Turning Back the Clock

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Where was *IEEE Pervasive Computing* 10 years ago? What were our special issue topics, and what were the top papers from each of those issues? What were the burning issues, and where do those issues stand today? Let's turn back the clock.

TEN YEARS AGO

In 2005, *Pervasive Computing* was only in its fourth year, a toddler. Mahadev Satyanarayanan, our founding father, was still at the helm.

Our January–March issue focused on "Energy Harvesting and Conservation." Our top-cited article from this issue was Joseph Paradiso and Thad Starner's "Energy Scavenging for Mobile and Wireless Electronics." Satyanarayanan's argument that "radical improvements in battery technology are unlikely"[1] certainly rings true. Battery life remains an important issue. In fact, at our editorial board meeting this past June, we selected energy harvesting as a theme for an upcoming special issue.

Our April–June issue focused on "The Smart Phone." Satyanarayanan observed that the most common pervasive device was the cell phone,[2] and the issue examined what would come next. Now, 10 years later, that has become clear. Smartphones are, indeed, ubiquitous. They include both PDA capabilities and email access, but so much more with music, games, health and fitness, and the ability to manage membership cards. The only thing my smartphone does not yet manage is my keys, and I think that is only a matter of time. Our top-cited article from this issue was "ContextPhone: A Prototyping Platform for Context-Aware Mobile Applications" by Mika Raento, Antti Oulasvirta, Renaud Petit, and Hannu Toivonen. I would argue that this is pretty much a solved problem at this point, with mobile apps having access to a plethora of context information.

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Our July–September 2005 issue focused on "Sports Technologies." This issue examined the use of pervasive sensing in sports, from equipment, to athletes, to sports governance. With the Deflategate scandal from the American Football Conference (AFC) Championship Game earlier this year,[3] it is clear that sensing in sports is not yet a solved problem. In fact, as with energy harvesting, our editorial board meeting identified sports and fitness as a theme topic for a future issue.

Our October–December 2005 issue focused on "Rapid Prototyping." Our most-cited article was written by Feng Zhu, Matt Mutka, and Lionel Ni on "Service Discovery in Pervasive Computing Environments." Looking at the literature, service discovery certainly remains a common topic for papers in mobile and pervasive computing, although service discovery has also made significant progress, such as the ease with which we can now connect headsets via Bluetooth or phones and laptops to Wi-Fi networks. Rapid prototyping, though not a solved problem, has also become easier. Just look at the progress people make during very short-term hackathons!

I hope you enjoyed this trip down memory lane as much as I did. I found it fascinating to see what we were doing 10 years ago, realizing just how far we have come! This year's special issues have focused on "Privacy and Security," "Smart Spaces," "Digitally Enhanced Reality," and "Pervasive Food." Some of these topics could easily have been topics of interest a decade ago, and others I think are well beyond where we were back then, especially this issue's focus on food.

IN THIS ISSUE

In addition to our theme articles on pervasive food, we also have two feature articles.

In "Classifying Text-Based Computer Interactions for Health Monitoring," Lisa Vizer and Andrew Sears examine the differences in typing behaviors by older adults with and without early cognitive impairment. They look at typing speeds and pauses between keystrokes, as well as the complexity of the language used and the number of references to other people. Their results show a promising mechanism to identify (and potentially measure the progress of) cognitive impairment in older adults using a common, everyday task. If this mechanism bears fruit, we might have a way to routinely monitor cognitive impairment in a minimally invasive manner.

For our second feature article, Mitja Luštrek, Hristijan Gjoreski, Narciso González Vega, Simon Kozina, Božidara Cvetković, Violeta Mirchevska, and Matjaž Gams present "Fall Detection Using Location Sensors and Accelerometers." In this article, the authors describe a system that uses wearable location sensors, enhanced with accelerometer sensors, to detect falls with surprising accuracy. Given the demographics of our aging population around the developed world, solutions such as this will prove important as we learn to help our elders (including, in many cases, ourselves) live independently longer and with fewer care providers.

