

Affective Interaction Design at the End of the World

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We are living in a time of ecological and humanitarian crisis that requires imminent action from the joint fields of HCI and interaction design today. This paper presents Affective Interaction Design as an emerging research agenda directly targeting end-of-world challenges. To arrive at this, the paper proposes a re-thinking of affect in HCI and interaction design based on recent theoretical advances in cultural and critical theory, in particular emphasizing how a broadened understanding of affect is necessary to better address affectively charged and uncertain situations such as those connected to the end of the world. The paper sketches out how Affective Interaction Design combines conceptual guidelines, design methods, a situational ethics and new ways of assessing the value of affective interactions over time. Finally, the paper outlines three end-of-world frames for engaging with concrete affective design experiments – the end of nature, the end of culture and the end of the human – where digital and interactive technologies can be used on a micro-level to catalyze changes in affective attachments on a macro-level.

Maximum 4 keywords; Affective Interaction Design; affect theory; transition design; design theory.

1 Introduction

In the last years it has become increasingly clear that the world is reaching a number of far- from-equilibrium tipping points related to recent developments in major environmental and societal crises facing us. In a very palpable way, we seem to be moving towards the “end of the world”. This image might be most clearly associated with the climate crisis, but is also present in such affectively tensed areas as the ongoing civil wars in Syria and Yemen, the current refugee and immigration crisis, the post-Brexit EU, the right-wing populism sweeping through politics in Europe and the US, a constantly looming terror and, lately, nuclear threat and the pervasive effects of the financial crash in 2008. According to the Belgian philosopher Isabelle Stengers, we are indeed living in ‘catastrophic times’ facing the imminent end of natural resources and a disequilibrium of the ecological and cultural systems with which we are familiar today (2013). In his book from 2010, *Living in the End Times*, Slovenian philosopher Slavoj Žižek identifies four so-called ‘riders of the apocalypse’, namely:



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“(...) the ecological crisis, the consequences of the biogenetic revolution, imbalances with the system itself (problems with intellectual property; forthcoming struggles over raw materials, food and water) and the explosive growth of social divisions and exclusions.” (2010, p. x)

Living at the end of the world means living in times where “choices in the present become highly charged affectively with fear for the uncertain future” (Massumi 2015, p. 4). For many this means coping with a growing urge to change this condition, accompanied by a feeling that it is impossible to find ways to act in the light of the overwhelming complexity presented by these interconnected global, ecological and humanitarian problems (Klein 2014). This is partly due to the difficulty of rationally comprehending the globally interconnected effects of a range of societal and environmental challenges that seem to be overlapping and spilling into each other (Tsing 2015).

Within HCI and design research, a response to this situation might be located in the emergence of Transition Design as an encompassing design-led agenda for engaging with a range of interconnected social, economic, political and natural systems to form more sustainable ways of living (Irwin 2015). Light et al. have also forcefully put forth a call for action under the heading of design for existential crisis in the anthropocene age (2017). The authors argue that technology designers and design researchers have a stake in the production of futures, and are hence implicated in the waves of change and uncertainty in a world characterized by ecological crisis, populism, mass migration, rising refugee numbers, automation and the like. Light et al. frame their project in relation to design as an existential challenge with a range of ethical concerns and the need for new design values to be explored in order to potentially “save humanity”. Within this frame, the authors point towards concrete suggestions for attuning designers’ towards meaning, purpose and fulfilment in difficult, unstable and rapidly changing times. Specifically, they argue that designers should focus on being “attentive, different, critical and in it together” (ibid., p. 6).

This paper extends the general call for action presented above while at the same time situating it in a tangential conceptual and genealogical trajectory presenting an emerging research agenda on Affective Interaction Design for end-of-world challenges. Essentially, the argument presented in this paper is that Affective Interaction Design can offer a research agenda that facilitates a sustained engagement with uncertain and affectively charged design situations at the end of the world. In cultural and critical theory, a large body of work within the so-called ‘Affective Turn’ has been instrumental in theorizing and analyzing situations characterized by uncertainty and trauma in more than a decade (Clough 2007, Gregg & Seigworth 2010). Starting from a basic Spinozan definition of affect as an “ability to affect and be affected” (Spinoza 1678), the paper introduces this affect theoretical genealogy into HCI and interaction design. Affect here is understood as a pre-personal intensity, that influences our bodily, vital forces directly (Massumi 2002). According to Spinoza, positive affects are those that make us feel alive and act in the world. Negative affects have the opposite effect, reducing our possible activity in the world and making this reduction felt. In this conceptual framing, end-of-world contexts would be characterized by negative affect, making it difficult to act or be acted upon. Living at the end of the world – or perceiving to be living at the end of the world – both has an impact on our ability to affect (what can we do?) and our ability to be affected (what matters?).

Based on three concrete affectively charged end-of-world design situations, this paper will show how it might be possible to design affective interactions on a micro-level for positive changes in affective attachments (Bennet 2001) and new possibilities for action on a macro-level. Importantly, though, this is not a trivial process, and often requires painful transitions tied to personal development and negative affects when effectuating this change (Massumi 2015). This means that Affective Interaction Design is not to be understood as an “easy-fix” for making people ‘feel good’ in difficult situations, or as overly relying on the supposed power to design your “way out of trouble”. Instead, this paper provides a call for action for a sustained engagement with affectively charged design situations at the end of the world.

