

When movement invites to experience : a Kansei design exploration on senses' qualities

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When Movement Invites to Experience: a Kansei Design Exploration on Senses' Qualities

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ABSTRACT

In this paper, we introduce a Research through Design on 'Sensual Dynamics', and explore four design projects (namely Be Touched!, Sound Flowers, Shylight, and Blow!) from which we extract design notions providing valuable insights on how to design with and for the senses' quality 'reciprocity'. 'Sensual Dynamics' designs are artifacts that are able to sense one person and to behave upon her presence to invite for movements enhancing the perceptive experience. Such an artifact is therefore at the same time the object of the experience as well as the trigger for a greater perceptive experience.

Keywords

Sensual dynamics, senses' qualities, perception, reciprocity, acting intuition, design.

INTRODUCTION

With the increasing integration of electronics in everyday products, to give them the ability to sense their environment (virtual and physical ones) and to act upon it, the focus of industrial designers has been greatly expanded. Next to the focus on classical formgiving aspects (form, texture, color, material of the product), industrial designers need as well to focus on designing for interaction. To design the artifacts' behavior, designers need approaches to design for aesthetical quality in interaction, i.e. they need an approach for artifacts to appeal to our kansei throughout our perceptive activity, and therefore to our senses and to our motor skills.

The main objective of this paper is the introduction of a Research through Design project entitled 'Sensual Dynamics'. We describe basic design notions at the sensorial level to design for perceptive qualities. To do so, we describe the concept of the senses' qualities as a starting point for design for perceptive experience. Thereafter, we focus on the quality of 'reciprocity' and intend to point out design notions to support the 'Sensual Dynamics' design approach.

APPROACH ON SENSES AND EXPERIENCE

In this paper, we take a philosophical standpoint on kansei. This philosophical outline has inspired our design approach. The approach differs from the generally taken approach in the discipline of kansei engineering. Kansei engineering can be described, in most of the cases, as embracing a systemic approach

based on a reductionist method (cf. [7,10]. The approach we take here aims at being practical for design, and holistic in its nature.

Acting intuition

This kansei design approach is inspired from the philosophy of Nishida Kitaro, the father of the School of Kyoto. In the case of the present research, we especially focus on the notion of acting intuition (*koiteki chokkan*). In short, Nishida describes acting intuition as follows [9]: "we see a thing by action, and the thing we see determines us as much as we determining the thing." From a design perspective, this description is composed of two strong inspirational arguments:

- **"The thing we see determines us as much as we determining the thing"** – The meaning of one (e.g., the thing) cannot be constituted independently from the other (e.g., me), and vice versa. This implies the reciprocal influence of the world and the individual. As Wilkinson (2009 – p120) explains: "We must experience the world in order to act on it. Just as he [Nishida] insists that practical reason is more profound than the theoretical, so he insists that our natural mode of being-in-the-world (Heidegger, 1962) is not contemplative but active, an aspect of constant mutual interaction between individual and world." Consequently, meaning emerges from interaction (between the person and the thing) and cannot be independent from it. From a design perspective, this implies that the context and the interaction with it should be considered to a greater extent, yet without attempting to define them completely. This consideration is required as it will be the place where meaning emerges. Yet an attempt to make it complete within the design process would actually be an attempt of meaning creation from the designer's point-of-view, not the user's one. This would depreciate the quality in interaction and consequently of the design.
- **"We see a thing by action"** – The environment ("the thing") is perceived in dynamics, i.e., in the dynamics of interaction. Therefore, designers should design for interaction taking into consideration its dynamics quality, this invites to design for action possibilities, preferred over usability of pre-determined actions.

To summarize, taking a Nishidian stance invites kansei designers to focus on dynamics (i.e. movement), to offer action possibilities, and to consider the context as a set

of dynamic elements. It is in the interaction that meaning emerges.

Acting intuition can be put in parallel with active nature of perception as described by Merleau-Ponty [8]: “Perception is inherently interactive and participatory; it is a reciprocal interplay between the perceiver and the perceived.” The practical value of doing so is to gain the design knowledge which derives from this notion [1,6]. From a phenomenological stance, Deckers [2] has proposed a model from which few artifacts have been already designed. The ones presented in the showcase section are built on this model, which should therefore be presented briefly here.

