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From Personal to Cultural Computing: how to assess a cultural experience

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Abstract

Based on a short overview over the different paradigms for human computer interaction we introduce and discuss the most recent paradigm of cultural computing. Cultural computing addresses underlying and almost unconscious cultural determinants that have since ancient times a strong influence on our way of thinking, feeling and worldview in general. Different cultures worldwide will have different approaches to address their particular cultural determinants. In the East, the project ZENetic Computer is a first and very promising approach for cultural computing addressing Eastern cultural determinants. In the West, we propose an interactive experience based on the narrative 'Alice's Adventures in Wonderland' to address the main characteristic of the Western culture: analytical reasoning based on formal logic. The effects on the user's self conception might be measurable via the mandala introduced as cultural archetypes by C.G. Jung.

1 Introduction

From a historical perspective, Human-Computer Interaction (HCI) has evolved over more than five decades. Although the history of HCI¹ is rich and complex, within the scope of this paper we will summarise some of the major paradigms that are: (1) personal computing, (2) cooperative computing, (3) social computing, and (4) cultural computing (see figure 1). The history of HCI goes back to the 60s. Originally it was about Man-Machine Interaction and the emergence of the Personal Computing (PC) paradigm. In the 80s, HCI was investigating media rich computing with the paradigm of networked computer mediated interaction. Interactive multimedia was the focus of attention. More recently, at the turn of the century, HCI was about the social computing paradigm with community mediated interaction². The HCI community investigated applications such as Computer Supported Cooperative Work (CSCW), and the Internet (e.g., on line communities). With mobile, portable and ubiquitous technology, HCI is looking at more personalised and intimate interaction with positive experiences. Several concepts have emerged in recent years for the future directions of HCI: ubiquitous, nomadic, mixed-reality computing, and so on. In general all these new directions have some common properties: (1) the disappearing computer; (2) the ease of use and positive experience and; (3) the building of communities. The computer is no more the centre of interest, nor is it the focus of attention of the user. It is the running applications and the benefits and effects these have on the user that matter. Finally, we propose as a new paradigm for HCI, *cultural computing* which is based on what we call Kansei Mediated Interaction (Nakatsu, Rauterberg & Salem, 2006). Kansei Mediation is a form of multimedia communication that carries non-verbal, emotional and Kansei information (e.g., unconscious communication). It is a combination of Kansei Communication (i.e., 'content') and Kansei Media (i.e., 'form'). The main research objectives in Kansei Mediated Interaction are the underlying almost unconscious cultural determinants (see also Salem & Rauterberg, 2005b).

¹ http://www.idemployee.id.tue.nl/g.w.m.rauterberg/presentations/HCI-history_files/frame.htm

² <http://www.idemployee.id.tue.nl/g.w.m.rauterberg/Movies/Living%20Memory/Living%20Memory.htm>

