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Making in the Digital Era

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Editorial: Making in the digital era

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Abstract: This paper track examines the new and changing materiality of design practice, caused by digitalization and new fabrication techniques, and its challenges and benefits. Several areas of design practice and research involve processes of making things. More often such processes unfold in a hybrid form combining both making by hand and with tools, both analogue and digital. The track illuminates designers' and makers' insider perspectives and embodied experience in such hybrid analogue and digital material processes. Many of the contributions also discuss collaborative making and how these hybrid forms of crafting are shared and distributed. Traditional, even indigenous crafts, take on new shapes and functions in the meeting with technology rich forms of making that still relates on embodied knowledge related to the materials and making processes. This track opens up many new avenues and ways of conceptualizing the role of knowledge in design and making.

Keywords: analogue and digital; experiential knowledge; hybrid making; insider perspective

1. Introduction

The 'Making in the Digital Era' track is organized by the Design Research Society's Special Interest Group on Experiential Knowledge (EKSIG), which is the first SIG ever established within the DRS in 2007. EKSIG focusses on the understanding of 'knowledge' and 'contribution to knowledge' in design research, especially when designing forms part of the research process (see also the EKSIG website: <https://eksig.org>). It aims to develop principles and criteria of research in design that employs the complex knowledge of practice within research, including propositional, procedural, and experiential knowledge and means for communicating such knowledge. In addition to holding a paper track session in DRS conference, the EKSIG has its own biennial conference that is held alternately to the DRS conference.

For this paper track at DRS2024, we take a closer look at the new and changing materiality of design practice that digitalization and new fabrication techniques brings with it, and its challenges and benefits (Pink et al., 2016). Several areas of design practice and research involve



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processes of making things. More often such processes unfold in a hybrid form combining both making by hand and with tools, both analogue and digital (Golsteijn et al., 2014; Nimkulrat, 2020; Wallace & Press, 2004; Zoran, 2015). The focus on discussing the theme ‘Making in the Digital Era’ is to illuminate designers’ insider perspectives on making and embodied experience in hybrid analogue and digital material processes. The blurry border between the two modalities enables the designers to delve themselves into the hybrid environment of making in which they can move seamlessly between the analogue and the digital (Fraser, 2010; McCullough, 1996) – but *what happens with the experiential knowledge of materials in this process?* Being insiders in such processes, designers can provide insights into their direct embodied experience in hybrid processes and contribute to the theoretical discussion of ways of knowing and how they use their experiential knowledge in this transition from the analogue to the digital realm – and back. The track provides a forum for debate on the concept of ‘thinking in making’ in design research that entails action and perception coupling (Baber, 2022; Malafouris & Koukouti, 2022), which results in artifacts as extensions of the designer-researcher’s experience.

2. Paper Contributions

Through a rigorous review process, seven papers out of 26 are selected for inclusion in the ‘Making in the Digital Era’ track.

‘Algorithmic Lace: Leveraging Mathematics in Design for Craft Resistance’ by Lisa Marks explores the way in which the mathematics of craft have created rich and diverse material cultures. The paper presents a project focussing on developing new technological adaptations and applications for traditional techniques, specifically bobbin lace making. The project showcases how the possibilities of new use and design can be created when viewing traditional techniques through the lens of modern technology. Tools such as 3D body scans, visual scripting, and CNC machinery are employed alongside traditional bobbin lace techniques to invent algorithmic lace – three-dimensional lace that is patterned to give a symmetrical look and adaptable to each individual. The project specifically shows how this algorithmic lace was formed into a seamless bra for women who, after having a mastectomy, have limited options for lingerie that is comfortable and embrace their body.

Interestingly, the traditional making of bobbin lace is also examined in ‘Beyond braiding: Transcending artifact-centered conceptions of craft in digital fabrication’ by Nathaniel Elberfeld, Lavender Tessmer, and Alexandra Waller, but with an application to architectural scale artifacts. The paper explores the technical complexity of a traditional craft through a conceptual lens of automation, software development, or knowledge encapsulation. The authors propose a positioning framework for digital work that is craft-based and new terminology to define its theoretical boundaries and to classify the increasingly loaded meaning of ‘digital crafts’ into five categories: simulated craft, pantographic craft, prosthetic craft, augmented craft, and composite craft. The authors apply the framework to the making of an architectural scale artifact whose design is based on bobbin lace. Such making engaged digital craft through not only material perspective but also behavioral, historical, and cultural ones. The

resulting artifact exemplifies composite craft with aspects that can be categorized as augmented craft. Instead of emphasizing the material aspects, the paper suggests an alternative approach to artifact-centred uses of traditional crafts to inform contemporary digital practices that engages the attributes of craft, including the material logic and economy, the communities and cultures, and the systems and ecologies of human expertise.

