Digital Crafts-machine-ship: Creative Collaborations with Machines

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Insights

- Learning a craft is to become undone in our relation to both the machine and the material.
- Crafts-machine-ship is the attempt to share our autonomy with the machine.
- The desire for such collaborations is driving our demand for different outcomes.

> *More than intangible material, than tones or words, tangible material can teach that it has demands of its own and suggestions of its own for its forming, that it asks for a reaction. Creating means this reacting to material rather than the execution of a dream, as the layman conceives it. The first vision of something to be done gives more the mood of the work than its final form. The form emerges as the work progresses.*
>
> —Anni Albers [1]

The weaver sits at the loom, moving with the rhythm of the shuttle, quietly counting or cursing, as row by row of lines of interconnected fiber is added into a set of raised and lowered threads. The threads are raised and lowered in different configurations for each flight of the shuttle, adding to the material line by line. A screen, a paper, a punch card holds the abstract of the pattern, but this is only a part of it. The emergent pattern is embodied in the weaver, their movements and rhythms entangled with the blue shuttle, gray shuttle, right-hand flight, left-hand reed, weft and warp, threads and yarns, that together form the double weave, the actual pattern—what is made, what is newly materialized from this hybrid arrangement.

WEAVING SAMPLES MADE BY ANK HAZELHOFF AND PHOTOGRAPHED BY DAN BUZZO

The loom is an early machine, a distinctly human construction; it is seen to be the start of automation and industrialization, seen to replace human hands with abstractions and mechanical movements. But as we know from Haraway, Latour, or Ihde, the weaver is still very much there, whether in cyborgian form or as a human in the assemblage. This machine is an intersection of the digital and non-digital; human flesh, movement, thoughts, and desires that together always produce a materially new thing, which then changes what was there before. The loom-weaver machine has a before and after: Material is added and the outcome has new qualities that transform everything. In this way, the abstractions of the machine melt away. To the weaver, the yarn is not an idea or a metaphor; it is present in its materiality; it has strength and fragility, length and friction. The yarn meets the pattern, the weft meets the warp, the human meets the nonhuman, and together structures are formed.

> ***The machine is not an it to be animated, worshiped and dominated. The machine is us, our processes, an aspect of our embodiment.***
>
> **—Donna Haraway [2]**

For now, let us consider *machine* as a name for any human construction, from the physical to the immaterial. The machine is a contraption; it entangles and incorporates us. As a contraption that we can become a part of, it invites us to express ourselves in different ways; it allows for emergence and the making of new things. The machine is a construction that holds the mechanics to effect change. Something is added, something is removed. Wheels whirr and squeak. Weavers whisper the numbers of repetitions: "1, 3, 2, 4..."

> ***Pattern can make sense—but not meaning.***
>
> **—Janis Jefferies [3]**

What we call machines may be as concrete as those in industrial production or as immaterial as ideas of form, structure, and pattern that have no location at all. Both kinds, through deeply entangled and woven collaborations with us, work to construct the computer in front of you, your desk, and the cup next to your hand, as you read this.

If we consider machines as our own contraptions that embody us in extended and collaborative ways, rather than as tools of automation and semi-automation, what does it mean to make with, collaborate with, or become a machine? In which ways can we share autonomy rather than delegate automation? That is, in which ways can we make together rather than delegate the making to the machine?

DIGITAL CRAFTS-MACHINE-SHIP

By emphasizing the shared human and nonhuman materiality and vitality of machines, we play down the ideas of machines as tools and materials as passive. We are not here to ask you to whittle your own spoons. We are not making a case against the digital in favor of the hand. Rather, we seek to propose a new kind of digital craftsmanship, one in which we may craft with the digital and find ways to make the machines craft along with us, in some kind of *digital crafts-machine-ship*.

