Handcrafting Electronic Accessories Using 'Raw' Materials

Ylva Fernaeus
Mobile Life @ KTH
Stockholm, Sweden
fernaeus@kth.se

Martin Murer
Mobile Life @ SICS
Stockholm, Sweden
martin.murer@sbg.ac.at

Vasiliki Tsaknaki
Mobile Life @ KTH
Stockholm, Sweden
tsaknaki@kth.se

Jordi Solsona Belenguer
Mobile Life @ KTH
Stockholm, Sweden
jordisb@kth.se

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Abstract
In this studio we explore the design of interactive electronic accessories made from natural materials such as wood, copper, silver, wool and leather. A set of handcrafted sensor components along with easy to use sensor boards that connect with example smartphone software, will be utilized as a toolkit for the studio activities. Participants will, through hands-on activity, create with, learn about and discuss the role of natural materials in the design of wearable interactive designs.

Introduction
In this studio we want to explore the materiality and implied aesthetics of prototyping tangible interfaces for wireless and wearable use settings. With the recent development of low energy wirelss connections (e.g., Bluetooth Low Energy, ANT+) available on standard hardware, there is an interesting design space for new interactive scenarios where tangible wearable designs and interactive accessories carried or worn around the body, can be made to communicate wirelessly with each other and with a range of consumer electronics (e.g., sports gear or other body sensors, or smartphones).

The studio is part of a research project that concerns the intersection between mobile interaction design and

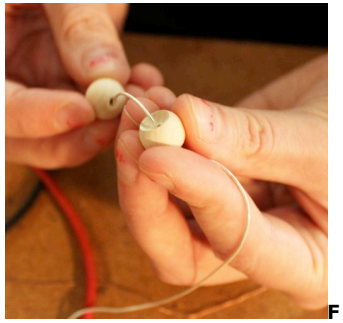

Figure 1. Creating a circuit by using 'bead element' components, made out of wood.

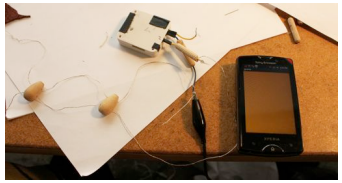

Figure 2. Testing the circuit's connection, as an output for controlling a smartphone's interface.

fashion. As such the project spans a broad range of patterns of mobile apps, the conceptualization of mobile devices as a form of fashion accessories, issues of branding and potential 'street fashions' among electronic products, and the design of novel interactive technologies which can be worn around the body or be embedded into e.g. clothes and other accessories [3].

Within the DIY culture, there is currently a growing practice of exploring ways of embedding cablings in beads, yarns and other materials [2]. Also from within product design at large, several companies manufacture earphones made in raw materials such as wood (e.g. fuubi[1]), or produce cables embedded in textile, or beads, or with some form of hand crafted decorative details. However, the blending of traditional crafting materials in these cases normally do not go beyond the very casings and cables, the technology is basically just embedded or covered in these raw materials, only minimally affecting the interaction design or internal functioning structure of the designs. The field of wearable technology has also been suffering from challenges in terms of developing solutions that are both meaningful in terms of interaction and that people would actually like to wear [1]. This is an interesting domain, since it concerns publicly visible items that are worn close to the body, associated with subculture and style.

This studio will specifically focus on hardware prototyping and electronic components made out of 'raw' materials, since there is a growing design challenge within HCI in terms of environmentally friendly designs, and a broader cultural interest in moving away from plastic designs, within the domain of tangible interaction.

The aim of this studio is to make use of a series of *alternative* handmade components made of natural materials (wood, silver, copper etc.), as wearable interfaces. Participants will be invited to work hands-on and explore the potential of 'electronic beads', as we name them, creating their own circuits that will communicate wirelessly with each other or with smartphone applications . For this we will make use of latest generations of sensor boards, which gives the possibility to create small remote controls by connecting various sensors to control e.g. software on smartphones. However, even if specific software applications is important for the design case, focus in this studio will be on the crafting of physical control devices.

Studio Proposal Description

During the studio, participants will have the chance to work hands-on for developing concepts and building physical and tangible interfaces as wireless controls for 'prepared' example smartphone applications, e.g., a music player. First we will give a short tutorial to introduce the hardware prototyping platform, which has been developed in our lab for quick and easy, wireless prototyping. Among other features, it uses the ANT+ wireless protocol, is compatible with Arduino[2] and with a small test bed of smartphone applications to play with.

