Experiencing-in-the-World: Using Pragmatist Philosophy to Design for Aesthetic Experience

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Abstract
With the growing use of personal and ubiquitous computing technology, an increase is seen in utilizing aesthetic aspects for designing interactive systems. The use of aesthetic interpretations, however, has differed in different applications, often lacking a coherent and holistic meaning of aesthetics. In this paper we provide an account on aesthetics, utilizing the pragmatist perspective, which can be used as a framework to design for aesthetic experience in interactive systems. We discuss seven major themes of aesthetic experience.

Using our framework we discuss two design examples. In the first example – Panorama, the framework is used to inform the design process and making design decisions for supporting aesthetic social awareness in an academic work environment. In the second example – Virtual Dancer, the framework is used to analyze the aesthetics of an entertainment experience and to elicit further improvements. In the end we discuss the role of aesthetics in the design of interactive systems.

Keywords
Aesthetics, HCI, Interaction Design, Experience.

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

Project/Problem Statement

Throughout the last decade the relationship between interaction design and aesthetics has been influenced, evolved and challenged by the kind of role personal and ubiquitous technology plays in people's lives. As the computing technology moves away from desktop and work environments into our everyday activities, issues such as expressivity, social and cultural influences and other facets of users' experience have become major qualities for their success.

The use and conceptualization of aesthetics has differed in different academic fields. It is now widely accepted within different design- and HCI- communities that the notion of aesthetics goes beyond the appearance-level[1] considerations and encompasses the overall experience of using a product or a technology [13]. For example, several researches [e.g. 4, 5, 22] focus on the use-quality of interactive systems for aiding aesthetics appreciations. Hence in addition to the appearance level beauty they emphasize the beauty-of-use, focusing on movement-based and tangible interactions to support aesthetics. On the other hand, several attempts [e.g. 28, 23] have utilized the aesthetic experience through the use of abstract and artistic displays representing the augmented reality of actual events within a physical environment.

Even though these approaches are very promising and they attempt to go beyond just the look-and-feel of interactive systems, they provide a limited view on aesthetic experience and its treatment for interactive systems design. The problem here is not about the way aesthetics is conceptualized for specific applications (such as tangible or augmented interfaces) but the lack of coherent meaning of aesthetics that is coming out of these approaches; a lack that makes aesthetic interpretations more illusive and ambiguous.
We believe that a proper foundation for aesthetic experience is lacking in the current research of interaction design. Aesthetics does not serve a specific function such as 'allowing users to finish their tasks sooner'. But it serves human beings in a more global manner as to provide quality of life, enjoyment, pleasure and fulfillment. It is difficult to provide concrete guidelines for designing aesthetics in interactive systems. Depending on the context in which the technology is situated, aesthetic experiences can be supported through different interaction techniques.

The central goal of this paper is to provide a design framework for aesthetic experience and illustrate its usefulness with two design examples. In order to do so, first we clarify the main characteristics of aesthetic experiences, using the pragmatist perspective of John Dewey [3]. We identify seven main themes that contribute towards an aesthetic experience. These themes encompass a very broad view of aesthetics in the context of interactive system design. Secondly, drawing upon these themes we provide details of two of our own design examples as illustrations of supporting aesthetic experience. The first example is an intelligent large screen display called Panorama [31] that intends to enhance social awareness within a work environment. And the second example is an entertainment oriented Virtual Dancer [24] as a large screen display, which works as an intelligent and empathic virtual dance partner. The first case uses the framework as a tool to conceptualize social awareness and to make design decisions. In the second design case, this framework is used to analyze the aesthetics experience supported by the system and make some

1. Norman [20] and Tractinsky [29] view aesthetics as an appearance-level quality. They claim, "Attractive things work better" and "What is beautiful is usable", respectively.

improvements for the future. In the end, we discuss the usefulness of our conceptual framework and the role aesthetics plays in current interaction design practice.

Challenge – A Shift in the HCI Paradigm

A call for a paradigm shift is seen in the field of HCI from a technological and a design point of view. They both point to the fact that the HCI field needs to focus on users' felt life and support the quality of experience with or through the use of interactive systems.