To arrive at a working notion of Affective Interaction Design, the first section will present a new affect theoretical foundation for understanding affective concerns in HCI and interaction design based on recent findings from cultural and critical theory. It will be shown how this conceptual reframing better allows for a designerly engagement with affectively charged situations such as end-of-world contexts. Based on this, a more detailed description of how Affective Interaction Design can be developed as a research agenda comprising conceptual guidelines, methods, situational ethics and longitudinal assessments of affective design experiments leveraging the potential for affective mobilization in existing digital and interactive technologies. Finally, the article frames three concrete design experiments relating to three different “ends of the world”; the end of nature, end of culture and end of the human. This feeds into a general discussion of the Affective Interaction Design research agenda and points in the direction of future work to be pursued under this heading.

2 Rethinking Affect in HCI and Interaction Design at the End of the World

In the past two decades, affect has played a central role in broadening the scope of both the theoretical foundations and practical design implications of interaction design and HCI. Intensive work has been carried out under the heading of Affective Computing in an attempt to make computers better at displaying and recognizing human emotions as a central part of improving the interaction with interactive systems (Picard 1997). Emotional Design (Norman 2004) argues for understanding affective and visceral attachments to product design as a central aspect of a product’s success or failure, much in line with e.g. Jordan’s work on pleasurable object design (2002). However, within HCI and interaction design, Affective Computing and Emotional Design have been criticized for attempting to overly structuralize, formalize, and represent emotions and affect as ‘informational’ (see, e.g., Sengers et al. 2002, Aboulafia and Bannon 2004). A range of researchers have advocated rethinking the ‘informational’ or ‘cognitive’ understanding of affect, arguing that emotions and affect are in the affective interaction between a user and a system, and not to be found in the code or hardware (Boehner et al. 2005, Höök 2008). Recently, Lottridge et al. have defined an ‘*affective interaction*’ as any interaction that is coloured by an emotional experience (2011, p. 201). These ‘interactional’ approaches all emphasize the centrality of affect and emotion to understanding the richness and complexity of human experience and consequently the need to explore this in the design of interactive systems. In this body of work, the aim is less to contain affect than it is to unfold a range of different affective relations to be experimented with in the crafting of interactive system for design values such as self-reflection or ambiguity. Höök has further argued that in addition to the ‘informational’ and ‘interactional’ approaches to affect a third approach exists, where affect more generally falls within an experience-oriented (McCarthy & Wright 2004) approach to HCI and interaction design (2012).

Notable examples within an Affective Computing approach to design include projects on affective learning in how to train autistic children to express and recognize affective states (Blocher & Picard, 2002) and a range of projects aimed at measuring and reducing stress in computer tasks, combining facial readings and physiological data (e.g. McDuff et al., 2016). Recent work includes studies of how emotion tracking through various forms of data logging can promote successful behaviour change through affective forecasting (Hollis et al., 2015) and the design of a context-sensitive smartphone app to naturally embed inspiration to express gratitude in everyday life (Ghandeharioun et al. 2016). Concerning design projects within the ‘interactional’ approach, a prototypical example is the *Influencing Machine* (Sengers et al. 2002), an enigmatic installation where users influence the emotions of an (invisible) artificial agent expressing its emotions through visuals and sound. In line with this, *Affector* is an experiment in the co-interpretation of affect, where a video window between the offices of two friends communicates their moods by systematically distorting the video feed according to sensor readings (Sengers et al. 2008). A more recent example is *AffectAuru*, an emotional prosthetic that allows users to reflect on their emotional states over time, combining a multimodal sensor setup for continuous logging of audio, visual, physiological and contextual data and an interface for user reflection while using the system (McDuff et al., 2012).

Whereas the ‘informational’ approach to affect has rightly been criticized for sometimes reducing the complexity of emotional and affective concerns in HCI and interaction design to make them fit within a computing perspective, the ‘interactional’ approach often leads to designs that attempt to make people reflect on the richness of their own emotional situation, it might be argued that this also reduces affect to an individual’s immediate feeling, and lacks in ambition and scope for unfolding the potential of affective interactions when considering affect as constitutive force for both human experience and larger societal formations. Indeed, the end-of-world challenges that we are facing today point to the necessity to engage with the long-term evolutions of affective relations and attachments while extending the focus of inquiry from the immediate feeling of the interaction towards larger relational issues.

To mobilize a theoretical starting point for Affective Interaction Design that deals directly with these issues, this paper combines the advances in affect theoretical studies in philosophy, aesthetics, cultural and critical theory with interaction design research targeted at crafting interactive and digital technologies. Indeed, the interest in addressing affective guidelines in HCI and interaction design as seen in e.g. *Affective Computing and Emotional Design* should be seen relative to a general acknowledgement over the last decades of articulating and conceptualizing affective and emotional forces as basically constitutive for understanding human experience and development in a number of disciplinary fields (Stern 1985, Damasio 1994, LeDoux 1996, Kahneman 2011, Dolan 2012). In critical and cultural theory, there has been an ‘Affective Turn’ towards research into the impact on a non-cognitive and bio-social level of new media and technologies on our possibilities of experience in a globalized world (Massumi 2002, Sedgwick 2003, Clough 2007, Gregg & Seigworth 2010, Blackmann 2012, Karatzogianni & Kunstman 2012, Hillis et al. 2015). Importantly, this research has emphasized how affect must be understood not only as relating to an individual’s self-relation or assessment of emotions (“how do I feel”), but also as a constitutive force in a range of larger societal formations such as economic markets and stock trade (Massumi 2015), networked and social media (Hillis et al. 2015) and activist politics and Culture Wars (Reestorf 2016). Affective Interaction Design draws on this work and cultivates established philosophical theories of affect (e.g. Spinoza 1678, James 1912, Whitehead 1929, Bergson 1907, Deleuze 1970) that will be applied in order to clarify how these conceptual starting points can lead to new affective concerns in interaction design.

