Personalized User Interfaces with Printed Electronics

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ABSTRACT
The goal of this workshop is to acquire conceptual and practical skills in developing thin, flexible and customizable physical user interfaces with printed electronics for interactive devices and objects. The workshop will cover personalized digital design of printed electronics, basics of different sensor types and actuators, and prototyping of printed electronics with conductive inkjet printing.

Author Keywords
Printed Sensors and Actuators; Tangible Interfaces; Digital Fabrication

INTRODUCTION
Tangible interaction aims to seamlessly integrate the digital and the physical worlds to enable natural, direct, and expressive interactions with digital information. Augmenting objects and the physical environment with computational components, such as sensors, actuators, data processors and communication devices, is a key part of tangible interfaces.

Computational capabilities can be externally added to tangible objects, for instance by using computer vision and projectors. Recent advances allow for embedding computational components directly inside the object itself even in case of challenging form factors. In either approach, these computational devices should blend in with the environment, satisfy user preferences, and be aesthetically pleasing while functioning efficiently. Therefore, such interfaces require a much higher degree of customization to the personal and contextual needs than a general purpose computer.

Recent advances in printed electronics have enabled the design and fabrication of thin and flexible computing components that capture user input and provide system output [1, 2]. The majority of these components can be designed digitally in a computer so that they can be easily customized and personalized. Rapid prototyping of such designs becomes possible with low cost fabrication methods such as conductive inkjet printing. This enables iterative design and evaluation of user interfaces with thin, flexible, and highly customized form factors.

PRINTED USER INTERFACES
Printed electronics can be used for directly fabricating an entire tangible interfaces (for instance an interactive paper solution). Alternatively, it also allows for fabricating components that can be embedded in existing physical object.

Olberding et. al. demonstrated a variety of interactive and customizable interfaces with printed electronics. These comprise multi-touch, proximity and bend sensors for input, while electroluminescent displays and thin-film actuators are used for output [2]. Furthermore, previous research has shown the capability of physical customization of printed electronics after they are fabricated, such as a cuttable multi-touch sensor [1]. These interfaces have enabled a variety of tangible interaction techniques such as touch, shear, fold, and rotation sensing with custom shaped displays and fold actuators.

WORKSHOP DESCRIPTION
The goal of this workshop is to acquire basic conceptual and practical skills in developing physical user interfaces with printed electronics for interactive devices and objects. Topics and learning outcomes of the workshop include:

- Personalized digital design of printed electronics.
- Basics of different sensor types and actuators (touch sensing, proximity sensing, RFID, EL displays, etc.).
- Rapid prototyping of printed circuits with conductive inkjet printing.
- Hardware interfacing and data communication with Arduino.
- Sample application scenarios with printed sensors/actuators.
- Introduction to high fidelity printed electronics with screen printing.

REFERENCES
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