Mark Weiser's [33] vision on making people's life comfortable, informed and effortless through technological support has not been properly met by the current research on ubiquitous computing [25]. In addition, there is a growing criticism about the notions such as seamlessness and disappearance within the ubiquitous computing and ambient intelligence applications for its narrow and deterministic focus [2]. When computers had recognized and pre-specified tasks to follow, artificial intelligence techniques such as machine learning, computer vision or other pattern recognition techniques were a useful option. However, when technology is becoming a part of people's life, technologists need to understand the subtlety, fluidity and idiosyncratic nature of technology use. Rogers [25] recognizes that the fundamental problem in the development of ubiquitous computing systems has been the lack of understanding of the complexity and variability of what people do, their motives, when they do it and how they do it, while interacting with a technology.

In the recent past, the domain of design has focused mainly on 'solving a set of problems' and has underestimated the importance of human felt-life and experience [11]. When designers limit their perspective on designing interactive systems to some implemented functionalities, user requirements and usability issues, they may not be able to address some aesthetical dimensions of their designed products. Even when focus is put on more subjective aspects such as emotions and product aesthetics, predictive and deterministic approaches are taken that reduce human experience to specific aspects [29, 20]. These design approaches also fail to account for the holistic and inseparable phenomenon of humans' interaction with their environments.

We argue that designers and technologists need to focus on supporting and enabling engaging user-experiences when designing personal and ubiquitous systems. In this paper our focus is to address this HCI paradigm shift by means of understanding and supporting the 'aesthetics' phenomenon. By taking an aesthetics stance, this paper argues that besides science and technology, also the arts, philosophy, humanity and other cultural and critical theories can provide great insights for designing interactive technologies. From the aesthetics point of view, design is no longer just a solution to a set of problems but a resource and a set of facilities that allows users to construct their own interpretations, appropriations and experience.

Approach – Aesthetics and Pragmatist Philosophy

Philosophical abstractions may seem far removed from the practice of engineering interactive systems. However, these abstractions could provide a better understanding of the various forces that are at work. Aesthetics is a long standing branch of philosophy.

Starting from the ancient Greek philosophies to its current day understandings, concept and interpretation of aesthetics has evolved and sometimes changed. Aesthetics, however, has remained ambiguous, complex and contested. This is partly because of its close association with art and beauty, and party because the study of aesthetics has a heterogeneous, complicated history with full of debatable issues [27].

We limit our discussions on aesthetics to the pragmatist philosophy of John Dewey [3] and elicit seven main characteristics concerning aesthetics. We believe that there are three main reasons why Dewey's pragmatist aesthetics could be useful to develop better understanding for aesthetics of experience.

1. Within different disciplines and schools of thought (See Text Box 1), Dewey's pragmatist approach to aesthetics indicates a common ground for understanding the conflicted and the contested notions on aesthetic experiences.
2. Dewey's pragmatist aesthetics focuses on the interaction between organisms and objects and their relationship with the environment. This in fact suits very well the field of interaction design that aims at understanding and designing for the users' interaction.
3. Dewey's pragmatist aesthetics focuses on the quality enhancing aspects of humans' everyday lives. Dewey suggests that non-task related or non-instrumental day-to-day activities and aspects such as fun, play and entertainment are as useful as the more instrumental activities and aspects.

* Transcendental: Abstract form of experience, by Kant (1781) [15]

* Speculative: Criteria for beauty, by Kant (1781) [16]

* Phenomenological: Self-conscious subjectivity, by Hegel (1807) [14]

* Psychoanalytical: Sub-conscious meaning, by Freud (1958) [8]

* Pragmatic: Art as experience, by Dewey (1931) [3]

* Hermeneutical: Understanding of the senses, by Gadamer (1977) [9]

Text Box 1. Aesthetic interpretations in different schools of thoughts

Seven themes for Aesthetics in Interaction Design

In order to facilitate a cohesive and holistic view of aesthetics for interaction design, we extract and identify seven major characteristics of aesthetics drawn from the works of the pragmatist philosophers John Dewey [3] and Richard Shusterman [26]. We call these characteristics – 'themes' to imply that designers can choose one or more of these, if not all, to aid the aesthetics support for their interactive systems. Several of these themes are closely connected and build on each other. In our discussion of these themes, we will first describe Dewey's original thoughts and then we will show what these individual themes mean for designing. When designing a single artefact, it may not be important and even in some cases difficult to utilize all the themes. Nevertheless, we believe that these themes can be used as a framework for understanding and supporting aesthetics of experience.

1. Form & Material. Central to Dewey's idea on pragmatist aesthetics was the interaction between a human organism and an object (or artefact) in the lived world. To Dewey, a human's interaction with the form and the material aspects of an artefact greatly characterize the quality of an aesthetic experience. According to this view, any kind of artefact (even static objects like paintings and sculptures) represents dynamic interaction displaying cumulation, tension, conservation, anticipation, fulfillment and so on. Aesthetics is formed and re-formed through this dynamic relationship between the human organism's interactions with an artefact.

