

# How to Pay Attention to the End of Our Life

An interactive installation in cultural computing

Kiarash IRANDOUST

Industrial Design Department  
Eindhoven University of Technology (TU/e)  
Eindhoven, The Netherlands  
k.irandoust@gmail.com

Matthias RAUTERBERG

Industrial Design Department  
Eindhoven University of Technology (TU/e)  
Eindhoven, The Netherlands  
g.w.m.rauterberg@tue.nl

**Abstract**— This paper contributes a novel research in cultural computing, by presenting an interactive installation which creates a unique experience for visitors to contemplate and conceptualize their own end of life, death resp. Our final goal is creating societal transformation and awareness through individual reflections. Death is ubiquities, but its conception is one of the deeply rooted cultural heritages, which varies dramatically among people and cultures. This paper describes different factors forming our notion of death and how we used scientific and engineered methods to make an experience for each individual regardless of his/her beliefs and religious point of view. Based on a theoretical framing we built an interactive installation to enable the visitor to get aware about his/her own death. Our focus is on interconnectedness in cultural and sensorial personal experiences.

**Keywords**—cultural computing, religion, ritual, societal transformation, end of life, death

## I. INTRODUCTION

This design paper is about human life in general and the end of life in particular [1] [2] [3]. Defining the meaning of life has been one of the most profound questions of human existence. The most common definitions for life are "the period between birth and death" and "the quality which makes people, animals and plants different from objects, substances, and things which are dead" [4]. Given the fact that facing our own death is inevitable, the main question raising here is what that quality is which differentiate humans from animals and plants. Answering this question from a sociological and humanistic point of view has concerned philosophers and social scientists for centuries. They have been trying to develop and evaluate principles which are meant to capture all the particular ways that a life could obtain a *meaning* [5].

In recent times, it has become more and more challenging to provide a framework for answering the existential question about 'meaning of life'. So far, we assumed that our life is limited and ends with death [1, 6]. But given these two empirical facts, birth and death, how can then death becomes a meaningful part of our life? In modern societies most ageing people do not want to be confronted with their own death [7], and most contemporary societies try to avoid death and dying [8]. In addition, young adults show fear of dying and death when they search for its meaning in life [9]. In an international cross-cultural study "greater longevity was *not* considered as

one of the most important components of successful ageing" [10, p. 52]. We are really in need of a new vision on life in general and end of life in particular. This paper focuses on the notion of a 'good death' as part of the human life [11] and how ICT could play a role in creating a meaning [5].

It is worth noting that research which is presented in this paper is limited to the western society. This constraint is made due to the fact that attitudes and approaches towards death are profoundly cultural oriented. Different cultures throughout the world have their unique and distinct approaches and practices [12], which are in contrast to more common western practices [13]. To highlight a few 'celestial burials', 'tower of silence' and 'famadihana' can be named.

## II. CONCEPTS OF DEATH

Every human being walks a unique path through this life. What happens in life, regardless of being religious or non-religious, is in essence the salvation history of that person [14]. Probably all people on this planet have this in common. In many cultures and religions there was and still is the conception that life happens in distinctive phases, each with a specific content, which is threshold for the next entrance [1]. Therefore, it still is important to cross these phases consciously and with the right effort. In contemporary societies, little is left from the earlier union of rites; however, the perception of phases and transitions are still present in religious and nonreligious people [15]. These phases can also be considered as ongoing processes of learning and discovering that life is not all about ego, enjoyment and achievement, but it is about living; living with love, receptiveness and thus becoming a mild, responsible, trustworthy and peaceful human being: a truly free human being who knows what resignation is. We can identify three main phases during each individual life that are mostly common among different cultures: (1) childhood, (2) adulthood, and (3) retirement [2]. Our work aims to shed light on the concept of death by presenting it as an inseparable part of life which reflects the connectedness of the previous phases.

Death has been defined in various ways. Encyclopedia Britannica defines death as "the total cessation of life processes that eventually occurs in all living organisms". In addition, it says "the state of human death has always been obscured by mystery and superstition, and its precise definition remains controversial, differing according to culture and legal systems."

In the first edition of Encyclopedia Britannica [16], death was summarized as "the separation of the soul and body; in which sense it stands opposed to life, which consists in the union thereof (1768, v. 2, p. 309). The confidence and concision had dissolved by the time the fifteenth edition appeared in 1973. The entry on death had expanded to more than thirty times the original length. The earlier definition was not mentioned, and the alternative that death is simply the absence of life was dismissed as an empty negative" [17]. This definition shows no certainty or confidence, talking about death. Although a same terminology may be used to describe death, the actual conceptualization and meaning of death vary drastically across cultures. A suitable analogy of cultural diversity is weaving (Kagawa Singer, 1998). Even though, weaving is a universal technique, the patterns that result from this process are culturally unique and identifiable. These various conceptions have an evident impact on people's lifestyles and their readiness for dying. The manifestation of these differences can be seen in rites and rituals such as settlement of dead bodies and diversity on grief and mourning across cultures [18]. In general, two dimensions define the approach of a specific culture towards death:

- A Culture may be death-accepting, death-denying or even death-defying.
- Death may be considered either as the end of existence or as a transition to another state of being or consciousness.

