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# **Interfacing design and making of Ceramics**

Expansion of ceramics practice through technology

By

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## **Introduction**

This paper reports from a research project between research environments within Architecture and Design. The project investigates the position, role and significance of the experiment with a strong focus on computation, material and form within practice-based research. The paper focuses on one of the six experiments within the overall project

## **Background**

The experiment in question is about the relationship between crafting materiality and digital representation, and how experiential knowledge of crafts rooted in ceramics can be transformed and utilized in the use of digital technologies. It is the direct physical and tactile interaction with a responding material that guides the ceramicist (Leach 1940, Dorner 1994). Thus the experiment explores how the involvement of the body is being exploited in the use of digital technology.

How can traditional craft knowledge based on skills and experience in making three dimensional objects be utilized through digital technologies, - and thus make a close link between the designers creative process and the digital manufacturing based on the idea about crafting and execution as a unity that is intuitive and humanistic (Leach 1940)?

Digital technology as 3D printing with ceramic allows to bridge from the digital design environment to fabrication. At the same time novel digital means can create new interfaces between the human, space and the material. Here advances in 3d motion capture technology and sensors allow capturing spatial hand gestures and body movement in real-time.

Where technology often seems to take us away from material (Senneth, 2008) this approach enables the designers body to be once again involved in the making. This approach builds on McCullough's (1998) idea about a close connection between digital work and a craft practice, where tacit knowledge (Dorner 1994, Polanyi 2008) is involved. The experiment investigates how this new relation is reflected in the product and opens spaces for new expressions and allows rethinking of traditions in ceramics.

## **Method**

In the experiment design as a method of inquiry is used as a reflective practice in which the designed engages in a dual mode of reflecting on action and through action (Schön 1993). Moving between the exterior and the interior of making, design creates a conversation between the dissection action of analysis

and critical assessment and the creative action of proposition and result. Design inquiries are thus, potentially at the same time, a material practice and a contribution to the production of knowledge (Brandt & Binder, 2007, Koskinen et. al., 2008). Design is a powerful form of experimentation: a means for inquiring and of producing knowing (Binder & Redström, 2006). “It is concerned with moving away from the existing and the known, through intentional actions to arrive at an as yet unknown, but desired, outcome” (Downton 2003). Design is therefore an active process by which the designer poses a question and develops its dimensionality and solution, and in which the identified design criteria are evaluated in context of a given problem (Buchanan 1992).

In practice series of parallel and interdependent introductory experiments with digital technology and ceramic material have formed the starting point in this research. The experiments have acted as inquiries by which the concepts, technologies and material have been tested and evaluated within a wide frame of possibilities that reflects the overall research questions. What is possible and how? The introductory experiments have given rise to new questions and experiments, which at the same time have focused the research. To verify the results selected experiments have been tested in larger and larger scale over time.

The final shown experiments are not to be seen as final results, but as representative examples of experimentations that reflects the dynamic and unique possibilities in the cross border between digital and ceramic crafting.

### **General description of the experiment**

The experiment is about an interactive digital design tool for designing wall like composition with 3d ceramics. The experiment is working on two levels. One which has to do with designing compositions and patterns in a virtual 3d universe based on a digital dynamic system that responds on the movement of the hands. At a certain distance the user's hands appear on a monitor screen as a pattern of circles, which size and 3d inner pattern are reflecting the position and speed of the hand. In that way the user are able to interact and model a responding pattern. The second level has to do with realizing the modules in ceramics by 3d printing directly in porcelain with a RapMan printer that coils up the 3d shape in layers. Finally the ceramic modules are mounted in a laser cut board that reflects the captured composition of the movement of the hands.

To capture the movement of the hands a “Kinect” developed for the video game console X-box is used (figure 1). The Kinect records the movement which is input to an interactive 3d system developed in Rhino with the plugin Grasshopper (figure 2). The movement is transformed into circles with a 3d pattern in a composition that reflect the position and speed of the hands on a screen (figure 3). Subsequently each of the 3d modular patterns is translated into a code. The code informs a RapMan 3d printer to print directly in porcelain layer by layer (figure 4 and 5). After printing the porcelain is glazed and fired to 1280 degrees. Finally the ceramic modules are mounted in a laser cut board that reflects the captured composition of the movement of the hands.