Past, Presence, and Future of HCI

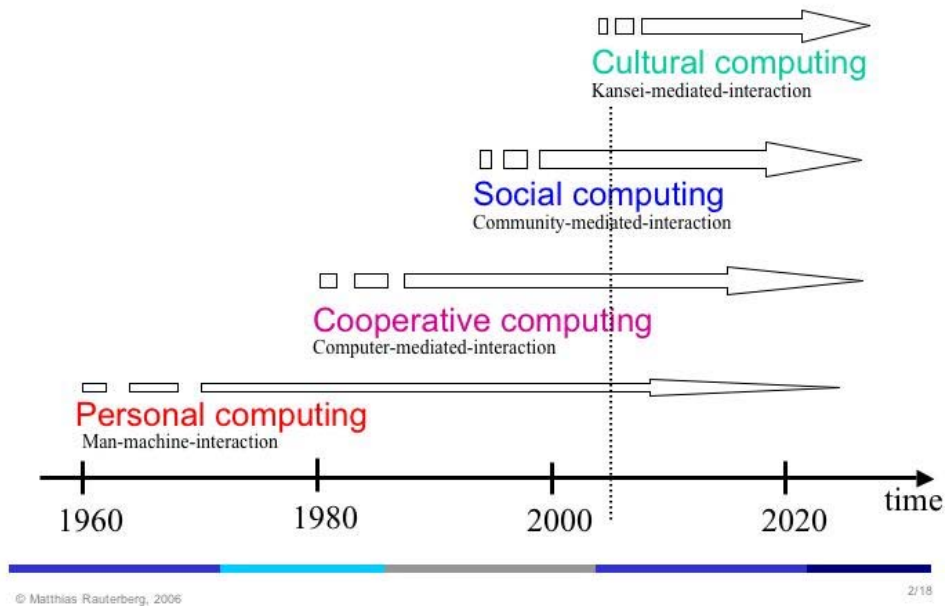


Figure 1. From Personal to Cultural Computing, an overview over the most relevant interaction paradigms.

2 Cultural Computing

The word *culture* (from the Latin ‘colo, -ere’, meaning ‘to cultivate’, ‘to inhabit’ or ‘to honor’) has been defined and used in many ways throughout different contexts. Kroeber and Kluckhohn (1952) compiled a list of more than 156 different definitions for *culture*. One of the most popular definitions of culture in the field of anthropology is “a complex web of shifting patterns that link people in different locales and that link social formations of different scales”³. Culture is the integration of human behaviour that includes attitudes, norms, values, beliefs, actions, communications and groups (ethnic, religious, social, etc.). Cultural computing⁴ is more than integrating cultural aspects into the interaction. It is about allowing the user to experience an interaction that is closely related to the core aspects of his/her culture. In a way that let him/her engage with an augmented reality using the values and attributes of his/her own culture. As such it is important to understand one's cultural determinants and how to render them during the interaction. In this paper we will focus on two cultural computing projects, one from the Eastern World (prevailing in Japan) and one from the Western world (prevailing in England).

Over the last 3000 years the peoples of four distinct regions of the civilized world created the religious and philosophical traditions that have continued to nourish humanity into the present day: *Confucianism* and *Daoism* in China; *Hinduism* and *Buddhism* in India; *monotheism* in middle east; and philosophical *rationalism* in Greece. ‘Monotheism’ and ‘philosophical rationalism’ is the religious and cultural foundation of the occident. We have investigated illustrative stories that are well known, accessible, classical in their culture and relevant from the point of view of cultural computing. We primarily looked for narratives that would be helpful in the understanding of the essential aspects of both Japanese and English cultures. To this

³ <http://en.wikipedia.org/wiki/Culture>.

⁴ <http://www.culturalcomputing.uiuc.edu/>

effect, we have selected the story of ‘ZEN Buddhism’ attributed to a Boddidharma (circa 500 AC), and ‘Alice’s Adventures in Wonderland’ by Lewis Carroll (1865). Both are detailed in the next sections, and both are examples either to help understand the underlying cultural value (i.e., Zen) or question it (i.e., Alice). For the Eastern and Western culture, the main value dealt with is *enlightenment*, but in different ways. Utilizing on modern technology Nakatsu et al (2006) try to give a new direction in form of ‘Kansei Mediation’ to enable societies transforming towards enlightenment (see also Rauterberg, 2004). Salem and Rauterberg (2005a) discuss the relationship of cultural computing and entertainment, and Hu and Bartneck (2005) could conclude that ‘culture matters’.

