [45], usability, beauty and goodness [20], and usability and affective qualities [49]. Tractinsky et al. [45], through experiments, found out that more beautiful artifacts are perceived to be more usable—i.e. better usability. In contrast to Tractinsky et al.’s claim, Hassenzahl [20] claims that usability
and beauty have no direct relationship with each other, but what matters is the holistic perception—i.e. goodness of an artifact—which can be determined by combined effects of usability and hedonic qualities. Zhang and Li’s research [49] claims “affective quality of a system influences user perceptions of usefulness and ease of use of the system.” Zhang and Li defined that affective quality exists in “stimuli” which can be artifacts (or systems) people use, and their study again was to understand the relationships among “perceived affective qualities,” “perceived usefulness,” and “perceived ease-of-use” to figure out whether people perceived them separately without being influenced by other qualities or there is a strong correlation among the three. The result showed that there are strong relationships between affective qualities and usefulness, and between affective qualities and ease-of-use.

Although these studies have helped designers understand that there are different types (or levels) of users’ perceived qualities when they interact with products, and also have helped to see that these qualities relate to different aspects of artifacts, this knowledge does not yet directly provide usable knowledge for designers to creatively figure out how to embody aesthetic qualities into their design ideas.

2.2 Aesthetics and Experience

There has been another major group of researchers [7,13,15,24,33] who have criticized the approaches where aesthetics are treated as “the icing on the cake” [7] or something that can be separately described as “non-instrumental” [24] components that need to be embedded into an artifact in addition to instrumental components such as functionality or usability. In this line of research, aesthetics is instead viewed as a holistic experiential outcome which cannot be separately treated as one type of component in addition to others. Aesthetics is equal to the most desired fulfilling whole experience. This view is much influenced by Dewey’s pragmatism [10]. The approaches dominated by psychological perspectives described in the previous subsection do not deeply consider or discuss the holistic notion of aesthetics as a whole as experience.

Fiore et al. [13] found their perspective on Dewey’s pragmatic perspective, and suggest a creative act as “an experience which connects designer and audience (p.130).” They particularly highlight the aesthetic experience as a meaning making and sense making process in which we can also experience aesthetics even if we are blind, and this claim led them to support the idea of storytelling as a tool to design more aesthetic artifacts.

Forlizzi and Battarbee [15] propose a framework to understand experience, which carefully and insightfully identifies types of user-product interactions which they label as “fluent,” “cognitive,” and “expressive.” Each of these types implies different levels of perception efforts that people make when interacting with products. This is in fact very similar to Norman’s three levels [29]. Forlizzi and Battarbee also identify the types of experience with their framework. These types include “experience” which is viewed as a “constant stream of ‘self-talk’ that happens when we are conscious,” “an experience” which can be named and articulated, having clear start and end, and “co-experience” which is what we experience when it places in social contexts. Since their attempt was oriented to support the collaborative work in a multidisciplinary
team to support the user experience aspect of interaction design, it does not directly provide a tool for supporting the creation of aesthetic interactions, although their focal discussion was on understanding people’s experience with interactive artifacts.

Petersen et al. [33] emphasize the importance of aesthetic experience as interdependence between mind and body experiences, and claim that the aesthetic interaction is not to be found in the artifacts but is what “emerges from the personal and interpersonal sensations, experiences, and reflections that is connected to the system […]. [33-p.271]” This perspective supports our perspective of interaction, which is that interaction is not something inherent only to the artifact but something that emerges through the inter-plays between people and artifacts. However, our proposal in this paper focuses more on the design of the immediate level of interactions and less on the high-level experiences that encompass lengthy socio-cultural contextual experiences over time. We also claim that these high-level experiences can only be formed by the collections and integrations of such immediate levels of interactions. Our goal is to provide the new design knowledge that can support design decision-making and creativity to form concrete and graspable aesthetic interactions rather than to form abstract and high-level design ideas.

2.3 “Somaesthetics” for Aesthetics of Interaction

It seems difficult to utilize the research outcomes from such a rich point of view like pragmatism-based ideas in practical design activities. One reason for this may be that such a view—i.e. philosophically inclusive and comprehensive, becomes too ideal and rich to be handled in practice. Some researchers also point out that theories “can only influence design indirectly, via education, principles, models, and guidelines [42].” Since our goal is to provide practical and useful knowledge which does not oppose the fundamental concepts emphasized in holistic accounts of experience, we started to look into another concept, “somaesthetics,” introduced by Shusterman [41], which is influenced by Dewey’s perspective but further developed.

