Celebration of Finitude as a Post-Industrial Aesthetics of Interaction

Ylva Fernaeus
KTH/Umeå Institute of Design
Sweden
fernaeus@kth.se

Andreas Lindegren
KTH Royal Institute of Technology
Sweden
alindeg@kth.se

ABSTRACT

This paper elaborates on design visions for computing, by attending to the values expressed in ideals around post-industrial ways of living. Such ideals highlight finitude not only as a challenge to overcome, but as an aesthetic quality, captured by notions of preciousness. We discuss three themes: to embrace possibilities within limits, to resist fantasies of unlimited power, and welcoming complexity as an inherent feature of the living.

CCS CONCEPTS

KEYWORDS

ACM proceedings, text tagging

1 INTRODUCTION

Within the fields of computing, the shared vision of the so-called "future" has relatively recently gone through a major shift in terms of aesthetic and experiential qualities. An example is the much criticised vision of future work that Microsoft released in 2009 [31]. Since then, future visions have been on a steady move away from space-age techno-minimalism, which dominated nearly all future visions of the 20th century, and we are now increasingly exposed to worlds loaded with organic materials, green living spaces, and eco-friendly energy systems (see e.g. Microsoft's corresponding vision from 2015 [32]). Other examples include the rise of research projects concerned with computing in support of e.g. urban farming, local sharing, designs that incorporate bio-materials, theories of permaculture and energy-aware computing [e.g. 1, 5, 45].

LIMITS '23, June 14–15, 2023,

The same trend can be seen reflected more broadly also in art and science fiction [e.g. 36, 47]. At a very aesthetic level, the apparent "coolness" (or coldness) so characteristic of futuristic designs of the modern era, is now increasingly replaced by a vibe of warm and down-to-earthy "cosiness". How might this relate to and resonate with ideals around computing within limits?

This paper reflects on the new hopeful visions, and how they relate to concerns of finitude in the design of interactive systems.

Needless to say, historical visions have had great influence on the field of interactive technology. Well-known examples include Vannevar Bush's envisioning of the information society from 1945 [8], Kay and Goldbergs presentation of the Dynabook in 1977 [26], and Weiser's concept of Ubiquitous computing in 1991 [44]. While it is true that in hindsight these visions can be seen as much as *"meditations on their presents"* [e.g. 3] as "predictions", these examples still worked as powerful drivers for the upcoming development of computing technology. Here, to tie this theme to the context of "Computing within limits" we will revisit another influential vision from the past, namely Katherine Hayles' *"How we became posthuman"*, from 1999 [21], in which she stated:

> *".. my dream is a version of the posthuman that embraces the possibilities of information technologies without being seduced by fantasies of unlimited power and disembodied immortality, that recognizes and celebrates finitude as a condition of human being, and that understands human life is embedded in a material world of great complexity, one on which we depend for our continued survival." [21, p. 5]*

Importantly, like the other influential visions in computing, Hayles' reasoning was grounded in deep understandings of empirical research around cutting edge technology of its time. Hayles' notion of the posthuman came to synthesise some of the core insights made in the research fields of cybernetics, robotics and AI, and its philosophical

implications. A core theme was the idea that intelligence, rather than residing inside people or machines, had to become understood as distributed, occurring in the world as bodies, machines, and the environment interact [34, 38, 25]. These discoveries formed an empirically grounded counter-reaction to the disembodied ideals expressed in science fiction at the time, pinpointing some of the then-contemporary themes for the development of HCI and computing.

By revisiting the above quote, this exploratory essay focuses specifically on what might be meant by "celebrating finitude" as a strategy for the design of interactive technology and its potential implications in terms of the user experiences strived for. We do this by elaborating on three themes in the above quote: 1) Embracing possibilities within limits, 2) resisting fantasies of unlimited power, and 3) understanding the fundamental complexity of the living. By grounding the essay in notions of post-industrial design, we aim to bring to discussion not only the pragmatic, technical or functional, but also the aesthetic or cultural dimension of such a re-orientation.

2 BACKGROUND

Today's economic, political, and environmental instability can be argued as largely rooted in the industrial ideals of mass consumption, which have been fundamentally developed and maintained through design. This applies not least to the short-termism, or presentism, that prevails in the design of interaction- and information technology. In order to develop more sustainable ways of living, essential changes from within and around the design disciplines are necessary [40].