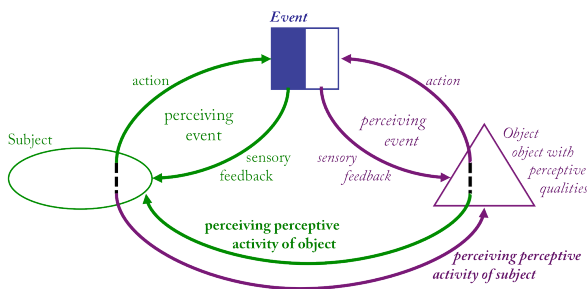


Figure 1: Design relevant model for designing perceptual crossing

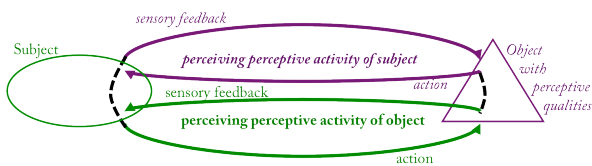


Figure 2: Model on perceptual crossing between person (Subject) and artifact (Object)

Figure 1 shows the theoretical model of the person (subject), the designed artifact with perceptible qualities (object), the event happening in their common space (event) and the perceptible connections between them. As one can see in the perception of the event, perception is here considered active [9] and is the result of the actions one undertakes and of the sensory feedback this results in, and vice versa. The actions the object undertakes towards the event are part of the perceptible activity the subject perceives of the object (the dashed lines in the model). Theoretically this also works the other way around.

The perception of each other is also active. The lower lines are a simplified representation of what happens and show the reciprocal interplay, i.e. perceptual crossing, between subject and object. Figure 2 shows the two lower lines of the model presented in Figure 1 in more detail. The actions the subject undertakes to perceive the object are part of the perceptible activity the object perceives. This also works the other way around (the dashed lines in Figure 2). The perception of each other crosses.

Qualities of senses

This research focuses on the exploration of the relation between the qualities of the senses (described in the following paragraph) and the perceptive activity of the subject, in order to find ways to design for a greater experience while interacting with dynamics artifacts.

We describe here a quality of a sense as a phenomenological property of the sense. Therefore, these qualities are not directly related to any physiological aspect, but to phenomenological ones.

Here we only focus on the quality of ‘reciprocity’. Nevertheless we worked on three qualities of the senses that we believe to be directly usable in design. They are used as a basic framework for our research: reciprocity, distance, and privacy (Table 1 gathers the qualities for the five senses):

- The “reciprocity” quality concerns the fact that sensing implies being sensed as well (e.g., I am touched by what I touch (touch is reciprocal), whereas I can hear without being heard (hearing is non-reciprocal)).
- The “distance” qualifies where my body should be relative to the artifact to sense it (e.g., I can see at a distance (sight is distant), but I cannot touch at a distance (touch is local)).
- The “privacy” quality concerns the fact that one piece of an artifact (or of an event) can be sensed by more than one person at a time (e.g., many people can hear the same thing at the same time (hearing is public), while nobody can touch what I touch at the same time as it is covered by my skin (touch is private)). Although pure publicity is not possible (because it always depends on the position of my body in space, which is where only my body can be), it is perceptively acceptable (the announcement in a train is heard the same way by all the passengers). Yet, this is particularly noticeable for sight, as obviously nobody sees the same artifact from the same angle at the same time. In the specific case of sight, this quality is named point-of-view.

	Reciprocity	Distance	Privacy
Sight	no	distant	point-of-view
Audition	no	distant	public
Touch	yes	local	private
Taste	yes	local	private
Smell	no	distant	public

Table 1: Qualities of the senses (excerpt)

This description of the qualities of the senses is valuable for design, as it provides a practical starting point to design for perceptual experiences. This starting point will help the designer to create new experiences, during which the qualities of the senses will be transformed by a proper use of technology. In other words, the qualities of the senses are considered here as a starting point to design for perceptible qualities. Figure 3 gathers a set of

examples of artifacts organized by the senses' qualities, sowing or transforming the 'natural' state of the quality.