Mentioned dimensions, form the vision of the cultures to the death which is either sacred or profane [19, pp. 27-28]. These different approaches define why some cultures consider death as a taboo (or at least to some extent), while the others have entirely distinct approach; the mourning rituals in the Toraja culture are an obvious exception [20] [21].

Among various opinions existing about death and afterlife religions simply accept the inevitability of death and try to offer alternatives that await the faithful in the afterlife [22, p. 101]. It is believed that these ideas bring comfort to many people who have lost loved ones or are facing death themselves. In order to understand where our perception of death originates from, this paper looks at the concept of death in two different disciplines: philosophy and history. Overall, six common philosophical views about concept of death are discussed [23]:

*i.* Death is permanent interruption to life. Two possible attitudes towards this view are either ignorance or rebellion.

*ii.* Death is considered as the act of culminating of life in which a person expresses his/her aim of life. This happens in two ways: (1) By the context or manner of dying or both which also referred as internal and external expression of life's context. (2) By providing an opportunity as a "final option" in order to authorize "fundamental option".

*iii.* Death is regarded as part of life, in which a person has to confront it and accept it as finitude. According to Heidegger, this is one of the key features of human existence "we are to live authentically".

*iv.* Death is considered as transition between two lives, from this earthly life to eternal life. In this view, which goes back to Plato, the eternal soul survives the body. Next life is eternal and death has not to be feared as real life starts after

that. However in traditional religion hell and suchlike concepts exist in those philosophies.

*v.* This view like the previous one considers a transition between lives without the idea of this life is for the sake of the next one. Life starts here and will last forever. Resurrection of body and final coming of the god kingdom is considered in such everlasting life.

*vi.* Death is identified as passage from current life to a similar life, which could be better or worse depending on one's deeds (karma). This view can be combined with view-iv, as life does not end and there is another chance to do it ("re-incarnation as the wheel of re-birth, final salvation").

Throughout human history, five distinctive concepts towards death can be distinguished [24]. However the chronology is not completely clear, due to the overlap between these conceptual stages. We briefly describe these concepts and their characteristics.

*Tamed death* (around 8th BC onward): During this era 'death was a very simple thing'; it was considered natural and inevitable, not an object of horror. Death was a ritual organized by the dying person, who was in charge of it and knew its protocol [25]. It was also a public ceremony. "The coexistence of the living and the dead" was another aspect of the old familiarity with death. Blurred borders between life and death can be shown by the fact, that cemeteries were also used for non-funeral purposes such as public performances and market places. Until late sixteenth and seventeenth century, the individual graves were unusual and the exact place of burial was not so important. The fact clearly reveals "community-oriented personal identity that was dominant" in this period.

*Death of self* (14th to 16th century): The idea of being confronted with individual judgment right after death was a new development during the Middle Ages towards the Renaissance. The perception of death was not greatly affected; however, death began to change subtly becoming dramatically personal. The individual's sins and God's reckoning of such sins also became more personal. Facing death people thought that exuding posture and not grasping onto one's earthly possessions would earn favor towards Heaven. Individual values arose changing how funerals were conducted, while rites administered on the deathbed remained the same. During the 12th century and reserved only for saints and kings, epitaphs appeared.

*Remote and imminent death* (17th and 18th century): As Ariès says [26, p. 28], "Where death had once been immediate, familiar, and tame, it gradually began to surreptitious, violent, and savage ... death, by its very remoteness, has become fascinating. ..." The fear and natural acceptance of death was an intermediate phase which occurred in the 17th and 18th century. In 1787 Mozart reflected the views of his time in a letter to his father: "As death, when we come to consider it closely, is the true goal of our existence, I have formed during the last few years such close relations with this best and truest friend of mankind, that his image is not only no longer terrifying to me, but is indeed very soothing and consoling! And I thank my God for graciously granting me the opportunity ... of learning that death is the key which unlocks the door to our true happiness" [27]. Interestingly, mourning was regulated by the church

to the extent of dictating what the mourning family member should wear and how long they are allowed to mourn. It was inappropriate to show one's emotions in public while mourning, and if it was not possible to overcome grief in a reasonable amount of time the person was forced into solitude or a monastery.

*Death of the other, Thy death* (19th century): An enormous shift occurred in the 19th century where death became more romanticized as beautiful" and the concern from one's death was replaced by the concern of losing family or friends. The relationship between family members have become exceedingly closer and emotional expression was accepted as normal when losing a family member or friend. The grave site is property of the family in the 19th and 20th centuries which is considered to be a cemetery cult. Family and friends visit the deceased in the cemetery indicating the significance of the burial site. Pictures of the deceased are often attached to the tombstone in remembrance.

*Invisible death* (Contemporary): Where dying was once done in one's home, in contemporary times the unpleasant is ignored and relegated to institutions like funeral homes and hospice care [28]. Thus far, death has not progressed in this era leaving excessive mourning to be indecent and society choosing to remove the topic from public discussion. While death is inevitable, the natural sciences in the contemporary is focused on constant progress rather than death [29].