As in all fields of design, the design of computers and computer systems is fundamentally shaped by the era of Bauhaus. On its surface, this is reflected in design principles grounded in notions of 'scientifically' (rather than culturally) grounded ideals, as reflected in e.g. a general aversion towards organic shapes, ornamentation, and colour [e.g. 2, 4]. On a more profound level, the principles of Bauhaus are evident in the very project of mass-consumerism, capitalistic imperialism, and a self image as disconnected from the natural world.

Already in 1981, design theorist Nigel Cross [10] introduced the concept of Post-Industrial Design, arguing that the Modern Movement approach to design was outdated. Cross described how a new movement had emerged in the mid-1970s, aiming towards a *"sane, humane, ecological (SHE) vision"* instead of the previous *"hyper expansionist (HE) vision"* of a future society. This approach would focus on sustainability, resource conservation, quality, and promoting social and economic reorganisation in small-scale units. Today, these ideals of post-industrial design, and what they might imply, appear more relevant than ever.

The post-industrial design ideal that we see being sketched out in contemporary culture draws fundamentally on the Arts and Crafts movement, which since more than a century has represented an ongoing cultural resistance to the industrial design project, as it developed and evolved since the late 18oo's. Central to this movement is an appreciation of traditional crafts as *precious*, compared to industrial manufacturing and labour [42]. Along with mass production, professional crafts were largely eradicated, and instead traditional crafting became gradually understood as a hobby, historical interest, or as a playful activity for children. However in recent years the notion of crafting has been re-popularised in contemporary culture, as can be observed on the contemporary art scene [24, 6], as well as in subcultures [37], the so-called "maker movement" [13], and interests in local-, environmental- and socially just production [38]. In the design of interactive technology, this is reflected primarily in projects related to hybrid crafting, but also in online platforms such as Etsy and Instructables. The above development has been linked to the above mentioned theoretical turn to new materialism in HCI, but also has obvious and close ties to the domain of sustainable HCI and computing within limits.

Several scholars have sought to imagine interactive technology that moves along with this perspective, especially in the context of sustainable computing [e.g. 7, 11, 9]. More speculative examples include "Eternally Yours" [43], "Technology Heirlooms" [27], "Gaian IxD" [28], "Interaction Design Otherwise" [19; 12; 23], and a large number of researchers exploring designs that explicitly engage with more-than-human assemblages, or other-than-human entanglements [e.g. 44]. Laurel's Gaian IxD expressed an ideal that design work should be grounded in an awareness that we belong to the biosphere, and in which *"Technology is not the other"* and *"Nature is not the other"* [28]. The similar notion of Gaia 2.0, as introduced by Lenton and Latour [29], highlights how, rather than relationships between specific organisms, the ambition should be to maintain a *"planetary-scale self-regulating system"*.

Information technology is often regarded as a fundamental part of the "post-industrial" era, and most interactive solutions are indeed more about service than production of goods (although it is rare for production to take place without use of computer systems). Yet, the IT-intense, so-called post-industrial society, still consumes more energy and other material resources than any other

Figure 1: Preliminary imaginings of practices, use-settings, artefacts: A smart-speaker, commuting merged with urban farming, guided repair, checking the weather, making energy (all images generated by first author using Open AI's Dall-e).

civilization. The dominant perspective of interaction design continues to rely on a lifestyle that presumes access to abundant and inexpensive resources (e.g. electricity), along with an unceasing pursuit of the latest. As these assumptions become less feasible, it is essential for new perspectives to emerge. As phrased by Arturo Escobar [15], we need "a significant reorientation of design from the functionalist, rationalistic, and industrial traditions from which it emerged, and within which it still functions at ease, towards a type of rationality and set of practices attuned to the relational" (p 42). In 2008, we identified four shifts from modernist ideals in interaction design, bringing design values towards the pragmatic, material, social, and subjective [18]. This paper follows directly on these works, by more explicitly focusing on aesthetic orientations towards finitude.