An basic example of a design that influences the senses' qualities are headphones. Headphones change hearing from public-distant-nonreciprocal to private-local-nonreciprocal. Their use profoundly changes both the way one can behave (action possibilities), the way one can sense the surrounding, and therefore the perceptive relation one has with the environment.

Research approach

For this research, we use a Research through Design approach [3]. This approach is formalized [11] as an iterative process during which artifacts are designed and considered as physical hypothesis [4] in the research process. Therefore, designerly skills and activities are highly involved and valued in the process: high quality is required for designing and the making of the physical hypothesis.

In this paper, we present the first iteration on designing for sensual dynamics, focusing on the quality of 'reciprocity'. Sensual dynamics artifacts are used as physical hypothesis to investigate how to design for perceptual experience, based on the senses' qualities. Because we present here the first iteration, our findings are based on the first set of artifacts and on the reflection upon experiencing them. Our insights get valuable as findings are crossed over various artifacts, and will get stronger in the future iterations as our reflection output will be challenged with new artifacts designed by different designers (seemingly similar to reliability in classic research).

Sensual dynamics artifacts

A sensual dynamics artifact is described as an artifact that is able to sense a person and to behave upon her presence to invite for movements enhancing the perceptive experience. Such an artifact is therefore at the same time the object of the experience as well as the trigger for a greater sensory experience. Such a concept is not easy to design from, so a design approach to create such artifacts is also described.

This approach was developed for and performed by a group of master students from the department of Industrial Design at Eindhoven University of Technology, during a one-week module taking place at the university.

This module was structured in three parts to support the students' exploration and progressive understanding of the concept of 'sensual dynamics'. In the first part, the students are introduced to the theoretical framework and the notion of the senses' qualities. After this introduction, students are assigned to create a similar table as presented in Figure 3 based on personal investigation. During the second part, we introduced further the notion of dynamics from a design perspective [5]. Thereafter students were assigned to do a dynamic exploration on the senses' qualities. Through acting, they explored the influence of one sense's quality on experience – e.g., what is to experience a private sight, or a distant touch. During the third and the last part, the students were assigned to design a experienceable prototype (introduced in the next section) expressing through design the outcome from the second part. This designed artifact should engage the person in a rich sensorial and active interplay with an artifact exploring especially one of the qualities of the senses.

	Reciprocal	Non-reciprocal	Distant	Local	Private	Public	PoV
Sight							
Touch							
Hearing							
Taste							
Smell							

Figure 3: Examples of designs for senses' qualities

SENSUAL DYNAMICS ARTIFACTS: SHOWCASE

In this section, we present four sensual dynamics artifacts. These artifacts are the outcome of the module previously described. We reflect on them to extract preliminary design considerations for the research. In this reflection, the characteristics and the qualities of the artifacts, and the reactions of visitors of a one-day exhibition were taken into account.

These artifacts explore respectively the reciprocity of touch (“Be touched” project), the reciprocity of hearing (“Sound flowers” project), the reciprocity of sight (“Shylight” project), and the distance of touch (“Blow back” project – upon which a reflection will be done focusing on reciprocity as well).

Presentation movies of all the artifacts can be seen at <http://dqi.id.tue.nl/sensual-dynamics>.

Be touched!

the students that designed BeTouched!, focused on the concept of ‘reciprocal touch’. The artifact the students designed exists out of several flexible bodies, gathered on one platform. All these bodies are touch-sensitive by the integration of a capacity sensor at both the front as back of the body. They are enabled to act as they are connected to a servomotor at the bottom. Figure 4 gives an impression of the artifact.

When one of the bodies is touched on the front it really let itself been stroked. It moves forward, in the direction of your hand, and you are touched back. At the backside the body is more ticklish. The body immediately moves away from your touch. Also, when one of the bodies is being touched the other bodies will start moving to draw your attention: they also want to be touched.