In Affective Interaction Design, affect is conceptualized as a pre-personal intensity that influences our bodily, vital forces directly. This is to be understood as a capacity to act and be acted upon through increase or decrease of e.g. joy, sorrow or desire (Spinoza 1678, Massumi 2002). Affect is neither purely natural/physiological, nor solely cultural. This also means that affect can neither be contained as the properties of a person, nor the properties of a system. Affective experience lies ‘in-between’ and thus brings together the natural and cultural in affective-felt tendencies that modulate the potential for action in a given situation (Massumi 2009). In earlier work, I have explored how this can be used in HCI and interaction design as a way to challenge basic notions of interaction and interactivity in material, processual and experiential terms (Fritsch 2009, Fritsch 2011). Here, the argument presented has been that starting from affective experience entails looking into the very formation of experience; that which *makes us* experience and the forces that modulate this. Importantly, affect differs from emotion, which is understood as recognized affect; affect is pre-personal and non-conscious whereas emotion has individuated to a conscious form. An example is feeling angry; you are already feeling something, before you recognize this feeling as anger. Munezero et al. have presented a framework based on the work of Massumi to better differentiate between affect, feeling, emotion, sentiment and opinion in relation to text detection, arguing that affect is non-conscious and a predecessor to feelings and emotions (2014, p. 104). Further, Massumi has argued that affect works on a microperceptual level with macropolitical consequences (2009).

Starting from an affect theoretical foundation means starting with affect as an in-between dimension of experience that modulates how we experience and the relations and attachments we form. Within the frame of Affective Interaction Design, this allows us to tentatively define affective

interactions as interactions with concrete digital and interactive technologies (on a micro-level) that catalyze new affective attachments and mobilize affect towards end-of-world problems (on a macro-level). End-of-world contexts are characterized by negative affect, making it difficult to act – and inter-act. Affective Interaction Design thus attempts to effectuate changes by altering affective attachments through affective interactions towards positive affects that offer new possibilities for action. Importantly, though, this is not a trivial process, and often requires negative affects as part of the process of change (Massumi 2015).

In addition to the explicitly affect-oriented approaches to design, Affective Interaction Design also draws on a range of findings from a number of design research approaches. The need to engage in critically challenging real-world issues, politics and policymaking through explorations of technology design adheres to longstanding perspective from Participatory Design (Greenbaum & Kyng 1991), Critical Design (Dunne 1999), Adversarial Design (Di Salvo 2012), Design Activism (Markussen 2013) and Transition Design (Irwin 2015). In relation to the proposed design experiments concerned with the climate and cultural crises, Sustainable Interaction Design (SID) serves as a foundational inspiration for exploring “(...) how interactive technologies can be used to promote more sustainable behaviors (Blevins 2007, p. 503). Affective Interaction Design adds to these design explorations an agenda for addressing affect conceptual guidelines, when intervening into design situations at the end of the world. The next section further develops how such an agenda might be comprised.

3 Sketching a Research Agenda for Affective Interaction Design

The societal imperative to find new ways of tackling the transversal nature and complex issues related to end-of-world challenges is coupled with the need presented in this paper to radically broaden the notion of affect in interaction design and develop Affective Interaction Design as a new design research agenda. In the following, the paper sketches out the different aspects of an affective research agenda in HCI and interaction design that fully acknowledges affect as a constitutive force of human experience and larger social and societal formations, such as those presented by end-of-world challenges.

3.1 Conceptual design guidelines and values

The majority of the research on affective design guidelines in HCI and interaction design has been aimed at establishing affect as a concept, which should be considered in the design and evaluation of computers to help people better perform specific tasks (Picard 1997, Norman 2004). Lottridge et al. present a range of guidelines for putting emotion research into practice, such as ‘to enhance performance through emotional input and regulation’, ‘to visualize emotion for decision support’ and ‘to foster the appropriate emotion for different learning goals’ (2012, p. 228f). However, what Affective Interaction Design aims to provide are specific conceptual guidelines for addressing behavioural change by altering affective attachments in relation to emotionally saturated issues such as end-of-world problems, through affective interactions. Developing appropriate affect conceptual guidelines and values to orient the design work in the proposed design experiments is a key activity in this respect. As opposed to design principles, which might be considered clear rules of thumb (Blair-Early & Zender 2008), the main task of these guidelines is to offer to interaction design researcher concepts, directions and themes of engagement that can guide the practical design work without in any way predetermining it. These guidelines will be formulated based on the presented theoretical foundation in the light of end-of-world challenges and refined through practical experiments.