2.1 Eastern Culture: ZENetic computer

In the East enlightenment is the state of awakening that a Buddha has attained, and is the ultimate goal of Buddhist practice and the highest of the ‘Ten Worlds’. The concept enlightenment is regarded as a state of perfect freedom, in which one is awakened to the eternal and ultimate truth that is the reality of all things. This supreme state of life is characterized by boundless wisdom and infinite compassion.⁵ With the spread of Zen Buddhism in the thirteenth century, the arts of Japan took on a new focus. Here was a religion which cultivated self-discipline and austerity as the path to enlightenment. Meditation is at the centre of Zen practice and many Zen art forms can be seen as vehicles for inward reflection or as visualizations of the sudden and spontaneous nature of enlightenment. A *love of nature* lies at the very core of Zen. The qualities of abstraction and suggestion which characterized *suiboku-ga* were fittingly applied to the design of Zen gardens. Japanese gardens employ artifice to create an environment that appears more natural than nature itself. Trees and bushes are carefully pruned, color is restricted and water channeled to convey, in one setting, the essence of the natural landscape. The word for landscape in Japanese is *sansui*, meaning ‘mountain and water’. In Zen-inspired *kare-sansui* or ‘dry landscape’ gardens, such as that of Ryoan-ji in Kyoto, these two elements are symbolically combined. *Kare-sansui* gardens consist only of carefully selected and positioned rocks in a bed of sand or gravel which is raked into water-like patterns. As vehicles for contemplation, such gardens convey the vastness of nature through the power of suggestion.

Tosa et al. (2005) think of cultural computing as a method for cultural translation that uses scientific methods to represent the essential aspects of a culture. Including cultural concepts that heretofore have not been the focus of computing, such as mental images of Eastern thought and Buddhism, and the Sansui paintings, poetry and kimono that evoke these images, they projected the style of communication developed by Zen schools over hundreds of years into a world for the user to explore – an exotic Eastern Sansui world: the ZENetic Computer. ZENetic Computer was and still is an ambitious project that tries to cross boundaries and complicates simple binary divisions such as those between East and West (i.e., modern and pre-modern, science and religion, science and art, etc.). The ZENetic Computer is based on cutting edge technology to offer users a chance to engage and understand Buddhist principles of ‘re-creation’ of the self. The Eastern essence of an ancient culture is delivered by means of Western technology to create an interactive experience dealing with complex issues such as human [un]consciousness. Through encounters with Zen Koans and haiku poetry, the user is constantly and sharply forced to confirm the whereabouts of his or her self-consciousness. So, what would be an equivalent system for Cultural Computing in the West?

2.2 Western Culture: Alice in Wonderland

In the West Kant (1784) gave an answer to the question, "What is enlightenment?" He indicated that the 'way out' that characterizes enlightenment in the West is a process that releases us from the status of 'immaturity'; and by 'immaturity,' he meant a certain state of our will that

⁵ <http://www.experiencefestival.com/a/Buddhahood/id/79203>

makes us accept someone else's authority to lead us in areas where the use of reason is called for. In the Western world *enlightenment* is defined by a modification of the preexisting relation linking will, authority, and the use of reason⁶.

Nisbett et al. (2001) can confirm that Westerners are *analytic*, paying attention primarily to the object and the categories to which it belongs and using rules, including *formal logic*, to understand its behavior. In contrast East Asians are more *holistic*, attending to the entire field and assigning causality to it, making relatively little use of categories and formal logic, and relying on '*dialectical*' reasoning. These Western and Eastern types of cognitive processes are embedded in different naive metaphysical systems and tacit epistemologies. Nisbett et al. (2001) speculate that the origin of these differences is traceable to markedly different social systems as part of the underlying cultural determinants.

To address logical reasoning in the western culture the most appealing narrative is 'Alice in Wonderland' of Lewis Carroll. Charles Lutwidge Dodgson (1832–1898), better known by the pen name Lewis Carroll, was a British author, mathematician, logician, Anglican clergyman and photographer. His most famous writings are 'Alice's Adventures in Wonderland' and its sequel 'Through the Looking-Glass'. His facility at word play, logic, and fantasy has delighted audiences ranging from the most naive to the most sophisticated. He was exceptionally gifted and achievement came easily to him. His works have remained popular since they were published and have influenced not only children's literature, but also a number of major 20th century writers such as James Joyce and Jorge Luis Borges. There are societies dedicated to the enjoyment and promotion of Lewis Carroll's works in many parts of the world including North America, the United Kingdom and New Zealand. In this perspective the book 'Alice's Adventures in Wonderland' can serve as input for a Cultural Computing project in the West.