Embodiment – The beauty of this artifact is that the form does most of the work. The shape and material of the body enhance the dynamics of the servomotor tremendously and give the body a continuous and sustained movement. This makes that it really feels that the body actively lets itself being stroke.

Sensing and acting are strongly embodied: the sensors move along with the moving body. When it is ticklish it moves away from the touch, literally getting the senses away from the hand. And when it likes to get stroked, on the front, it really moves it senses towards the hand, moving the whole length of the sensitive area along the hand. From the sensual dynamics perspective, this point provides a valuable insight: the embodiment of the sensing and the acting provides a high quality of reciprocity. The notion of reciprocity implies a notion of force, and physical resistance when forces are (partially) opposite. Similar findings were output on the research of perceptual crossing [1].

Invitation – Furthermore, the request for attention expressed by the non-touched bodies while one of them is being touched, was quite effective in inviting the users to touch them in return. This body expression, directly relates to the current experience of the person as touching one of the bodies, the non-touched bodies will

react with by performing a same type of movement. This appearst to be a great invitation to act towards reciprocal touch. Movement invites to movement.

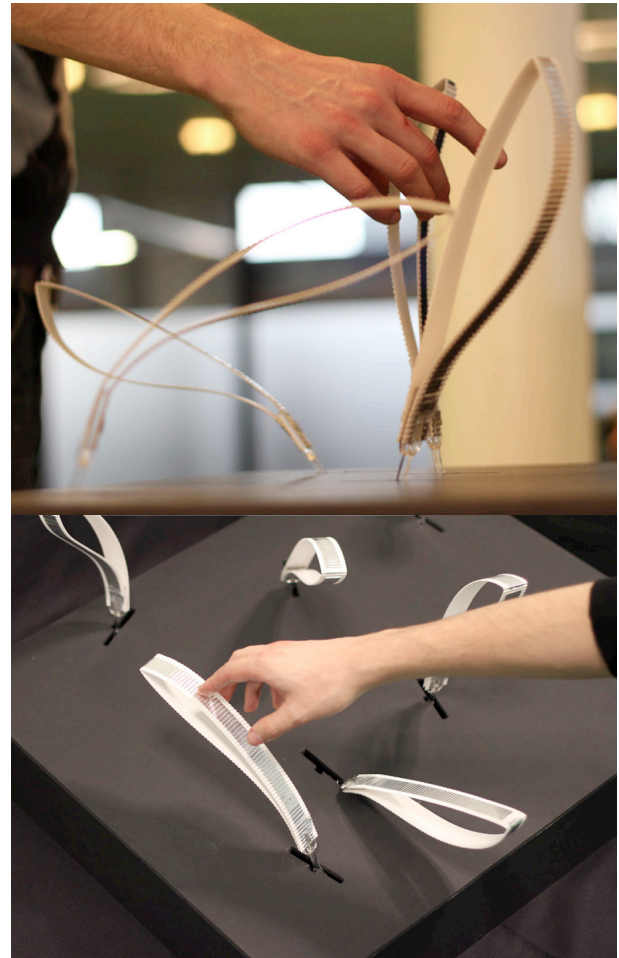


Figure 4: Be Touched!

Sound Flowers

Sound Flowers results from an exploration of the concept ‘reciprocal hearing’. It is composed of three mechanical flowers which open when they hear sound next to them. As they open, the sound of a musical instrument can be heard. Each of the three flowers diffuses a different instrument, which together form an orchestrated piece of music. The flower closes progressively and the music turns off, unless sound is produced again by the person. To attract the person, the set of flowers uses a slightly similar technique as ‘Be Touched!’: when one of the flowers is being opened, the other ones start to lure the person by opening very briefly. Figure 5 gives an impression of the artifact.

Distributed system – An original aspect of the Sound Flowers, compared to other artifacts presented in this paper, is the distribution of the flowers in the environment. For the Sound Flower this distribution is easier than for the Be Touched!. The earlier focuses on hearing, which is distant, and the latter on touch, which is local. Each flower has its own sensor to hear the person’s voice (a microphone) and its own actuators to play its own layer (instrument) of the global music (speakers) and mechanism to open the flower. Each of

them produces one of the layers of the total music provided by the flowers together.