3.2 Developing affective design methods and a situational ethics

It requires great considerations and care to intervene into affectively charged design situations at the end of the world, characterized by uncertainty and vulnerability. There is a substantial amount of literature in HCI and design addressing e.g. designing for vulnerable user groups but no established methods for addressing affective issues in the design process. Among others, Munteanu et al.

describe this situation and call for a need to establish a 'situational ethics' (2015) for intervening into such problematic design settings. The authors argue that a situational ethics is necessary to meet the ethical challenges in field work or design experiments involving at-risk or vulnerable user groups, both in the planning and execution stages of the research (2015). Since Affective Interaction Design deals with concrete affective tensions in cultural, natural and physiological situations of crisis, it will be imperative to consider the ethical challenges for both users and researchers. According to Munteanu et al., a strategy to build a situational ethics requires looking for 'ethical triggers', continuously assessing risks and adjusting protocols accordingly and ensuring a multidisciplinary design team (ibid. p. 113). A situational ethics will also outline viable ways of entering, leaving and sustaining the design initiatives. It will also affect the design methods and techniques occurring at all stages of the design process. Some of these methods will be appropriated in the light of the affective design agenda. In addition, new methods and techniques must be developed to cater specifically for affective data and concerns. Developing an extensive repertoire of affective design methods and a situational ethics is therefore key to guiding the practical design processes related to end-of-world problems.

3.3 Assessing the value of Affective Interaction Design over time

Measurements of affect have a long history of influencing the development of HCI, where extensive research has been carried out to explore methods of assessing affective and emotional features in the evaluation of interactive systems (Lottridge et al. 2011, Pollak et al. 2011). However, this research is primarily concerned with establishing an accurate account of an individual's experience of a given interaction with a computer system and this system's capability to influence affective states and does not engage with the end-of-world issues presented above. There is a need to develop non-reductionist ways of assessing the value of Affective Interaction Design that go beyond the individual's immediate feeling, when interacting with the system, and accentuate long-term affective mobilizations and changes in affective states and relations towards specific societal issues. Therefore, it will be necessary to develop a model for studying affective attachments over time combining longitudinal digital ethnographic studies (Markham 2015) and continuous logging of physiological measurements (Lottridge et al. 2011) for observations on relational changes (macro). This will be combined with qualitative micro-analytical interviews (Stern 2004) and video-cued recall methods (Suchman & Trigg 1991) unfolding the micro observations of the affective qualities of the interactions with the different technologies. The aim is to combine the micro-analytics of the affective interaction with the long-term relational impact on affective attachments to cultivate new design values in an affective perspective.

3.4 New technologies and affective design exemplars

Affective Interaction Design must be established as a form of research-through design (Frayling 1993), where the theoretical mobilization should continuously be informed through a practice-based engagement with building affective design prototypes. It will be necessary to develop a range of affective design exemplars (Binder & Redström 2006), i.e. designs that specifically embody the Affective Interaction Design research agenda. As shown above, prior design experiments engaging with affect include work on the display and measurements of affective states in computer systems for learning and motivation and artistic interventions aimed at making people reflect on their emotions. The existing affective design prototypes within HCI and interaction design present a multifaceted interpretation of affect; from physiological measurements, facial recognition and computers aiming to express emotions to systems that foster affective and emotional reflections. However, there are no prototypes concerning the explicit use of an affective approach to meeting end-of-world challenges. Hence, Affective Interaction Design will develop affective design prototypes that can serve as guidance for future explorations. These prototypes will explore particular technologies believed to hold a potential for changing affective attachments, which will be further explored in the next section.

4 Framing Affective Design Experiments for End-of-world Challenges

This section presents three potential ‘ends of the world’ that can be used to suggest three overall frames for directing affective design experiments within the overall agenda of Affective Interaction Design. Some of the experiments draw on existing explorations, others remain on a more conceptual level, but they are all in-the-making. All three frames attempt to give an indication of how specific technologies can be developed and tested in the design of real-world applicable affective design prototypes proposing to change affective attachments and relations through micro-interactions targeting three end-of-world design situations: the end of nature, the end of culture and the end of the human.

4.1 End of Nature

The end of nature relates to the challenges we face with the current climate crisis. Data from the UN’s *World Meteorological Organization* (WMO) indicate that 2016 was the world’s hottest year ever on record, with devastating consequences for the melting of the Arctic Sea and a growing number of natural disasters worldwide¹. Within the overarching frame of Affective Interaction Design, a starting point for engaging with design experiments related to the end of nature might explore the design of affective interactions for changing habits related to the climate crisis deploying advanced and distributed sensor and actuator technologies. The goal would be to technologically stage affective attachments to issues related to the climate crisis, such as food or product consumption, CO2 emission, carbon footprints, deforestation and other environmental issues. The hypothesis would be that creating a stronger affective link between people and the environment can lead to changes in behaviour and habits. This might be achieved through sensorial augmentation, which refers to an augmentation of the senses, using technological enhancement to detect something that the body cannot normally perceive (Linden et al. 2011). In an earlier project, we have developed Feltradio (Grönvall et al. 2016), which is a portable technology for sensing WiFi through sensorial augmentation and Electric Muscle Stimulation (EMS). In relation to the end of nature, we are currently exploring how to use the same infrastructure to affectively relate to e.g. the level of CO2 emission, so people can actually experience that which they cannot normally sense. This might foster a critical awareness of the relations between people and the natural resources being used and lead to changes in behavior and action. The experiment thus utilizes micro-perceptual triggers (the sensor and actuator technologies) to create a sustained engagement with macro-issues (environmental challenges) through augmentation of big data streams into our affective and embodied experience of the world. This would potentially lead to a better sense of how one’s actions might be connected ecologically to the greater environment, thus creating the foundation for making different choices and facilitating new forms of positive action.

