

Some Thoughts on Haptic Aesthetics for Design Transmodal Aesthetics

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Abstract. Designing for total user satisfaction is or should be the goal of human centered product design. However, satisfaction is a complex function of multiple interdependent variables many of which are only recently being explored. Among these are the haptic senses and sensations. Considerable research attention is currently given to them particularly in interface design. However, the existence and role of haptic emotions and aesthetics in product design and their interactions with visual aesthetics and emotions seem to be comparatively overlooked. The proposition is made herein that an object should be so designed that it is as pleasurable to hold and use as it (or its image) is pleasing to look at. Furthermore, it should be so designed that viewing it or its image arouses the appropriate virtual haptic responses. That is, the object should be designed so as to maximize its haptic as well as visual aesthetics and emotions. As an aid to progress in this area, this paper makes the argument for more recognition of the existence of a visual → virtual haptic synesthesia; the evocation of mentally aroused haptic sensations which follow on viewing an object or even its image. Such sensations may lie below the conscious level but still be potent in forming the viewer's total aesthetic and emotional response to an object.

The descriptor "transmodal aesthetic" is used here in postulating a related phenomenon in which a feature or object which affects one sensory aesthetic will influence the aesthetic response of another sense. In the product case for instance, this occurs when an object or feature of it which is pleasing to the haptic senses results in the object (or image of it) being pleasing to the visual sense. This postulates or acknowledges that if the hand finds something pleasant/unpleasant, it will evoke pleasing/displeasing emotions to the eye rather than vice-versa.

Because we are not often consciously aware of the haptic sensations evoked in us by visual stimuli, we must learn to conscientiously attend and respond to them. This will greatly increase our appreciation of art in general and product design in particular.

This paper is a discursive attempt to set out several aspects of fundamental virtual haptics which should be explored in their role of providing haptic pleasure as an important aspect of product design. Several areas for research into haptic aesthetics and their relationship to visual aesthetics particular for products are suggested.

Keywords: aesthetics, art, design, haptics, product, sculpture, synesthesia, transaesthetic.

1 Introduction

“Haptic” is derived from the Greek *haptikos*, from *haptesthai*, meaning to touch or grasp. Haptic includes the tactile sensations through skin receptors, kinesthetic and proprioceptive sensations from the muscles and joint receptors. It is the most important sense in that we can live without sight and hearing but without haptic sensations informing our brain of our interior and exterior world and our relation to it, we would perish. We would be unable to do such things as make coordinated movements or feel pain and all that follows from those deficits. Considerable scientific attention is finally being devoted to issues of the haptic senses for interfaces and industrial purposes[1]. However researches into haptic aesthetics for product design appear to be in its infancy. This paper discourses on issues of haptic responses to visual stimuli using as examples, *faute de mieux*, pictorial stimuli.

We often describe what a product *looks* like by how we *imagine* it would *feel*. For example, we commonly describe (at least in English) an object as *looking* “heavy”, or “hard” or “sharp” or “soft” or “cold” or “sticky” or any of a number of fundamental haptic descriptors. But we don’t describe how something *feels* by how it *looks*. We don’t say that something *feels* “red”, or “dark”, or “high”, or such. As will be stated later, it seems that in a general sense, the hand informs the eye rather than vice versa.

Consider this quote discussing a recent textile exhibition: “... finely woven silks in a display so *visually intense* you could swear you *feel* the fabrics’ *smoothness* on your *skin*”[2] [italics mine]. The writer is describing her very intense *virtual* haptic sensation in response solely to visual stimulation.

In fact, there is a powerful urge to touch objects[3]. Gombrich[4] relates that visitors in front of a life-size marble sculpture of a large furry dog generally wanted to stroke it. In fact the custodians had to wash it once a week because so many did. He further says that: “... the stroking gesture may well have been compounded of irony, playfulness, and a secret wish to reassure ourselves that, after all, the dog was only of marble.” [This suggests some reasons *why* people want to touch objects.] Nor are such impulses confined to actual objects. Gombrich further relates the great but controversial art connoisseur and critic Bernard Berenson’s account of “ideated sensations” in front of paintings which *stimulated* his *tactile sense* and changed the *tonus of his muscles*. [This suggests how an object, in this case a painting, can *affect* a sensitive observer.] Gombrich also mentions that touching things can serve as a cross-check on hypotheses we may form about an object.