Aesthetically, the contemporary visions of Solarpunk imagines a warm and hopeful, sustainable future [36, 47]. Importantly, the "solar-" represents positive energy on a metaphorical level, but also renewable energy sources very concretely, which from a computing point of view relates to research that highlights energy use as a fundamental aspect of interactive systems, and more fundamentally to new materialism as it has been taken up in interaction design [46, 14, 17]. The '-punk' in solarpunk is used as an aesthetic style with elements of rebellion, improvisation, and patchwork, in the same sense as in cyberpunk and steampunk [38]. Solarpunk here differs through its vivid, flourishing and daylit character. Solar panels, windmills, bicycles, and other sustainable technologies are common elements, but the role of interactive media in these futures is rarely depicted.

In this paper we discuss aesthetics as used in contemporary interaction design, with attention to concepts such as user experience and somaesthetics. While aesthetics is sometimes implied to be insignificant, e.g. an arbitrary choice of color or materials, every interaction is mediated through digital and physical materials, fundamentally shaped by as well as shaping cultural contexts. Thus aesthetics is an embedded quality of our life world and the futures we hope for.

3 CELEBRATING FINITUDE

Below we highlight and discuss three themes originally raised by Katerine Hayles [21]: 1) Embracing possibilities within limits, 2) Resisting fantasies of unlimited power, and 3) Understanding the complexities of the living.

3.1 Embracing Possibilities Within Limits

The notions of finitude expressed by Hayles [21] resonate strongly with the philosophy of wabi-sabi, which has been highly influential as a materially-grounded and crafts-oriented design style, but also as conceptually relevant to computing contexts [42]. By articulating the realities of the world as "nothing lasts, notion is finished and nothing is perfect", Wabi-Sabi has relevance in particular to computing within limits.

Tsaknaki et al. [42] propose that we need to embrace the limitations of current technology in order to fully explore its potential. This idea relates to the concept of bricolage, in which available materials, tools, and resources are used in a creative dialogue to achieve a desired outcome [43]. Interaction design relies heavily on technological advancements and computational materials, such as circuit boards, software systems, and peripherals and therefore, a working knowledge of these technologies and their expressions is essential to create successful user experiences. For example, recent advancements in human-powered interactions demonstrated the value of engaging with functional demonstrators, rather than relying solely on speculation. Acknowledging the limitations of current technology also fosters a sense of honesty in design, recognizing that artifacts will break and may need updates. This perspective may seem pessimistic, but it is argued to be the only way to create fully convincing and lasting designs. It is simply a mistake to assume that hardware platforms, electricity, storage space, or connectivity would always be available (or increase), or that established "standards" are permanent.

Life itself is impermanent, and bodies are changing throughout life. In computing, impermanence is evident in the decay and fragility of physical materials, as well as in software built on unreliable foundations. We all experience

full disk space, declining battery life, broken screens, and malfunctioning hardware. It's important to recognize the impermanent nature of interactive systems both to prepare them for lasting use and that systems communicate the same. Durability notwithstanding, designs that prioritise permanent assembly or software locked for modification will still become useless as the surrounding world changes.

Our culture has clearly idealised new, and therefore short lived, products. However, the revived interest in material practice seems to open for a shift towards *lasting design* by allowing for repair, upcycling, repurposing and recycling. It may seem contradictory, but utilising impermanent materials and media in resourceful ways could be the most reliable way to enhance the longevity of interactive systems. For example, Bell et. al. [5] suggest growing interactive designs using biomaterials and recovering internal precious metals and components before composting the design. While that might seem an extreme direction, alternatives to the current and harmful industrial design project, which instead explores possibilities within limits, are both possible and have always existed alongside mass consumption. Embracing the values of these practices, we are led towards designs that build on and emphasise material craftsmanship, both in the design of the systems, but also in practices of maintenance, repair, upgrading or recycling of these designs. Figure 1 depicts a series of preliminary imaginings, with each image attempting to capture aspects of these ideals of tightly coupling technology to the limits and reality of the material world.

3.2 Resisting Fantasies Of Unlimited Power

Hayles [21] highlighted the need to resist fantasies of unlimited power, and the risks associated with a view of computing as disconnected from the material world.

Computer systems are fundamentally driven by electrical power to function, and the design of computer systems can be claimed to fundamentally be about the shaping of electrical currents. The enormous amounts of electricity required for e.g. data storage, online media streaming, spam emails, mining of crypto currencies, and training of machine learning algorithms is also a concern regularly brought up in everyday discussions around the ongoing global climate crisis. This information is however fundamentally contradicted with services accounting for such material over-use, e.g. chat GPT and advertisement financed social media, being used essentially free of charge.