4.2 End of Culture

The end of culture relates to the ongoing Culture Wars (Reestorf 2016), not least in the wake of the current migration and refugee crisis (especially from a European perspective), but also from a result of the geopolitical challenges caused by climate change. The *UN Refugee Agency* (UNHCR) reports that we are witnessing the highest level of displacement of people on record with an unprecedented 65.3 million (21.3 million refugees) people being forced from their homes². In addition to this very concrete end of culture, the increase in right-wing populism in a range of European countries is very much based on the perceived cultural threat posed by the flows of refugees and immigration which to many warrants an end to the culture they are familiar with. From an Affective Interaction Design perspective, one way of engaging with these issues might explore affective design experiments that use location-based and interactive platforms for affectively engaging storytelling to provide spaces

¹ <http://public.wmo.int/en/media/press-release/global-climate-breaks-new-records-january-june-2016>

² <http://www.unhcr.org/figures-at-a-glance.html>

for lasting cultural dialogue around issues of integration. The hypothesis is that it is necessary to initiate an actual dialogue between people to actually create changes in affective attachments towards refugees and migrants, but also to different fractions within native groups in increasingly culturally divided societies. Here, we would follow Guattari's call for individuals to "(...) become both more united and increasingly different (2000/1989, p. 69). Creating conditions for cultural dialogue and differential attunement might be explored through the use of mobile technologies, as a way of collecting and curating people's personal stories and sound in real-time from a range of distributed locations. These might include refugee camps, asylum centers or different residential areas in cities and villages. In the context of this paper, this would be a European country, but the scope is not limited to Europe. Around these sound recordings, spaces will be facilitated where people can listen to and engage with the stories and people behind those stories. These experiments extend an ongoing project with the use of interactive audio design in the creation of an affectively engaging interface for attuning to the differential qualities of people's voices (Fritsch & Jacobsen, 2017). In the overall project frame this experiment stages different encounters between people, stories and voices creating changes in affective attachments towards more positive forms of cultural dialogue.

4.3 End of the Human

The end of the human relates to recent advances in technological implants and the rise of automation and robots replacing human skilled labor. The latter is closely connected to advances in AI and machine learning – e.g. in stock trading – once again challenging notions of intelligence and agency. Important existential questions have re-emerged with new intensity due to a number of advances increasingly challenging and blurring boundaries between humans and technology. The perspective of 'human enhancement', which aims to increase human capacities above normal levels through the use of different kinds of technology (Savulescu and Bostrom 2011), is inextricably tied to discussions of loss of humanity and economic inequality on a global scale. Affective Interaction Design experiments targeting this framing might explore different interfacial engagements and uncertainties connected very concretely with implantable technologies, for instance the Implantable Cardioverter Defibrillator (ICD) pacemaker. In short, an ICD is a device implantable inside the body (the heart) and able to perform cardioversion, defibrillation and pacing of the heart. In addition, the ICD collects and sends data about the patient's heart to the hospital via a router that comes with the device. People get the device implanted through an operation due to severe heart problems, potentially following a heart attack or stroke. This is in itself a life-changing situation characterized by anxiety, affective saturation and uncertainty, often involving a near-death experience. Following this, patients' need to both cope with getting used to living with a life-threatening disease and an implantable technology in their heart. This presents a range of challenges, as explored by e.g. Andersen et al. (2017) who have developed an app that makes the data from the ICD accessible for the patients. An Affective Interaction Design approach would seek to design concrete affective interactions through technologies that might change people's relations to their bodily vulnerability towards more positive affective attachments.

The three frames for affective design experiments presented in this section all concern design situations characterized by affective uncertainty and crisis, where the affective tensions are far more palpable and form part of larger, collective eco-systems of power, politics, technology and resources. They are far-from equilibrium design situations saturated with fear since they very clearly present affective encounters with "difference as alterity – as otherness" as noted by Susan Ruddick (2010). This is most obviously the case for the end of culture and the current refugee and migration crises in Europe, where the feeling of cultural identity and values for many is being questioned in the encounters with refugees and immigrants defined as 'others'. Difference as alterity, however, is also central to understanding design challenges at the end of nature and the human. Concerning the end of nature and the climate crisis, 'the other' can both be used as a way to frame the clash of alternative positions in the climate debate, but also in our lack of establishing a real relation or affective attachment to nature understood as an 'other'. Here, cultivating affective attachments

through sensorial augmentation becomes a way of bridging between culture and nature. Concerning the end of the human, an implantable technology might be immediately understood as an ‘other’ – but the same might be said about the relation to the whole body, which has been altered into something completely different from what you were used to. In direct continuation of this, Massumi reminds us that “(a)ffective politics, understood as aesthetic politics, is dissensual, in the sense that it holds contrasting alternatives together without immediately demanding that one alternative eventuates and the others evaporate. It makes thought-felt different capacities for existence, different life potentials, different forms of life, without immediately imposing a choice between them.” (2009, p. 12). This calls for design experiments that explore “actual differentiation” and conditions of emergence, and do not attempt to impose solutions in advance. This is very much in line with the ideas presented in a Transition Design approach to engaging with “wicked problems” on an ecological, social and societal scale, and in a non-reductionist way (Irwin 2015).

