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Impact of Perception Theories on Kansei Design

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1. Introduction
This paper is an adaptation of the one published at KEER14 [1].

Despite the relative youth of kansei design as a discipline, compared to kansei engineering, different approaches can already be pointed out. Non-surprisingly, similar differences seem to be observed in the field of tangible interaction design as well. This similarity seems to be due to the materiality these approaches focus on, and the way they consider how the artifacts and the humans relate.

The first type of approaches focuses on the physical materiality of artifacts (i.e., their intrinsic properties), and their evaluation or preference by the user [2]. This type is very close to kansei science in terms of domains of application and tools (often based on semantics), but differs by its attitude towards ambiguity and uncertainty. While kansei science intends to avoid it or to “solve” it by means of logic reasoning, kansei design deals with it by means of design skills. The second type of approaches focuses on the interactive materiality [3] of artifacts (i.e., the qualities of the artifact in interaction [4]). However, underlying their focus, it is the theoretical standpoint they take that clearly differs these two approaches. Therefore this paper intends to describe these theoretical standpoints in order to clarify their influence on kansei design approaches.

The notion of sensory perception relates to the way one recognizes and makes sense of the surrounding world. Theories of perception are often categorized in two groups. The first group, more conventional and dominant, is called the indirect (or mediated) perception theory, as it assumes that perceiving is an animal faculty which requires information processing to make sense of the surrounding. Perception is mediated, and therefore indirect. The second group is called direct perception theory, as it assumes that the world is perceived directly (without the need of information processing such as inference, memories, or representations) and that perceiving is an animal-environment system.

Both perception theories will be introduced here, followed by the implications on kansei design. The specificities of these kansei design approaches will then be discussed.

2. Perception Theories

2.1 Indirect perception theories
The indirect perception theory describes perception as follow. Sensory receptors capture stimuli and convert them into neural information (this conversion is called transduction) to be processed by the central nervous system. Each sensory organ is capable of converting a certain type of stimuli into neural information. In the case of sight, visible light is captured by the photoreceptor cells at the surface of the retina, creating the retinal image. This retinal image is then converted into a neural signal. However, this captured input is meaningless as is: a complex set of cognitive processes is required to translate this signal into a meaningful perception of the surroundings.

This approach suggests three aspects on the relation between the subject and the world. First, the capture input is not the world itself, but – in case of sight – the retinal image of it. This image is a distorted two-dimensional projection of the three-dimensional world on the retina. The visual cognition process has to be able to rearrange the retinal image and the reconstruct the lost dimension.
Second, the retinal image is a mosaic of stimulations, leaving to the cognition process the role of reconstructing the spatial continuity of the world. The visual cognition process has to be able to rearrange the retinal image and the reconstruct the lost dimension. Second, the retinal image is a mosaic of stimulations, leaving to the cognition process the role of reconstructing the spatial continuity of the world. Third, experience is composed of perceptual moments [5], leaving to the cognition process (highly involving iconic memory) the role of reconstructing the continuous flow of events (i.e., the continuity of the temporal dimension) as we experience it.

From this, a couple of reflections can be pointed which have consequences for indirect kansei design (i.e., kansei
design approaches based on indirect perception theory). First, it is a representation (i.e., the retinal image) of the world that is perceived, and not the world itself. This aspect explains well the value of representation, metaphors and models often present in indirect kansei design approaches. Second, a unique retinal image is senseless on its own. Iconic memory needs some retinal images captured in a series of perceptual moments to make sense of the dynamics of the world. This suggests that perception is not a continuous but somehow a discreet process, and that memory plays a crucial role in the ‘reconstruction’ of the continuous flow of a perceived event. Third, in the description of the perceptive process, the body is quasi absent. As shown in Fig. 1, the body is ‘just’ the carrier of the senses which transform information towards the central nervous system. However, the motivity of the body appears irrelevant in this process. The Cartesian nature of this theory is obvious.

2.2 Direct perception theory

The direct perception theory is radically different in the way it considers the richness of what is perceived. Whereas indirect perception theory considers the retinal image, being a poor stimulus enriched by the cognitive processes, direct perception theory considers richness to rely directly from the stimulation itself.

Although different approaches could be included in the present description (e.g., embodied cognition [7], phenomenology of perception [8], ecological psychology [9], etc.), only the ecological psychology will be described and taken into consideration in this section. An excellent and more detailed description of this theory was done by Michaels and Carello [10].

Ecological psychology reformulated the notion of stimulus and showed how richness can be located in the animal-world couple (i.e. human-artifact from a design perspective). The notion of stimulus, described by indirect perception theory as an energy captured by the senses, is described in direct perception theory as an information being the structure that specifies an environment to an animal. Consequently, direct perception theories do not regard cognitive processes as the place where meaning arises. However, direct perception does not refute the existence of cognitive processes involved in the perceptual activity. Differently, cognitive skills contribute to the perceptual activity, but are not the place of the construction of the perceptual richness, i.e., the place where meaning is constructed. Meaning is constituted in between the animal and the world, and cognition is one of the crucial activities taking place on the animal side of this coupling.