A line of work that aims to address this theme is self-sustainable interactions, e.g. battery-free systems running on microcontrollers driven by human muscle power [e.g 30], or solar-driven websites [e.g. 1]. Another example is how the concept of the cloud on the one hand might appear to promise free, unlimited, and permanent storage, but in reality cost enormous resources to maintain. This failed promise has inspired designs that value temporality, from commercial successes like Snapchat, to a range of research explorations [42].

These insights point to an aesthetic orientation towards new ways of thinking about energy in interactive systems, in which every bit of data or processing power might be considered precious. Rather than everything relying on batteries or a stable supply of electricity, systems need to function also with alternative energy sources and new bodily practices of use. Instead of walking or driving to a store to purchase batteries, the interaction could include the user powering the system, aesthetically making the energy use transparent.

Instead of the friction-free vision of ubiquitous computing, which is often reiterated in internet of things innovation business of new gadgets, as well as in the first microsoft video, and in the cyberpunk discourse of materially detached and body-less intelligence, the truly post-industrial vision instead romanticises manual labour, which is perhaps most clearly reflected in the tastes expressed within contemporary hipster culture. Likewise, the recent hype of crafting in contemporary art, as well as the solarpunk worlds, all appear to value the felt experience of being actively engaged, of developing skills, of not just passively receiving the ready-made. This material grounding can also be interpreted as a pragmatic direction, distrusting a discourse of computing that circulates around fantasies of unlimited power.

3.3 The Complexities Of The Living

Understanding computer systems as residing within the biosphere, rather than in a kind of digital void, was a fundamental part of the vision outlined by Katherine Hayles [21]. Importantly, these complexities not only concern the material and computational aspects of technology, but also the social and material (eco)systems they affect. Complexity is here not to be seen as a hurdle to overcome or to 'designed away' from reality. Rather, it is a beautiful feature of all natural (as well as the artificial) worlds, which could and should be embraced.

For instance, rather than 'human-computer interaction' being simplified into a case of one system-one user, the real-world situation of any interactive system is a "fluid assemblage", as expressed by Redström and Wiltse [35]. Any design challenge within this mesh concerns considerations of several systems, several people, multiple contexts, and a world in constant change. Importantly, this mesh also includes the low-tech, the world outside of

computers, and nature itself. Thus it is fundamental to understand *"the material world as being of great complexity, one on which we depend on for our continued survival",* and how computer systems concretely and materially affect and play into this reality.

A well-known strategy to address the complexities of unknown and changing future use settings is to design openings for improvements and adaptations for different contexts and purposes. This approach contrasts with the ideals of mass-production, aiming to create a large number of identical products, and also products that are difficult to repair or adapt. Instead, the 'imperfect' shapes of organic materials and handcrafted objects, can be celebrated for their uniqueness. This may encourage designers to acknowledge and account for potential redesigns and evolutions over time, recognizing that systems (all systems) must be prepared for continued change and transformation. This aligns with current strategies of customization and tailorability in software, serving as a way of future-proofing, enabling backwards as well as forward-compatible designs, which in turn opens up for more long-term, sustainable interactions. Moreover, a modern and simple aesthetic may also present a mismatch in relation to the complexities and preciousness of embedded components and resources.

Importantly, addressing such complexity relies not only on the designer's intentions and abilities, but also on available tools and cultural and historical contexts. While minimalism might still be a powerful strategy in design, we may need to acknowledge the world as more complex than the proponents of the modernist design ideals tended to hope. This thereby embraces and celebrates the limits of the industrial project as such, requiring designs beyond simplification and quick fixes, towards careful attention to the richness of real world experience.