The first interactive, but semi-immersive virtual reality system based on parts of 'Alice in Wonderland' was developed at the Entertainment Technology Center of Carnegie Mellon University. Pierce et al. (1999) created a successful virtual experience based on a head-mounted display to overcome some or all of the following problems: entering a virtual world is a jarring experience, people do not naturally turn their heads or talk to each other while wearing a head-mounted display, putting on the equipment is hard, and people do not realize when the experience is over. In the Electric Garden at SIGGRAPH 97, they presented the Mad Hatter's Tea Party, a shared virtual environment experienced by more than 1,500 SIGGRAPH attendees. They addressed these head-mounted display related problems with a combination of back story, see-through head-mounted displays, virtual characters, continuity of real and virtual objects, and the layout and setting of the physical and virtual environment.

We started the cultural computing project ALICE as an interactive, entertaining experience (see Nakatsu, Rauterberg & Vorderer, 2005) inspired from 'Alice in Wonderland'. In the scope of this project interactive adventures are experiences provided by an Augmented Reality (AR) environment based on selected parts from Lewis Carroll's book 'Alice's Adventures in Wonderland'. The user assumes the role of Alice and explores this interactive narrative. ALICE is an exploration of interactive story-telling in AR. By exploiting the unique characteristics of AR compared to established media such as film and interactive media, the project uses AR as a new medium for edutainment and entertainment as a particular carrier for cultural transformations. Innovations include the refashioning of conventions used in film and interactive tools for the development of an AR narrative, and the use of simple artificial virtual and real characters (avatar and robot respectively) to create an immersive interactive experience.

ALICE is an augmented reality (AR) narrative with intelligent agents acting as characters who lead the user through virtual and real locations, moral choices and emotional states. The

⁶ http://en.wikipedia.org/wiki/The_Enlightenment

narrative is a surreal quest, sometimes funny, sometimes disturbing. The character White Rabbit (representing the concept of *time*) introduces him and joins with the user in a series of absurdist challenges. ALICE is an educational journey towards the user's heart's desire, designed to provoke self-reflection on a number of other issues: bullying and trusting others; selfish- and selfless-ness; enjoying the moment or sublimating pleasure. The user is given the opportunity to occupy and experience any of these mental and emotional positions. This will be achieved in line with the 'Alice in Wonderland' plot (albeit shortened).

Alice in Wonderland can be used to give interesting examples of many of the basic concepts of adolescent psychology. Alice's experiences can be seen as symbolic depictions of important aspects of adolescent development, such as initiation, identity formation, and physical, cognitive, moral, and social development (Lough, 1983). Alice's adventures are deconstructivist⁷ in nature and as such are directly challenging the strongly held belief of a linear, single track and sequential reality.

2.3 Implementing Cultural Computing in the West

Our approach is to create an interactive experience based on the cultural values (e.g., highlighted in the story 'Alice in Wonderland'). A westerner would understand and appreciate the implementation of an interaction inspired from 'Alice in Wonderland'⁸ adventures or 'Le Petit Prince'⁹, but will be puzzled if s/he was presented with an interaction inspired from the eastern 'Ox story'¹⁰ or 'The Journey to the West'¹¹. Similarly, an easterner would appreciate the second set and be confused by the first. Alice's adventures are illustrative of English culture. Indeed English and Western culture in general are based on Monotheist religions (Judaism, Christianity, and Islam) which are concerned with certainty and absolutism, in the sense of absolute truth and certainty. Western culture is also based on Cartesian logic and a linear and constant flow of time. To understand the culture shock that our proposed interactive experience could generate, it is interesting to look at the book 'Alice in Wonderland'. Alice, who is tired of the rational world she lives in and therefore follows the white rabbit into a hole, leading to a world without rational boundaries, experiences several culture shocks in this new world. Alice adventures happen in a world of paradox, the absurd and the improbable. The key aspects of Alice in Wonderland can be resumed in the following points: (1) a non linear non constant time flow; (2) a distortion of experience in space and with other characters; and (3) a counter-intuitive, common sense defying heuristics. To be able to investigate the effects of cultural computing on the user's experience we will build an interactive installation with the following experiences.