We also have several interesting departments this issue. In our Smartphones department, Lori Flynn and Will Klieber from CERT discuss security issues as they relate to smartphones. They point out the amount of sensitive data, both personal and business, stored on smartphones and the need for vigilance. They examine all of the common smartphone platforms and operating systems. I strongly encourage you to take the time to read through this.

In our Conferences department, Ana Nika, Sofia Scataglini, and Sirine Taleb provide a fantastic overview of MobiSys 2015. Some interesting highlights include a keynote by Krishan Sabnani (Research VP at Bell Labs), a ring that detects typing on a non-existent keyboard from

PERVASIVE BORED AND BRILLIANT CHALLENGE

This issue's challenge is to consider how an electronic reading device, such as a Kindle, enhances or detracts from boredom. Is such a device simply a lighter replacement for a paperback book that you would otherwise carry around? Or is it something that you find yourself using for time-wasting activities?

These are questions to which I have been giving much thought since I initially heard the NPR "Bored and Brilliant" series (www.wnyc.org/series/bored-and-brilliant). I own a smartphone, but I also own an electronic book. I do not read books on my smartphone because I prefer the experience of my eBook. Based on my observations of my own eBook-reading behavior, I use my eBook at times and places where I would have picked up a paper-based book. I don't reach for my eBook every spare moment in the same way that I do my phone. In fact, I often do not carry my eBook with me. I much prefer my eBook to paper-based books simply because of the weight of some of the books I like to read. I also prefer it when I travel because I can bring a number of titles with me for the same investment in space and weight. I must admit that in considering these questions for myself, I do not consider my eBook in the same class as my smartphone in terms of avoiding boredom.

Returning back to last issue's challenge of deleting time-wasting apps from your phone, I have identified the next game that needs to go … now I just have to hit the delete key!

Shahriar Nirjon (HP Labs), and a joint session between WWW and MobiSys.

In our Innovations in Ubicomp Products Department, Lars Lischke, Dominik Weber, and Scott Greenwald observe that we now also have "boards" in widespread use and not just the "tabs" and "pads" from Weiser's vision.[4] As someone who does not pay much attention to the latest television technology, such as "Apple TV" and "Chromecast," I enjoyed learning about the smart TV "boards" and their interactions with the "tabs" and "pads" of today. I also found the discussion of "Android Auto" an interesting foreshadowing for our upcoming special issue on smart vehicles.

Our Notes from the Community department looks at a wide variety of topics. I find the use of location technology by the NFL interesting, but I would have expected to find the technology in the footballs rather than on the players after last year's "deflategate" scandal. I have to admit that I have a very negative reaction to the Jewelbots. Though middle-school girls might think they are very cool (and the Jewelbots might sell like hotcakes), the new opportunities for bullying are very real. I also found the discussion about Aibo being on the endangered species list to open an important topic of conversation. As

we look at robots to be companions for our aging population, we really need to consider the ability of those seniors to adjust to new "companions." Are there ways we could make the "personality" portable so that it can be moved into a new robot as the technology improves so that our senior citizens do not have to grieve the loss of another "friend"? I have mixed feelings about the "Do Not Fly Over" list. I appreciate the attempt to "do the right thing," but I fear it will work about as well as the "Do Not Call" list does with chimney sweep companies! These are but a few of the topics covered in this issue's column.

Finally, in our Pervasive Health department, Michael Gonzales and Hanna Schneider provide a thorough overview of the Pervasive Health conference, which was held this past May in Turkey. From the keynotes to the technical sessions, it sounds like a wide variety of healthcare-related work was presented. I look forward to the day when some of these technologies prove successful enough to help patients in the real world.

Reviewing how far we've come makes me wonder where we'll be in another 10 years. Will the vision of robotic companions help address the challenges surrounding an aging

FROM THE EDITOR IN CHIEF

population? Will autonomous cars be commonplace? Where will we be on energy generation and consumption? What device might displace the smartphone? My personal opinion is that we will make some pretty impressive progress on home robots and autonomous vehicles, in part because the demographics demand that we do. I fear that the battery issues will still be challenging us. For my generation, I expect a smartwatch could displace the smartphone or perhaps a smart "pin" (similar to Dick Tracy's watch or the Star Trek tricorder). Only time will tell.... ⋿

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