

Semester/Master Thesis:

# A Prototype Context-Aware Medical Monitoring Device

## Motivation and Informal Description:

The goal of this semester thesis is to design and construct a prototype of a battery-operated medical monitoring device that can capture both human vital signs (e.g. oxygen saturation and heart rate) in combination with ambient characteristics (e.g. temperature and humidity). A proposed system architecture is illustrated in Figure 1. The prototype device must be designed using a combination of low-power system design principles (e.g. power gating, duty cycling, MCU sleep modes and dynamic frequency scaling) in order to maximize system lifetime.

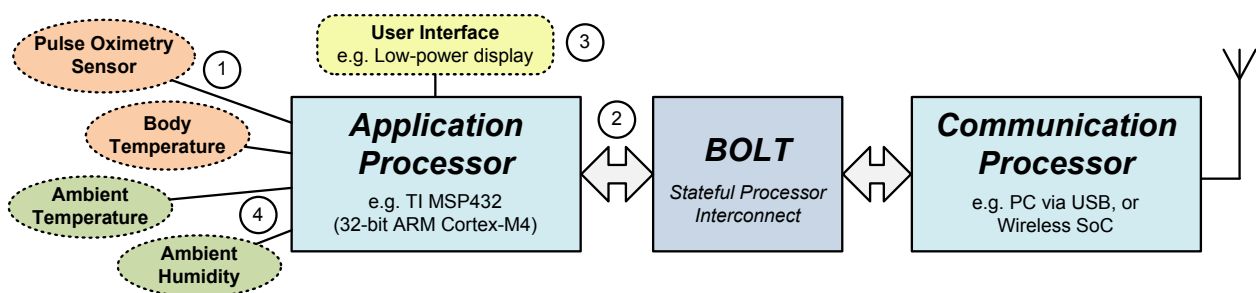


Figure 1: Proposed system architecture.

**Your project:** The goal of the project is to (i) integrate a commercial pulse oximetry sensor [1] to a state-of-the-art microcontroller [2], (ii) integrate the microcontroller to BOLT [3] using the FreeRTOS [4] real-time operating system, (iii) devise a suitable user interface, and (iv) optionally integrate additional ambient sensors.

This is a challenging thesis that provides the opportunity to gain practical experience with hardware/software co-design, real-time processing and communication, and low power system design.

**Requirements:** You should have experience with low-level C programming and have experience in developing and debugging embedded systems.

**Interested? Please have a look at <http://www.tec.ethz.ch/research.html> and contact us for more details!**

## Contacts:

- Georgia Giannopoulou: [georgia.giannopoulou@tik.ee.ethz.ch](mailto:georgia.giannopoulou@tik.ee.ethz.ch), ETZ G77
- Felix Sutton: [felix.sutton@tik.ee.ethz.ch](mailto:felix.sutton@tik.ee.ethz.ch), ETZ G75
- Pengcheng Huang: [pengcheng.huang@tik.ee.ethz.ch](mailto:pengcheng.huang@tik.ee.ethz.ch), ETZ G77

## References:

- [1] Nonin OEM III Oximetry Development Kit, <http://www.nonin.com/OEM-III-Module>
- [2] Texas Instruments MSP432P401R LaunchPad, <http://www.ti.com/tool/msp-exp432p401r>
- [3] Bolt: A Stateful Processor Interconnect, SenSys 2015, <ftp://ftp.tik.ee.ethz.ch/pub/people/fsutton/SZDLGGFBT2015a.pdf>
- [4] FreeRTOS, <http://www.freertos.org>