Dewey claims that aesthetic experience is inherently driven by “normal processes of living” quoted in [41-p.6]. Shusterman’s interpretation of Dewey’s perspective on art is that “all art is […] an undergoing and a doing which involves a reorganization of energies, actions, and materials [41-p.6].” This perspective has influenced several research attempts in HCI including Petersen et al.’s work [33] and Fiore et al.’s work [13] regarding aesthetic experiences with technologies. The focus on “felt experience” [25] is what we also think may be an effective way to conceptualize aesthetic experiences. However, many approaches that follow this philosophy so far have focused more on the environmental and total experiential level rather than the lower-level dynamics of interactions between human sensory and materials. This level of interaction between human sensory faculties and materials is also one of the fundamental sources of what shape aesthetic experiences, based on the concept of “somaesthetics”.

We think that the lowest level of experience that focuses on the tight coupling between human sensory and materials of the tools they interact with is what eventually drives the total and holistic level of experiences as a whole over time, influenced by the dynamics with individuals’ prior experiences, and by all personal meanings and values. Shusterman says “As an object grasped by our external senses, the body […]
can provide beautiful sensory perceptions or [...] ‘representations.’ But there is also the beautiful experience of one’s own body from within—the endorphin-enhanced glow of high-level cardiovascular functioning, the slow savoring awareness of improved, deeper breathing, the tingling thrill of feeling into new parts of ones spine [41-p.262],” and he defines this as the meaning of “somaesthetics.”

This account of aesthetics cannot be created without an understanding of the materials dealt with in design. For example, if we, in product design, do not understand the properties of materials we manipulate, such as texture, size, weight, and hardness, we cannot create bodily-connected aesthetic experiences—i.e. somaesthetics. To develop such insights about material properties is not easy, especially when it comes to interaction. The material we deal with is not tangible like plastic, metal, wood, or visual elements that constitute familiar building blocks in traditional design fields. The material we need to understand for interaction design is flexible, ungraspable, and phenomenal.

In this paper, we particularly address this level of understanding aesthetic experiences, and we propose a conceptual tool which we claim will help designers describe and articulate the characteristics and nature of the attributes of interaction that will be used for creating such experiences. We will not discuss how to judge the qualities of aesthetics that can be created by using our conceptual tool. The decision of such judgment is always dependent on individuals, personal historical backgrounds, and particular contexts [8].

3 Interaction Gestalt for Aesthetics of Interaction

As we argued in the previous sections, it is essential to define and research what the shape of interaction is, which we call interaction gestalt, so that we can help designers articulate and manipulate this unusual type of phenomenon which does not have tangible shapes, and is flexible, ungraspable, and easily changeable [23]. In this section, we aim to define what we mean by interaction gestalt, and also to explain how we think about the shapes of interactions as a part of the definition of the interaction, how our definition is different from current notions of interaction models, and why our definition of interaction can be an effective conceptual foundation for supporting the field of aesthetics of interaction. And then we propose an initial foundation to support the interaction design by identifying a set of attributes of this unusual design target, i.e. interaction.

3.1 Defining Interaction Gestalt

The pragmatic perspective of aesthetics especially works well when we try to explain the aesthetics of interaction that does not have tangible properties because it emphasizes that the aesthetics is not intrinsic to the artifact itself, but to the way people experience it. As we emphasized before, interaction is basically viewed as a phenomenon that emerges in-between people and digital artifacts. It is not inside of the artifact. It is continuously going on and changing over time.

Unlike physical and tangible gestalts, interaction gestalts are dynamic and difficult to grasp. Fig. 2 shows our definition of interaction gestalt in relation to other qualities
that have already been much discussed in the field of HCI and Design such as user experience (shown on the left-hand side on Fig. 2) which can be described by user experience qualities such as pleasantness, fun, ease-of-use, and affect—and interactive artifact (shown on the right-hand side on Fig. 2) which can be described by artifact properties such as size, texture, weight, layout, arrangement, and structure. The interaction gestalt is different from these two but is tightly related and interdependent of the two. The interaction gestalt also has its own types of attributes which can be used to shape, describe, and analyze the interaction gestalt.