### **Focus**

The paper is referring to the overall theme 1: Materiality and Aesthetics in the conference and more specifically to the themes:

- The opportunities arising for developing new aesthetic qualities through the use of digital tools.
- The opportunities for craft practitioners to contribute to developing technologies and/or to make their own digital tools.
- The role of craft practitioners in interdisciplinary teams and collaborative research projects.
- The capabilities of code and generative systems to enable material aesthetic output.
- The value of craft skills and material understanding in developing human computer interfaces and understanding human relationships with physical objects.

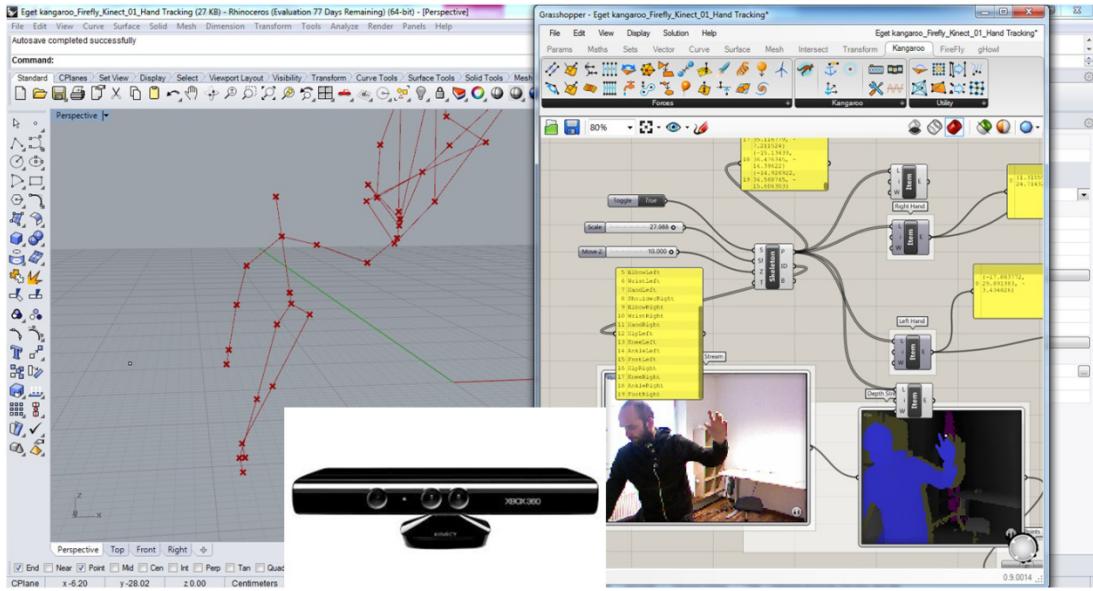
### **Exhibition and demonstration**

Objects and demonstration are offered for the exhibition.