Experience-1: 'Escaping Reality'; "Alice was beginning to get very tired of sitting by her sister on the bank and of having nothing to do. She was considering, in her own mind, whether the pleasure of making a daisy-chain would be worth the trouble of getting up and picking the daisies, when suddenly a White Rabbit with pink eyes ran close by her. There was nothing so very remarkable in that; nor did Alice think it so very much out of the way to hear the Rabbit say to itself 'Oh dear! Oh dear! I shall be too late!' When the Rabbit actually took a watch out of its waistcoat-pocket, and looked at it, and then hurried on, Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waistcoat-pocket, or a watch to take out of it, and burning with curiosity, she ran across the field after it, and was just in time to see it pop down a large rabbit-hole under the hedge."¹² In this stage the user will start in a park like labyrinth to encounter a pet like rabbit behaving closely to the original plot. Following the rabbit the user will end at the entrance to the rabbit hole.

⁷ http://en.wikipedia.org/wiki/Jacques_Derrida

⁸ <http://www.gutenberg.org/etext/11>

⁹ <http://www.saint-exupery.org/>

¹⁰ http://www.shantimayi.com/ox_story/10ox1.htm

¹¹ http://en.wikipedia.org/wiki/The_Journey_to_the_West

¹² <http://www.alice-in-wonderland.net/?books/1chpt1.html>

Experience-2: ‘Down the Rabbit Hole’; to simulate this experience, the entrance is a four meter high spiral tube slide that will end in a projection cave of experience-3. The spiral tube slide includes visual and audio projections throughout the sliding down experience. The rabbit-hole goes straight on like a tunnel, and then dips suddenly down, so that the user has no opportunity to stop. The hole is very deep, or the fall is very slow, for the user has plenty of time as s/he slides down to look around and to wonder what is going to happen next.

Experience-3: ‘Shrinking and Growing’; the end of experience-2 is connected to a cave with four projection walls. Through one of the projection walls the user will be able to go through to continue the whole journey. Inside the cave the user has access to two tangible devices: ‘nibble’ and ‘drink me’. Both devices control the user’s perceived physical height. With these two devices the user can interact with the environment to adjust his/her size: shrinking or growing. In case of proper sizing the exit door will be opened so that the user can leave the cave and to enter the next experience.

Experience-4: ‘Advice from a Caterpillar’; to address the western individual self-concept Alice’s self is challenged in this situation. After Alice entered the rabbit hole to follow the white rabbit, she experienced a lot of transformations both physically and mentally. This brought her in an initial *state of confusion*, which is emphasized in her conversation with the Caterpillar: ‘Who are YOU?’ asked the Caterpillar. This challenging attitude of the Caterpillar makes Alice uncertain about herself, making her vulnerable for criticism. Such a situation gives the possibility for a confrontation with and awareness about one’s self-concept.

Experience-5: ‘Talk with the Cheshire Cat’; to talk to the Cheshire Cat a painted tree with a back projection area inside this painting will be provided. In front of this tree a pressure sensitive floor is laid out. Depending on the position and verbal input of the user, the reaction of the Cat is different (e.g. visible or disappearing).

Experience-6: as the final stage of the ALICE experience is planned the ‘Mad Hatter’s Tea Party’, in which virtual characters and objects are mixed with real objects and agents. The Helio display technology will be investigated for projecting virtual objects on the table. Cavazza et al (2004) describe a new approach to the behavior of 3D environments that supports the definition of physical processes and interactive phenomena. The work takes as a starting point the traditional event-based architecture that underlies most game engines. These systems discretise the environments’ physics by separating the objects’ kinematics from the physical processes corresponding to objects interactions. This property can be used to insert a new behavioral layer, which implements AI-based simulation techniques. They introduce the rationale behind AI-based simulation and the techniques they use for qualitative physics, as well as a new approach to world behavior based on the induction of causal impressions. This approach has implications for the definition of complex world behavior or non-standard physics, as required in our interactive experience installation.