The notions of form and material are central for explaining the logic of a designed artefact. Over the years, this theme has been the center of focus for

Figure 1. Panorama Mesdag is a master piece by Hendrik Willem Mesdag (1831-1915) that is situated in The Hague, the Netherlands. It provides a 360^{o} view of a 19th century Dutch village – Scheveningen. For visitors, the artwork depicts an almost similar photographic representation of the architecture and seascape of Scheveningen 125 year ago.

many designers to support aesthetic experience in interactive systems design. Some researchers have mainly focused on the representational aspects involving form and material to support aesthetic experience [29, 20]. In order to make a better use of the relationship between users and artefacts, in addition to better representations, designers need to develop suitable dialogue and expressions taking into account the social, cultural and other contextual aspects. Designers can manipulate material properties of an artefact to make it part of users' everyday life and not just a usable product [13, 4]. On certain occasions the form and expressions of artefacts are designed for expressing the non-obvious aspects such as different emotions like love, anger and so on, which can be seen as possible components of aesthetic experience [17].

2. Natural & Instrumental. In contrast to the analytical philosophy[2], which suggests that the purpose of an art is gratuitous and not directed towards solving any problems; pragmatists aesthetics suggests that the aesthetics of an artefact is rooted in the natural and basic needs, constitutions and activities of human organism. For an artefact to have any aesthetic value it must relate to human needs, desires, fears and hopes. Every designed artefact represents some strong indications to suggest a relationship between the humans and their environment. Hence, aesthetics cannot be considered outside of our everyday lives.

From a design point of view this theme points to the fact that aesthetics has a purposeful function to play in the design of interactive artefacts and it may not be conceptualized to only the attractiveness and look-and-feel aspects. In some recent examples it has been shown that aesthetics of certain artefacts could have a purpose of being ambiguous and provocative [10], exaggerative [4] and defamiliar [1]. This theme also points to the fact that the value of our day to day used objects cannot be reduced to their instrumentality and usefulness. Especially when the use of personal and ubiquitous systems is growing faster than ever, everyday used objects could play a role in supporting aesthetics.

3. Overall Impact. To Dewey, evaluation of any artefact depends not on the mere truth or knowledge it provides but on the quality of experiences or experienced values that it supports. The function and value of aesthetics lie not in a specialized, particular end but in satisfying humans in a global way. The aesthetic qualities continue to operate in indirect channels even when the direct act of perception has already stopped. Interactions with an artefact also work towards sharpening and modifying perception and communications, and to inspire, energize and get integrated into other ongoing activities. As Dewey said, "aesthetics keeps alive the power to experience the common world in its fullness."

This theme suggests that in addition to serving its normal functions, the effects of an artefact could last longer than just the immediate interaction. For example, the perception of the Dutch culture and a typical Dutch village could change and new perceptions may emerge after visiting the Panorama Mesdag (Figure 1). Here the aesthetic values of the art work not only represents a snapshot of a physical world but also enhances sensual and emotional feelings of knowing a part of the Dutch history.

2. British philosophers like Bertrand Russell and George E. Moore were the promoters of the analytic philosophy. An account on the contrast between pragmatist aesthetics and analytical aesthetics is presented in [26].

4. Embodied & Intellectual. One of the most basic functions of aesthetics is to provide a satisfyingly integrated expression to both mind and body. Dewey was against any approaches that separated mind and body. To Dewey, the separation of action and perception fractures and compartmentalizes our sensory engagements because all mental operations occur in the context of actions and vice versa. The meaningfulness of an action can only be realized when all our senses unite to create a common, coherent experience.

For design, this theme suggests that the role of aesthetics is to provide satisfying experiences to the bodily as well as the intellectual dimensions. It has been argued that our intellectual (cognitive) dimensions are given precedence over the bodily dimensions [5, 21]. Research on *embodied interaction* [6] makes a strong case for social and bodily dimensions of human interaction. A right mixture of relevant sensory-motor skills involving thinking, feeling and doing could lead to more valuable aesthetic experiences [21, 22].

5. Socio-Cultural Implications. Aesthetics is not a product property, shaped or designed by the designers. Aesthetics is fundamentally rooted in the lived world and social, cultural and historical dimensions play an important role in shaping the aesthetics. Aesthetics of an artefact emerge during the observer's interaction with it, in a lived world (theme 1). And aesthetics cannot be precisely understood without its socio-historical and cultural contexts.