During the history of Western civilization, a fundamental shift in the conception and attitude towards death occurred; death which once had been a familiar and "tamed" concept twisted into the radically different conception that characterizes by untamed, strangeness, and forbidden. These changes result largely from the gradual replacement of community-oriented personal identity with today's radical individualism. The contemporary society tends to deny death existence and banish it from sight. We do not longer die among beloved ones but alone in the hospital. None the less, the strangeness of the society in facing death leaves individuals isolated and makes it more intimidating or even inhuman than ever before. Our interview with more than twenty individuals was a proof that our society is in the final stage, *invisible death*. We found that people are reluctant to talk about death as it seems to be a kind of taboo or they try to evade this topic by making fun of it.

Because of such important aspects in any human life we are aiming for a new type of user experience through cultural computing to enable people becoming aware about their own end of life. With this experience people can become more conscious about issues which normally remains unconscious [30].

### III. COLLECTIVE UNCONSCIOUS

In the past decade, research on human-computer interaction has embraced cultural computing that enhance awareness of cultural issues about conscious cognitive and affective states of users and increase their adaptive capabilities [31] [32]. Still, human experience is not limited to the levels of cognition and affect but extends further into the realm of universal instincts and innate behaviors that form the collective unconscious [33] [34].

One of the theoretical frameworks for describing unconscious processes was introduced by Jung as a part of his model of the psyche [33]. Jung's framework uses the concept of archetypes that represent prototypical experiences associated with objects, people, and situations. Although the validity of Jungian model remains an open question, this framework is convenient from the practical point of view. The archetype of initiation represents a powerful and essential component for the adolescent transitioning into adulthood [2]. Depth psychological literature on the adolescent psyche suggests that youth are drawn to death imagery to satisfy their needs for archetypal transformation in this purgatorial stage of development. In contemporary Western societies, many adults have neglected to create a modern, formal rite of initiation for adolescents. Youth have resorted to create their own life-threatening initiatory rites of passage that encompass many of the elements of primitive initiation rites by recapitulating a symbolic death and rebirth [35].

Patterns of instinctual traits shape archetypes that represent images of the unconscious. The study of Ivonin et al. [36] investigated whether seven various archetypal experiences of users lead to patterns of physiological responses. Empirical observations of both conscious and unconscious traces related to archetypal experiences seem to be an interesting research endeavor. In another study of Ivonin et al. [37] with 36 subjects, they examined the effects of experiencing conglomerations of unconscious emotions associated with various archetypes on the participants' introspective reports and patterns of physiological activations. Their hypothesis for this experiment was that physiological data may predict archetypes more precisely than introspective reports due to the implicit nature of archetypal experiences. The subjects were stimulated to feel four archetypal experiences and four explicit emotions by means of film clips copied from known blog busters. The data related to the explicit emotions served as a reference in analysis of archetypal experiences. Their findings indicated that while prediction models trained on the collected physiological data could recognize the archetypal experiences with accuracy of 55 percent, similar models built based on the SAM data demonstrated performance of only 33 percent. Statistical tests enabled them to confirm that physiological observations are significantly better suited for observation of implicit psychological constructs like archetypes than introspective reports only.

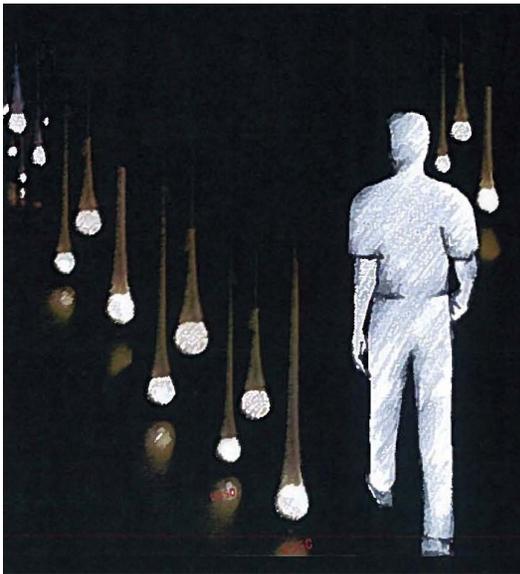
Based on this knowledge and in order to provide such kind of new experiences for people we decided to build an interactive installation being placed in public spaces.

### IV. DESIGN APPROACH

We divided the initial design process into two phases; first phase was dedicated to understanding the concept of life, gathering information regarding different stages of life and choosing a particular stage in order to continue the project upon that. Different interviews, analysis and readings devoted our direction to the final stage in life, "death" [3]. The second phase focused on attaining knowledge about the final stage of life. We tried to get a comprehensive picture of this stage by looking at different disciplines' viewpoint on death. The main results of this phase are already described above. During this iteration it was crucial to understand how society and individu-

als are influenced by the concept of life and death. Furthermore, what are the critical factors on this impact? The main focus dedicated to find a common agreement on the concept of death regardless of religious or specific point of view.

All our research, interviews and analysis provided us with the insights that people in the contemporary society consider death as a separate phenomenon from life. This point of view on death has led to an unfamiliar perception of death which can be considered as a taboo. Furthermore, even though death is a universal experience people have their own individual understanding of the concept of death; these distinctive understanding is clearly reflected in art, cultures, religions and philosophy[3]. Based on all the research and personal understanding we defined the following guidelines to continue the project: (1) designing an installation which encounter people with the "reality" of death; (2) this reality is quite subjective; therefore it should be presented in a way that individuals can perceive it based on their personal believes; and (3) our design should emphasis on common agreements about death rather than distinctive point of views.