3 How to measure the user experience

The state of the art in the empirical assessment of the user’s experiences is best described by diversity (e.g., Kuniavsky, 2003). For example, a variety of methods and measures have been introduced for measuring *Presence* (Baren & Ijsselstein, 2004), but only very few have been evaluated against standard quality criteria, such as objectivity, reliability, and validity. The large number of different methods and measures is a consequence of the numerous theoretical approaches to Presence (see Vorderer et al., 2003). The IST project ‘Presence: Measurement, Effects, Conditions’ (MEC) has selected a variety of promising approaches to measure Presence and has compared them with respect to quality criteria of social scientific research. MEC’s findings (Vorderer et al., in prep.) indicate that there is considerable value in using Presence questionnaires right after exposure to an interactive experience (e.g., a Virtual Environment, VE), if the scales have been validated systematically. The ‘MEC Spatial Presence Questionnaire’ (Vorderer et al., 2004) meets these requirements and is based on an integrative theoretical framework. Its value has been demonstrated in more than 20 experiments. However, ex-post assessments are insensitive to temporal variations in Presence during the course of exposure to a VE. For very dynamic kinds of VEs, like those used in entertainment contexts, the additional use of process-oriented measures is indicated. Most important are think-aloud techniques for their ability to assess multiple dimensions of Presence during exposure, and task-oriented measures. For example, MEC has identified some capacity of the Secondary

Task Reaction Time paradigm to measure Presence 'online', although findings demand further exploration (Klimmt et al., 2005). A variety of alternative task-based measures has been proposed (e.g., Basdogan et al., 2000). In sum, the context of VEs for entertainment suggests to employ a combination of process-oriented and ex-post measures of Presence and to establish improved, validated task-based methods. But how can we measure effects regarding the self-consciousness?

A collective constructionist theory of the self as proposed by Kitayama et al. (1997) can describe many psychological processes, including enhancement of the self (pervasive in the United States) and criticism and subsequent improvement of the self (widespread in Japan), result from and support the very ways in which social acts and situations are collectively defined and subjectively experienced in the respective cultural contexts. In support of the theory, two studies showed, first, that American situations are relatively conducive to *self-enhancement* and American people are relatively likely to engage in self-enhancement and, second, that Japanese situations are relatively conducive to *self-criticism* and Japanese people are relatively likely to engage in self-criticism. Kitayama et al. (1997) discuss the implications for the collective construction of psychological processes implicated in the *self* and, more generally, for the mutual constitution of *culture* and the *self*. One of the prominent research regarding self and culture was done by Carl Gustav Jung.

Jung (1959) refers to the mandala as "the psychological expression of the totality of the self" (p.20). The mandala is a template for the mind, a state of peace and order, and a resolution to the high dynamic complexity within: "The severe pattern imposed by a circular image of this kind compensates the disorder and confusion of the psychic state--namely, through the construction of a central point to which everything is related" (p.4). This central point is the absolute location of the self, the anchor for all the extraneous elements of our environment and psyche. We refer to our environment and others psyche as if they were separate entities, but in reality the two are inextricably linked. The world within and the world without are indistinguishable as far as our self is concerned. To describe this with a metaphor: 'A drop knows that it is in the ocean, but it does not know that the ocean is in it as well'¹³. Internal elements (ideas, emotions, obsessions, etc.) interact with external elements in our mind as the interface to the perceived outer world. Following Jung we can better understand how certain patterns and symbolic elements from our most ancient origins have been embedded, internalized and carried through the ages, only to be unconsciously externalized in the beauty of the mandala.