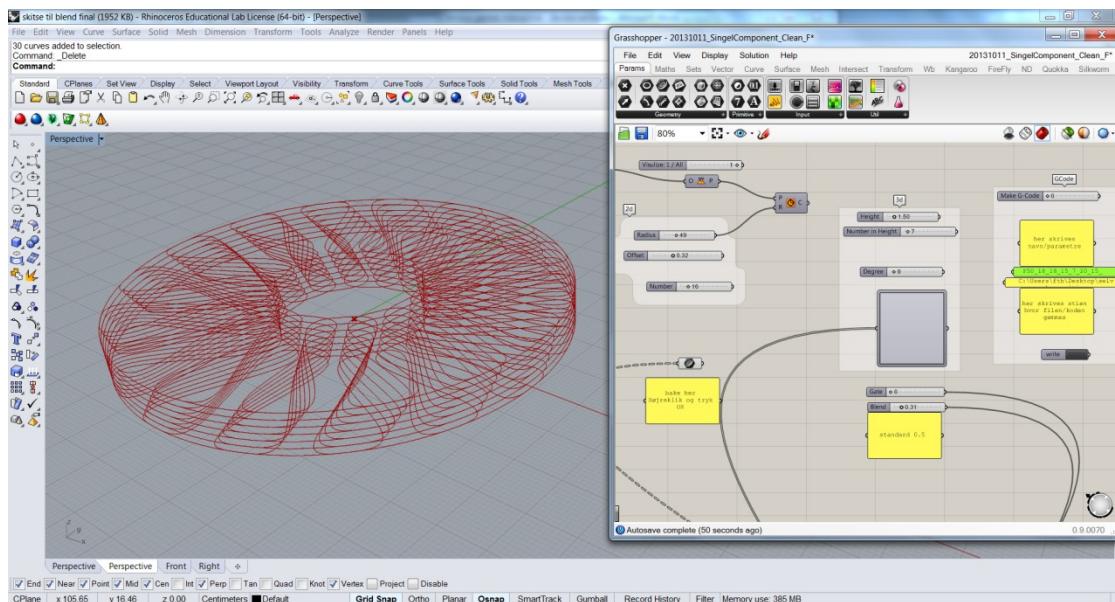
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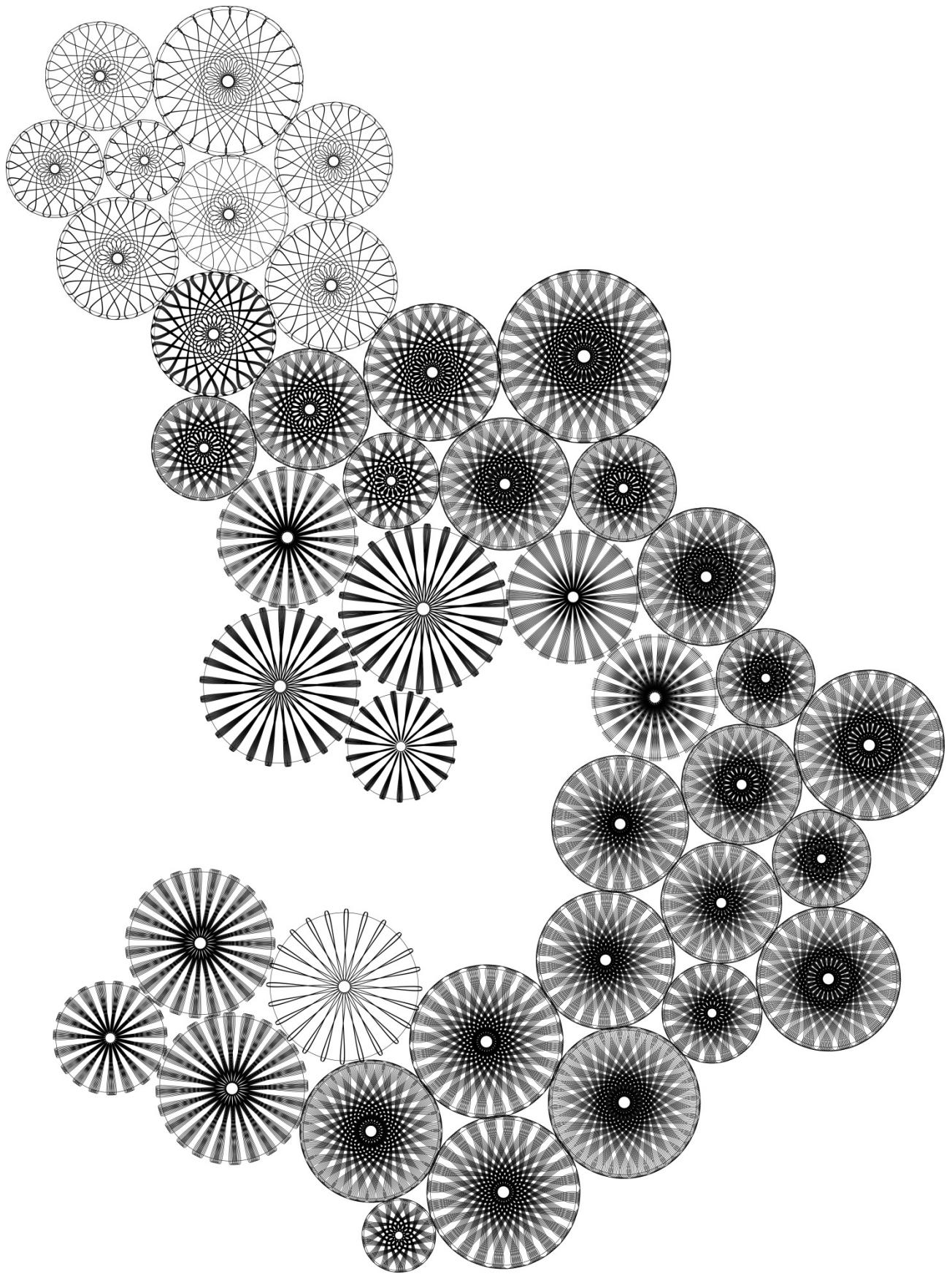
## Illustrations:



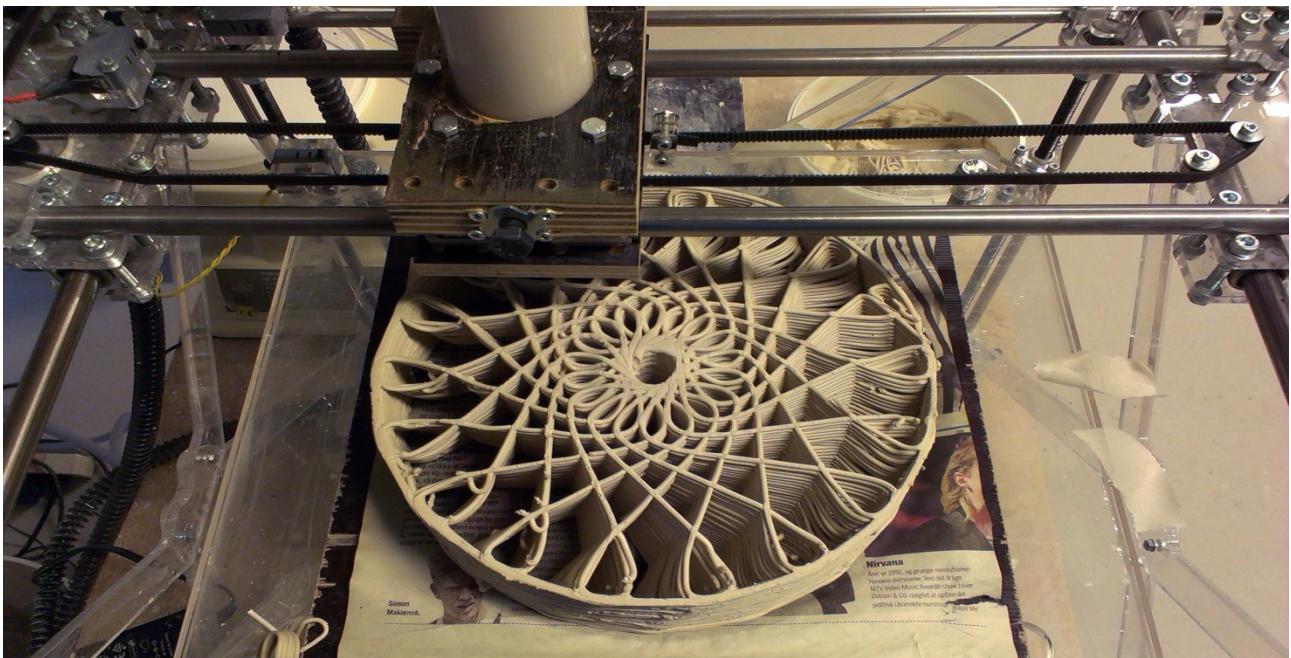
**Figure 1.** The Kinect records the movement which is input to the interactive 3d system developed in Rhino with the plugin Grasshopper.