For design, this theme suggests that designers should take into account the socio-historical and cultural position of the user. An artefact can have a greater aesthetical value when they convey certain social, cultural or historical message. In fact from a design point of view, several artefacts and their affordances (i.e. ways of using) embody cultural norms and values. E.g. George Orwell's novel 1984 describes a fictional language called Newspeak, which constrains the English language to only the acceptable topics – thus representing the culture of the totalitarian regimes. Similarly, the Panorama Mesdag (Figure 1) would carry specific aesthetic qualities when it is seen within the historical and cultural dimension in a museum.

6. Continuity Thesis. An aesthetic experience cannot be seen as a collection of isolated and separated entities. It is a coherent whole that is continuous and irreducible. Contradicting with the analytical philosophy, pragmatist philosophy suggests that by separating an aesthetic experience, our understanding of an 'experience as a whole' is distorted and impoverished.

This theme suggests that the different functional and symbolic aspects of an artefact do contribute towards the overall aesthetics experience, however, these should be seen in a coherent and holistic manner and not individually. McCarthy and Wright's book Technology as Experience [18] suggests that understanding aesthetic experiences in this way is not straighforward. They propose six sense-making skills (anticipating, connection, interpreting, reflecting, appropriating and recounting) to give a holistic account for making sense of an aesthetic experience.

7. Primacy of Practice. As was stated in theme 1, aesthetics is a product of the interaction between a living organism and its environment. Dewey refers to this as iterative 'undergoing' and 'doing' processes that

involve reorganization of energies, actions and materials. Aesthetics do not belong to a piece of object as such but the dynamic and developing activities through which they are created and perceived by the humans. Thus, aesthetics of experience 'emerge' during the human's practice and engagement with an artefact and they are 'appropriated' in use.

From a design point of view this theme points to the fact that designers cannot explicitly add-on aesthetic features in their artefacts and the actual use (or practice) of the artefact would determine its aesthetic values. Once designed, an artefact can surprise or provoke its users during the actual practice. Additionally, this theme suggests the fact that users are the active constructors of their individual aesthetics experiences. When they are provided with an opportunity to go beyond just receiving the information but being creative and active, they can have better aesthetics experiences.

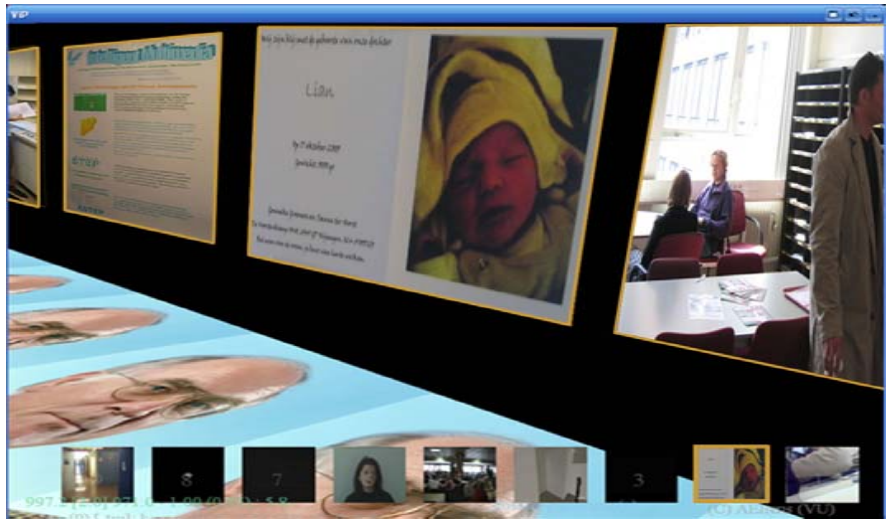

Figure 2: The Panorama interface in a 'Normal' mode

Example 1: Panorama

The Panorama (Figure 2) system is an intelligent, artistically inspired interface in the form of a large screen display for a staff room in an academic department [31]. Equipped with sensors, Panorama collects interesting information from different public places within the department and represents them on its large screen to allow the staff members to be aware of different activities happening in the department. Additionally it allows members to send their personal information such as holiday cards, announcements or personal interests to the system. It uses a representation system called ViP [31]. ViP allows projection of live video feeds, digital video clips, texts and sequence of images on an immersive 3D space. Panorama also allows a variety of visual effects, including texture mapping of image feeds on 3D objects, overlays of multiple image textures, as well as particle systems with streaming image feeds projected on sprites. Panorama detects different activities from the environment and represents them by adjusting the speed, movements and overlay effects on the screen.

