Roundtable

MODERATED BY CHRIS WARNER | EXECUTIVE EDITOR

MEMs & Nanotechnology

Q: *Beyond smart phones and tablets, what type of device or application do you feel will emerge next to drive the demand for MEMS?*

Roger Grace, President, Roger Grace Associates

I trust that we are all familiar with the recent notoriety of large-volume MEMS applications in mobile phones and tablets. However, based on recent research, I believe that there are many other high-volume application opportunities that are quickly emerging for MEMS. I would like to take this opportunity to discuss wireless autonomous sensor networks (WASNs) and, more specifically, "smart buildings". A European Commission definition states Smart Buildings to be "buildings empowered by information and communication technologies in the context of the merging Ubiquitous Computing and the Internet of Things: the generalization in incrementing buildings with sensors, actuators, micro-chips, micro- and nano-embedded systems will allow to collect, filter, and produce more and more information locally, to be further consolidated and managed globally according to business functions and services." What is pertinent to this article is the subject of sensors and micro/nano chips. The US Census has reported that there are more than 160 million households in the US. Other statistics state that there are more than 1.7 billion households globally. There also exists millions of commercial buildings worldwide. Most provide heating (and possibly cooling) functions to their inhabitants. They also need to provide a number of additional functionalities including security, safety and convenience...thus, we have a very large available market for this application.

The key to the delivery of these functionalities is a WAN and at its core is the sensor node. The sensor node can have a number of sensors including pressure, temperature, humidity, and air quality as well as light-level and presence in its front end. MEMS are uniquely suited to supporting these functions based on their low cost, small size, robustness, and production maturity. The "fusion" of these sensors with low-power signal-conditioning ASICs with embedded microcontrollers, high-efficiency batteries, and a networked back-end communication chip completes the node. I have named this approach "MEMS-based systems solutions" and have authored an article in a recent ECN on this subject. All of these sensor inputs are delivered to the host computer in the building whose job it is to optimize the environment of the building while minimizing the energy used to accomplish the task. The good news is that all of the elements of the system are current production realities available through many manufacturers and all that is needed is systems engineering to create the solution.

As a final note, Nest Labs of Palo Alto California (www.nest.com) has introduced in October 2011 their "Nest Learning Thermostat" and appears to have implemented my advice. This $249 device as described in their promotional materials uses six (MEMS?) sensors along with embedded microprocessors that learn from your behavior, preferences, and surroundings to create a heating and cooling schedule, keeping you comfortable when you are at home and conserving energy when you are away. This will go on top of my 2012 Holiday Gift list. What about you?

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