A sensor converts a physical phenomenon into a measurable analog voltage (or sometimes a digital signal) converted into a human-readable display or transmitted for reading or further processing.

This is a paper about grain finding. Grain in this context means following the course of the materials while bending it to their evolving purpose, intervening in the fields of force, direction and currents of material based on the influence of the creator. Patterns of influence on design processes and outcomes are the only way to perceive the grain. Material turn is a transformative process where material descriptors can signify relationship between surfaces, structures and forms across physical and digital. The material unfolds throughout a process.

In order to develop creations that function effectively with the environment around them, designers explore open-ended contexts. This open-endedness may involve a lack of familiarity and ambiguity, and both of these ideas have become themes in recent HCI discourse.

This principle involved a conductive element that could move within a particular pattern constrained by non-conductive substrates.

Practitioners address themselves to challenge theorizing practices.

) Understanding the world comes from process of handling things. Active materials, they interact with maker.

practice that is grounded in hands-on practice.

Research =processes, must specify research problem, context of inquiry and methods employed.

Craft nowadays are means of thinking by making things by hand.

Materialization of an object(craft-making), can be considered ”subject-matter and sustainer of conscious activity.”(p7)

Weakness of craft practice: requires actions in order to prevent it to reappear in subsequent creative productions

) An artifact is seen together with coexisting artifacts in the same space , all referring to one another and creating a significant whole. (p9)

Perception: bodily phenomenon coexisting with movements as an interrelated whole, both grounding the objectivity and subjectivity of experience including inner feel and intentional grips on the world.

) Embody attitude of viewer while making to understand audience perception. (p10)

The touch searches for a relationship between the touched object and the consciousness of the person who touches it. (p11)

These methods are more used nowadays in creative practices, developing its intellectual and scholar aspect.

Knowing in practice have some criterias: 1-implementation of methodologies from “unknown to known”, 2- research practices involving data that are created, not collected in traditional research.

Using creative practice to conduct research demonstrates its rigor and general criteria of objectivity, reliability, and validity that research entails(p2) Reading and making support each other.

Literature-> brought ideas to be experimented in creative practice

. Openness, rigor,clarity of process pute practice in research context, stages ensure rigor and transparency.

Craft practice facilitates and leads the research process into a particular direction in order to tackle the research problem. Practice-led methodology allows designer to study their own work.

The procedural and experiential knowledge becomes explicit as awritten text and visual representations. (p11)

Importance of exhibition context, influence ones experience exhibits, exhibition and material, also affect craftsperson during interaction with expressive material.

Due to poor resources, practitioners need to understand the material through manipulation.

by making them understandable to other researchers

by creating objects through layers of refinement and knowledge through deep engagement with such objects

of perfectly abstracted blocks of pre-defined functionality,

The design explorations in this paper turned the conductive element (i.e., of the sensor) to a range of conductive materials from e-textiles, including various metallic threads and adhesive metallic tape.

The creative process and production of artifacts in research are target of reflection.

generated from within the researcher-practitioner’s artistic experience

Framing research project in relation to nature of practice and researcher expertise

The preparation of physical materials became more advanced through each workshop.

.  The intersection of ethnography and practices consist of techniques (i.e., methods), translation (i.e., a shift of ideas across multiple platforms) and transmission (i.e., an act of communication).

.  It holds the potential to disturb inevitable power dynamics while inviting active engagement.

Two objectives for this research were to identify affordances e-textiles can bring with alternative game controllers, and develop materials and kits usable in future jams.

Time was devoted to teaching, designing, and crafting a game controller.

Focus placed on multiplayer/collaborative games.

It entails a critical process where practitioners reflect on their thinking, action, and feelings in relation to their practice, making it a major strategy for developing craft-based design research methodologies.

Handling materials arise tacit knowledge, which provides way of understanding the practice. (p3)

Materials were “un-crafted” and presented to practitioners in more raw and open forms, to allow uncommon ideas to develop.

Designers had to semi-functional prototype objects based on sensor material, the required behaviour was speculative, and no electronics were allowed.

Making and questioning are important concepts in the study. Making suggests relevant literature to be discussed in relation to productions

Their comments benefits as research material or as basis for subsequent craft production.

Their involvement creates a cultural activity where the maker and the viewers can meet and exchange thoughts, generating mutual understanding.

The experience was done by moving a magnet over a piece of conductive tape in various directions while the preamp was connected to an oscilloscope.  The results of this experiment varied depending on the position of the magnet

It was realized by combining conductive and non-conductive materials. Through this exercise, Nordmoen found that thin lines of conductive material are more effective than larger surfaces. The relationship between the interactive part of the object and the placement of the magnet has an impact on the signal.

The results of Nordmmoen’s experiment were consistent, but not easily described. The only clear information was the result of specific signals from particular gestural movements.