In a world on the verge of collapse, the aesthetics of cyberpunk suddenly appears not only old-fashioned (in contrast to futuristic) but also brutally tasteless. Even ignoring the orientalism and xenophobia embedded in the genre, what was originally "punk", the strife of people trying to survive at the bottom of society, became commoditized and sold as a legit vision of the future (see e.g. the aesthetic style of Microsoft first vision video). Cyberpunk was thus a capitalist dystopia but became rebranded as utopia and then declared almost inevitable. But instead of neon lights and lifeless sleek glass and steel aesthetics, we now look forward to shared gardens, crafted woodwork, cosy sofas (just as depicted in Microsoft's follow-up vision video). This new aesthetic direction obviously spills over also to the design of interactive systems and experiences. In contemporary interaction design this might be reflected primarily on a surface level, e.g. using natural materials like wood or colourful screen displays, but also in niche projects concerned with nature, gardening, and material care. On a deeper level, this aesthetic ideal would be reflected in ethically and sustainably developed systems, and designs that dare to address truly long-term perspectives of use.

CONCLUSION

We have discussed what might be meant by celebration of finitude as an emerging aesthetic direction within the design of computer systems, by revisiting notions of postindustrial design along with notions of finitude in posthuman HCI [21]. The first theme, to embrace possibilities within limits, highlights alternative aesthetic values in terms of design practice and material features of designed systems and artefacts. Rather than the innovation frenzy and rapid release mentality that until now has characterised much of the computing discourse, this might suggest a shift towards caring for materials and people, in crafting practices and in long-term maintenance. Secondly, resisting fantasies of unlimited power highlights alternative experiential qualities in terms of interaction and use, in which the scarcity of electrical energy might be treated as the precious material it is, rather than something 'cheap'. Finally, by acknowledging the complexities of the living, we highlight a broadened conception of computing systems as parts of the social and material contexts in which they operate, on local as well as global scales, in physical spaces and in history. By highlighting these themes as aesthetic orientations, we argue that a shift towards a post-industrial culture within computing is more fundamental than mere policies or technical strategies. Put simply, the *aesthetics* of post-industrial interaction design is playing within a broader culture which recognizes, embraces, and ultimately *celebrates finitude as a condition of human being.*

ACKNOWLEDGEMENT

The writing was funded by a generous grant from the Swedish Research Council, project no: 2019-04826.

REFERENCES

1. Abbing, R. (2021). 'This is a solar-powered website, which means it sometimes goes offline': a design inquiry into degrowth and ICT. In LIMITS'21.
2. Alexander, C. (1979). The timeless way of building (Vol. 1). New york: Oxford university press.
3. Attali, J. 2009, A Brief History of the Future. Allen & Unwin, Sydney.
4. Batchelor, D. (2000). Chromophobia. Reaktion books.
5. Bell, F., Chow, D., Choi, H., & Alistar, M. (2023). SCOBY Breastplate: Slowly Growing a Microbial Interface. In Proc TEI'23 (pp. 1-15).