Panorama allows staff members to interact and engage with the information about other members and their surrounding environments with an artistic flavor that aims to improve their social awareness within the department. Panorama is not intended to provide productive information such as staff profile, research interests or projects details. Rather, the goal of the Panorama is to enhance social awareness by providing

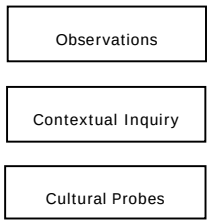

Figure 3. Methods used in exploration

Figure 4. The staff room door carrying awareness information

interpersonal and rich information related to staff members and their everyday interactions in the department.

The Design Process

As a first step towards designing for mediated social awareness in a co-located academic department, we sought to understand staff members' current and aspired practices of being socially aware within the department. We carried out an ethnographic investigation utilizing naturalistic observations, contextual interviews and cultural probes [12] (Figure 3). Details of our design exploration are discussed elsewhere [32].

From the results of our investigation, we found two main categories of interaction for being socially aware: Casual Encounters and Self-Reflections. Casual encounters are the patterns, where staff members during their routine activities interact with the other members and objects, directly or indirectly, within the surroundings that provide hints and cues of social awareness. Self-reflections are the patterns of activities where staff-members attempt to let others know about their identity either in groups or individually by providing information about their achievement, status or announcements. These two patterns of interaction were implemented in Panorama as a large screen display in the staff room. A two-phase assessment study of a prototype of Panorama showed that the concept of casual encounters and self-reflections could potentially serve well in a work organization.

Design Rationale based on the Framework

We will show here how the seven themes helped us conceptualize social awareness in an academic environment and aided us in making design decisions.

1. Form & Material.

From the ethnographic investigation we found: in what forms social awareness is conveyed and what materials are used to do this. Amongst different staff member this varied largely in terms of tools, places and the contents of awareness information. For example, figure 4 shows the staff room door that is used as a tool for conveying social awareness and has a varied set of information from very personal and sentimental to more playful. It was also observed that both direct and indirect forms of communication were used to be aware of other. The situation and positioning of different tools that conveyed awareness information was mainly observed in public spaces, in the easily accessible manner.

When translating the data from this ethnographic study into a designed product, we decided to make an application that is in a public place which allows portability in a sense that members can add or delete their own information whenever they want. We decided to put a large screen display in the staff room that most of the staff members can see everyday. The representation of Panorama shows an artistic mixture of 2D and 3D information showing the asynchronous information sent by staff members and synchronous information collected from the public spaces of the department, respectively. The images, texts and other graphical objects are presented as continuous overlays augmenting the activity level of the department. Similarly, video feeds are captured to show a more direct form of social awareness.

(a) (b) (c)

Figure 5: Characteristics of awareness information, (a) representing the personal history of a senior researcher, (b) representing a playful act of celebration from a secretary and (c) representing a work related activity as a research poster

Member A: “Whose trophy is that?”
Member B: “...aaa....I think its Jan’s.”
Member A: “Ohh, I didn’t know he runs marathons.”

Text Box 2. A conversation of viewers recorded during the evaluation of a Panorama prototype

2. Natural & Instrumental.
This theme allowed us to understand the purpose of being and making others socially aware of each other. We found out that aesthetics of social awareness had a varied set of function in our work environment that was not limited to only the professional activities. In line of Dewey’s conceptualization of aesthetics, we found that in addition to work related acts, personal and playful issues within the work environment had a role to play – an instrumental role in supporting social awareness at work. As it can be seen in figure 5, from the cultural probe study we found that members wanted to communicate their personal history (a), academic and professional achievements (c) and also carry out some playful acts by sticking greeting cards on the staff-room door (b).

The Panorama system allows members to send their personal images and messages via emails to be shown on the screen. This also supports the need to be well-informed about the professional and individual activities within different members. See Text Box 2 as an example of members getting informed by each others. It also encourages curiosity and allows freedom-of-interpretations where members make stories and construct their own view on the department. This way Panorama challenges members to explore the activities happening in the department

3. Overall Impact.
This theme triggered us to understand the effects of social awareness on the other activities of staff members. A main strategy that we applied in designing Panorama was to support ‘reflections’ while interacting with it. Through its artistic representation of different activities and the self reflection objects posted by different staff members, Panorama allows its staff members to reflect on themselves and on other members of the department. In order to support this, Panorama allows staff members to explicitly and implicitly leave cues and traces of their activities and preferences. Through the mechanism of self-reflection, for example, members in the department could know each other’s personal and professional interests and the things one is up to. The Text Box 2 also stands as an example for this theme. This way, Panorama provides opportunities for viewing non-instrumental information that may trigger a commitment to reading and commenting on information that is related to the personal traces.

