PlaceLab

Research in the Real World to Develop Tomorrow's Technologies

We've all been asked to fill out questionnaires on lifestyle and health habits. And we've all cheated. So how do researchers get accurate feedback on how people live so that they can develop technologies that really work? How can new technologies be evaluated in the context of everyday life?

For four projects that focus on lifestyle and health, the answer is the PlaceLab, MIT's highly instrumented, "living lab," where volunteers come for extended stays to test technologies and design concepts.

During construction

Integrated into this environment:

85 Switch Sensors **11 Humidity Sensors** **1 Barometric Pressure Sensor** **6 Light Sensors**

36 Temperature Sensors **3 Gas Sensors** **37 Electrical-Current Sensors** **18 Speakers**

125 Wireless Object-Movement Sensors **1 Wearable Heart-Rate Sensor**

14 Water-Flow Sensors **3 Wearable Body-Movement Sensors**

18 Video Cameras **19 Microphones** **16 Micro-Controllers**

Located a short distance from the MIT campus, the PlaceLab is a 1,000-square-foot apartment equipped with more than 250 sensors and dozens of cameras and microphones to record every aspect of ordinary life. It can provide researchers with data on nearly everything you do—from the time you wake up, to the foods you eat, to how much TV you watch. The architecture and technology of this first-of-its-kind, fully instrumented, live-in environment were developed under the auspices of the MIT Department of Architecture's House_*n* consortium, led by architect and principal research scientist Kent Larson, head of the Media Lab's Changing Places research group, and Stephen Intille, House_*n* technology director.

Neither a prototype nor a demonstration environment, the PlaceLab is a new type of scientific "instrument" that allows researchers to collect critically needed information on how people interact with their homes, and to systematically test and evaluate strategies and technologies in a natural setting. It is capable of accommodating multiple studies simultaneously, and is particularly useful for hypothesis testing and for generating pilot data prior to large, longer-term studies.

Integrated interior infill (I^2) with sensors

"Chassis" wires and pipes

Server closet

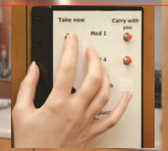
PlaceLab is a joint initiative between the House_*n* Consortium and TIAX LLC. Two Media Lab alumni played key roles: T.J. McLeish, as detailing and construction manager, and Jennifer Beaudin, as study protocol and participant-interaction coordinator.

MITes+ : PORTABLE, WIRELESS SENSORS FOR STUDYING BEHAVIOR IN NATURAL SETTINGS
Emmanuel Munguia Tapia, Louis Lopez

MITes (MIT environmental sensors) are low-cost, wireless devices for detecting the motion of people and objects in environments. These sensors have now been extended to provide additional information to technology and medical researchers, and include mobile MITes for people movement (3-axis accelerometers), object movement (2-axis accelerometers), indoor location, ultraviolet light exposure, heart rate, and electrical-current flow. The sensors can be used to measure medication adherence, physical activity, use of home devices, and exposure to environmental situations that may impact health. This project is sponsored by the National Science Foundation and the sensors are being used in work sponsored by the National Institutes of Health.

VITO
Jason Nawyn

Vito is a persuasive television "remote control" to encourage more physical activity and decrease sedentary behavior such as TV watching. Vito works unobtrusively to help people reflect on their screen time and non-exercise activity thermogenesis (NEAT) behaviors. It offers tailored suggestions, movement games, and other challenges to help people stay active—without going to the gym. Vito was implemented using MITes and the PlaceLab's sensing and communication infrastructure, and was tested with a PlaceLab volunteer for two weeks.



A MOBILE CONTEXT-SENSITIVE MEDICATION REMINDER SYSTEM
Pallavi Kaushik

This system uses information from PlaceLab sensors to provide context-sensitive health reminders and alerts that adapt to the user's behavior. Analysis of preliminary data suggests that a context-sensitive reminder system may lead to more timely medication adherence than a fixed-time reminder system. In addition, a qualitative analysis of system use provides information about how to build novel health-care applications for the home.

Photos: Kent Larson

RECOGNIZING ACTIVITIES OF DAILY LIVING IN THE HOME SETTING USING UBIQUITOUS SENSORS
Emmanuel Munguia Tapia, Randy Rockinson

Medical professionals believe that one of the best ways to detect an emerging medical condition before it becomes critical is to look for changes in the "activities of daily living" (ADLs). The PlaceLab is being used to develop new pattern-classification and context-based artificial intelligence algorithms to detect such changes. Particular attention is focused on identifying behaviors that indicate mental illness and cognitive problems related to aging, as well as associated medication compliance issues. This project is sponsored by the National Science Foundation.

To learn more, visit http://architecture.mit.edu/house_n