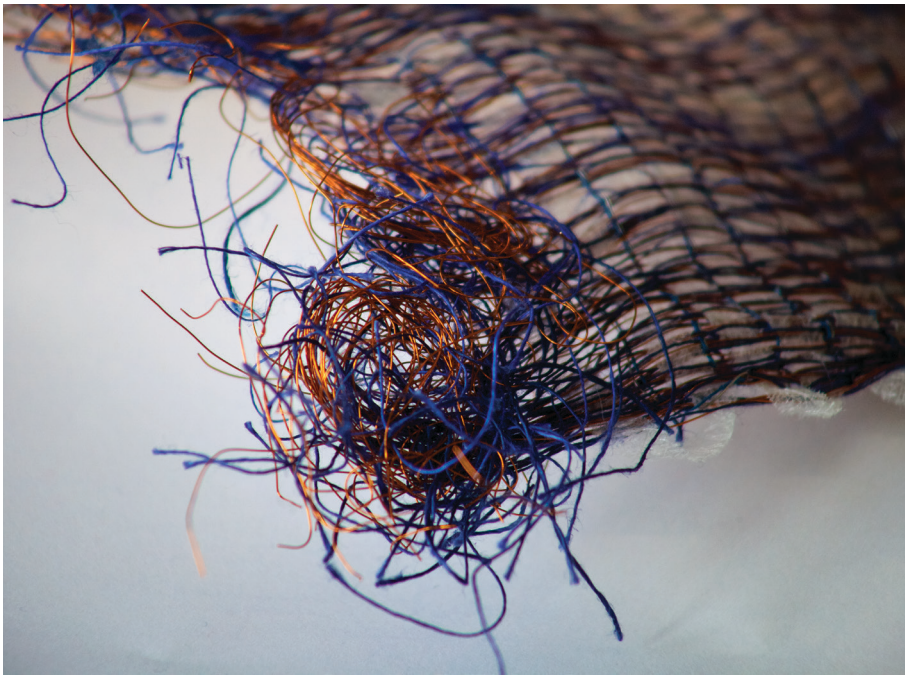
Digital crafts-machine-ship lets us make the things we are not yet ready to speak about, or can imagine only through making. We engage in weaving, knitting, and embroidery not just as a way to innovate and produce within these fields of craft, but also to aid our thinking processes outside and alongside these materials. We address things and touch them without solving them; we walk up to the edge and say, "There you are my friend, it is good to see you." It may well be that in this encounter, we learn not-to-make in a given instance, but we always learn how to make.

If you want to let your body know how something works, take it apart; if you want to feel insignificant and human, build something from scratch. Learn a craft. Build a machine. Maybe one for thinking with.

PLAYING ALONGSIDE THE MACHINE

By engaging a shared autonomy of creating objects and things, we see correlations between music, art, computation, politics, and fiber crafts. All are patterned by codes, whether via notations, formal languages, systems of law, weaving drafts, or knitting patterns. These codes invoke patterns of repetition and combination, of interferences and glitches, always turning up surprises.

Creating in reaction to material means we work beyond our imaginations. This is especially true when we work with machines and software, which arguably have imaginations of their own to contribute to the process, adding to the layers of enactments between us and the material result. This distances us from the result in that it can pull us back from the process, to watch the mechanical or software systems that also make the things. In this dialogue of closeness and distance, we are still making and



changing the machine, and what the machine makes. This is live coding or live building: We touch the system and the system touches us back.

A new machine is full of open questions, if we approach it well. With no rigid social hierarchy and norms already set around a new technology, we are able to push against its constraints. This was true in early communities of computer music and computing, which have to some extent since ossified. Perhaps craftsmanship is in part about preserving this spirit, keeping craft and culture open to change; in turn, digital crafts-machine-ship is about encoding the rules of making, not to preserve them but so that they may be more easily modified and changed.

Experimental electronic music is driven by a desire to make a new kind of music; weaving is a way to form a pliable plane of threads by interlacing them. Can we imagine a field of experimental design driven by a desire for a new kind of making, in response to the changing gears of our world?