It is noticeable that the students have intended to keep the embodiment (as previously described) within the distributed system, in order to design for the same level of qualities in experience.

Embodiment – However, in the case of the Sound Flowers, the sensors were put on the table next to each flower, and were not strictly embedded in the flower itself. Because the sensors were easily noticeable, many people actually knocked on the table or spoke gazing at the table instead of the flower in order to ensure a greater effectiveness in opening the flower. This detail disembodied acting and sensing. This lack of integration shows how much subtleness is important to create qualitatively appreciable prototypes, and how much embodiment is an important variable for reciprocity.

Invitation – Two phenomena were perceived as inviting for further interaction:

- The first was obviously the designed lure, which was created for the closed flowers to divert the attention of the subject towards them. Similarly to *Be Touched!*, the movements of a Sound Flower invites to movement (of the gaze). However, we would have been interested more in the creation of a sonorous invitation, to initiate a reciprocal sonorous interaction.
- The second was created thanks to the distribution of the music among the flowers. Each opening of a flower has been perceived as a sonorous improvement of the experience in interaction. As one flower opens, the total experience is enriched. Symmetrically, as another flower closes, the total experience is impoverished. This creates a form of tension in the experience, during which the person cares for none of the flowers to close, and acts contingently.



Figure 5: Sound flowers

Shylight

Shylight is the result of exploration on the ‘non-reciprocity of sight’. The artifact is a light that is able to turn in the horizontal plane, situated in a dark room. It is equipped with a webcam that can detect the presence and dynamics of people. It sets out to find movement and thus a person but if you come too close it moves away. Once you look at it, it really gets shy and the light turns off. Figure 6 gives an impression of the artifact.



Figure 6: ShyLight

Embodiment and active behavior – The most fascinating aspect of this artifact is that when the light gets shy and turns off, it really escapes from perceiving the person. For the webcam to detect a person the light has to be on, otherwise it is too dark in the room. So when the light goes off it really cannot see the person anymore. To try and see if the person is there the artifact has to turn on its light again or it can move and dare to look in a different direction.

The integration of the webcam and actuator actually are at the basis of this embodiment of sensing and acting. They are naturally embodied as the sensor moves along with the actuator. When we want to look behind us we need to turn which prevents us to see forward.

Although it is almost inescapable to use human and animal references when talking about behavior, when designing it should be about the perceptive activity and not the shape. The Shylight incorporates a strong embodiment of sensing and acting but the pitfall of making an ‘eye’ lurks. The way the students integrated sensing and acting by turning of the light when you come too close is therefore in our opinion a far more beautiful way of embodying sensing and acting.

Blow!

The artifact *Blow!* was designed by students assigned to focus on ‘distant touch’. The ‘reciprocity of touch’ is a more natural quality as we can only touch something because we are touchable; to touch always means to be

touched. This has a very local and private character. In this assignment the students were challenged to think through technology about touch in a more open and distant form without losing the embodiment of acting and sensing and without losing the reciprocal quality of touch.

Active behavior – The students designed Blow! an artifact that is able to detect the subject activity of blowing and that acts by blowing hot air itself. The students were still developing the behavior of the artifact while the first people were interacting with it, on the spot. In the first instance their design was a very reactive, not that much a perceptive entity: it would blow back at you when you blew on the sensor. Once the artifact obtained some own initiative, the quality of the interaction immediately enriched. Figure 7 gives an impression of the artifact.



Figure 7: Blow!

Embodiment – Although the students did a very good attempt in reaching an experience of touching something at a distance, using air as mediator, the fact that sensor and actuator were clearly disembodied makes that the reciprocity of this distant touch could have been stronger. When blowing on the sensor, that is right under the actuator, the artifact will show perceptive activity by blowing back. Yet because of the placement of the sensor the air hits your forehead instead of the two streams of air (of artifact and person) actually meeting each other. If the placement of where I blow is where the artifact acts the two forces would meet. It is in this resistance that perceptual crossing would happen. In other words then I could feel the artifact touching me, even on a distance, while I'm touching it.