In this studio we will bring along a number of handmade components, developed during a series of

[1] http://www.slipperybrick.com/2009/12/fuubiwoodenearphones/

[2] www.arduino.org

Figure 3. Examples of hand made components made out of copper and wood, used for tangible interfaces.

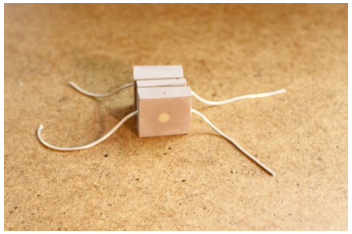

Figure 4. Component that can function as a push button sensor, by touching the silver circle.

workshops, together with a jewellery designer (Figures 3,4,5) in Stockholm. By making use of copper and silver's innate conductive properties, and by combining them with wood, leather, wool and similar 'raw' materials, we will provide some examples of handmade 'bead elements' that can be used as alternative input sensors or other types of components for building a circuit. For example, a *bead element* as the one shown in Figure 4, can function as a discreet push button element, when a person touches the small silver circles (by making use of the human body's conductivity). Other controls are designed to make sliders and a variety of simple switches (Figure 6).. Besides these *alternative electronic components,* we will bring a collection of soft conductive and non-conductive materials, such as textiles, yarns, leather, chords etc. that participants can use for their prototypes, as they like.

The platform with which we are testing the interaction between the wearer and the interface is a new board for wireless interactions based on the Arduino framework. The ANT+ technology embedded into the board enables wireless communication with e.g. smartphones.

After the introduction to the hardware prototyping platform and the available materials, participants will be invited to sketch quick ideas and concepts for the studio's explorations. In a "show and tell" session they will briefly present their own concepts, which they will have time to work for the longest part of the studio.

We will end the day with short presentations of each participant's prototype(s) and discussions of two-three central questions, raised during the explorations with materials, *alternative electronic components* and the prototyping platform (See 1.C Topics to be Covered and Expected Outcomes).

Topics to be Covered and Expected Outcomes

Participants with different backgrounds will work together and exchange knowledge in the intersection of handicraft techniques, tangible components, circuitry and programming. Being highly practical in nature, the main outcomes will concern the hands-on experiences of working with the materials provided, and the interactive projects created at the studio.

More theoretical topics that will be touched upon during the group discussions include:

- The significance of the hand made, including traditional physical crafts, in the future of tangible interaction design.
- The aesthetics of natural materials, in relation to the plastics and aluminium compounds normally used in interactive products.
- The potentials of new wireless protocols and sensor boards for the development of wearable designs and solutions.
- Conceptualising tangible crafting in terms of sustainable practice.
- Existing possibilities and demands for future toolkits for everyday crafting practices.

Technical Level

The main activity will concern traditional physical crafting, with conductive and non conductive materials in order to connect basic circuits and prototyping boards. To make most out of this studio, you should

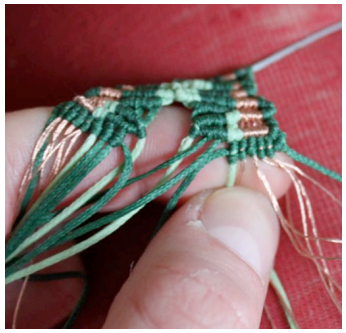

Figure 5. Constructing a hand made sensor made out of waxed yarn and copper thread.

Figure 6. Testing a switch control, in a circuit made out of *alternative electronic components.*

have a deep interest and background knowledge in either of these domains:

- Developing smartphone applications with wireless connectivity with other devices
- Arduino coding
- Electronic sensors and circuitry
- Traditional physical crafting, e.g. metalwork, sewing, woodwork, leatherwork, jewellery

Studio Learning Goals

We end by a discussion on how specific physical materials used in electronic product design may affect the products' potential of being treated and valued as fashion items. We also discuss the general challenge of bringing interactive technology, which inevitably require the design certain gesture, actions in software etc, into the realm of fashion design. With fashion being an ephemeral phenomenon as such, interactive technology is perhaps even more burdened by short life cycles and wasteful maintenance in terms of difficulties of repair and almost non-existing vintage value. Challenges for the future concern how these domains could collaborate on a material level to resolve not only the issue of sustainability, but also a desire for a more varied range of aesthetic expressions.

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