THE CRAFT MACHINE AS SWIMMING

> *I can't wait to swim in the ocean / where I can feel small and insignificant.*
>
> —Laura Devendorf

Consider the complexities of swimming in the sea, indescribable and impossible if you try to think about it. But the body knows. We are made for engaging with this, an intentionality toward the world, the wind and the waves, the knowledge of the body and the strokes of the swim, the currents and the undertow, the shoreline and the place on the beach where we left our shoes.

The digital twin promises an understanding of the complexity of the original, so that we can explore and control without risk, without consequences. But a digital model is a plan out of water, or like swimming at your desk. It is at best an abstraction, at worst a simplification, a safe reduction. When it reaches an impending level of complexity it overflows our coping capacities, typically cognitive, as we sit hapless, staring at our screens.

Arguably, we can make a digital simulation of the sea and the currents. We can experiment safely within the confines of this reduction, a space of alternatives. Yet the difficulty for us is how to switch between plans and simply swimming, succumbing, feeling, as the currents push against the body; becoming insignificant in the process, humble; negotiating a camaraderie with the humbled; joining together, appreciating, flowing, and forming, to become again in relation to another.

To succumb to smallness is to become dense, physically and emotionally, to be responsive, to make space. To practice craft is to become eroded, formed into the smallest grains of sand, forced to see ourselves in the vastness, the common, the crowd. At the same time, from this perspective of the small and the many, we can appreciate the processes that have eroded the others around us, and the specific delicacy in which the learning of a craft has worn into their sense of stitch and sequence. Being eroded, humbled, made insignificant heightens the significance of others, human and nonhuman, form givers, from a perspective of appreciation instead of empowerment. When was the last time we whispered *thank you* to a machine or admired the precision of a human?

WHAT DO WE WANT FROM MACHINES?

To paraphrase the poet Søren Ulrik Thomsen, we dream that nothing is in vain, that the old machines only broke so that we can stumble together in a much more engaging manner.

Digital crafts-machine-ship is our addition to the broader conversation about digital craftsmanship in HCI and design. A truly kindred partner in this conversation is industrial design. Industrial design is traditionally the desire to make use of the possibilities of industrial production systems. We stand next to the machine as it makes an endless stream of light bulbs or pasta shells, and we wonder: What else can it do? We hold the thing the machine makes in the palm of our hands and wonder: How big is it, really, or how big could it be? What does this shape remind me of? What would happen if it were different? The domesticated or industrial machine is made to fulfill a specific goal. But with the crafts-machine, we listen to its noises and wonder about its edge capabilities, what opportunities they might bring.

The industrial workfloor and its production capabilities are changing again, with machines increasingly taking on the work of human hands, and human hands to a lesser degree executing and correcting machine work, in an act of delegated automation. We like to pretend that the machine is like us somehow, an extension of us, which might be why we work so hard to correct and conceal the errors machines make.

In the book *Autonomous Technology*, Langdon Winner describes the Luddite strategy of applying the following criteria to new technologies or machines: "Does the new device

enhance the quality of the product being manufactured? Does the machine improve the quality of work?" [4]. The questions raise the issue of quality, not only of the outcome but also of the work or process to arrive at those outcomes—what we call craft.

Just as the Luddites found themselves not on the boundary between craft and industry, but rather caught between one version of industry and another, we are now finding ourselves on the boundary between the machine we understand (which delegates automation) and the one we only partly comprehend (which allows us to share autonomy). Maybe eventually we will meet the machine we don't grasp at all. Will we still sit at its edge and count for it, in order to make things that are of both of us, created in a *sammensurium* [5] of systems and rhythms?

> ***First, you build the machine, then it tells you what it's for. A machine is only a kind of magnet for attracting Use. That's why we say things are Useful—because they are all full of the Use that chose them to perform itself.***
>
> **—Catherynne M. Valente [6]**

In trying to understand what we want from our contraptions or machines, we might want to add a third question to those already in hand from the Luddites: Is this machine capable of producing different things? What Use might choose it to perform itself?