4. Embodied & Intellectual.
This theme triggered a question: what are the embodied and intellectual dimensions of social awareness within our academic department? Staff members directly or indirectly interact with the information available in the environment and make sense of it. And this continuous iteration of members interacting with the environment (including other members) and making sense of it helps them constructing the social awareness.

To utilize the embodied and the intellectual aspects, we attempted to design a kind of representation that co-occurs with the real-time activities in the department. E.g. when the activity level increases to a certain level the presentation of panorama gets changed to indicate a hectic work environment. This offers the staff members a two-level communication mechanism. At the first level, staff members receive information about announcements, news, and so on from the different objects floating on the screen. And at the second level,

the speed, movements and presentation of these objects provides indications of the kind of mood or emotion the department is going through, e.g. normal, idle, or chaotic. Figure 6 shows an instance of staff members interacting with Panorama for the first time.

Figure 6: Staff members interacting with Panorama

5. Socio-Cultural Implications.
The Panorama system embodies staff-members, their artefacts and their activities in a sense that their presence is reflected on the system. According to Fels [7] this type of embodiment can lead to a feeling of belonging when users can relinquish the control over to the system. Panorama captures the presence of the staff-member in a compelling and artistic way that leads to an emotional response of belonging to a community. In a large organization, this could lead to social benefits even when it is difficult to establish face to face interactions with other members. This way Panorama serves as a platform to support awareness as feeling of belonging.

Panorama provides information in a compelling manner, which makes the members explore possible facts hidden in the given information. Panorama provides a different way of interacting with other staff members within the department. Members could intentionally leave cues and traces of their existence to make the environment playful. Nevertheless, this being unselective information allows open and rich awareness amongst the staff members. The randomness and non-critical aspect of Panorama (since we did not focus on supporting the productive information such as staff profile or project details) allows staff members a sort of freedom-of-interpretations.

6. Continuity Thesis.
This theme refers to the fact that social awareness can not be seen in isolation of the ongoing activities in the department; and over time members can build specific patterns of social awareness when different acts are seen in a coherent manner. The former means that the act of social awareness is rooted into the specific work environment and it is continuous with other activities. As we observed in our ethnographic investigation that people intentionally or subtly make each other aware about the information of their status during their mundane activities. The later means that the act of being aware of somebody is not an individual, one of a kind episode. People build specific patterns of making a judgment about being aware of something, which can be a combination of several different acts.

For this theme, Panorama supports several ways to make staff members capable to construct their own interpretations about being socially aware of each other. Panorama supports live video streaming to notify the important events in the department. It shows

textual messages sent by individual or the administrator as a departmental announcement. Additionally it also shows images that are taken by members. By providing more than one view of the department with several modalities, Panorama aids staff members to develop their own interpretation for social awareness.

7. Primacy of Practice.
The primacy of practice theme should be interpreted to emphasize that it is the everyday mundane practice within the work environment in which members take action (Dewey's 'doing') and perceive its effects (Dewey's 'undergoing') and construct their own individual social awareness from these interactions. This theme suggests that social awareness emerge and evolve overtime in the lived environment where members are actively involved and participating.

For designing Panorama, our focus has been on the non-critical awareness. Our staff room is used as a place to have a break from heavy work-load, stress and obligatory tasks related to work. During the field study, we observed members chatting and playing cards. Panorama adds a suitable technology in the staff room. Panorama does not focus on the precision of information but on how the information is experienced by the viewers through the traces it represents for supporting social awareness. Additionally, the information that is presented on the Panorama screen does not require full attention from the users. It is possible to ignore such information, and the viewer may choose not to interpret the details of someone else's traces in great detail.

Example 2: Virtual Dancer

The Virtual Dancer [24] is an interactive dancing agent. It dances together with the user, aligning the appropriate dance moves in real time to the beat of the music, adapting its style to what it observes from the user through real time computer vision techniques. See Figure 7. By alternating patterns of *following the user* and *taking the lead* with new moves, the system attempts to achieve a mutual dancing interaction. The Virtual Dancer tries to invite and engage the user, with the sole purpose of having a dance. We see dancing as an entertaining form of task-less interaction. We aim to evoke an intuitive and seamless interaction between the dance movements of a user and the Virtual Dancer, without any explicit appeal.

