Submission to *Toolkits & Wearables* Workshop at CHI 22

MYOW – Make Your Own Wearable

A Toolkit and Platform for the development of textile-based wearables

CLARA E. GLEISS

German Research Centre for Artificial Intelligence, DFKI, clara_elisabeth.gleiss@dfki.de

EMIL WOOP

German Research Centre for Artificial Intelligence, DFKI, emil.woop@dfki.de

ESTHER ZAHN

German Research Centre for Artificial Intelligence, DFKI, esther.zahn@dfki.de

CCS CONCEPTS • Human-centered computing • Human computer interaction (HCI) • interactive systems and tools • User interface toolkits

Additional Keywords and Phrases: Wearables, E-textiles, E-textile Toolkit, smart textiles, modular, hardware

THE MYOW SYSTEM

The MYOW-system was developed for the integration of electronics into textiles. The system encompasses a hardware toolkit and a web-based software platform providing coding environment, design interfaces and detailed manuals. The hardware toolkit is composed of a set of textile conductive trace elements and custom-made adapter modules that allow the system to interface with commercially available sensor and actuator PCBs frequently used by makers. The conductive trace elements, which replace cables or stitched conductive yarn typical for e-textiles [1, 2] can be applied additively to all textiles in any desired trace layout by means of thermal transfer pressing, similarly suggested in other related work [3]. The whole system functions as an I²C bus. Any electronic component with an I²C interface can theoretically be connected to it.

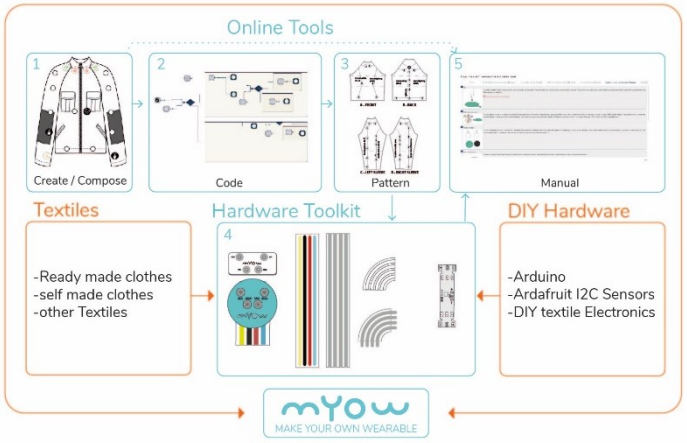

Figure 1 - the MOYW system

HARDWARE COMPONENTS

The conductive trace system, used in the MYOW-toolkit, has several properties, which are suitable for the adaptation on textile surfaces: The conductive traces are thin, soft, flexible and easy to apply. The system was developed to maintain typical textile properties, like flexibility and drape. The conductive traces are made of 4 conductive textile strips, that are fused to a highly flexible heat activated transfer foil. The conductive traces are applied to the textile in a single operation and the sensitive, silver coated conductive fabric is shielded from corrosion. By designing the trace elements in straight trace modules and curve modules (90°, 45°), users can easily reach all positions on the wearable, when cutting and combining elements. Sensors, Actuators and Compute are added to the electronic textile with adapter modules made from polyimide. Those flexible PCBs are fixed between the textile and conductive traces directly in the heat transfer bonding process. Several pinout-variants directly connect most breakout boards commonly used in the electronic

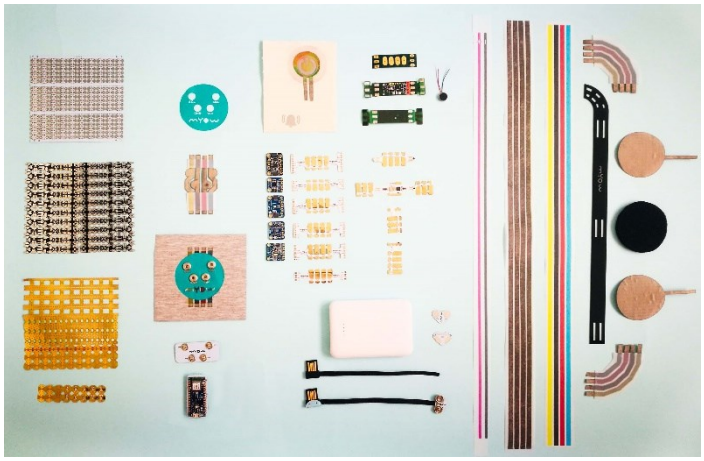

Figure 2 - Components of the MYOW system

maker culture to the I²C bus. For analogue components or components without an I²C interface the toolkit comes with a configurable adapter module, that makes those components addressable via the bus.

INFLUENCE ON THE DESIGN PROCESS

The toolkit elements can be used for the integration in many different designs (shapes and materials). The thermally applied conductive traces were tested on several different knitted and woven textile surfaces, constructed with different thickness, flexibility and drape. The design process of MYOW wearables highly differ from those of conventional clothing. New design approaches can thus not only arise from the original design idea but also from the uniqueness of the process.

USERS

The MYOW-toolkit targets users that have either electronics or textile processing knowledge but might not have any know-how in electronic textiles, to offer them the opportunity to create their own textile-based wearables. The toolkit enables the experts in their respective fields to apply their domain knowledge to the electronic textile space. Textile experts will be innately familiar with the layering of material and bonding process while for electronic experts the production process mirrors circuit development in common visual circuit design tools.

CONCLUSION

By directly interfacing with the breakout boards used in the electronics maker culture we gain access to the distributed knowledge available there in form of tutorials and communities and naturally extend the functionality of the toolkit with new developments in that space. MYOW eliminates the need for specialized tools - and the preplanning and knowledge-requirements that come with them and streamlines the manufacturing process into a single step. Through this, true electronic textile prototyping becomes possible. [4]

REFERENCES

[1] Mika Satomi and Hannah Perner-Wilson. 2019. Kobakant DIY Wearable Technology Documentation. (2019). https://www.kobakant.at/DIY/

[2] Hannah Perner-Wilson, Leah Buechley, and Mika Satomi. 2011. Handcrafting Textile Interfaces from a Kit-of-no-parts. In Proceedings of the Fifth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '11). ACM, New York, NY, USA, 61–68. DOI:http://dx.doi.org/10.1145/1935701.1935715

[3] Konstantin Klamka, Raimund Dachselt, and Jürgen Steimle. 2020. Demonstrating Rapid Iron-On User Interfaces: Hands-on Fabrication of Interactive Textile Prototypes. In Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems (CHI EA '20). Association for Computing Machinery, New York, NY, USA, 1–4. DOI:https://doi.org/10.1145/3334480.3383139

[4] Emil Woop, Esther Friederike Zahn, Rahel Flechtner, and Gesche Joost. 2020. Demonstrating a Modular Construction Toolkit for Interactive Textile Applications. Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society. Association for Computing Machinery, New York, NY, USA, Article 115, 1–4. DOI:https://doi.org/10.1145/3419249.3420075