

Design and Application of Body Sensor Systems in Healthcare

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Body sensor systems are becoming increasingly ubiquitous and have amazing potential to revolutionize healthcare delivery. Sensors come in a variety of form factors (e.g. wearable, ambient, ingestible or injectable) and can measure a plethora of physiologic and behavioral states in a near continuous fashion. Integrated into networks of sensors, these body sensor systems offer a mechanism to integrate technology into daily life. Perhaps most promising is the potential of such sensor systems to contextualize sensor data, to provide understanding of the milieu in which changes in health occur and to intervene in an automated, real time fashion to change behavior and promote health.

Many challenges need to be overcome before body sensor systems can be widely adopted and highly effective. Designing sensors that are highly accurate while being non-obtrusive and aesthetically acceptable to users is a top priority for designers. Optimization of machine learning approaches, big data management, and privacy are other considerations that will influence success and uptake. In addition, the design process must involve the end users, maximize acceptability and intercalate with daily life. The ideal end product is a body sensor system that can track specific behaviors, but also create a new opportunity to deliver feedback, corrective interventions and other behavioral modifications in the setting of detection of specific parameters.

Last year's mini-track focused on the state of art of wearable sensor systems and generated recommendations regarding design of closed loop sensor systems and methods for evaluating sensor systems. This year's mini-track builds upon last year's work by discussing deployments of body sensor systems, interpretation of data generated from systems and the implications that body sensor systems have on understanding health, wellness and populations.

This year, the mini-track has two exciting papers that describe practical and innovative approaches to body sensor system applications. In our first paper, the authors leverage off-the-shelf wearable devices and on-board smartphone sensors to contextualize the daily activity of adolescents and quantify opportunities to increase academic engagement during the daily activities of students. Our second paper discusses the use of contactless body sensors in the form of ultra-wide band radar to detect the presence of an individual in a room and measure respiratory rate noninvasively. The authors of both papers will describe novel applications of body sensor systems for unobtrusive detection of biometrics that may correlate with key features of daily life or health status. Importantly, these papers establish important preliminary data which can be used to develop automated interventions, whether the context of academic engagement or healthcare

Following the paper presentations, we will open the forum for discussion on the material presented. We will use the challenges and successes from each paper to explore how this information can immediately inform research, commercial and clinical endeavors. We will also crowdsource ideas for a follow-up mini-track that will fill identified gaps and be highest yield for future HICSS participants. We anticipate that presentations and discussion will help attendees consider key design factors in their own work evaluating body sensors and generate new ideas for collaborations and applications in this space.