
Decentring the Human in Digital Making - Towards Embodied Mattering

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Abstract

The key objective for this research is to understand how materials shape the outcome of craft practice to create embodied ways of making and being with technology, that supports our material existence as bodies in a more-than-human world. To achieve this, I will use a mixed-method approach consisting of ethnography, experimental lab work, as well as research-through design and making workshops. The first half of the PhD is concerned with understanding the relationship woodworkers and hand carvers have with their material as well as values connected with their work and craft process. An ethnography of woodcarvers lays the foundation for a lab experiment using a custom-built apparatus for augmenting hand carving experience. I will draw on insights gained in the first part of the PhD to develop novel processes for embodied making with machines using research-through-design methods.

Author Keywords

Embodiment; material entanglement; craft practice; sustainability; material agency; posthumanism; digital fabrication

CCS Concepts

•**Human-centered computing** → *Interaction design; Activity centered design; Human computer interaction (HCI); Interaction design process and methods;* Activity centered design;

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Introduction

My research examines how the material influences the outcome of a making practice. By exploring values and material relationships in woodworking practices, I aim to de-centre the human in digital making. This shift in focus away from a human-centred viewpoint, which places humans at the centre of action, acknowledges that agency is not limited to humans. Further, this decentered approach opens up the possibility of being ecological. My work is divided into two stages where the first is focused on gaining a deep understanding of material agency and practices within the woodworking community through ethnographic fieldwork as well as experimental in-the-wild lab work. The second part of my work consists of craft/material-based interventions for digital making using research-through-design methodologies such as critical and speculative design.

Context

Digital fabrication scholarship is predominantly focused on technological advancements in the field driven by technosolutionism and optimisation of processes. Recently there has been a shift in digital fabrication towards embodied, interactive form of making [3, 14]. In both approaches, the human is at the centre of the process and the material is to a large extent seen as an inert matter that can be freely shaped into the desired form.

Alongside this development in fabrication technology, there has in the last decade been an increased interest in the materiality of technology [12] and designing for material experiences [6], not just screen-based ones. Designers recognise the importance materials have on the the design process as well as the user experience of the physical outcome. These hybrid materials offer challenges of their own as they often consist of digital elements in addition to tradi-

tional materials [13]. Traditional craft practices have been re-examined as a result [10].

Craft practitioners further provide an alternative relationship to the material than that typically found in fabrication technology. They are in direct contact with the material and respond in real-time to the variations within the material on which they are working. Their material knowledge has an embodied element gained through experience with the material over time.

In a making process, material agency manifests itself through embodied interaction. Karen Barad argues that agency is not an attribute but rather something that emerges through doing or “intra-action” [1]. Material agency and embodied knowledge are, in other words, entwined. The skilled practitioner understands how to shape the material in and through the form-giving process. Ingold refers to this as a “correspondence” [8] with materials but it is perhaps better understood through Barad’s performative lens [1].

Craft practitioners see the material, to some extent, as a collaborator. Timber, for example, is not uniform, and each piece of wood has its own unique properties [4]. Seeing the material as “vibrant” creates space for more than human actors. Drawing on Thoreau, Jane Bennett suggests that by seeing the world as vibrant we become more attuned to living sustainably [2]. Moving beyond human-centred design is crucial for tackling increasingly complex design problems such as environmental issues. Laura Forlano argues that decentering the human in design could be an opportunity to move beyond what is considered sustainable design, which she understands as being predominantly focused on human needs. Instead, a wider recognition of nonhumans in the design process could change our view of the world and radically shifts our priorities [5].

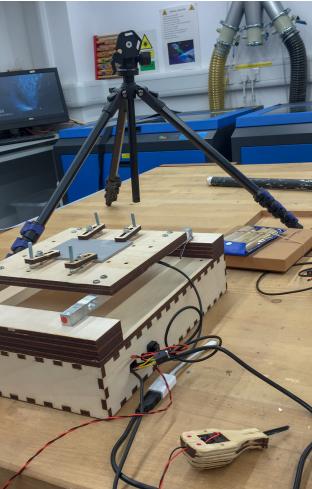


Figure 1: Prototype of the apparatus. Load cells, sensors typically found in scales capture pressure exerted by the hand carvers on the carving platform. This sensor data is used to provide feedback through haptics in the tool and visuals through a projection onto the carving surface.

Aim and Motivation

In a world overflowing with products, it matters how material objects come into being. As Donna Haraway puts it, “It matters what matters we use to think other matters with” [7, p.12]. Besides issues of sustainability and overproduction, there are also issues of alienation from the environment and our bodies. Making provides a way to reconnect with our bodies and opens up a different way of thinking.

I have always loved craft ever since I was a young child. In making I find a way of thinking that does not rely on language - something which, as a dyslexic, I struggle with - but rather an understanding gained over time. It allows me to think through my hands and body. Through my research, I aim to explore alternative ways of making and being with technology - ways that support our material existence as bodies in a more-than-human world.

Research Approach

As outlined in the introduction, a mixed-method approach is taken which uses ethnography, experimental lab work as well as research-through design and making workshops. The work can be divided thematically into two steps. The first is seeking to understand and find insights from woodworking practices. The second step applies these insights and opportunities within digital making practices - seeking to find alternatives to current practices.

Finding insights and opportunities

I have conducted an ethnography of woodworkers to get a better understanding of their values, and their material and embodied knowledge. Four different wood workshops were visited during the study. I collected video recordings of their practice and interview data.

Building on the findings of the ethnographic study I am in the process of developing an apparatus for studying the

material relationship within woodcarving practice more closely. The woodcarver’s ability to pay attention to the grain becomes internalised and automatic through experience and practice. It is what is called tacit knowledge, and as a result, it’s hard to communicate or study. One method of overcoming this difficulty is by defamiliarising the experience. By making the experience of woodcarving unfamiliar, the aim is to make the woodcarver re-examine their practice and become aware of habits and skills they take for granted.

The apparatus will augment the carving experience through digitally generated haptic feedback in the tool, visual feedback through a projection onto the material and audio feedback through headphones. A prototype of the apparatus can be seen in figure 1. The augmented feedback system is responsive to the woodcarver’s actions in real-time, creating a persuasive, novel material experience.

Alternative approaches to making and making with technology
I will also be drawing on an earlier study into making new sensors with an unfamiliar technology [9]. Here an exploratory, open-ended approach was taken to develop new sensors consisting of a conductive material, a non-conductive material and a magnet. Figure 2 shows some of the diversity in the sensors developed using this method.

The outcome of these explorations was physical sketches of tangible interactions. Designers that partook in an extended exploration of the sensor material gained a deeper understanding of what the sensor material was yet found it hard to articulate the richness the sensor allowed for without reducing the meaning. This demonstrated that the experience of working with the sensor material relies predominantly on a bodily way of knowing rather than a symbolic.

A world where the maker and the material are not separate



Figure 2: Examples of sensors developed during the experimentation phase of the sensor research

entities exerting their agency on each other is starting to emerge. The woodworker only knows the wood they are working with through their practice. Likewise in the sensor workshops the designers gained knowledge and understanding of the material through making something.

The sensor workshops further suggest a different way of developing new technology - where experiential, tacit, and embodied cognition is at the centre of the working process and symbolic knowledge takes a back seat. As Claire Petit-mengin says, quoting a proverb from the shamans of New Guinea, "Knowledge is nothing else than a rumour until you feel it in your muscles." [11]

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