In all of the proposed frames above, affective interactions would attempt to catalyze experiential changes creating more positive affective attachments during the long-term use of the design, leading to new abilities to act. The suggested experiments both highlight how it is possible to define design challenges from an end-of-world perspective, and how it might be possible to engage with these challenges through design from an affective point of view. While this move into concrete contexts and technologies comes with a risk of reducing the overall design agenda, they are necessary to connect the conceptual guidelines with an interventionist design agenda. Importantly, though, it must be stressed that the presented experiments are in no way the only experiments that could be carried out within the presented ends of the world.

5 Discussion

Affective Interaction Design is an emerging research that arguably poses a range of questions and strikes many themes that must be critically discussed both in relation to the framing of end-of-world challenges as well as the overall affective framework. First, it should be noted that the argument put forth in this paper is not that the world is about to end any time soon – statistically speaking it has never been more peaceful, prosperous or connected as it is today (e.g. Pinker 2011) – or that digital technologies can save us or provide sustainable solutions to the multifaceted problems we are facing today. Rather, the argument is for interaction design to develop a serious commitment and engage explicitly with affectively saturated design situations at the end of the world to be able to change the current course towards more sustainable transitions. As has been shown, the ‘ends’ also hold a generative potential, and point to a need for rethinking our existing affective attachments and habits and thus stimulate positive shifts in attitudes and policies that will help us better act in the face of the challenges we are facing.

As emphasized above, this attitude should not be mistaken for a naïve optimism based on a too strong belief in the role of design in making these transitions. There are a number of seemingly insurmountable dilemmas and challenges that characterize an engagement with design situations at the end of the world. And there is a fair chance that processes and proposed designs will fail. This should not, however, prevent the joint fields of HCI and interaction design from engaging with these issues. Affective Interaction Design tries to pose a nuanced approach to thinking interaction design’s role in changing our current conditions for living in the light of the challenges presented at the end of the world. The presented research agenda embodies a commitment for making a difference through a sustained engagement. To achieve this, the agenda must be conceptually founded, bound up with concrete methods and ethics and develop strategies for making sense of the potential impact and value of the different designs in a non-reductionist perspective over time. In addition, it would also be necessary to cultivate Affective Interaction Design into an engagement with broader issues of large-scale policymaking to ensure a continued impact.

Affective Interaction Design does not attempt to ‘annex’ existing design approaches such as Adversarial Design, Transition Design or Sustainable Interaction Design under an affective heading.

These are existing approaches that all deal with pertinent aspects when it comes to developing a critical, reflective and interventionist approach to interaction design in order to engage with some of the most important societal problems we are facing today. Indeed, some of the main values and motives going onto Affective Interaction Design draw on and relates to a range of different design approaches that are not directly affectively motivated. However, the argument presented is that HCI and interaction design can greatly benefit from developing a long-lasting design agenda that explicitly aims to engage with the affective complexity characterizing design situations at the end of the world. As has been shown, in order to do this, it will be necessary to revise the existing definition of affect as it is currently presented in Affective Computing and Emotional Design. Again, it is important to stress that an affect theoretical foundation opens a way of thinking affect as a constitutive force in an experiential, societal and socio-cultural perspective, which goes beyond reflecting on one's own emotions or trying to teach computers to register and express human emotion to smooth out interaction.

A valid point of critique concerning both the overall framework and the presented design experiments would be whether it might not be possible to engage in activities that would contribute even better to a more sustainable future than the examples in this paper. A derived question might be, whether a range of the things you could do would in fact not work better and more sustainably without technology. Here it is important to remember that the outset for the Affective Interaction Design research agenda is to develop a different approach to developing digital and interactive technologies in the light of the challenges presented at the end of the world. This does not mean, however, that a non-technological solution might work better in a concreted design case, e.g. for creating spaces of cultural dialogue and lasting integration. A continuous awareness of the possibilities and limitations of the design agenda should be integral to the situational ethics developed.

6 Conclusion

This paper presents Affective Interaction Design as a new research agenda for engaging with end-of-world contexts and challenges in HCI and interaction design. The agenda introduces an affect theoretical foundation for understanding design contexts characterized by crisis and uncertainty, and comprises conceptual guidelines, methods, a situational ethics, measures for assessing the longitudinal value of affective interactions and novel affective design exemplars. Three frames for design experiments have been proposed targeting affectively charged end-of-world challenges through concrete interactions with different technologies (micro-triggers) that might lead to positive changes in relations and attachments, potentially triggering behavioral changes or changes in habits (macro changes).

In the future, it will be necessary to further cultivate this research agenda to develop be fundamental new insights into design processes concerned with affectively saturated design situations, and strategies for leveraging the affective potential of existing and new digital and interactive technologies. The sheer complexity of the presented affectively saturated design situations at the end of the world and the pervasive and transgressive nature of the challenges they embody, provide a complicated starting point for a necessary engagement with a range of issues. There are no signs that end-of-world challenges will disappear in the coming years, rather on the contrary. In this light, Affective Interaction Design functions as general call for action for HCI and interaction design to rethink existing and explore new ways of thinking and doing design.

