# Textile Sensor for Human Motion Detection in Healthcare Applications

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## Introduction

The research project wearITmed 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 provide 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 (fig. 1) that is accepted by the patients for daily use.

Fig 1: T-shirt for objective monitoring, the gray parts of the garment are the active sensor area. In the early prototypes the sensors are out of traditional electronics, such as accelerometers, commonly used [1] for motion sensing.

## Future work

Our current focus is on developing textile sensors for human motion detection, connected to the specific motions regarding the neurological disorders. Using piezoelectric bicomponent fibres (fig. 2)[2] a strain sensitive structure which gives an electrical output when stretched mechanically due to movement can be created. Early prototype of textile accelerometer (fig. 3).

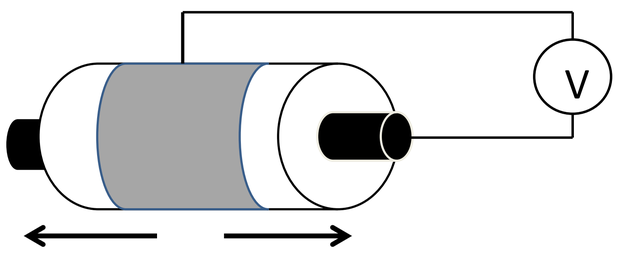


Fig 2: Piezoelectric bicomponent fibre,[2] when the fibre is stretched an electrical output is created.

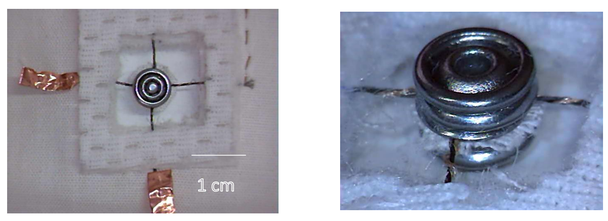


Fig 3: Textile accelerometer structure.

The possibility to use computer simulation programmes, such as COMSOL Multiphysics (fig. 4) for predicting the behaviour and optimizing the textile sensor structures for the specific application. This is a new approach of design method for smart textile sensors.

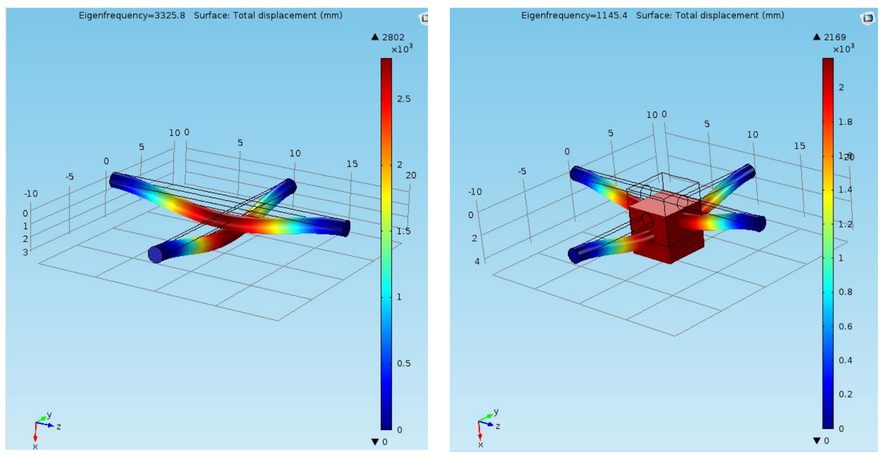


Fig 4: Eigenfrequency of polyvinylidene fluoride (PVDF) fibre with and without a weight. Simulated with COMSOL Multiphysics.

## References

[1]Bailey, R. and Lang, C, Upper extremity activity in adults:Referent values using accelerometry, *J Rehabil Res Dev.* 2014, 50(9)
[2] Lund A., et al, Piezoelectric Polymeric Bicomponent Fibre Produced by Melt Spinning. *Journal of Applied Polymer Science*, 2012, 126 (Issue 2).

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