**Figure 1:** Conceptual drawing of a path along lights.

These three criteria were the pivotal pillars of our design. Within this framework, concept of death was analyzed from different point of views. We intended to present how life and death are influenced by each other. In other words, how individuals are influenced by death; it can be contemplating on death of themselves or death of the others. During all our investigations we were looking for a criterion which links life to death and vice versa; a criterion which makes death a universal experience regardless of personal believes, culture and religion. We came to the conclusion that we have to look at life and death from two different angles:

(a) Life is a passage of time, and death is cease of this passage (the end of 'earthy' life); while birth is the commencement, death is the end (regardless of what is going to happen subsequently). This end is directly linked to the time. While life is

the passage of time, death is the moment when this passage stops.

(b) Reflection; life shapes by reflection of death on it and death is the reflection of life. To state it differently, what we do in our life is influenced by our notion of death and these creations, words and thought remain even subsequent to our death (a reflection which continues even after death).

The first point of view (a) can be addressed by moving along a path, and additionally from light towards darkness (see **Figure 1**), and the second one (b) can be envisioned as moving along walls in a tunnel while seeing yourself (see **Figure 2**). We were also considering moving from darkness to bright light at the end of a tunnel (see **Figure 3**) to indicate the intended transition 'back to life'.

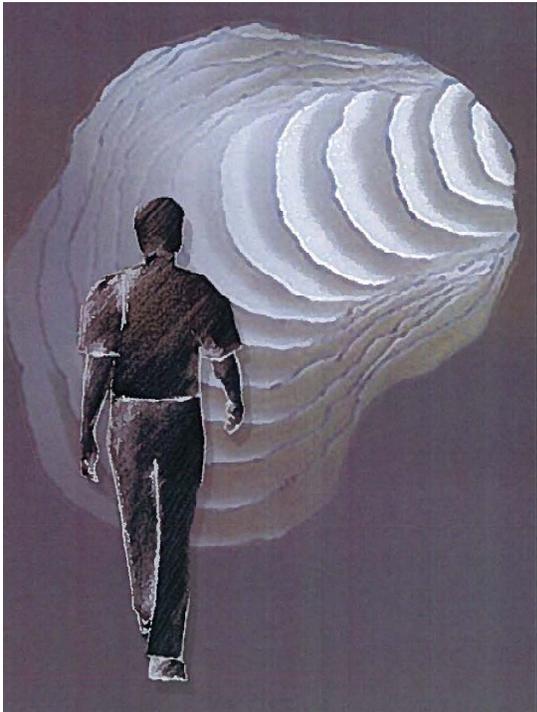


**Figure 2:** Conceptual drawings for moving along side walls made of reflective material.

As final step we had to focus on combing all the information gathered from our initial design stage into a final concept and to deliver a tangible experience of 'death'. Here is a brief description how the final concept is made. Using all the information from all interviews and discussions, background information, etc. we defined a set of guidelines as following (Gx):

- G1: Simplify the complex nature of death.
- G2: Death is part of life and it is not separate.
- G3: Death in contemporary society is considered as black and negative, however the experience that we want to create is mainly creating awareness.
- G4: Whether believing in terminal death at the end of life or not, the most important aspect of death is how we have lived and what we leave behind; in other words, our creations (deeds), actions, thoughts and words remain even after death (a link between life and death).
- G5: The legacy aspect of life (see G4) and death is not dependent on personal believes.

- G6: Birth and death are connected together by time (a link between life and death).
- G7: Death is a transition in life (a link between life and death).
- G8: There is no universal answer to the questions concerned by death, the answer lies in the person who enters the installation.
- G9: There is an historical drift in interpreting old symbols, symbolic language should be used carefully or even avoided.



**Figure 3:** Conceptual drawing from moving inside a tunnel from darkness to brightness.

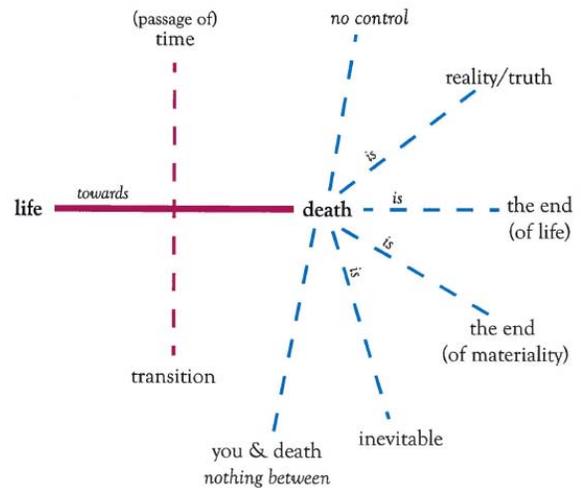
The schematic diagram (see **Figure 4**) depicts these nine guidelines and their relations among each other.