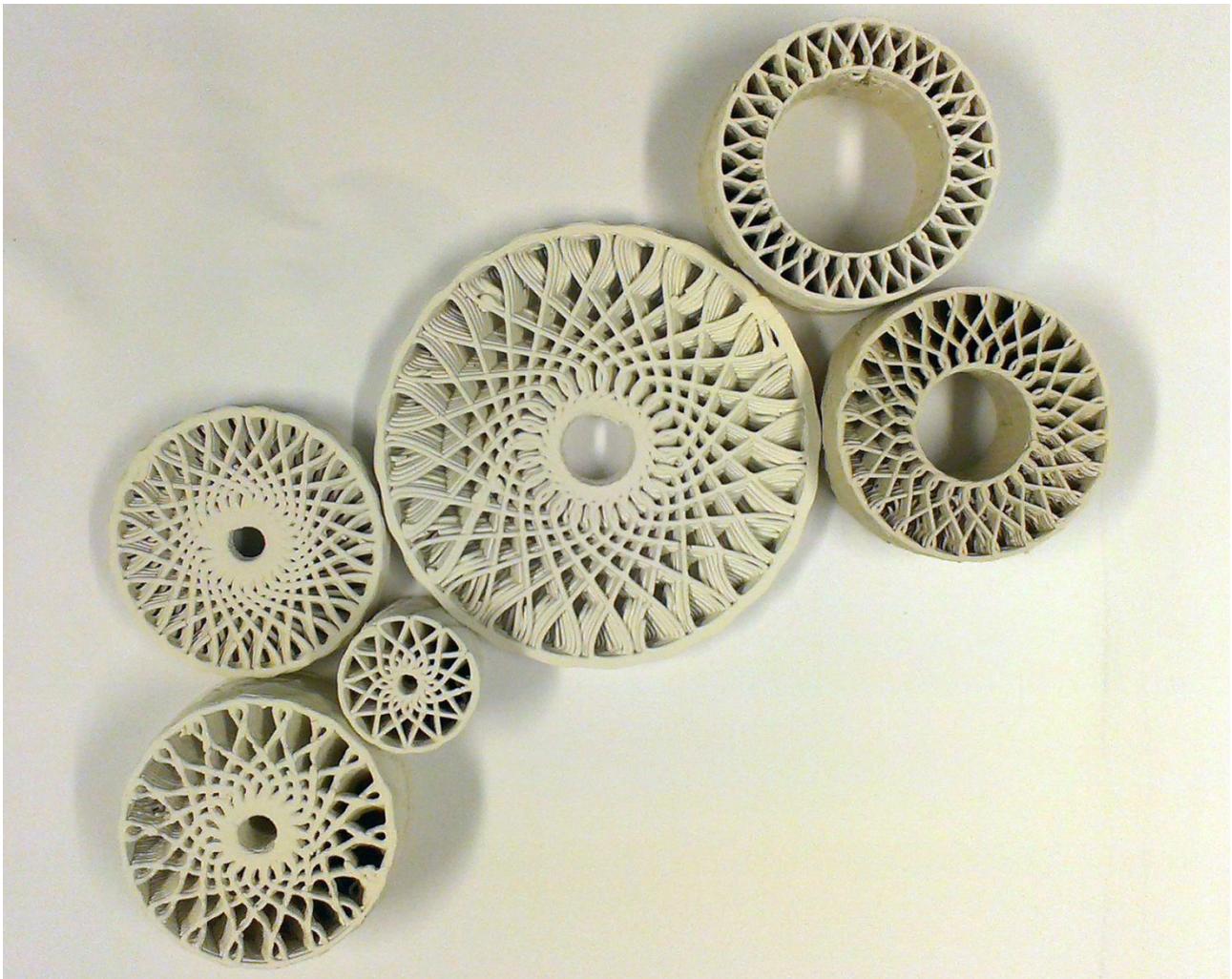
**Figure 2.** The movement is transformed into circles with a 3d pattern that reflect the position and speed of the hands on a monitor screen and translated into a code. The image is showing an example of one module.



**Figure 3.** A wall like composition has been captured and each module is ready to be printed directly in porcelain by a RapMan 3d printer.



**Figure 4.** The code informs a RapMan 3d printer to print directly in porcelain layer by layer.



**Figure 5.** Examples of printed modules in porcelain, which are ready to be glazed and fired to 1280 degrees.