Figure 7: The Virtual Dancer installation

The challenge ahead of us was to investigate the subtle aspects of task-less entertainment. During our iterative design process, in order to make design adjustments and to understand the aesthetic experience of the Virtual Dancer, we carried out several installations of

our initial prototypes. The notable installations were at a dance club, at a scientific conference as an interactive demo (Figure 8) and at an ICT exhibition. During these installations we recorded users' behavior and their comments while interacting with the prototype. The seven themes of aesthetics were not used for designing the Virtual Dancer prototype. However, we were interested in understanding the kind of aesthetic experience that was supported by different Virtual Dancer installations. In the next section we will show how the seven themes helped us in understanding an empathic entertainment experience and aided us in making further design adjustments.

Understanding Aesthetic Experience based on the Framework

1. Form & Material
Virtual reality's ultimate aim seems to be to create real-life simulated experiences. On the other hand, it shares with cinema and animation, the effects of play and imagination. The play with the real and the unreal is manifested in both the appearance and the behavior of the virtual characters.

Figure 8: Virtual Dancer installation at a conference

The life-sized representation and the engaging interaction supported by the Virtual Dancer makes the experience more compelling. We understood that the type of music (Rap) that was used as a design material had some effects on users' dancing capabilities and choices. The Virtual Dancer could not follow all kind of moves of the users. This was due to the technical support and the computer vision techniques used by the application. During the installation some of the participants commented about Virtual Dancer's inefficiency to replicate or follow the hip-movements or spin-movements. It is important, from a design perspective, to become aware of these moments where the suspension of disbelief fails.

2. Natural & Instrumental
Dance is an activity of fulfillment that does not always serve external, practical goals. It is a form of human expression and personal creation as well as a form of art.

The different installations of our Virtual Dancer prototype allowed us to observe different effects and purposes of our application. When it was installed in a dance club the purpose became more obvious. However, when it was installed at the conference and exhibition, purposes such as duty of participation, relaxation and having fun in a serious environment were observed. We understood that when the interaction had exaggeration, over-interpretation and seduction, new patterns and dancing combinations were generated which lead to better aesthetic experiences. From the design point of view this theme made us aware of the fact that in order to support an aesthetic dancing experience the Virtual Dancer should not just imitate or replicate the participants' actions. To

make the dancing experience more natural and instrumental in addition to following users' behaviors the Virtual Dancer should take a lead to make the user more active in the act of dancing.

3. Overall Impact

Unlike many other activities, there seems to be no real purpose to dancing. The interaction in itself seems pointless. As Dewey states of aesthetics, the function and value do not lie in a particular end. However, dancing has an overall impact that engages both the body and the mind in its cognitive and emotional dimensions (see the next theme). Quintessentially, it sharpens the overall experience of one's own body and how it relates to the flow of the physical and social context. It makes time tangible in the beats and tempo, it plays with distance, both physical and interpersonal, and may challenge forces of nature such as gravity. All this, not as a side product or effect of some activity with another purpose, but by itself, for its own sake.

4. Embodied & Intellectual

In order to interact and have a dance with the Virtual Dancer, the users need both their intellectual and physical abilities. The physical movements are the sole way of providing answers to the inquisitive mind. Does she read me? Does she know what I'm doing? Will she engage? The engagement with a virtual dancer – an unknown entity is not much different from the interaction with the dance in a discotheque. There is no intellectual talk between partners but an exploration of understanding, approachement, engagement, rapport through a signal of recognition and a reaction such as mimicking or a looking away [19].

Is she real? Does she behave real? The virtual dancer is all concerned with the play of tensions between suspending disbelief and exploring, quizzing the capabilities and artificialities of the virtual dancer. The pleasure from movements and music, the resonance of dancing with a real partner and the feel and response to each other's movements contribute to an aesthetic dancing experience.

5. Socio-Cultural Implications

Dancing can arise in a variety of situations: as part of courting, as a formal dance, or as part of a ritual. Spontaneous outbursts of dancing can occur when one feels happy. The settings in which the Virtual Dancer installations have been set up re-create an urban scene, where the Virtual Dancer invites the visitors to join the dance. The virtuality of the dancing partner creates a context in which not just the moves of a dancing partner are explored, but also the technological condition becomes manifest. The three installations where the Virtual Dancer prototype was exhibited elicited different behaviors and reactions from the users, some being pleasurable and fun (at the dance party) and others eliciting awkwardness and embarrassment (in the scientific conference).