The used questionnaires collect opinions from viewers.

They got a brief introduction to sensors and offered materials and received a sensor toolkit.

Social science methods can be used in creative process: case studies, participant-observation, interviews, questionnaires, surveys for others’ opinions, etc. Questioning aspects of the study aims to record participants response and investigates material’s influence on users interpretations.

(p4) Before starting the workshops, the participants in the workshops were asked to fill a survey about their design skills and material preferences. At the end of each workshop, participants needed to present the final result of their project, followed by filling another survey about their realized product, the whole process they came through, and their final thoughts.  (p5) The process aimed to guide researchers in how to approach the research problem at each stage and acknowledge accessibility and transparency. (p6) Disturbance leads to notice aspects of the tool and turns it into an object to be thought about.(p9) The reflection-in-action suggests a process in which practitioners encounter unfamiliar situation that requires different course of action from what was planned.

Tinker material throughout design process.

Designers need to entail a thorough undwerstanding of material to unfold its qualities.

MDD can be employed to create playful interactions.

MDD is used to unfold playful interactions through qualities of the materials.

We considered following experiential components in our research: sensorial, interpretative, affective, performative.

Play= be “highly situated”.

Play: quality of experience., something people feel and experience whicle playing; a dynamic, ever-changing process filled with ambiguity and surprise. Play as an experience, in light of interaction, is what he characterizes as being generous with various kinds of improbability and excitement.

Playful interaction-> exhibit distinctive qualities such as the uncertainty in course of action, surprise novelty and excitement. Fundamental notion of playful experiences are the qualities of curiosity and exploration. Playful artefacts should offer a range of possible actions and meanings for people to explore. Design to entail what they could do.

Fascinated by material dimensions of interaction design. These levels, articulate an understanding of materials experience, categorizing different experiential qualities that can be elicited by the materials. Play shares an equally important influential factor. Highly interlaced and experienced as a whole, by each other and Not separated from the context to the point that it is misleading, Leave behind the notion of acknowledging the context in which the play will be played. Designers need to consider the situated nature of play to best serve the overall design purpose and to understand the nature and degree of play required. Playful interaction lends itself well to integrating with the context and in many cases depdns on it. The context determines whether an artifact is playful or not. Need to understand context in MDD.

Material properties are a source of inspiration, negotiation and influence do not only enable and constrain action, but Material experimentation and improvisation shifts the focus of outcomes to processes in conversation with materials. Materials unfold through collaborations with materials and creators

. Faraday’s Law is applied in sensor material design, in which a loop of conductive wire moving in a magnetic field will produce an electric voltage proportional to the rate of change in the magnetic flux through the loop. The study also uses an open-ended process in which designers structure materials to elicit different types of interaction, underlining the importance of which materials are picked as the combinations are practically endless. Some had to reinterpret their work due to technical issues, others needed to simplify their concepts. DIY method allows to create and manipulate something into becoming the output material for this project. (p3)

, owing to the “value-based” and “person-centric” perspective of craft practice. The creative practice in research needs to follow some criteria: posing a research problem, providing a context of inquiry, serving as a method to gain new knowledge and understanding, and providing evidence to support research outcomes. It allows designers to familiarize themselves with this technology.

Meanings are unpredictable during the interactive experience. Pay close attention to the materials at hand and understand how these materials communicate back to us as designers. Bring material thinking to the early steps of designing and mobilizing characteristics of materials in the design process. Interaction gestures are varied: from holding a magnet and moving it near the conductive material to creating random signals from suspending a magnet on a string. Participants found the sensor ambiguous because it was unknown to them.

Agency can emerge in short-time prototyping sessions. rather than as meanings merely ascribed by actions of designers. The analyses showed how interaction design is to a large extent driven by emergent characteristics of available materials.

Recent notions of agency analyze performative role of design materials as intra-actions between components within given phenomenon. cknowledged within HCI community. Design materials ‘talk back’ to designers.

Artefacts can act without having to simulate any kind of intentional or intelligent behaviour. HCI: concern with design of artefacts that actively play a role in human activities , and especially with recent attempts at conceptualizing the role of materials in interaction design. Materials as the unit of analysis. In HCI, it’s often assumed that designer is the sole agent that acts intentionally in design activities. Agency: effect of outcomes, generated through specific configurations of human and non-human entities. rather than as meanings ascribed by singular actions of designers. The notion of configuration in this context suggest that each component, either human or non-human always participates and becomes meaningful within constantly reconfigured phenomenon