#### V. REALIZATION AND CONSTRUCTION

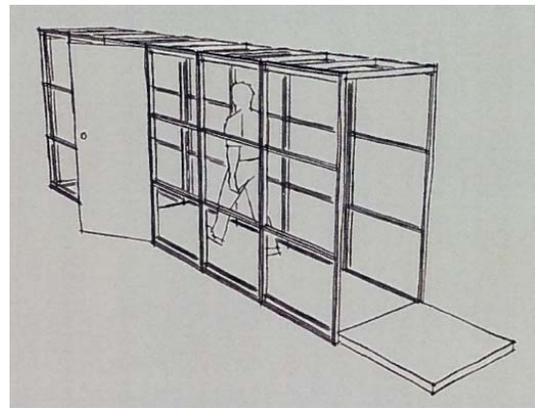
In order to have a clear picture of this installation, it is described in two subsequent sections: the space and the interaction (technical part).

##### A. Description of the space

The installation comprised of a long corridor which continued towards a mirror at the end. The intention was designing an individual experience, hence users were asked to be alone inside the installation (see **Figure 5**). The direction which had to be followed, was described for each person (explaining the exit door at the end of the pathway). No color was used inside the space; everything was plain black. The only existing colors were provided through the person who entered the tunnel.



**Figure 4:** Schematic diagram with relations among guidelines



**Figure 5:** Schematic diagram for the tunnel construction.

Furthermore, three rows of light as columns were located on the left side of the corridor. These lights were designed in the most possible abstract form to avoid any symbolism of shapes (see **Figure 6**). They were made of half transparent half brushed Plexiglas in order to diffuse sufficient light for filming.

To conclude, the installation was designed by considering how human's perception of surrounding is shaped; what is reality and how it is shaped in our mind [38]. The reality can be captured through our five senses and that is how our mind perceives the surrounding. The mind and senses create our world. Therefore based on one person's interpretation and imagination, his/her surrounding world comes to reality. In addition those parts that are perceived will be further strained by other elements such as culture, language, beliefs, values, interests and assumptions. This world view is then different from the one person to another. A simple example can be mentioned while an object is observed we then create images from that in our mind. This image or imagination differs between different observers. What we see actually depends on what we predict or want to see from that certain object. The important point is the interpretation of things that we experience through our senses.

### B. Description of the interaction and technical part

In order to have a better understanding of the interactive experience the sensors are explained at first. The whole corridor is controlled by five different motion sensors; two PIR (passive infrared) sensors and three LDR (light dependent resistor) sensors. Three LDR sensors control the lights. Whenever a person enters the installation, the first PIR sensor detects the motion and subsequently video recording starts. At the begin of each individual experience all three light columns are switched on (see **Figure 6**, left). By passing along each light column, it gradually dims and finally turns off (see **Figure 6**, middle and right).

One PIR sensor is located in front of the entrance. It starts the video recording. The other one, which is located close to the end of the person's path way, stops the recording and start the playback; the recorded video is showing the user moving towards the end of the tunnel. The recorded video is projected from the back of the front panel (called 'mirror'). At this point all the lights have already turned off. Due to the changes in the ambient light inside the tunnel, the mirror changes into a transparent glass. This semi-transparent mirror acts only as a mirror when one side is brighter than the other side. This effect enables the person to look at his/her own past and start reflecting on it provided by the short video recording of his/her move through the tunnel. The effect of being confronted with his/her own face/body entails a certain moment of surprise, but it is also of transferring the message how short and final life actually is. After the video recording finished the hidden door in the side wall opens automatically to release the person. This interactive installation (see **Figure 66**) provides the new type of experience in line with our nine design guidelines (see above).

### C. User Test

The installation was exhibited at Eindhoven University of Technology, The Netherlands. During the exhibition, eighteen

people participated in the user test (11 male, 7 female; age range 21-26 years). Each person was asked to enter the installation individually. It was briefly introduced that this installation is called a "Path of life" experience.

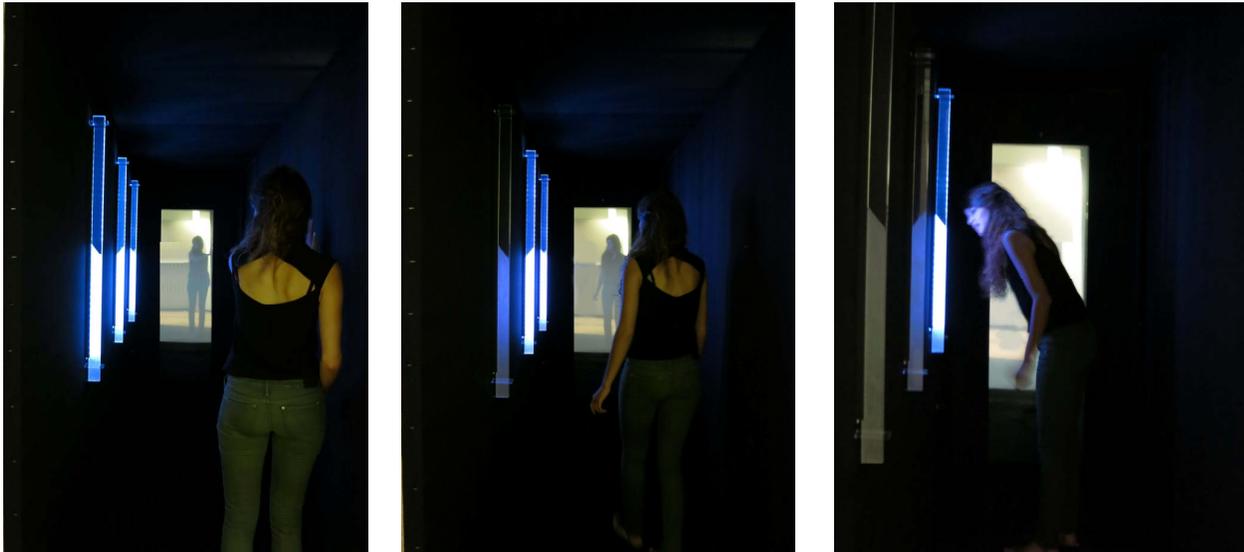
Starting the experiment without any indication of death or related topics, participants had no anticipation what they are going through. Afterwards, they were asked during a semi-structured interview 'how they related this experience to life?' and 'to describe their experience in single words'. Although most of the test subjects had difficulties to express their individual experience in wording, the provided answers were remarkably distinct; such as 'eternity' (12x), 'continuity' (8x), 'fear' (6x), 'reality' (6x), 'void' (3x), etc. Interestingly, when the test subjects were informed about the purpose of the installation (during de-briefing after the interview), most participants described 'death' in a similar manner. Most test subjects reported a deep impression being confronted with their own video image at the end of walking in front of the semi-transparent mirror.