Figure 1 shows a kitten sleeping in a woven basket. In this picture we have the pleasurable though *virtual* haptic finger sensations as though we were feeling the soft fur of the sleeping kitten as well as running our fingers over the strongly textured basket. Part of the pleasurable sensations, both visual and virtual haptic, lies in the contrast between the wispy, soft, irregular fur of the kitten and the hard, bumpy, regular surface of the basket. These contrasts add to more than the separate virtual sensations. It is not too much to say that we can “feel” the small head and body of the kitten as well.



Fig. 1. Kitten in basket

Or consider in Figure 2 the Chinese scroll painting by Dai Jin, the famous the 15th century landscape painter. With his art the master artist of such pictorial images can cause the sensitive viewer to experience strong haptic illusions as in the commentary quoted below.



Fig. 2. “Returning Home Through the Snow” (c. 1455) by Dai Jin

“In the artist's quick brushstrokes, we *feel* the winter wind whipping his thin robe. As our eye *moves up* to tree branches outlined in snow, to an expanse of empty sky and distant bare mountains, the *chill* of this man's lonely walk engulfs us. ... By contrast, other hanging scrolls feature tiny, anonymous figures that draw us inside the scene. We *climb* the mountain path that stretches before them, *glide* along the twisting river, *brush against* low-hanging branches, *feel* our heart rate slow as we marvel at the scenery.”[5] (My Italics to indicate the virtual haptic sensations)

As modern peoples, we have consciously or unconsciously downplayed attention to virtual haptic sensations and the role they play in our aesthetic evaluations of an image or object. “*The aesthetics of non-Western cultures have traditionally been framed within the West in terms of Western categories of visual arts or musicology, with little or no consideration given to the possible aesthetic role of the proximity senses. An instance of this is provided by Navajo sand paintings which have been incorporated into Western museums and aesthetic discourse as objects for the gaze, while for the Navajo their tactile qualities are fundamental*”[6].

Nearly blind when old, Edgar Degas (1834 – 1917) commented that “Sculpture is a blind man’s art.” and relied on his haptic senses of touch to model wax figurines of dancers and horses which were later cast in bronze such as the famous “Little Dancer” in Figure 3.



Fig. 3. The Little Dancer (Degas)

The artist Hebborn in deploring the pernicious influence of the rise of photography speaks of “the ancient tactile meaning once attached to line, and understood by our whole anatomy – our physical and subtle bodies – being replaced by a mechanical

copying of shape and shadow which speaks only to the eyes.”[7]. He also speaks of reproductions of a painting being impossible to convey truly the tactile quality of the handling of a painting depending as it does “on a variety of touch and texture, impasto, scumbling, and glazed transparencies, all of which are painterly qualities.”

The phenomenal Taiwanese sculptor/artist Mary Leu[8] can sculpt wood as in Figure 4 so expertly that it not only fools the eye (a 3-D trompe-l'oeil) but it can also give rise to the most powerful virtual haptic sensations as though it were also being felt. Her skill at producing minute texture and the appearance of fabric is astounding. Viewing this picture in Figure 4 of the actual sculpture still produces very strong virtual haptic sensations of the fabric’s texture and pliability. Viewing the actual piece in her gallery in Yilan, Taiwan produces not just visual pleasures but also the additional pleasurable virtual haptic sensations of actually lifting and manipulating it.



Fig. 4. Carved wood shoe

2 Virtual Haptic Synesthesia

Based on the above comments and examples, Figure 5 suggests a *visual* → (*virtual*) *haptic synesthesia*, i.e., the evocation of virtual haptic sensations triggered by stimulation of the visual sense (but not vice-versa although there may be such cases[9]). The figure illustrates that in viewing the actual object we can consciously attend to otherwise unconscious *virtual* haptic sensations arising from the imagined sensations evoked by the object’s textures, hardness, and more which are primary to touch. Other virtual haptic sensations such as size, thickness and thinness can be aligned with the imagined spread of the fingers and finally the virtual haptic sensations of weight, balance and the important but elusive sense of the moment of inertia (MOI) although the latter is unlikely to be accessible virtually in as much as the object’s MOI which pertains to the distribution of the mass about some point such as the balance point, center of gravity or point of grasp. MOI is a physical property which like the center of gravity is not visible but is a definite factor in haptic sensations.