6. Continuity Thesis

In an act of dancing, one is both creator and experiential subject. Several dance movements build the act of dancing, which can not be seen individually. The act of dancing needs to be seen as coordination: the users interpret moves of the Virtual Dancer and follow it as if it is their real partner, at the same time add new dance steps and lead the dance. So, in the case of the Virtual Dancer it was impossible to divide the aesthetic experience into specific aspects.

The aesthetic pleasure provided by the Virtual Dancer comes from many different aspects that in combination setup its quality. These aspects are not just the technology and the design materials like the quality and type of music and Virtual Dancer's interactivity. The social connection and coordination that are built over the interaction as well as the environment within which the interaction takes place play a vital role here.

7. Primacy of Practice

The pleasurable aesthetic experience is evoked when the user takes active participation in the dancing act. Experience is built and appropriated over the continuous cycle of action and perceptions of different dancing acts by the users. In the three different installations, we observed that the important variations of users' participation level and how the virtual reality was appreciated were dependent on the different socio-cultural settings in which an installation was displayed. The common set of behaviors of visitors of a technological exhibit is quite different from the expectations and schematic behaviors of people when clubbing. For instance, the intellectual distance that people create when they are exploring the technological possibilities of the Virtual Dancer and the awkwardness of dancing at an exhibit could disappear in the interactions at a techno-inspired dance club.

Discussion

1. The Role of Aesthetics

Everything around us has some level of aesthetic quality. This is because nothing can be seen totally isolated from the environment that we live in. It is possible that certain things have a better or more significant quality of aesthetics, whereas others do not. Our emphasis in this paper has been on designing technologies using aesthetics as the central focus. Following Dewey's pragmatist perspective on aesthetics would allow designers to see aesthetics as a much broader phenomenon than only a representational aspect. Central to the notion of aesthetics is supporting human felt life and enriching their mundane experiences. Quality enhancing aspects of our everyday lives such as playfulness, fun and entertainment are thus important for understanding and supporting aesthetic experience. It is also important to note that aesthetic experience can not be attached onto a technology. It is the users who construct their own experience through their active participation [30]. For designers, it becomes vital to understand users' socio-cultural contexts through creative design methods (such as cultural probes [12]) to understand users' lives, attitudes, aspirations, contexts and experiences. Supporting Rogers's new research agenda [25] for '*designing ubiquitous technologies for engaging user experiences*', we believe that aesthetic notions can play a vital role towards going about achieving this.

2. Usefulness of the Framework

The framework presented in this paper provides a much broader account on aesthetics compared to the other approaches [e.g. 4, 20, 22, and 29] that use aesthetics in the design of interactive systems. The seven themes that constitute this conceptual framework prompt designers to see aesthetics from seven different viewpoints: form and material, natural and instrumental, overall impact, embodied and intellectual, socio-cultural effects, continuity thesis and primacy of practice.

The first design example, Panorama, uses the framework as a starting point to conceptualize social awareness and make design decisions. With the help of the framework we could conceptualize social awareness as not being limited to only the physical presence of the staff members but also taking into account their sentimental, emotional, playful and instrumental needs. In the second design example the framework was used to understand the aesthetic experience of a virtual dancing agent and make design adjustments. It was seen here that most themes turned out to be relevant to understand the aesthetics phenomenon. In fact, we argue that the seven themes are introduced in the framework only to provide a complete account on aesthetic experience. Depending on specific applications designers may choose to work on specific themes to support their design process.

It is also important to mention that there is a huge amount of literature about aesthetics in the field of art, philosophy and cultural theories but we have limited our discussion on aesthetics from Dewey's pragmatist perspective. We believe that this is not a short-coming of our framework, since Dewey's perspective on aesthetics has a lot of common ground amongst the others. We, however, do believe that the framework that is produced here is only a stepping stone towards bringing awareness about this variety of aspects that concern aesthetics while designing interactive systems.

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Acknowledgements

This work is supported by the European IST Programme Project FP6-0033812 (Publication ID: AMIDA-31). This paper only reflects the authors' views and funding agencies are not liable for any use that may be made of the information contained herein. We would like to thank Paul van der Vet and Dennis Reidsma for their comments and other colleagues and students who participated and helped in both the projects.