## VI. DISCUSSION AND FUTURE WORK

The installation is finished and first user feedback points in the intended direction. The next step in our research is measuring the effects of such kind of deep user experiences [39], not only through introspective verbal reporting but also by measuring bio-signals and physiological data [37].

### ACKNOWLEDGMENT

We want to acknowledge the invaluable contributions from Lucian Reindl from A1 PRODUCTDESIGN (Reindl + Partner GmbH, Germany). We are also grateful for the support from our Industrial Design department at TU/e.



**Figure 6:** The final installation with a person walking inside towards his/her own mirrored image online captured by a hidden video camera above the mirror for playback at the end of walking inside this tunnel (three snapshots are presented).

## REFERENCES

1. Rauterberg, M., *The three phases of life: An intercultural perspective*, in *Proceedings 2nd International Conference on Culture and Computing*. 2011, IEEE Computer Society: Los Alamitos. p. 80-85.
2. Vissers, M., et al., *Path of life in mixed reality*, in *Proceedings 3rd International Conference on Culture and Computing - ICCC 2012*, Z. Pan, Editor. 2012, Hangzhou Normal University: Hangzhou. p. 216-227.
3. Irandoust, K., *Path of life in mixed reality*, in *Industrial Design*. 2013, Eindhoven University of Technology: Eindhoven, The Netherland. p. 104.
4. Cambridge Dictionary, o. *Death*. 1995 [cited 2015 May 8]; Available from: <http://dictionary.cambridge.org/dictionary/british/death>.
5. Rauterberg, M. and K. Irandoust, *Ageing and death: breaking a taboo*, in *Proceedings of International Conference on Information and Communication Technologies for Ageing Well and e-Health*, M. Ziefle, et al., Editors. 2015, INSTICC Sictypress: Lisabon, Portugal.
6. Craig, W.L., *The absurdity of life without God*, in *Reasonable Faith: Christian Truth and Apologetics*, W.L. Craig, Editor. 2008, Crossway Books: Wheaton, IL. p. 65-90.
7. Cappon, D., *Attitudes of the ageing toward death*. Essence, 1978. **2**(3): p. 139-147.
8. Todd, S., *Death does not become us*. Journal of Gerontological Social Work, 2003. **38**(1-2): p. 225-239.
9. Cicirelli, V.G., *Personal meanings of death in relation to fear of death*. Death Studies, 1998. **22**(8): p. 713-733.
10. Fernandez-Ballesteros, R., et al., *The concept of 'ageing well' in ten Latin American and European countries*. Ageing & Society, 2010. **30**(01): p. 41-56.
11. Kehl, K.A., *Moving toward peace: An analysis of the concept of a good death*. American Journal of Hospice and Palliative Medicine, 2006. **23**(4): p. 277-286.
12. Hofstede, G., *Dimensionalizing cultures: The Hofstede model in context*. Online Readings in Psychology and Culture, 2011. **2**(1): p. article no. 8.
13. Bryant, C., *The sociology of death and dying*, in *21st century sociology: A reference handbook*, C. Bryant and D. Peck, Editors. 2002, Sage: London. p. 156-166.
14. Girolimon, M.T., *Hugh of St Victor's De sacramentis Christianae fidei: The sacraments of salvation*. The Journal of Religious History, 1994. **18**(2): p. 127-138.
15. Bax, M., *Generic evolution. Ritual, rhetoric, and the rise of discursive rationality*. Journal of Pragmatics, 2009. **41**(4): p. 780-805.
16. Encyclopedria Britannica, o. *Death*. 2013 [cited 2013 February 10]; Available from: <http://www.britannica.com/EBchecked/topic/154412/death>.
17. Kastenbaum, E.R. *Encyclopaedia of Death and Dying: Definitions of Death*. 2001 [cited 2015 17 May]; Available from: <http://www.deathreference.com/Death/Definitions-of-Death.html#ixzz2IBszvzPM>
18. Gire, J.T., *How death imitates life: Cultural influences on conceptions of death and dying*. Online Readings in Psychology and Culture, 2002. **3**(2): p. article no. 2.
19. Kearl, M.C., *Endings : A Sociology of Death and Dying*. 1989, Oxford: Oxford University Press.
20. Nooy-Palm, C.H.M., *Introduction to the Sa'dan Toraja people and their country*. Archipel, 1975. **10**(1): p. 53-91.
21. Volkman, T.A., *Visions and revisions: Toraja culture and the tourist gaze*. American Ethnologist, 1990. **17**(1): p. 91-110.
22. Nel, A.J., *Falling Higher: Reason to Believe*. 2014, Bloomington: iUniverse.
23. Rahner, K., *On the theology of death*. Vol. 2. 1961, Freiburg im Breisgau: Herder and Herder.
24. Aries, P., *The hour of our death: the classic history of Western attitudes toward death over the last one thousand years*. 2nd ed. 1982, Oxford: Oxford University Press.
25. Bergesen, A., *Centuries of death and dying*. American Journal of Sociology, 1984. **90**(2): p. 435-439.
26. Aries, P., *Western attitudes toward death: from the Middle Ages to the present*. 1975, Baltimore: The Johns Hopkins University Press.
27. Mozart, W.A. *Quotes: Letter to Leopold Mozart*. 1787 [cited 2015 May 8]; Available from: [http://en.wikiquote.org/wiki/Wolfgang\\_Amadeus\\_Mozart](http://en.wikiquote.org/wiki/Wolfgang_Amadeus_Mozart).