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7 References

- Aboulafia, A. and Bannon, L. J. (2005). Understanding Affect in Design: an Outline Conceptual Framework. *Theoretical Issues in Ergonomics Science*, 5(2), 4-15.
- Andersen, T.O., Andersen, P. R. D., Kornum, A. C., Larsen, T. M. (2017). Understanding Patient Experience: A Deployment Study in Cardiac Remote Monitoring. In Proceedings of the *11th EAI International Conference on Pervasive Computing Technologies for Healthcare*.
- Bennet, J. (2001). *The Enchantment of Modern Life: Attachments, Crossings, and Ethics*. Princeton University Press.
- Binder, T. and Redström, J. (2006). Exemplary Design Research. Proceedings of *Design Research Society*, Lisbon.
- Blackman, L. (2012). *Immaterial Bodies: Affect, Embodiment, Mediation*. SAGE Publications Ltd.
- Blari-Early, A. and Zender, M. (2008). User Interface Design Principles for Interaction Design. *Design Issues*, 24 (3), 85-107.
- Blevis, E. (2007). Sustainable Interaction Design: Invention & Disposal, Renewal & Reuse. Proceedings of *CHI'07* (pp. 503-512), ACM, New York.
- Blocher, K. and Picard, R.W. (2002). *Affective Social Quest: Emotion Recognition Therapy for Autistic Children*. Chapter 16 in *Socially Intelligent Agents - Creating Relationships with Computers and Robots*, ed. by K. Dautenhahn, A. Bond, L. Canamero and B. Edmonds, Kluwer Academic Publishers.
- Boehner, K., DePaula, R., Dourish, P., and Sengers, P. (2005). Affect: From Information to Interaction. Proceedings of the *4th Decennial Conference on Critical Computing* (pp. 59-68) ACM, New York.
- Clough, P. T. (ed) (2007). *The Affective Turn: Theorizing the Social*. Duke University Press.
- Damasio, A. R. (1994). *Descartes' Error*. Penguin Books.
- Deleuze, G. (1970/1988). *Spinoza: Practical Philosophy*. San Francisco: City Lights Books.
- DiSalvo, C. (2014). *Adversarial Design*. MIT Press.
- Dolan, P., Hallsworth, M., Halpern, D., King, D., Metcalfe, R., Vlaev, I. (2012). Influencing Behaviour: The Mindspace Way. *Journal of Economic Psychology* 33, 264–277.
- Dunne, A. (1999). *Hertzian Tales: Electronic Products, Aesthetic Experience and Critical Design*. Royal College of Art Research Publications, London.
- Frayling, C. (1993). Research in Art and Design. *Royal College of Art Research Papers*, 1 (1), 1-5.
- Fritsch, J. (2009): Understanding Affective Engagement as a Resource in Interaction Design. Proceedings of *"Engaging Artifacts", Nordic Design Research Conference 2009*.
- Fritsch, J. (2011). Affective Experience as a Theoretical Foundation for Interaction Design. PhD dissertation, Dept. of Information and Media Studies, Aarhus University.
- Fritsch, J. and Jacobsen, M. (2017). The Voice Pump: an Affectively Engaging Interface for changing Attachments. DIS'17, Edinburgh.
- Ghandeharioun, A., Azaria, A., Taylor, S. and Picard, R. W. (2016). "Kind and Grateful": A Context- Sensitive Smartphone App Utilizing Inspirational Content to Promote Gratitude." *Psychology of Well-Being*, 6 (9).
- Greenbaum, J. & Kyng, M. (Eds.) (1991). *Design at Work*. Hillsdale, New Jersey: Laurence Erlbaum Associates.
- Gregg, M. and Seigworth, G. J. (2010). *The Affect Theory Reader*. Duke University Press Books.
- Guattari, F. (2000/1989). *The three Ecologies*. London/New York: Continuum.
- Hillis, K., Paasonen, S., Petit, M., Eds. (2015). *Networked Affect*. MIT Press, Cambridge Massachusetts, London , England.
- Hollis, V., Konrad, A. and Whittaker, S. (2015). "Change of Heart: Emotion Tracking to Promote Behavior Change." Proceedings of *CHI 2015*, ACM, pp. 2643-2652.
- Höök, K. (2008). Affective Loop Experiences – what are they? Proceedings of *PERSUASIVE 2008* (pp. 1- 12).
- Höök, K. (2012). Affective Computing. *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Interaction Design Foundation.
- Irwin, T. (2015). Transition Design: A Proposal for a New Area of Design Practice, Study, and Research. *Design and Culture* 7(2), 229-46 .
- James, W. (1912/2008). *Essays in Radical Empiricism*, New York: Cosimo Inc.
- Jordan, P. (2002). *Designing Pleasurable Products: An Introduction to the New Human Factors*. Taylor & Francis, London and New York.
- Karatzogianni, A. and Kunstman, A. (Eds.) (2012). *Digital Cultures and the Politics of Emotion: Feelings, Affect and Technological Change*. Palgrave Macmillan
- Kahnemann, D. (2011). *Thinking Fast and Slow*. Penguin Books.