Intelligible interaction: created through a constantly on-going negotiation creating a shifting boundary unfolding through practice. affordances of objects can be discovered by users, while, s not viewed as a fixed property embedded in the object, but Recent notion of agency: how interactional possibilities of materials unfold in interaction with users and other actors. We argue that drawing on the notion of agency provides a ground to better understand how materials talk back to designers , and the role materials play in design processes. It is through particular arrangement of the materials that the idea temporally emerges and gets produced. Agency enacts within relationships between people and artefacts. Affordance does not provide ways of understanding how a particular action interactively shapes the on-going process. Results have implications for understanding material interactions and materiality in interaction design. Various materials allow various kinds of interactions. Materials are actively contribute to the design process through the way they are arranged, their relation to one another, and to the participants. Within an activity, the object is an actor that performs its task. Understand how the state of the design ideas and its different material manifestations contributed to the final outcome of the design process. The need to give digital materials a more prominent role in understanding interaction design, and to create a richer language for talking about the active role that materials play. It became visible that the design is also to a large extent driven by characteristics of available materials. Recent theories on agency provide a way of analysing the performative role of design materials, as ‘intra-actions’ between components within a given phenomenon. (p2500)

Actions of people and material contribute to the “doing” and the forming of a designed object. The agency of a design material is an emergent relationship. Different properties of various design materials reflect the way they are actually used within design processes. The difference is the way we consider the role of materials in interaction design. The notion of agency allows for reflection on the creative intraactions whereby a lump pf clay has played a part in the design of the concept of a twittering bird. (p2505)

The way of linking and overlaying the textual object (design brief) with movements and gestures continuously occurred throughout the design process. Requires in-situ improvisation to express design ideas. Bodily movements are an actual way of creating a physical, interactive design object. The interactive qualities emerges through material interactions, and implicitly that there is a limitation to the conceptual language available for discussing interactive qualities in materials. Ways of talking about how interactive design materials contribute to the unfolding reconfigurations of a design idea. Understanding design practices regards how people and material objects develop design objects in interplay. Our argument is that the material itself enacts certain aspects of the design activity as it unfolds. . Design concepts emerge from: 1-through delegation of roles such as for facilitation, inspiration and metaphor for concrete design actions. 2- from separate material objects to a shaped design object. 3- from a basic idea to well-defined interactive artefact. 4- from physical performance to embodied object. The objects become meaningful through specific material configurations. Rethinking agency as something that emerges and is dynamically enacted through practice, rather than as a property of a particular actor. In line with a way of thinking that attempts to make room for a richer understanding of materials in social constructivist theory, and what is claimed to be an often overly strong focus on language in human meaning making. Humans and material objects intra-act(p2506)

The objects actively contribute in the meaning making process and humans construct meaning out of their representational acts. is thus not an attribute of things but, , rather than relations between independent agents (human and thing). What constitutes an interactive object has to be seen as constantly shifting dependent on context and activity. Agency is a phenomenon that emerges through a process of delegation of roles in a particular context, which allows material objects to take on the performance of certain tasks, that otherwise would be performed by people. . Agency: help understand how materials contribute and become actors, rather than mere objects to be acted upon. can thus not be understood as having different states that change through human action, is but As the design process continues, participants clarify the various actions that the material object may perform. (p2503) ) Design processes as the phenomenon of “design -activity-together-with-design-objects.” Agency is an “on-going reconfiguring of the world.” How to understand the role of material objects in design and interaction, suggest that we need to look for agency as it unfolds in a particular situation. Designers can read qualities in a design object and use them to elaborate a specific design idea. . It is often assumed in HCI that designer is the sole agent that acts intentionally in design process. Agency shares similarities with the concept of affordance, in which suggests humans interpret possible usage of an object from its shape and their earlier experience. The difference is that agency emerges in a continuous on-going dialogue between humans and things in a specific context. (p2499) The notion of intra-action is critical. It shows how a design process is an on-going performance. Agency is reflected in how performances of humans and material objects enact qualities that get ascribed to the object under design. Dynamics and change are created through agency. Agency temporally emerges in practice, meaning that it is never decidedly known in advance but rather shifts depending on the particular configurations of actors and objects. Materials are also performing agents, and consequently changes the situation. (p2507)

The first type of ambiguity was evident among participants. Most of them ambiguously understood sensor material as a familiar electronic sensor component. The lack of experience with technology also led participants to erroneous conclusions. The second type of ambiguity manifested in the participants’ meaning to the signal and how they described it. The third type of ambiguity was found through the unclear function of the object. Participants were ambiguous about how the sensor works, the purpose of the produced signal, and the function (or lack) of the objects built with.

, which may elicit more meaningful experiences.

Experiential components through MDD provide structure and vocabulary, revealing new insights and facets of how materials can produce novel and playful interactions.[[1]](#footnote-1)

Material-driven practices can be influenced by craft research and vice versa. This experience-oriented perspective is influenced by the context of use. The projects’ materials usually represented the environment where the object would be used.

1. Taner Olcay, “How Can Material Driven Design Create Playful Interaction?,” (Report, Malmö University, 2017), 2. [↑](#footnote-ref-1)