![Fig. 2. The interaction gestalt, and its relationships with user experience and interactive artifact.](image)

The interaction gestalt is shaped by a set of interaction attributes that must be translated to and manifested in the interactive artifact properties in order to be communicated, perceived, and experienced by users. The interaction gestalt also has to be designed in a way that will evoke the desired user experiences. The designer has to anticipate how a certain gestalt will be experienced by a user, and that anticipation has to be translated back into ideas on how the gestalt should be shaped. We believe that existing approaches without the notion of the interaction gestalt have a large gap between use qualities and artifact properties which designers need to bridge. We argue that this gap is what makes interaction design unclear and difficult in terms of forming aesthetic interactions. We believe that the idea of the interaction gestalt will provide designers with a concept that can support such bridging.

Traditionally in HCI, interactions have been described by languages of 1) interface styles such as WIMP (widows, icons, menus, and pointing device), 2) forms of interface devices such as tangible interfaces and graphic user interfaces (GUIs), 3) actions that are supported by interfaces such as instructing, conversing, navigating, and browsing [35], and 4) object-based concepts such as spreadsheet applications designed following traditional ledger sheet forms [35]. Although all these approaches have helped conceptualizing and shaping interface designs, they have not directly supported the aspect of aesthetics when designing interactive artifacts. Major approaches for supporting aesthetics in interaction design have primarily focused on providing indirectly influential techniques such as storytelling [13], use of extreme characters [11], and metaphors [9], or with visually-oriented and static elements such as color, texture, shape, contrast, balance, etc. [14].
We appreciate all these approaches and think that they all are effective approaches in their own right. However, we believe that the way we define the interaction gestalt will significantly help designers manipulate the design space of interaction design to more effectively consider the aesthetic aspect of its design. The concept of interaction gestalt will lead us and hopefully other interested researchers in near future to contribute to develop an interaction design language as with, for example, visual designs—visual literacy [48]—which has been established, educated, and significantly contributed to shape aesthetics of visual designs.

3.2 Defining Attributes of Interaction Gestalt

In order to grasp and articulate an interaction gestalt, we define an initial set of attributes which can form various interaction gestalts. This set of attributes will provide a conceptual tool for designers to form a particular interaction gestalt with which they expect to create aesthetic interactions that potential users may experience in a desired way.

We distinguish the dynamic aspect of the interaction gestalt as the nature of interaction from other types of gestalts. In Löwgren and Stolterman [23], a gestalt for interactive artifacts is defined as “dynamic gestalt” which “emerges in the interaction with the user over time (p.137).” This dynamic aspect of interaction has been emphasized by many researchers in different ways such as kinetic aesthetics focusing on bodily movement [26,43] and speed of artifact behaviors with a notion of “slow technology” introduced by [19]—i.e. creating a slow movement and transition of technologies which give time for reflections in order to create more aesthetic experience. All of them have emphasized the notion of time when describing the nature of interaction. The importance of the time aspect of interaction is also emphasized by [8,18,33]. The concept of the “dynamic gestalt” with the emphasis on time has influenced our definition of the interaction gestalt.

In order to extract the set of attributes of the interaction gestalt, we closely examined the characteristics of emerging interactions through the use of various interactive artifacts. In this process, three key factors of interaction emerged as fundamental, namely time, space, and information. Time is already proved to be an important factor of interaction as we discussed above. Space is another key factor of interaction which we believe is critical. Although space is an important factor in any types of artifacts we design, we think that the way of conceptualizing space for interactive artifacts is quite unique comparing to other types of artifacts. It often connects physical and virtual spaces at the same time, and, even within a virtual space, the way of creating and feeling space is very different from what we do with physical artifacts. When virtual elements in an interactive artifact are combined with the concept of time—for example, movement, it also creates a kind of spatial perception even though it is only an illusion. Information is another important factor that makes interactive artifacts unique from other types of artifacts. In terms of the term, information, we mean digital information. The characteristics of digital information such as flexibility, abundance, pervasiveness, and promptness enable various possibilities that are unique to interactive artifacts [22]. This factor is also carefully considered when we determine the set of attributes.
The first attempt of the set of interaction attributes we propose in this paper include the following: *connectivity, continuity, directness, movement, orderliness, pace, proximity, resolution, speed, state, and time-depth*. The definition of each attribute and relevant examples to explain what each attribute indicates are shown in Table 1.

