NTAG5-Based Wireless Sensors for Body-Worn Biomedical Applications

Protecting workers with near-field powered sensors

Graduate Candidates

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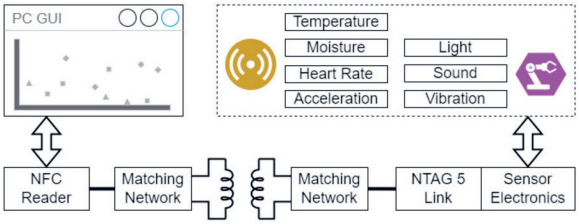
Objective: Near-field communication (NFC) is a technology that enables wireless communication between devices in close proximity based on inductive coupling. In general, such a communication link is established between an active reader and a passive tag. Beyond communicating, NXP's NTAG 5 is able to harvest additional energy from the active reader's magnetic field to power other system components. This technology is envisioned to be a key ingredient for body-worn, textile-based sensor applications. The objective of this project is to analyze the feasibility and possibilities of such systems and to build a demonstrator for a set of defined use cases.

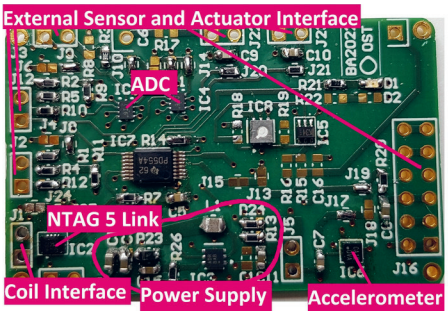
Approach: To determine the performance of different coil geometries, several textile-based reader and tag coils as well as suitable impedance matching networks were fabricated and evaluated. Based on these observations and analytical calculations, a model was created that shows the dependence of the available power on the orientation of the coils. This model can be used to design coils for specific applications.
Various sensor and actuator types were evaluated with respect to the power delivery limitations of the NTAG 5. For demonstrational purposes, a small multipurpose PCB hosting the NTAG 5 chip, power supply and sensor electronics was developed and incorporated into body-worn textiles. In addition, a software was developed that allows control and data display through a graphical user interface.

Result: A fully functional demonstrator was produced, consisting of two combinations of shirts and sweatshirts equipped with various coils, sensors and actuators. Both coil configurations allow wireless power transfer close to the 30 mW output power limit of the NTAG 5. Hence, it could be demonstrated that the wireless sensor system envisioned in the objective is indeed practically realizable and enables a variety of sensing applications, including heart rate monitoring as well as moisture, temperature, and acceleration measurement.

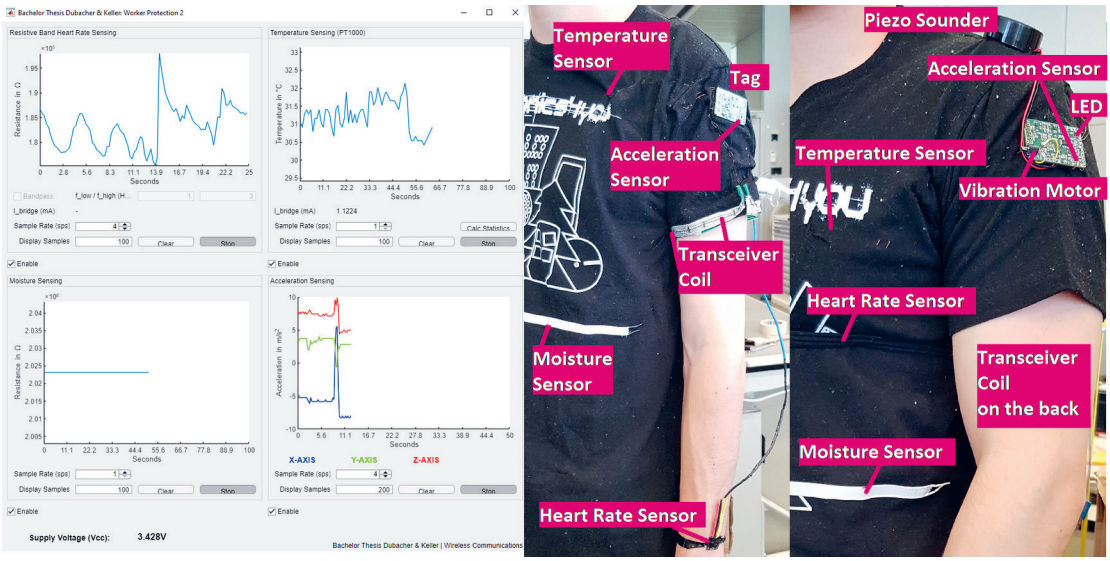
Block diagram of the envisioned NTAG5-based sensor system.
Own presentment



The printed circuit board hosting the NFC Tag, power supply and sensor electronics.
Own presentment



Demonstration setup with software on the left and textile-based hardware used for worker protection on the right.
Own presentment



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Subject Area
Wireless Communications

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