THE DREAM OF THE BETTER THING

The designer dreams of making something that is better than before—improved, lighter, smarter, or of a more sophisticated aesthetic. The weaver dreams of this too, but this dream is mixed with a certain form of vertigo. The outcome is aimed toward the pattern and the time spent at the loom, but the journey there is fraught with risk and opportunity, like in the fairy tale of the boy who went into the world to learn to know fear. As Albers says above, we react to the material rather than executing a dream, or maybe in the process of executing a dream we engage in a conversation with the material world. More so, *we* is the weaver of digital crafts-machine-ship in which the nonhuman machine imagines, alongside and within the human machine, to jointly engage in conversations.

This forms an improvisation of sorts in which all concerned desire a better outcome. The musician goes on stage prepared, focused and rehearsed, as the audience arrives from the other side of the room, expectant and attentive. The musical performance itself is created by a temporary shared attention, formed by the mental projection onto and from the stage, executed in a limited temporal zone where the musician picks up the machine and says: Yes!

> ***And then the performance itself becomes the test bed, where the unexpected curved into your plans and you are forced to reconsider everything; from the premises to the gage of wires in your cables.***
>
> **—Joel Ryan [7]**

Live coding and live making allow us to stay with all the reconsiderations, redirections, reactions, and surprises that are not exceptions within a well-planned performance, but rather the performance itself. The musician weaves lines of code, builds a fragile entity of sound, and the audience members try to hold the complexity of this in their minds, and dance.

Collaborating with machines is the desire of crafts-machine-ship to make something better.

THE DREAM OF THE BETTER WORK

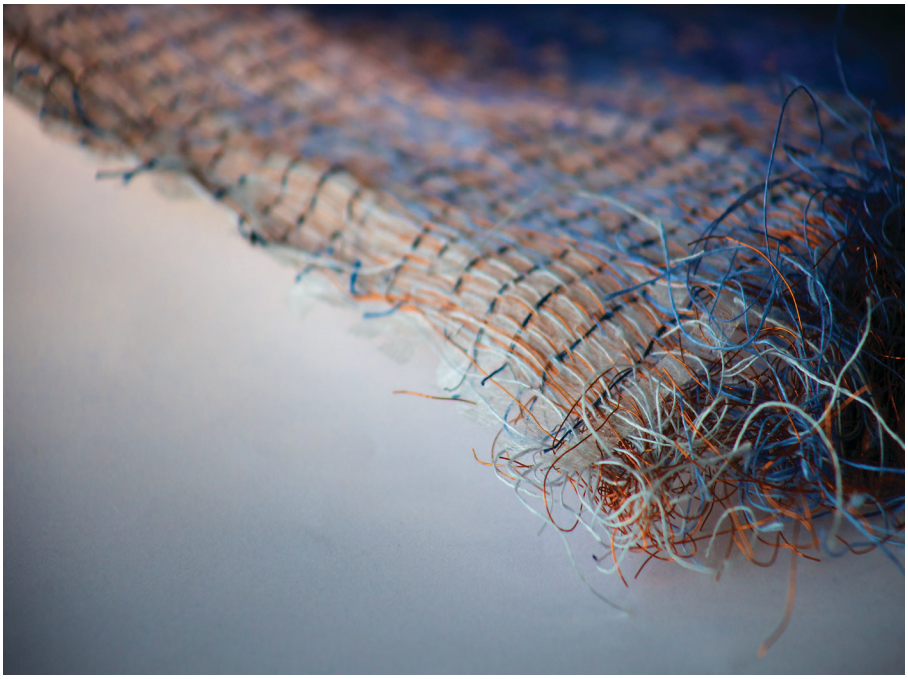
The loom is a stern teacher. Try to rush and you will pay with tangles and time wasted. The loom doesn't ask you what you want to make, but rather presents you with basic forms of computation that challenge you to make something of them. To weave is to surrender to the pattern and choices that were already made at the point of the loom's construction. The moments of surprise and delight are punctuated within the suspense of wasted time and materials.