Table 1. Our initial list of attributes of the interaction gestalt with definitions and examples.²

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directness</td>
<td>The level of directness of what is shown through an interactive artifact or its information elements.</td>
<td>Ambient Orb [4] Weather.com [28]</td>
</tr>
<tr>
<td>Movement</td>
<td>The level of movement dynamics for both users’ manipulating interface elements and artifacts’ showing information elements.</td>
<td>AIGA Des. Archive [1] BBDO [6]</td>
</tr>
<tr>
<td>Orderliness</td>
<td>The level of orderliness of either artifacts’ showing information, or users’ searching or manipulating information through an interactive artifact.</td>
<td>Scattr [40] Flickr Slideshow [46]</td>
</tr>
<tr>
<td>Proximity</td>
<td>The level of proximity of controlling information.</td>
<td>Adobe Photoshop Adobe Photoshop</td>
</tr>
</tbody>
</table>

² We highly recommend the readers of this paper to check the actual websites of these examples shown in Table 1 to be able to more clearly understand what each attribute means.
Table 1 (continued). Our initial list of attributes of the interaction gestalt with definitions and examples.\(^2\)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RPA</strong> (using keyboard for browsing) (^{[38]})</td>
<td>The rate of moving or the relative speed of change. Tempo. A combination of different rates of paces may create some kinds of rhythms.</td>
<td><img src="slow" alt="RPA" /> <img src="fast" alt="RPA" /></td>
</tr>
<tr>
<td><strong>Pace</strong> (slow-to-fast)</td>
<td>The rate of moving or the relative speed of change. Tempo. A combination of different rates of paces may create some kinds of rhythms.</td>
<td><img src="scarce" alt="Autodesk AliasStudio" /> <img src="dense" alt="Autodesk AliasStudio" /></td>
</tr>
<tr>
<td><strong>Resolution</strong> (scarce-to-dense)</td>
<td>The level of resolution of either users’ manipulating information or artifacts’ representing information.</td>
<td><img src="scarce" alt="typical loading pages" /> <img src="dense" alt="typical speedy games" /></td>
</tr>
<tr>
<td><strong>Speed</strong> (delaying-to-rapid)</td>
<td>The speed of either users’ behaviors or artifacts’ responses.</td>
<td><img src="delaying" alt="typical loading pages" /> <img src="rapid" alt="typical speedy games" /></td>
</tr>
<tr>
<td><strong>State</strong> (fixed vs. changing)</td>
<td>The case of state, it has only two variables: fixed vs. changing. When elements stayed in a same state, it is in a fixed state. When elements change to different states, it is in a changing state.</td>
<td><img src="fixed" alt="Philips USA" /> <img src="changing" alt="Samsung Australia" /></td>
</tr>
<tr>
<td><strong>Time-depth</strong> (concurrent-to-sequential)</td>
<td>The time-based depth of events occurring during interactions—simultaneous and concurrent events, or multiple elements with a few steps of depth, or every individual element shown through a larger number of steps of depth.</td>
<td><img src="concurrent" alt="Mac OS X Exposé" /> <img src="sequential" alt="Mac OS X Switcher" /></td>
</tr>
</tbody>
</table>

An important character of these attributes is that they are not experience qualities. They are simply descriptions of the shape of the interaction, and not emerging experience qualities. Experience qualities are, as we discussed earlier, connected to personal judgment such as fun, engaging, comfortable, pleasant, excited, and etc., which do not describe the interaction shapes, but describe overall qualities of user experience.

As we discussed earlier, our motivation for this research is to bring into interaction design the traditional design way of thinking and manipulating the attributes of what is designed. There was an attempt by other researchers \(^{[12]}\) to approach to interaction design from an industrial design perspective. However, their focus was more on the

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\(^3\) We acknowledge John Zimmerman at HCII at Carnegie Mellon University for this attribute.
physical artifact properties which will “form part of an invitation for action” [12-p.296] with more of interests in “the affective aspects of affordance [12-p.296]” especially for designing tangible interactions. Their focal discussion was primarily on physical properties that are intrinsic to interactive artifacts (with more of tangible characteristics) which invite certain ways of operating and interacting with the artifacts.

