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New approaches to sensing in the home

Sensors have the potential to have a profound impact on our daily lives, especially relating to technologies in the home. Researchers and companies have begun to identify a wide range of applications that interact with people by detecting and classifying human activity and events in the home and reacting to those events in a way that provides important benefits to the human. For example, research and commercial systems have been developed for providing peace of mind to caregivers of elderly people living alone, assisting caregivers of children with developmental disorders, managing chronic diseases, and exercise monitoring.

More recently, energy monitoring for sustainability has garnered significant attention as an emerging application area. Residential energy consumption is one of the largest and least understood areas of energy consumption and is responsible for 28% of US energy consumption. Strategies for addressing our energy crisis clearly require a multifaceted approach that transcends technology. However, for developing a more complete understanding of personal energy consumption in the home, computing technology plays a critical role in the collection, analysis, and presentation of data to answer important sustainability questions by the scientific community. Past work has demonstrated sustained energy savings of 10-15% in the home with the appropriate feedback of highly granular disaggregated data, but required complex sensor installations. There is a strong desire to demonstrate the value of these applications in real-world settings and then eventually enable their adoption. **However, a great challenge still remains in practically deploying sensing technologies to gather this relevant data at a large-scale to explore the long-term and broad implications of these applications in the home**. Consequently, identifying a widely accepted, cost effective, and easily deployable sensing solution remains a major hurdle in home energy sensing.

Current sensing methods remain in their infancy and are limited to sensors that are tied together for small isolated deployments, and many existing sensing approaches tend to be deemed obtrusive and difficult to deploy. In addition, no comprehensive public dataset on residential electricity and water use and sensor data exists for researchers to build and compare new analytic tools and methods, thus limiting the ability to participate in this kind of work to a small number of groups who have access to this proprietary information through their own small deployments.

Dr. Patel will highlight the development of a complete energy and water sensing and analytics platform for residential environments. His will discuss a new generation of electricity and water sensing systems that are capable of providing consumption data down to the individual appliance or device from single sensing points. These techniques use signals sources that have often been regarded as “noise.” In addition, Dr. Patel will describe a new class of low-power wireless sensors that use the electrical wiring in a building as an antenna to increase range and lower the power consumption of wireless sensors.