- Kensing, F. & Blomberg, J. (1998). Participatory Issues and Concerns. In *Journal of Computer Supported Cooperative Work (CSCW)*, 7(3), 167-185, Springer Verlag,
- Klein, N. (2014). *This Changes Everything: Capitalism vs. the Climate*. Penguin.
- LeDoux J. E. (1996). *The Emotional Brain*. New York: Simon and Schuster.
- Lottridge, D., Chignell, M. and Jovicic, A. (2011). Affective Interaction: Understanding, Evaluating, and Designing for Human Emotion. *Reviews of Human Factors and Ergonomics*, Vol. 7, 2011, pp. 197–237.
- Light, A. Powell, A., Shklovski, I. (2017). Design for Existential Crisis in the Anthropocene Age. In *Proceedings of the 8th International Conference on Communities and Technologies (C&T '17)*, 9 pages. DOI: 10.1145/3083671.3083688
- Markham, A. N. (2016). Ethnography in the Digital Era: From Fields to Flow, Descriptions to Interventions. In Denzin, N., & Lincoln, Y. (Eds.). *The Sage Handbook of Qualitative Research*, 5th Edition. Thousand Oaks, CA: Sage.
- Markussen, T. (2013). The Disruptive Aesthetics of Design Activism: Enacting Design between Art and Politics. *Design Issues*, 29(1), 38-50, MIT Press Journals.
- Massumi, Brian, 2002, *Parables for the Virtual: Movement, Affect, Sensation*. Duke University Press.
- Massumi, B. (2009). On Microperception and Micropolitics. *Inflexions: A Journal for Research-creation*, vol. 3., September 2009.
- Massumi, B. (2015). *The Power at the End of the Economy*. Duke University Press.
- McCarthy, J. and Wright, P. (2004). *Technology as Experience*. MIT Press, Cambridge.
- McDuff, D., Karlson, A., Kapoor, A., Roseway, A., Czerwinski, M. (2012). AffectAuru: an Intelligent System for Emotional Memory. *Proceedings of CHI'12* (pp. 849-858), ACM, New York.
- McDuff, D. J., Hernandez, J., Gontarek, S., Picard, R. W. (2016). COGCAM: Contact-free Measurement of Cognitive Stress During Computer Tasks with a Digital Camera. *Proceedings of CHI'16* (pp. 4000-4004), ACM, New York.
- Munezero, M., Montero, C. S., Sutinen, E. and Pajunen, J. (2014). Are They Different? Affect, Feeling, Emotion, Sentiment, and Opinion Detection in Text. *IEEE Transactions on Affective Computing*, 5(2), pp. 101-111.
- Munteanu, C., Molyneaux, H., Moncur, W., Romero, M., O'Donnel, S., Vines, J. (2015). Situational Ethics: Re-thinking Approaches to Formal Ethics Requirements for Human-Computer Interaction. In *Proceedings of CHI'15*(pp. 105-114), ACM, New York,.
- Norman, Donald A., 2004, *Emotional Design*, Basic Books, New York.
- Picard, R.W. (1997). *Affective Computing*. MIT Press, Cambridge.
- Pollak, J. P., Adams, P. and Gay, G. (2011). PAM: A Photographic Affect Meter for Frequent, In Situ Measurement of Affect. *Proceedings of CHI'11* (pp. 725-734), ACM, New York.
- Pinker, S. (2011). *The better Angels of Our Nature: Why Violence has Declined*. Viking Books.
- Reestorff, C. (2016). *Culture War: Affective Cultural Politics, Tepid Nationalism and Artivism*. Intellect Press, London & Chicago.
- Ruddick, S. (2010). The Politics of Affect. Spinoza in the Work of Negri and Deleuze. *Theory, Culture & Society*, 27 (4), SAGE, 21-45.
- Savulescu, J. and Bostrom, N. Eds. (2011). *Human Enhancement*. Oxford University Press, U.S.A.
- Sedgwick, E. K. (2003). *Touching Feeling: Affect, Pedagogy, Performativity*. Duke University Press.
- Sengers, P., Liesendahl, R., Magar, W., Seibert, C., Müller, B., Joachims, T., Geng, W., Mårtensson, P. and Höök, K. (2002). The Enigmatics of Affect. *Proceeding of DIS2002* (pp. 87-98), London.
- Sengers, P., Bohner, K., Mateas, M. and Gay, G. (2008). The Disenchantment of Affect. *Journal of Personal and Ubiquitous Computing*, 12(5), 347-358, Springer Verlag.
- Spinoza, B. (1678/1957). *Ethics*. New York: Citadel Press.
- Stengers, I. (2009/2013). *In Catastrophic Times: Resisting the Coming Barbarism*. Open Humanities Press.
- Stern, D. (1985). *The Interpersonal World of the Infant*. New York, Basic Books.
- Stern, D. (2004). *The Present Moment in Psychotherapy and Everyday Life*. W. W. Norton & Company.
- Suchman, L. A. and Trigg, R. H. (1991). Understanding Practice: Video as a Medium for Reflection and Design. In *Design at Work: Cooperative Design for Computer Systems*, J. Greenbaum, M. Kyng (Eds). New Jersey: Lawrence Erlbaum Associates, pp. 65-89.
- Tsing, A. (2015). *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton University Press
- Whitehead, A. N., (1929/1979). *Process and Reality: An Essay in Cosmology*, Columbus: The Columbus Free Press.
- Žižek, S. (2010). *Living in the End Times*. Verso Books.

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