

## **Master Thesis Abstract**

### **In-Ear Pulse Wave Detection - Signal Genesis and Measurements**

The heart activity results in an oscillating blood pressure, the pulse wave (PW). It is detectable in arteries and veins. A system developed by the Laboratory of Medical Electronics at Lübeck University of Applied Sciences detects a pulse synchronous pressure oscillation in the air tight sealed outer ear canal. The pressure signal looks like an inversion of a in parallel recorded photoplethysmogram (PPG) signal. Hence, it is assumed that the pressure signal is an arterial pulse wave.

Different components are designed to conduct the measurements for this thesis. The individual ear mould for pressure sensor positioning and ear canal sealing is replaced by a universal pressure sensor fixation with ear tips. A second pressure sensor fixation is build to detect pressure oscillations on the head skin. A second pressure sensor is put into operation to be able to measure on the right and left side, simultaneously.

A comparison of in-ear measurement and pulse at the temple can prove the signal inversion. To be on the safe side, sign errors in the hard- or software of the constructed device are dismissed with a system verification. The signal origin is narrowed with measurements, respectively anatomical and physiological deliberations. It is assumed that the pressure signal is generated in the cartilaginous external acoustic meatus. It might be that the tragus and parts of the concha contribute to the signal, too. The arterioles of the mentioned anatomical regions are most likely responsible for the signal generation. The inversion of the signal is related to the ear tip positioning in the conical entrance of the outer ear canal.