From this perspective, perception is not limited to a perceptual moment delivering and impoverished stimulus, but is the determination of (rich) information through an extensive length of time during which an event - itself nestled in other events - is perceived. This way, perception is a continuous activity of determining information within a continuous flow of events in space and time.

This consideration leads to a second significant difference between the two perception theories: the active nature of the perceiver. For indirect perception theory, the stimuli are captured automatically, effortless for the perceiver. The perceiver is passive (although some theories would claim that the perceiver is cognitively active to reconstruct the richness of what is been captured). For direct perception theory, the perceiver is engaged in, and therefore active in obtaining the information of its environment.

This fundamentally impacts the way perception theories consider the perceiver-environment relation. Indirect perception theories consider the dualism perceiver-environment, i.e., the perceiver and the environment are separate and independent entities. Consequently, indirect perception psychology focuses on the on-going processes taking place “inside” the perceiver (from stimuli capture to behavioral response), and the environment is “just” considered as input for the inquiry. Differently, direct perception theories consider the ecological system perceiver-environment, i.e., they are part of one system which needs both to function and to be comprehended. Perception is about understanding the perceiver’s environment, in which her/his body is, and actually is part of. Therefore, considering the relation between the perceiver and the environment in the inquiry addressed by ecological psychology, and considering the fact that understanding
the environment requires the perceiver to be active in the environment she/he is engaged in, it seems impossible to consider these two entities separately. Moreover, because understanding a perceiver can be done by describing her/his environment from her/his unique perspective, and the other way around, I can conclude that according to direct perception theories, the perceiver and the environment are not only dependent on each other: their relation is mutually constitutive of each of them.

In this being-environment ecosystem, information is also present. Relevant information, i.e., the one that can be perceived by the being, can be so depending on the composition of the environment, on the sensory system the being is equipped with, and on the way this being engaged in the environment. However, one supplementary fundamental condition is necessary for the information to be relevant: what Gibson calls the affordance.

Affordances are what can be done in interaction with the objects, the places, or the events. Gibson [9] describes "the affordances of the environment as what it offers animals, what it provides or furnishes, either for good or ill". However, it is important to look at affordance from the ecological system perspective, that is to consider both the constitution of the environment and the animal to understand this notion. A chair can be seated on only if it has the physical properties (surface, steadiness...) and if the being is capable to sit on it. The capability depends on the physiological qualities, the strength, and the skills of this being. Looking at the object qualities, we can imagine that a chair, a bench, and a table may be seated on. It is not the intention of the designer, nor the intended primary function of the object, nor the term used to label an object that dictate how the object can be used. It is the way it stands in the world, the way it is structured, the way it appears to the being that influence the way it can be used. Moreover, it is not these qualities alone that condition the way it can be used. A priori, a small child cannot sit on a table or on a bar stool on her own. If one can walk, run, swim, or fly will influence the way one engages with the world, and therefore the relevant quality of the information available in the environment varies.

Gibson argues that it is affordances that are perceived. In other words, the one perceives (i.e., makes sense of) the world by what one can do or behave within it. One does not perceive chairs, benches, or tables, but places to sit on. This perception is therefore dependent on information available in the environment and on the effectiveness of the being. That means what is perceived is relevant (and rich) information available, detectable, and usable in the perceptive ecosystem.

2.3 Japanese theory on direct perception

The Japanese world of philosophy and psychology does not escape from this debate between indirect and direct perception theories. However, the Nishidian philosophy brings a strong and relevant perspective on perception for the discussion stressed in this paper. Three Nishidian notions can be very instructive on this perspective: action-intuition, pure experience, and basho. “We see a thing by action, and the thing we see determines us as much as we determine the thing. That is action-intuition” [12]. Action-intuition describes the view that intuiting entails acting, and acting intuiting. Both the world and the subject are formed mutually and are reflected in one another [13]; pure experience corresponds to the notion what the primal undifferentiated form that subsequently dirempts into differentiated forms including: experiencing subject and experienced objects, intellectual intuition and reflective thought, objectified nature and objectifying spirit—all on their way to a higher unity [13]; basho is described as the place where individuals are located in terms of their substance and attributes. This basho is not the world of actual, concrete beings but an initial and partial reflection that abstracts part of that world so that it can become intelligible [14].