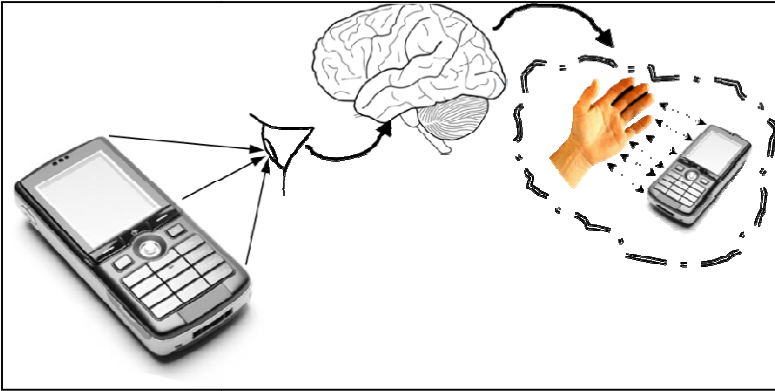


Fig. 5. Visual → Virtual Haptic Synesthesia

However it is possible to imagine actually using familiar objects such as the pieces of tableware in Figure 6[10]. Our long familiarity with such utensils can help assess mentally what they might feel like actually using them. The objects in the set of silverware are visually pleasing to the eye but they are for (and perhaps primarily) functional use as well in which case the haptic sensations arising in use will determine their total pleasing or displeasing aesthetics and user satisfaction. An object may be well designed to please the eye yet still be haptically displeasing in actual use because of poor “feel” in the hand, difficulty in grasp and clumsy manipulation arising from the various shape factors controlling weight, weight distribution, center of gravity and moment of inertia. Whether or not any virtual haptic sensations agree with the actual ones, as well as the degree to which the visual aesthetics are influenced by the virtual and actual haptic sensations are important researchable questions.



Fig. 6. Silverware setting

Considerable attention is appropriately paid to the role of texture in design. (This includes two and three dimensional art objects such as in Figures 5.) But designers should be aware that tactile sensitivity as defined by the two point threshold declines fairly severely with increasing age[11]. This however does not likely apply to those virtual haptic sensations, pleasurable or otherwise arising from viewing objects.

Although as illustrated in the examples above we readily form strong virtual haptic sensations from visual images, we are considerably less able to make a mental image of an object from haptic information. This is familiar to those who have played games as children where the objective was to identify an object while blindfolded and so leaving only haptic sensations for that purpose.

Imagine looking at a picture or object. We cannot “take it in” all in one glance. Our field of sharpest vision is a cone about 3° wide. Therefore only that which falls within this cone is imaged sharply on our retina while that which lies outside is less and less sharply imaged as distance from the cone center increases. For example, if we look at an image which is 3 feet away, the spot of sharpest vision is about 2 inches across. So that a painting which is, say, 2' x 3' requires our shifting the 2" diameter vision spot over its surface while our mind builds up an image composed of these many shifted retinal images. For a simple example, look at a word on this page and while staring at it and without shifting your gaze, try to discern what the words are two to the left and right and two lines above and below. At a common reading distance of 18", the sharpest field of view of the 3° cone is about 1" across on the paper.

Similarly, we cannot identify an object by “feel” all at once. We must “feel” it at our fingertips, finger spacing, tactile and thermal properties, etc. Also we assess its static and dynamic properties such as its weight, balance and MOI. Out of this we try to form a mental image as a composition of all this information. However, haptic-to-visual synesthesia is not as direct as visual-to-virtual haptic.