As the machines, threads, patterns, and patience collectively plot to hold your attention and you their attention, you become transfixed by motions, monotony, and the becoming of the fabric. As you tend to the selvedge, fix broken warps, and wind bobbins, you enter into parasympathetic rhythms with the machine, breathing with its gasps and relaxing when it releases. Its tension is your tension, extending from beam to body, winding around your consciousness, forcing you into a psychedelic experience born from repetition, movement, attention, fixation, fascination.

Collaborating with machines is the dream of better work that is more than better outcomes. It is the desire for a dance partner that is more a part of you than a part from you, a friend that is a shared rhythm in which together you count time, and hold close and turn each other loose within the sounds.

THE DREAM OF DIFFERENCES

In each repetition, we make ourselves. We become different. Our fingertips,



minds, intuitions, and choreographies become different. Not better, different. We begin to approach a nexus of expectation and surprise, and learn to see the value in the practice itself. Crafts-machine-ship joins body and material, the self with the apparatus, and makes and remakes all those involved. If we succumb to its flows, feel and follow the tides, act and react to its rhythms, we find the nuances within action; we see difference where we may not have seen it before.

The desire for differences is the drawing-in of crafts-machine-ship. To design or to make in this way is the determined, grim, deliberate return to being the machine day after day. By doing this we are repeating human/nonhuman material engagements that not only expect different outcomes but demand them. The shared autonomy of the machine as contraption jolts the machine from its delegated automation. This is to imagine the new as a matter of process as well as to encounter failure. Failures, like scraps on the floor, abandoned patterns, or gloriously misplaced pride in previous things, become surprises and new differences that can delight just as well. The shared autonomy of digital crafts-machine-ship lets us live with, if not encourage, the errors and failures of machines. By entering into the ring again and again, we engage with our materialities and capabilities as part machine, in which we make anew of our own failures.

Collaborating with machines is the desire for differences, pursued as a shared autonomy to think anew, to discover and fail.

COLLABORATING WITH THE MACHINE

In this text, we have returned over and over to physical making that we allowed, even encouraged, to act as our template for thinking about machines. This making is a way of thinking with our hands and then letting the resulting things support the imagining and talking about ideas that are neither fully understood nor articulated in language. The ideas, objects, and concepts presented here are active props that become animated and investigated through their own production. But more than that, the act of making, spending time on repetitive tasks, and counting in delegated automation lets us think and allows to arise the imagining of us, things, and machines, with whom we may share autonomy.

In telling this story, we wanted to address the spirit in which we work, share our hunches and the things we faintly know. We wanted to tell of the things that are not done yet (at least not by us), that are becoming and unfolding. We wanted to find a way to allow these notions to remain fragile and thoughtful.

We wrote this, finishing each other's sentences and telling each other stories. We wrote as if the text itself were a machine with desires for outcomes, better work, and new differences. We wrote, like we weave and make, with and as machines, and we wanted to share this.

Endnotes

1. Albers, A. *The Weaver 6*, 1 (Jan.–Feb. 1941); https://albersfoundation.org/teaching/anni-albers/texts/
2. Haraway, D. *A Cyborg Manifesto*. Univ. of Minnesota Press, 1984.
3. Jefferies, J. Pattern, patterning. In *Inventive Methods, The Happening of the Social*. C. Lury and N. Wakeford, eds. Routledge, 2012.
4. Winner, L. *Autonomous Technology, Technics-out-of-Control as a Theme in Political Thought*. The MIT Press, 1978.
5. Untranslatable Danish word roughly denoting something like an organized mess or a medley.
6. Valente, C.M. *The Girl Who Fell Beneath Fairyland and Led the Revels There*. Feiwel & Friends, 2012.
7. Ryan, J. and Andersen, K. 821 words and 20 images. In *No Patent Pending, Self-Made Performative Media*, iii editions with MER. Paper Kunsthalle, 2014.

Kristina Andersen is concerned with how we can allow each other to imagine our possible technological futures through digital craftsmanship and collaborations with intelligent machines, in the context of material practices of soft, fiber-based things. How can we innovate, design, and act around that which is yet to be imagined?
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