Karin Rundqvist, Niina Hernández, Felicia Syrén, Anja Lund and Vincent Nierstrasz
The Swedish School of Textiles, University of Borås, SE-501 90, Borås, Sweden

karin.rundqvist@hb.se

Textile sensor for human motion detection in healthcare applications

This project aims to develop a wearable and comfortable sensor system useful for continuous monitoring of symptoms of epilepsy and Parkinson´s disease, and progress during rehabilitation after a stroke. The system is to monitor both physiological electrical signals and movement, providing an objective assessment tool for hospital personnel monitoring the wearer's progress. This gives a possibility to improve diagnosis, monitor disease progression or improvement and tailor treatments. By integrating the wearable sensors into a garment, preferably into the fabric itself, we aim to develop a functional demonstrator that is comfortable enough to be accepted by the patients for daily use. [1]

The use of textile sensors in healthcare applications is one step closer to a more comfortable wearable sensor system for continuous measurements. For heart rate detection textile based electrodes in garments have been investigated. e.g. [2] Our current focus is on developing textile sensors for human motion detection, connected to the specific motions regarding the neurological disorders. One approach is to integrate electromechanical properties in the textile structure, creating strain sensitive structures which give an electrical output when stretched mechanically due to movement.

When investigating a suitable textile construction developing textile sensors often takes a trial and error approach, which is time consuming. In a recent study[3] we showed that the textile construction influenced the performance of a textile sensor. The study pointed to a need of a more controlled developing method, such as computer simulation, to make more accurate predictions of the sensors performance. By investigating the possibility to combine existing computer simulation programmes, such as Comsol Multiphysics and TexGen, for an assessment of the behaviour and performance of the electromechanical properties of textile structures a new design method for smart textile sensors could be achieved.

In an ongoing interdisciplinary research project, wearITmed, partners from healthcare, electronics and textiles development (Sahlgrenska Academy, Acreo ICT, The Swedish School of Textiles, Swerea IVF and Medtech West) collaborate to develop a novel wearable sensor system for use in healthcare.

The financial support from SSF (Swedish Foundation for Strategic Research) is gratefully acknowledged.

References

1. Stoppa, M. and A. Chiolerio, *Wearable Electronics and Smart Textiles: A Critical Review.* SENSORS, 2014. **14**(7): p. 11957-11992.
2. Karlsson, S.J., Wiklund, U., Berglin, L., Östlund, N., Karlsson, M., Bäcklund, T., Lindecrantz, K. and Sandsjö, L., *Wireless Monitoring of Heart Rate and Electromyographic Signals using a Smart T-shirt* in *In Proceedings of pHealth. International Workshop on Wearable Micro and Nanosystems for Personalised Health*. 2008: Valencia, Spain.
3. Rundqvist, K., Nilsson, E., Lund, A., Sandsjö, L. and Hagström, B., *Piezoelectric Textile Fibres in Woven Constructions*, in *Ambience 1410i3m*. 2014: Tampere, Finland.