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## Heaven and hell: visions for pervasive adaptation

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## Heaven and hell: visions for pervasive adaptation

### Abstract

With everyday objects becoming increasingly smart and the "info-sphere" being enriched with nano-sensors and networked to computationally-enabled devices and services, the way we interact with our environment has changed significantly, and will continue to change rapidly in the next few years. Being user-centric, novel systems will tune their behaviour to individuals, taking into account users' personal characteristics and preferences. But having a pervasive adaptive environment that understands and supports us "behaving naturally" with all its tempting charm and usability, may also bring latent risks, as we seamlessly give up our privacy (and also personal control) to a pervasive world of business-oriented goals of which we simply may be unaware.

### Keywords

pervasive, visions, adaptation, hell, heaven

### Disciplines

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**Title: Heaven and Hell: Visions for Pervasive Adaptation**

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**Abstract**

With everyday objects becoming increasingly smart and the “info-sphere” being enriched with nanosensors and networked to computationally-enabled devices and services, the way we interact with our environment has changed significantly, and will continue to change rapidly in the next few years. Being user-centric, novel systems will tune their behaviour to individuals, taking into account users’ personal characteristics and preferences. But having a pervasive adaptive environment that understands and supports us “behaving naturally” with all its tempting charm and usability, may also bring latent risks, as we seamlessly give up our privacy (and also personal control) to a pervasive world of business-oriented goals of which we simply may be unaware.

Keywords; Pervasive adaptation; ubiquitous computing; sensor networks; affective computing; privacy; security;

**1. Visions of pervasive adaptive technologies**

This session considered some implications for the future, inviting participants to evaluate alternative utopian/dystopian visions of pervasive adaptive technologies. It was designed to appeal to anyone

interested in the personal, social, economic and political impacts of pervasive, ubiquitous and adaptive computing.

The session was sponsored by projects from the FET Proactive Initiative on Pervasive Adaptation (PerAda), which targets technologies and design methodologies for pervasive information and communication systems capable of autonomously adapting in dynamic environments. The session was based on themes from the PerAda book entitled “This Pervasive Day”, to be published in 2011 by Imperial College Press, which includes several authors from the PerAda projects, who are technology experts in artificial intelligence, adaptive systems, ambient environments, and pervasive computing. The book offers visions of “user heaven” and “user hell”, describing technological benefits and useful applications of pervasive adaptation, but also potential threats of technology. For example, positive advances in sensor networks, affective computing and the ability to improve user-behaviour modeling using predictive analytics could be offset by results that ensure that neither our behaviour, nor our preferences, nor even our feelings will be exempt from being sensed, digitised, stored, shared, and even sold. Other potentially undesirable outcomes to privacy, basic freedoms (of expression, representation, demonstration etc), and even human rights could emerge.

One of the major challenges, therefore, is how to improve pervasive technology (still in its immature phase) in order to optimise benefits and reduce the risks of negative effects. Increasingly FET research projects are asked to focus on the social and economic impacts of science and technology, and this session aimed to engage scientists in wider issues, and consider some of the less attractive effects as well as the benefits from pervasive adaptation. Future and emerging technology research should focus on the social and economic impacts of practical applications. The prospect of intelligent services increasingly usurping user preferences as well as a certain measure of human control creates challenges across a wide range of fields.

## **2. Format**

The networking session took the form of a live debate, primed by several short “starter” talks by “This Pervasive Day” authors who each outlined “heaven and hell” scenarios.

### *2.1. Speakers*

The session was chaired by Ben Paechter, Edinburgh Napier University, and coordinator of the PerAda coordination action. The other speakers were as follows:

*Pervasive Adaptation and Design Contractualism.*

Jeremy Pitt, Imperial College London, UK, editor of “This Pervasive Day”.

This presentation described some of the new channels, applications and affordances for pervasive computing and stressed the need to revisit the user-centric viewpoint of the domain of Human-Computer Interaction. In dealing with the issues of security and trust in such complex systems, capable of widespread data gathering and storage, Pitt suggested that there is a requirement for Design Contractualism, where the designer makes moral and ethical judgments and encodes them in the system. No privacy or security model is of any value if the system developers will not respect the implicit social contract on which the model depends.

*Micro-chipping People, The Risk vs Reward Debate*

Katina Michael, University of Wollongong, Australia

Michael discussed the rise of RFID chip implantation in people as a surveillance mechanism, making comparisons with the CCTV cameras that are becoming commonplace in streets and buildings worldwide. These devices are heralding in an age of “Uberveillance”, she claims, with corporations, governments and individuals being increasingly tempted to read and record the biometric and locative data of other individuals. This constant tracking of location and monitoring of physical condition raises serious questions concerning security and privacy that researchers will have to face in the near future.

*Who is more adaptive: the technology or ourselves?*

Nikola Serbedzija, Fraunhofer FIRST, Germany

Serbedzija discussed how today's widespread information technologies may be affecting how we are as humans. We are now entering a world where information is replacing materiality, and where control over our individual data allows us to construct ourselves as we wish to be seen by others. Serbedzija then presented examples of research into ethically critical systems, including a reflective approach to designing empathetic systems that use our personal, physical data to assist us in our activities, for example as vehicle co-driving situations.

Following the presentations, the discussion was opened out and panelists answered questions from conference delegates. This was augmented by the use of a “tweet wall” which was open to delegates to send comments and opinions using a Twitter account. This was displayed on screen during the discussion session.