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Human-Centered Monitoring: From Enabling Technology, Human Factors to Computational Diagnosis

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ABSTRACT:

Chronic diseases are the leading causes of deaths around the world. The high cost of prolonged in-hospital care on chronic conditions facilitates the transformation from hospital-centered to human-centered healthcare. Wearable devices provide a preventive, proactive approach for daily monitoring and well-being management. The people's comfort, biocompatibility, and operability call for special attention to new generation technologies. The recent progress in smart fabrics, textile, and garment and their manufacturing techniques open the door for next generation wearable electronics with fully flexible system on cloth. This study aims to establish a platform technology of accurate embroidered electronics that can monitor multiple vital signals with the entire system on cloth. To further assist daily monitoring, we first tackle the major challenge of motion artifacts by investigating the physical model from a new perspective and provide the electrode design to mitigate motion artifacts. Based on the understanding, flexible embroidered electronics for multiple vital signals are explored using physical modeling and new design tools. To further realize automatic design-to-manufacturing translation of E-logos on cloth for ubiquitous sensing, a cloud manufacturing framework is established on our server, connecting customers, designers and small businesses. The overall goal is to realize ubiquitous sensing without any disturbance of people's daily life.

BIOGRAPHY:

Dr. Sun is an assistant professor in the Department of Mechanical Engineering-Engineering Mechanics and an adjunct assistant professor in the Department of Biomedical Engineering at Michigan Technological University since 2014. Dr. Sun received her Ph.D. degree from the Department of Electrical Engineering and Computer Science at Case Western Reserve University in 2014. Her research is mainly focused on wearable sensors and electronics, human-centered monitoring, and human-machine interaction. She is the director of Cyber-Physical Systems Center and an associate director of Institute of Computing and Cybersystems at Michigan Tech. She is a recipient of NSF CAREER award and an active member of IEEE. She serves on the Wearable Biomedical Sensors and Systems Technical Committee in the IEEE-EMB Society. She also serves as the poster and demo track chair of IEEE-CHASE'17/18, the poster track co-chair of IEEE-BSN'18, and a TPC member of IEEE-CHASE'16/17/18, IEEE-SMC'17, and IEEE-BSN'18.