The mandala is a symbolic diagram (either imagined or depicted), and typically a circle enclosing a square with a central symbol which can be a figure. Ritualistic mandalas from specific cultures display a style and variety of elements with specific significance to that culture. There are nearly as many types of mandalas as there have been societies in the history of humankind. But the essence of the pattern of a mandala is a basic motif in the psyche architecture of so many dreams and fantasies whose unifying similarities stretch across the ages. The quaternary pattern imposed upon the circle symbolizes the application of a specific architecture upon the infinity of the cosmos. It gives the psyche a safe place upon which to stand, a solid foundation upon which it can gather itself to achieve completeness and harmony. Furthermore, the central point is the reference point for the self to identify with. Jung (1959) refers to this pattern as the "archetype of wholeness" (p.4). Jung stresses that this ordering effect on the human psyche is *not* the result of conscious reflection or cultural effort. Because Jung could find the mandala to be present in so many cultures and mythologies spanning the globe as well as the history of Humankind itself, he concluded that it is a pre-existing condition of consciousness that such patterns help bring it into focus or return to an earlier, more peaceful state. The mandala is an integral part of the *collective* unconscious that is shared by every person that has ever lived. The mandala represents an unconscious state in which all opposites come together and are united, where the polar aspects of both cosmos and personality can be

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http://wahiduddin.net/mv2/VII/VII_17.htm

come one. This union of opposites is the very process by which we become whole, and through which we find peace.

A great deal of Jung's psychotherapy dealt with the interpretation of individual mandalas created by his patients. In addition to the soothing, focusing effect he noted as a result in his patients' psychological states, there was also a great deal of commonality between the images they created. Patients who for the most part had no knowledge of mandalas or any other conscious symbolic expression, repeatedly put to paper strikingly similar images in the course of their progress. Jung writes of the significance of the similarities:

"In view of the fact that all the mandalas shown here were new and uninfluenced products, we are driven to the conclusion that there must be a transconscious disposition in every individual which is able to produce the same or very similar symbols at all times and in all places. Since this disposition is usually not a conscious possession of the individual I have called it the collective unconscious, and, as the basis of its symbolical products, I postulate the existence of primordial images, the archetypes" (Jung, 1959, p.100).

According to Jung these archetypes are ageless connections between every conscious being, in conjunction with the elemental pattern of the quaternary and the cardinal points. There is a common reference point at which all our seemingly individual consciousnesses are connected, and it is from this realm that the form and effect of the mandala are drawn. The mandala can be seen as a blueprint for the essential structure of our existence, and something about this structure is instantly recognized by the unconscious within us. We perceive the shape, the pattern, the elements within it and their relationship to each other, and within that sacred matrix we recognize our self and our place in the world. The mandala is the key to recovering that it is an ancient and fundamental relationship from which we have strayed. It is evident that the mandala is the unconscious link between our modern consciousness and our most ancient origins. "Their basic motif is the premonition of a centre of personality, a kind of central point within the psyche, to which everything is related, by which everything is arranged, and which is itself a source of energy" (Jung, 1959, p.73). Getting in touch with these unconscious structures we will be enabled to find ourselves, as well as each other. Future research has to figure out what the best way will be to assess this particular personal experiences based on cultural computing probably observable via mandala.

4 Conclusions

The upcoming paradigm of cultural computing introduces new research challenges, such as: (1) what are the relevant cultural determinants in different cultures to enable the user to transform his/her self towards enlightenment (see Salem & Rauterberg, 2005b); (2) what kind of interactive experiences will have the most supportive potential regarding this transformation (see Nakatsu et al., 2005), (3) what are the differences between cultures worldwide and how to address them, and (4) how to measure the effects regarding the progress achieved in transforming once self. We have discussed several possible answers to these challenges and can conclude that (ad 1) the Western culture is mainly characterized by analytical reasoning based on formal logic (Nisbett et al., 2001), (ad 2) the narrative Alice in Wonderland is a promising candidate for such kind of interactive experiences to address the before mentioned cultural determinants, (ad 3) cultural computing projects (e.g. ZENetic Computer) will not fit to western cultures, and (ad 4) cultural awareness might be assessed by utilizing on the concept of the mandala as introduced by Jung.

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