The making of architectural scale artifacts through the use of digital tools and hands-on textile techniques is also discussed in Virginia Ellyn Melnyk's paper entitled 'Parametric design for machine knitted patterns'. The paper presents a project that explores the integration of parametric design principles into the designing of knitted patterns. It proposes how parametric design can be applied to generate dynamic patterns with manual knitting machine techniques. Using Grasshopper in Rhino3D as a computational tool to develop knitting patterns, the possibilities of creating customizability and diversity in the designs are expanded. The diverse and customizable designs can then be translated to a knitting pattern for knitting by hand on a domestic knitting machine. By using computational tools, designers can explore a wide range of design possibilities but still apply their tacit knowledge of the craft and thus control the fabrication process. This project demonstrates the use of parametric design in knitting patterns as a design tool to push the boundaries of textile-based architectural elements and discover the possibilities of architectural expression and spatial experience.

The use of digital tools can also be used for preserving and transferring traditional local craft knowledge. In 'Decoding the banana fiber craft of Kerala using a shape grammar', Nimmi Elizabeth-Thomas and Avinash Shende explore the way in which the craft knowledge of the banana fiber craftswomen of Kerala can be preserved, advanced, and transferred. The decline in number of banana fiber craftspeople poses a threat to the craft heritage of Kerala around the usage of natural materials such as banana fiber, as this craft knowledge is usually transferred by learning in proximity with the master craftsperson for a significant period of time. The paper presents a study that creates a document of such systematic craft knowledge application and decodes this knowledge through a shape grammar. The methodology involves gaining insights through contextual inquiry and artifact analysis as well as the use of software such as AutoCAD, MATLAB, and Desmos to develop and illustrate the shape grammar. The resulting shape grammar presents not only the material vocabulary, but also the rules for creating patterned units and the function that corresponds to different configurations of the units.

Similarly, Chhail Khalsa and Pranshu Kumar Chaudhary's paper entitled 'Co-creation framework to develop and situate e-textiles with indigenous crafts' presents an ongoing project called 'Anuvad'. In this project, the authors collaborated with traditional indigenous artisans in a remote village in India called Bhujodi, a seemingly unrepresented community. The paper discusses the benefits and challenges of the collaboration as the artisans take on the role of co-designers and technical collaborators. It also examines the power of the collaborative making through craft of interactive textile art frames, which work as music synthesizers. The study concludes that by collaborating with indigenous communities and providing them with an equal platform for expression, not only generational knowledge is built and accumulated,

but unconventional ideas and uses can also be developed by the support of the wisdom and latent understanding of indigenous culture.

Collaborative making is also emphasized in ‘Workshopping the textile hand: Reimagining subjective assessment of textile materials with digital technologies’ by Zhengtao Ma, Lissy Hatfield, Chipp Jansen, Boyuan Tuo, Elif Ozden Yenigun, Sharon Baurley, Stephen Jia Wang, and Kun Pyo Lee. The paper examines material decision making in contemporary design practice that is increasingly collaborative. Focussing on textile materials, the paper analyses two workshops in which participants assessed sensory properties of ten textile materials, individually in one workshop, and in groups in another. The workshops aim to explore three aspects of material decision making that provide insights for the assessment process in digital environments: first, the difference of subjective material collection between individuals and groups; second, the comparison between physical and digital tools used regarding improvements of the subjective assessment process; and third, the validation of the subjective disparities among various material properties. This paper sheds light on how the use of digital technologies in textile assessment allows for more accurate and valuable evaluations.

‘Designing 3D printed ceramics from a clay with tunable shrinkage’ by Fiona Bell, Erin McClure, Camila Friedman-Gerlicz, Ruby Ta, and Leah Buechley focusses on the material element of the hybrid practice of clay 3D printing in which physical ceramic artifacts are designed and fabricated with digital technologies. The paper presents a material exploration of a series of 3D printable clay materials with tunable shrinkage called clay-dough; these materials are made up of various ratios of stoneware clay to bio-based dough. The dough burns away after firing, resulting in the remaining clay shrinking dramatically while transitioning into a ceramic artifact. Designing 3D printed ceramics from clay-dough offers new artistic possibilities, as makers can determine the final form of ceramics by tuning the ratio of clay-to-dough and stoneware clay and thus shrinkage as a result. The paper emphasizes embodied making by designing ceramics primarily through material knowledge rather than through computer-based platforms.

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