These notions obviously appear to be constitutive of the Japanese approach on kansei, as well as on perception, on experience, and on context. Moreover, the notions introduced by Nishida can be considered in regards to the Gibsonian ecological psychology. The Nishidian philosophy suggests that the subject and the environment (or basho, being fundamentally the experienced object) are related by essence (pure experience) and are ‘formed mutually and are reflected in one another’ (acting-intuition). This approach appears
therefore as an ecological nature and is close to the Gibsonian psychology.

3. Consequences for Kansei Design

Based on these two categories of perception theories, kansei design approaches can be also be categorized in two groups. The first group focuses on the physical materiality of artifacts (i.e., their intrinsic properties), and their evaluation or preference by the user (e.g., in textile design [15, 16], and in automotive design [2]). The second group focuses on the interactive materiality [3] of artifacts (i.e., the qualities of the artifact in interaction).

3.1 Indirect kansei design

Different works have been done to support the development of indirect kansei design. Two notorious ones are the work presented by Lee [17] and the work developed by Toyota Motor Europe. More direct applications can also be seen in [18, 19].

According to Lee [17], designers have to balance between objective and subjective properties, between functional technology and emotional expressiveness, between information and inspiration. Kansei design is proposed as an approach to implement these considerations in the design of a product in order to trigger a certain type of affective reaction. The result of this implementation is described and the subjective properties of the object.

The attempt developed by Toyota Motor Europe (TME) constructs an upstream phase integrated to the early design process phases of the company [20, 21]. Kansei design was initially described as the way to introduce kansei engineering approaches into the scope of design thinking (as described by Gero [22]). The aim was to determine the design space (understanding), create propositions fitting in this space (creating) and to assess propositions based on users’ kansei (assessing). TME uses kansei engineering techniques for assessing, but has come to recognize the need for a design approach in the first two parts: understanding and creating, i.e., the need for a kansei design approach to create a kansei space. The kansei design approach developed by TME aims at bringing users’ experience earlier into the creation of the design space.

3.2 Direct kansei design

A direct kansei design approach is therefore also possible as it can be supported by an inquiry in Japanese philosophical or cultural works related to kansei, using them as inspirational means for design. Therefore, I suggest here that direct kansei design explores Nishida’s philosophy (and other related philosophies and Japanese cultural traits) as a source of knowledge and opportunities to be handled by design.

With its roots in Japanese culture, direct kansei design takes the Japanese tradition for craftsmanship into highest consideration [23, 24] and reaches end users through the relationship between craftsmen and their artifacts. The stance of an artifact is not revealed only by the experience of the users. It also acquires meaning through the intention of the designer. This is how kansei should be explored in the design process, incorporating all the varieties of points of view held by designers and users.

Existing projects based on this approach are, among others, the passage [1], BeTouched!, and Cololo [25].

4. Conclusion

Although the discipline of kansei design is still in an emerging phase, looking for its position and its role in both the research fields of kansei and of design, it is possible to identify different types of kansei design approaches. The first one, indirect kansei design, is based on an indirect (or classical) perception theory, and is consequently close to kansei science from a theoretical perspective. The second one, direct kansei design, is based on a direct perception theory, and is close to interaction design as described by Overbeeke [26].

Therefore I argue here that a primary fundament of kansei design is the perception theory on which the notion of kansei is approached. An indirect kansei design approach implies that kansei is defined as a high function of the brain related to emotions, sensitivity, feelings, experience and intuition, including interactions between them [27]. Beauty is evaluated from the way the design is experienced in the user’s mind. A direct kansei design approach relies on designerly iterative explorations from which meaning emerges, and implies that kansei is described as the ineluctable and affective experience of “being-in-the-world” [25]. Beauty is in interaction between the user and the artifact, i.e., as a quality of the interplay.

This primary structure provides a set of means (theory, approaches, tools…) for various kansei design approaches. However, it also opens numerous questions (e.g., applicability and relevancy of each theory depending on the nature of the design project). I expect that the attempt to answer these questions will help the kansei design community to explore and to clarify
further the discipline, to gain insights on kansei, to better differentiate and associate kansei design with other types of design disciplines, and to progressively create tools and frameworks to better operate kansei design projects.

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BIOGRAPHY

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He is an Assistant Professor in the Designing Quality in Interaction Group at the Department of Industrial Design of Eindhoven University of Technology, The Netherlands. He graduated from the Department of Mechanical Engineering (with a focus on industrial design) at the Compiègne University of Technology, France (2001), and gained a PhD with honors in Kansei Science at the University of Tsukuba, Japan (2006). He has been an active member of the Japan Society of Kansei Engineering (JSKE), serving currently as a member of the Editorial Board of the Affective Engineering International Journal, and as the coordinator of the International Board of the International Conference on Kansei Engineering and Emotion Research. He is also a co-founder of the European Kansei Group. He explores opportunities for applying Kansei science and Kansei philosophy to product and interaction design.

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