Our approach leads designers to think about interactions themselves without even thinking about the artifact properties. For example, if a designer considers movement as one attribute of an interaction gestalt he or she tries to design, he or she will explore a design space for the interaction gestalt from static to dynamic movements that can be shaped as an interaction both by a user’s input behaviors toward the artifact as well as by the artifact’s output behaviors shown to the user. Designers basically apply the attributes to manipulate both ‘input’ behaviors from users and ‘output’ behaviors through interactive artifacts. This process corresponds to visual designers’ manipulating the margin value from small to large, which is one attribute they deal with in the design of a 2-dimensional visual artifact.

We believe that this will enable designers to explore the interaction design space without being confined by specific physical properties intrinsic to the artifacts themselves, and in addition, they can still think about those artifact-intrinsic properties when they explore possible interaction gestalts when manipulating interaction gestalt attributes. This does not mean that we ignore the importance of the discussion and the exploration of the artifact properties. We bring an additional important and new perspective to be researched in the design of digitally enabled interactive artifacts. The most significant benefit of introducing this concept for aesthetics of interaction is that it enables designers to understand the effects of interactions themselves as their design target when exploring a design space. We believe that it will open up designers to think more clearly about the dynamic nature of interactions, and to explore various different forms of emerging behaviors over time through interactions.

4 Implications of Interaction Gestalt in the Design of Aesthetic Interactions and Future Studies

An understanding of interaction as a dynamic gestalt with the attributes that we can use to describe that gestalt can help designers to expand their design space, to inspire ideas of new combinations and new shapes of interactions. Since the notion of interaction gestalt does not force designers to think about things only intrinsic to artifacts—e.g. features and forms of artifacts, the notions of physical or virtual interfaces, and etc., we believe that opportunities for creativity increase. What designers explore with the idea of interaction gestalt is the space of emerging shapes of interactions; it is not about how interfaces look like or what features need to be implemented. For example, if designers manipulate an attribute, such as directness, in designing an information display for an office worker’s awareness of other workers’ activities in casual meeting places—e.g. kitchen spaces or public gathering places, you may think about a certain level of directness of visualizing various types of information of, for example, the number of people in the place currently, the number of people in the place for different time periods, or presence of foods, etc. Then you may think about other
attributes such as *movement* and *pace* to visualize different types of information in different ways. You may come up with an idea of a ball contained in a glass bottle rotating or floating around with different rates of *pace* with different levels of *movement* according to the change of the number of people in the place over time. Or you may have an idea of a small water fountain which changes its water behavior and colored lighting according to the information change. Or you may use a simple display that shows information more directly with some kind of chart-like visual information showing the change of numbers of people over time, and it can be a constantly moving and changing chart.

From these examples, we can see that the artifact-intrinsic properties do not confine the ideation of interaction gestalts. But attributes guide the conceptual directions of the intangible phenomena of interaction gestalts the designer wants to realize by manifesting them through the actual interactive artifacts.

It is important to understand that the attributes are not supposed to be used individually. As the original meaning of *gestalt* tells us, the sum is different from the whole. The ways of combining attributes should be constantly explored and examined to establish useful interaction design principles, as we see from traditional design examples—e.g. various visual design principles such as juxtaposition, symmetry, contrast, and harmony. Establishing such principles is only possible when we understand the gestalt effects and the relationships among attributes when they are combined. It also requires studies on the effects of each different attributes, and different ways of combinations of the attributes toward user experience qualities. We should continue to explore and research how different ways of manipulating interaction gestalt attributes will affect people’s aesthetic experiences with interactive artifacts. Through this effort, it may also be possible to develop ways to describe genres and styles in interaction design.

For the future studies of this line of research, we expect to see following research activities, some of which we are already engaged in:

- Refining the definitions of each attribute of interaction gestalt,
- Collecting more attributes and refining the list of core attributes,
- Implementing design cases that apply these attributes for actual interaction design projects,
- Studying the effects of different attributes and their combinations manifested in actual interactive products toward user experience qualities, and,
- Establishing a deeper understanding of the meaning of interaction itself from the design perspective.

We hope that this first attempt can be an important foundation to make this line of research activities possible.

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