28. Howard, C., *Architecture for living with dying and death: the design of a hospice and funerary complex in Halifax NS Canada*. 2014.
29. Ariès, P., *Images of man and death*. 1985, Boston: Harvard Univ Press.
30. Chang, H.-M., et al., *Feeling Something without Knowing Why: Measuring Emotions toward Archetypal Content*, in *Intelligent Technologies for Interactive Entertainment*. 2013, Springer. p. 22-31.
31. Tosa, N., et al., *Cultural computing with context-aware application: ZENetic computer*, in *Entertainment Computing - ICEC 2005*, F. Kishino, et al., Editors. 2005, Springer: Berlin Heidelberg New York. p. 13-23.
32. Rauterberg, M., J. Hu, and G. Langereis, *Cultural computing - How to investigate a form of unconscious user experiences in mixed realities*, in *Entertainment Computing Symposium - ECS*, R. Nakatsu, et al., Editors. 2010, Springer: Heidelberg. p. 190-197.
33. Jung, C.G., *The archetypes and the collective unconscious*, in *Collected Works of C.G. Jung*. 1981, Princeton University Press: Princeton. p. 470.
34. Salem, B. and M. Rauterberg, *Aesthetics as a key dimension for designing ubiquitous entertainment systems* in *The 2nd International Workshop on Ubiquitous Home-ubiquitous society and entertainment*, M. Minoh and N. Tosa, Editors. 2005, NICT Keihanna: Kyoto. p. 85-94.
35. Cabaldon, L.D., *Archetype of initiation: death and rebirth in adolescence*, in *Counseling Psychology Program*. 2014, Pacifica Graduate Institute: Carpinteria.
36. Ivonin, L., et al., *Beyond cognition and affect: sensing the unconscious*. *Behaviour & Information Technology*, 2014. **34**(3): p. 220-238.
37. Ivonin, L., et al., *Traces of unconscious mental processes in introspective reports and physiological responses*. *PLoS one*, 2015. **10**(4): p. e0124519.
38. Nakatsu, R., M. Rauterberg, and B. Salem, *Forms and theories of communication: From multimedia to Kansei mediation*. *Multimedia Systems*, 2006. **11**(3): p. 304-312.
39. Tosa, N., *Unconscious flow*. *Leonardo*, 2000. **33**(5): p. 442-442.

**Proceedings**

**2015 International Conference  
on Culture and Computing  
Culture and Computing 2015**

**17-19 October 2015  
Kyoto, Japan**



# IEEE Computer Society Technical & Conference Activities Board

## T&C Board Vice President

Cecilia Metra  
*Università di Bologna, Italy*

## IEEE Computer Society Staff

Evan Butterfield, *Director of Products and Services*  
Lynne Harris, *CMP, Senior Manager, Conference Support Services*  
Patrick Kellenberger, *Supervisor, Conference Publishing Services*

## IEEE Computer Society Publications

The world-renowned IEEE Computer Society publishes, promotes, and distributes a wide variety of authoritative computer science and engineering texts. These books are available from most retail outlets. Visit the CS Store at <http://www.computer.org/portal/site/store/index.jsp> for a list of products.