SUMMARY ON RECIPROCITY

A few notions have been extracted during the description and the reflection of these four artifacts. We gather and summarize them here.

Embodiment

The notion of embodiment is unquestionably an important factor for reciprocity. At the experiential level, we have pointed out the importance of embodiment of that sensing and acting. Be Touched! is a

great example, as the moving parts are themselves the sensing ones as well. When the body escapes from the touch, so does the sensor. Shylight is also a brilliant example shown thanks to a tentative of non-reciprocity. As the Shylight turns off to escape from perceptual crossing, it also prevents itself to perceive its surroundings. Differently, Sound Flowers shown the risk of disembodiment of the sensors and the actuators, as subjects were progressively focusing on the table more than on the flower.

“What senses is what is moving (and therefore reacting); What moves away loses sensing abilities.” seems in adequacy with the Nishidian stance. At the technical level, this implies a wise integration of the sensors together with the actuators, with subtlety.

Subtleness

The notion of subtleness has been indeed recurrent in our reflection. It concerns appearance in both static and dynamic dimensions. Movements and behaviors need to be smooth. Material needs to support the expected quality in interaction. For the designer, it also requires to work on details, where quality (in interaction) resides. By the dynamics, the shape and the material used for the bodies, Be Touched! enhanced greatly the experience and quality in reciprocity. Behavior is smooth and beautifully expressed. The behavior of reacting to caress and tickle, or inviting for it, is well embodied, and provides a nice experience to the person. For both the Sound Flowers and Blow!, the disembodiment of the sensor (on the table for the Sound Flowers and under the blower (actuator) for Blow!), due to the lack of time to tune up the prototypes, was a source of a lesser quality in interaction.

Active behavior

Designing for explorative behavior is crucial for sensual dynamics artifacts. In their own way, each of the four artifacts presented here has an active behavior. The notion of active behavior reflects that the artifact acts even in the case of absence of any input from the person: it acts, it explores and tries to engage in interaction. Therefore the artifact is not only responsive, not all the initiative to engage in interaction is at the person's side, but the artifacts is also active. The artifact takes initiative.

Be touched! and Sound Flowers actively invite the person to further explore and engage in interaction. For the earlier, the non-touched bodies act when another body is touched to call for attention. For the latter, a closed flower might open slightly to attract the attention of the subject. Because the camera cannot observe the entire space at once, Shylight scans its environment in order to find somebody.

Blow is an interesting case, as the students programmed its behavior continuously throughout the exhibition, from a following to an active one. The reaction of the visitors evolved accordingly, expressing more and more interest and appreciation towards the quality in interaction.



Lure

The notion of Lure is used here to describe the requirement of inviting the subject to interact with the sensual dynamics artifact. Even though only the designers of Be Touched! and the Sound Flowers created consciously a behavior to attract the attention of the subject, the same behavior was experienced by the subjects as well for the two other artifacts. In the case of ShyLight, the scanning of the environment invites the subject to get in its gaze to initiate the interaction. In the case of Blow!, in the later versions of the behavior, the blower was not necessarily reacting immediately to the subject's blowing, and was also sometimes blowing first, which was perceived by an invitation to start the interaction. -> this alinea is very similar to the previous

CONCLUSION

In this paper we presented a kansei design approach to design for perceptive experience in interaction, considering the senses' qualities as the starting point of the approach. Both the notion of interaction and the notion of senses' qualities were described at a phenomenological level.

In this on-going research, through a Research through Design approach, we pointed out a few notions for the quality of 'reciprocity' valuable from a kansei design perspective. More iterations need to be performed in order to strengthen these notions and possibly to output new ones, especially regarding other qualities, such as distance and publicity.

Besides the insights that are directly valuable for our research we also hope to show that making means trying, means experiencing, means knowing. All these short and longer design projects are all treated as valuable.

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