During April, 2012, an illustrative interactive haptic experiment was in place at the Shisanhang Museum in the Bali District of New Taipei City in Taiwan. An object such as the pistol in Figure 7 was hidden from view inside a box into which the hand could be inserted and the object “felt” by moving the fingers over it. Importantly, the object was fixed in place and could not be moved or picked up. For all but the simplest objects I found it very difficult or impossible to identify them. For example, I could not identify a .45 caliber pistol although I have handled handguns many times and this type in particular during my military service and elsewhere. Perhaps the difficulty in identification was because I could not actually pick it up and orient it in my hand, or because the object was fastened in an unfamiliar orientation. This has many interesting aspects. Perhaps if I could have actually picked it up, I would have been able to identify it. Moving my fingers around on it did not help. That is, I could not form a mental image from the partial haptic images although there was no doubt that they were strong. I was able to identify such features as texture on the handle and body, the ring of the trigger guard, sharp projections of hammer and sight, etc., but not the whole. Thus while vision \rightarrow virtual haptic synesthesia is quite strong, the reverse; haptic \rightarrow vision seems to be much less strong which is itself an important researchable issue.



Fig. 7. .45 caliber pistol oriented "upside down"

It is a very worthwhile and sensitizing experience to spend some time in a museum in front of sculptures and objects and concentrate on the virtual haptic sensations you receive by mentally running your hands and fingers over their surfaces. (Of course, this can be performed anywhere.) Spend time in front of each object doing this and your enjoyment and appreciation of both the piece and its artist will increase dramatically. You can also do this in front of paintings by “feeling” the rounds and smooths, angles and lines and such and being attuned to the various emotions it evokes.

To the extent our satisfaction with a product depends on how it actually “feels”, it is important in design to convey as much as possible its actual feel to the imagination of the viewer. Pleasant virtual haptic sensations as well as pleasing visual appearances could also be very important in a competitive purchase/use environment particularly for objects which cannot be handled prior to purchase.

3 Transmodal Aesthetics

I would like to use here the term “transmodal aesthetic” to describe the phenomenon by which one sensory aesthetic may influence the aesthetic response of another sense. I propose that to some extent our aesthetic and emotional response to visual images is based strongly on our actual (or virtual) aesthetic and emotional haptic responses. “The hand tells the eye” means that we learn much of our visual aesthetic/emotional responses from our haptic experiences. And this holds for both virtual and real haptic aesthetic responses. To what extent and under what circumstances this happens is a researchable question.

So, as distinct from visual → (virtual) haptic synesthesia we have haptic aesthetics → visual aesthetics. Instances of the latter are most clearly seen in the cactus-like spiky teapot of Figure 8. Our emotional reaction to this visual image must be based on our virtual haptic sensations which are themselves based on our actual (and usually painful) haptic experiences with sharp points. If we had never encountered sharp points before, it is unlikely that this image would affect our reactions in the disturbing manner it does.



Fig. 8. Spiky teapot art object ancoraimparo.org

The image of Meret Oppenheim’s “furry cup and spoon” in Figure 9 is a further example of the haptic aesthetics → visual aesthetics. In looking at this image of an actual object, we receive a strong virtual haptic sensation as though the cup or spoon were actually touching our lips and fingers. To the extent this haptic sensation is unpleasant, so is the visual emotion the image arouses. It is likely that our emotions would be even stronger if viewing the actual object of Figure 9. If we had never had any haptic experiences with fur, it is again unlikely this image or the object would cause the reactions and emotions they do.



Fig. 9. Breakfast in a Fur Teacup. Meret Oppenheim. 1936.

4 Research

The preceding discussion mentioned several researchable haptic/vision questions. Others are summarized below in no particular order.

1. How much do the aesthetics of the “look” of an object depend on the mental aesthetics of the “feel” of the object?
2. How much do the aesthetics of the “look” of an object depend on the actual aesthetics of the “feel” of the object?
3. To what extent and under what circumstances is there any relationship between mental and actual aesthetics of feel?
4. To what extent do rankings by visual and haptic aesthetics of similar objects agree?
5. To what extent do rankings by visual and haptic aesthetics of dissimilar objects agree?
6. Are some people more sensitive to haptic aesthetics than others?
7. What are the haptic dimensions of an object?
8. What makes an object “feel good” in the hand?

5 Conclusion

Because of the pleasures and displeasures we (can) derive from our haptic senses, both virtual and actual, an object should be designed so as to be as pleasant to hold and use as it is pleasing to look at. Furthermore, it should be so designed that viewing it or its image arouses the appropriate virtual haptic responses. Research into the fundamental essentials of both real and virtual haptic experiences is in its infancy and represents perhaps the last frontier in design.

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