

Applications of PPGI: from Incubator to Psychiatry

Markus Lueken, Steffen Leonhardt

Medical Information Technology (MedIT), RWTH Aachen University
Aachen, Germany

PPG Imaging (PPGI) is a rather novel method to acquire information about cardiac activity by means of camera technology. Its application is based on both micro-movements of the human body due to the mechanic impacts of blood flow and heart contraction as well as slight color changes of the skin surface due the superficial perfusion. PPGI thus allows a contact-less and remote measurement of the heart rate (HR) and can be applied in contact-sensitive scenarios. However, extracting cardiac activity from video data can be a challenging task in the real-world clinical everyday life due to its high sensitivity to motion artifacts and environmental and illumination disturbances.

This talk discusses two different applications of PPGI in the clinical setting and the potential and challenges related to these scenarios. The first application is monitoring in the neonatal ICU. For this scenario, we have integrated a multi-modal camera-based setup for remote vital sign monitoring into a neonatal incubator for preterm infants. The setup contains different cameras in the visible and near-infrared spectrum and is installed above the mattress base of the incubator. The HR estimates were extracted from the video data and compared to the clinical ground truth provided by a Philips patient monitor. The second application addresses a clinical interview scenario of psychiatric patients and aims at assessing the mental state. A standardized interview was conducted in a clinical trial with 140 subjects. Among other camera modalities, the interview was recorded using a commercially available webcam. Different algorithms from the pyVHR framework were used to extract pulse information. The HR estimates were compared to the ground truth provided by a reference PPG sensor (Shimmer3). Both clinical scenarios could potentially benefit from remote HR monitoring. However, both applications are also associated with severe constraints, i.e. motion artifacts due to natural body movements.