6. Black, A., & Burisch, N. (Eds.). (2020). The New Politics of the Handmade: Craft, Art and Design. Bloomsbury Publishing.
7. Blevis, E. (2007). Sustainable Interaction Design. Proc. CHI '07. ACM.
8. Bush, V. (1945). As we may think. The atlantic monthly, 176(1), 101-108.
9. Chen, J. (2016). A strategy for limits-aware computing. In Proceedings of the Second Workshop on Computing Within Limits (pp. 1-6).
10. Cross, N. (1981). The coming of post-industrial design. Design Studies, 2(1), 3-7.
11. DiSalvo, C., Sengers, P., & Brynjarsdóttir, H. (2010). Mapping the landscape of sustainable HCI. Proc. CHI '10. ACM.
12. DiSalvo, C. (2022). Design as democratic inquiry: putting experimental civics into practice. MIT Press.
13. Dougherty, D. (2012). The maker movement. Innovations: Technology, governance, globalization, 7(3), 11-14.
14. Dourish, P. (2022). The stuff of bits: An essay on the materialities of information. MIT Press.
15. Escobar, A. 2018. Designs for the Pluriverse: Radical Interdependence, Autonomy and the Making of Worlds. Durham and London: Duke University Press.
16. Fernaeus, Y., Jonsson, M., & Tholander, J. (2012). Revisiting the jacquard loom: threads of history and current patterns in HCI. In Proc. CHI '12. ACM.
17. Fernaeus, Y. and Sundström, P. 2012. The material move how materials matter in interaction design research. In Proc. DIS '12. ACM, New York, NY, USA, 486-495.
18. Fernaeus, Y., Tholander, J., Jonsson, M. (2008). Towards a New Set of Ideals: Consequences of the Practice Turn in Tangible Interaction. In Proc. TEI '08. ACM
19. Garcia, M. (2007). Otherwise engaged: new projects in interactive design. Architectural Design, 77(4), 44-53.
20. Gaver, W. (2012). What should we expect from research through design?. In Proc. CHI '12. ACM.
21. Hayles, N. K. (1999). How we became posthuman: Virtual bodies in cybernetics, literature, and informatics. The University of Chicago Press Chicago Ltd., London
22. Helms, K., & Fernaeus, Y. (2021). Troubling Care: Four Orientations for Wickedness in Design. In Designing Interactive Systems Conference 2021 (pp. 789-801).
23. Helms, K. (2023). Designing with care: Self-centered research for interaction design otherwise (Doctoral dissertation, KTH Royal Institute of Technology).
24. Hung, S., & Magliaro, J. (2007). By hand: The use of craft in contemporary art. Princeton Architectural Press.
25. Hutchins, E. (1995). Cognition in the Wild. MIT press.
26. Kay, A., & Goldberg, A. (1977). Personal dynamic media. Computer, 10(3), 31-41.
27. Kirk, D., & Banks, R. (2008). On the design of technology heirlooms. Proc. SIMTech '08.
28. Laurel, B. (2011). Gaian IxD. Interactions, 18(5), 38-46.
29. Lenton, T. M., & Latour, B. (2018). Gaia 2.0. Science, 361(6407), 1066-1068.
30. Lundström, A., & Fernaeus, Y. (2022). Making Crank-Powered Interactions: Methods, Demonstrators, Materials. In Proc. DIS'22 (pp. 913-924).
31. Microsoft (2009), Microsoft Future Vision of work https://www.youtube.com/watch?v=cEeht3nyhec
32. Microsoft (2015), Microsoft Future Vision of work, https://www.youtube.com/watch?v=w-tFdreZB94
33. Poikolainen Rosén, A., Normark, M., & Wiberg, M. (2022). Towards more-than-human-centred design: Learning from gardening. International Journal of Design.
34. Pfeifer, R., & Bongard, J. (2006). How the body shapes the way we think: a new view of intelligence. MIT press.
35. Redström, J., & Wiltse, H. (2018). Changing things: The future of objects in a digital world. Bloomsbury Publishing.
36. Reina-Rozo, J. D. (2021). Art, Energy and Technology: the Solarpunk Movement. International Journal of Engineering, Social Justice, and Peace, 8(1), 47-60.
37. Scott, M. (2017). 'Hipster capitalism' in the age of austerity? Polanyi meets Bourdieu's new petite bourgeoisie. Cultural Sociology, 11(1), 60-76.
38. Sesini, G., Castiglioni, C., & Lozza, E. (2020). New trends and patterns in sustainable consumption: A systematic review and research agenda. Sustainability, 12(15), 5935.
39. Suchman, L. A. (1987). Plans and situated actions: The problem of human-machine communication. Cambridge university press.
40. Tanenbaum, T. J., Tanenbaum, K., & Wakkary, R. (2012, May). Steampunk as design fiction. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 1583-1592).
41. Tonkinwise, C. (2014). Design away. Design as Future-Making, Barbara Adams and Susan Yelavich (eds.). Bloomsbury Academic, London and New York, 198-213.
42. Tsaknaki, V., & Fernaeus, Y. (2016). Expanding on Wabi-Sabi as a design resource in HCI. In Proc. CHI '16. ACM.
43. Vallgårda, A., & Fernaeus, Y. (2015). Interaction design as a bricolage practice. In Proc TEI'15 (pp. 173-180).
44. Verbeek, P. P., & Kockelkoren, P. (1998). The things that matter. Design Issues, 14(3), 28-42.
45. Wakkary, R. (2021). Things we could design: For more than human-centered worlds. MIT press.
46. Weiser, M. (1991). The Computer for the 21 st Century. Scientific american, 265(3), 94-105.
47. Wiberg, M. (2016). Interaction, new materials & computing – Beyond the disappearing computer, towards material interactions. Materials & design, 90, 1200-1206.
48. Williams, R. (2019). 'This Shining Confluence of Magic and Technology': solarpunk, energy imaginaries, and the infrastructures of solarity. Open Library of Humanities, 5(1).