## IEEE Computer Society *Conference Publishing Services* (CPS)

The IEEE Computer Society produces conference publications for more than 300 acclaimed international conferences each year in a variety of formats, including books, CD-ROMs, USB Drives, and on-line publications. For information about the IEEE Computer Society's *Conference Publishing Services* (CPS), please e-mail: [cps@computer.org](mailto:cps@computer.org) or telephone +1-714-821-8380. Fax +1-714-761-1784. Additional information about *Conference Publishing Services* (CPS) can be accessed from our web site at: <http://www.computer.org/cps>

*Revised: 18 January 2012*



**CPS Online** is our innovative online collaborative conference publishing system designed to speed the delivery of price quotations and provide conferences with real-time access to all of a project's publication materials during production, including the final papers. The **CPS Online** workspace gives a conference the opportunity to upload files through any Web browser, check status and scheduling on their project, make changes to the Table of Contents and Front Matter, approve editorial changes and proofs, and communicate with their CPS editor through discussion forums, chat tools, commenting tools and e-mail.

The following is the URL link to the **CPS Online** Publishing Inquiry Form:  
<http://www.computer.org/portal/web/cscps/quote>

Copyright © 2015 by The Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved.

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries may photocopy beyond the limits of US copyright law, for private use of patrons, those articles in this volume that carry a code at the bottom of the first page, provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

Other copying, reprint, or republication requests should be addressed to: IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, P.O. Box 133, Piscataway, NJ 08855-1331.

*The papers in this book comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors, the IEEE Computer Society, or the Institute of Electrical and Electronics Engineers, Inc.*

IEEE Computer Society Order Number E5716  
ISBN-13: 978-1-4673-8232-8  
BMS Part # CFP1510R-CDR

*Additional copies may be ordered from:*

IEEE Computer Society  
Customer Service Center  
10662 Los Vaqueros Circle  
P.O. Box 3014  
Los Alamitos, CA 90720-1314  
Tel: + 1 800 272 6657  
Fax: + 1 714 821 4641  
<http://computer.org/cspress>  
[csbooks@computer.org](mailto:csbooks@computer.org)

IEEE Service Center  
445 Hoes Lane  
P.O. Box 1331  
Piscataway, NJ 08855-1331  
Tel: + 1 732 981 0060  
Fax: + 1 732 981 9667  
[http://shop.ieee.org/store/  
customer-service@ieee.org](http://shop.ieee.org/store/customer-service@ieee.org)

IEEE Computer Society  
Asia/Pacific Office  
Watanabe Bldg., 1-4-2  
Minami-Aoyama  
Minato-ku, Tokyo 107-0062  
JAPAN  
Tel: + 81 3 3408 3118  
Fax: + 81 3 3408 3553  
[tokyo.ofc@computer.org](mailto:tokyo.ofc@computer.org)

*Individual paper REPRINTS may be ordered at: <[reprints@computer.org](mailto:reprints@computer.org)>*

Editorial production by Juan E. Guerrero  
Cover art production by Annie Jiu  
Printed in the United States of America by Applied Digital Imaging



*IEEE Computer Society*  
**Conference Publishing Services (CPS)**

<http://www.computer.org/cps>

# Message from the Conference Chairs

## Culture and Computing 2015

Welcome to the 2015 International Conference on Culture and Computing (Culture and Computing 2015)!

International communities are facing various problems in different topic areas such as: population demographic shifts, energy use and creation, the environment, and food supply. It is necessary to build a global consensus for resolving problems within these topic areas. Unfortunately, there are difficulties that hinder communication among cultures. It is imperative to develop information and communication technologies that encourage mutual understanding and bridge the difference in cultures.

Several research directions impinge on the relations between culture and computing: archiving cultural heritage via ICT (cf. digital archives), empowering humanities researches via ICT (cf. digital humanities), creating art and expressions via ICT (cf. media art), generating culturally-directed behavior (cf. cultural agent), supporting multi-language, multi-cultural societies via ICT (cf. intercultural collaboration), and understanding new cultures born in the Internet and the Web (cf. net culture).

This year, Culture and Computing is held in Kyoto, the cultural heart of Japan, to provide an opportunity to share research issues and discuss the future of culture and computing. The conference proceedings include full papers and short papers for oral presentation, poster papers and demonstration papers. The oral presentation track will present a collection of scientific or engineering research results that include seven regular sessions and one organized session: art and design by information technologies, VR and agents in culture, open data for culture and computing, digital storytelling, culture in social networks, intercultural communication and collaboration, information environments for analysis of culture, and the city's intangible cultural heritage. The poster session and the demonstration session will provide thought-provoking stimulation and discussion. The conference is also organized with an exhibition on the integration of state of the art cultural computing technologies and Japanese traditional culture. We are sure you will find your participation in the conference fruitful and hope that it is enjoyable.

We wish to express our sincere appreciation to everyone who has contributed to Culture and Computing 2015. Our foremost thanks go to the authors of the submitted papers from 22 countries for their valuable ideas and substantial efforts. We are also very grateful for the hard work of the program committee members and external reviewers who have helped to ensure the quality of the Culture and Computing program. Without them, the review process would not have been so thorough and effective. Finally, we wish to thank the IEEE Computer Society Conference Publishing Services for their support in compiling the proceedings.

We hope you enjoy the stimulating Culture and Computing program and your stay in Kyoto!

Toru Ishida, Naoko Tosa, and Kozaburo Hachimura  
*Culture and Computing 2015 General Co-chairs*

Donghui Lin, Akira Maeda, and Matthias Rauterberg  
*Culture and Computing 2015 Program Co-chairs*