Curriculum Vitae

Prof. Gerhard Tröster

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Degrees/Higher Education

1984	Dr.-Ing. in Electrical Engineering, University of Darmstadt, Germany
1979	MSc in Electrical Engineering, University of Karlsruhe, Germany

Professional Career

2004–2005	D-ITET Department Head
1993–present	Professor of Electronics, Department of Information Technology and Electrical Engineering, D-ITET, ETH Zurich
1984–1993	Manager research at Telefunken electronic, Heilbronn, Germany
1979–1984	Scientific Assistant, University of Darmstadt, Germany

Professional Activities

- Chairman ARCS Architecture of Computing Systems, Zurich, 2007
- Organizer MRS Symposium Smart Nanotextiles, San Francisco, 2006
- Chairman ISWC International Symposium on Wearable Computers, 2001, Zurich
- Chairman International Workshop on Chip-Package Co-Design CPD 1998 & 2000, Zurich
- Foundation of Swiss Chapter IEEE Components, Packaging & Manufacturing Technology Society CPMT, 2000
- Chairman IEEE CMPT Swiss 2000–2005
- Project Reviewer for the European Commission and several conferences
- Co-Founder and Board member of u-blox ag

Publications

ca. 300 refereed publications

Achievements

- ETH Wearable Computing Lab established
- MCM Integration Technologies for 80 GHz
- Opto-electronic MCM
- Embedded stereo vision for mobile HCI
- Non-invasive nutrition detection
- Accommodation-insensitive retinal projection
- System-on-Textile (SoT) technology
- Motion aware clothing
- Weaving of sensors and active devices
- Human motion assistance
- Sound-based activity recognition
- Design space exploration of autonomous sensor nodes
- Reconfigurable context recognition in sensor networks
- On-body textile UWB antennas
- Flexible thinfilm electronics for smart textile
- Performance evaluation of continuous pattern recognition methods

Committees

- ETH Recruiting Committees
- D-ITET Strategic Planning Committee
- Member of D-ITET Department Management

Teaching

- Digital Systems
- Wearable Systems 1
- Wearable Systems 2
- Digital Systems Laboratory
- Seminar on Wearable Computing

Facilities and Major Equipment

- Thinfilm Lab
- SEAT Lab
- MCM Lab

For more information visit www.ife.ee.ethz/people/gerhartr

Prof. Gerhard Tröster- Research Highlights

Wearable Assistance

Keywords

- Flexible and thinfilm electronics
- Wearable computing platforms
- Electronic textiles
- Body area sensor networks
- Context recognition
- Personal health assistant

Future priority areas

- Smart textiles
- Mobile and user-centered healthcare
- Wireless sensor and actuator networks
- Multimodal interfaces
- Opportunistic sensing
- Application of Wearable Computing: healthcare, sport, music
- Wearable assistant for patients with Parkinson's disease
- Crowd-sourcing of human activity recognition on mobile phones
- Behavioral modeling and detection e.g. of emotions and stress using wearable devices

Focus

The core expertise of the interdisciplinary Wearable Computing Group lies in miniaturized digital electronics, high density packaging and smart textile, as well as signal processing. We capitalize on this expertise in designing wearable computers capable of smart assistance. A personal assistant, unobtrusively integrated in our daily outfit, which is always on, always available, knowing and supporting us in our daily activities, and continuously connected to the environment, illustrates the vision of wearable computing.

Wearable and Mobile Computing Platforms

Considering wearability requirements we have introduced several wearable research platforms. The ETH Onbody Sensor (ETHOS) implements a wearable sensor platform that is optimized for long-term monitoring of human body-segment orientation. The system comprises tri-axial accelerometer, earth magnetic field-, and gyroscope sensors. An internal temperature sensor, used for compensation of sensor drifts, can be interfaced, too. Gathered data can be stored in a raw format, or fused by an on-board DSP to an orientation in an Euler-angle representation. In both cases, data can be transmitted via wired (USB) or wireless interface (ANT+) for real-time display, and stored on internal non-volatile memory for offline analysis after the recording. (Fig. 1).

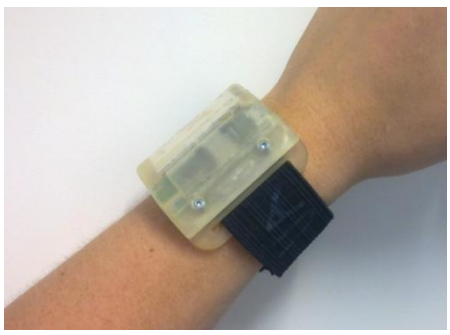

Figure 1:
ETH Onbody Sensor (ETHOS), packaged in a bracelet housing

Smart Textiles and Clothes

The convergence of electronic components and advanced fibers with man-made textiles straddles the fields of materials science and digital electronics. Such 'smart' textiles (also known as electronic or e-textiles) fall into the category of intelligent or smart materials that sense and respond to environmental stimuli. Smart textile innovations will enable challenging and competitive applications in healthcare and relevant industries in consumer electronics. We have developed a method of combining thin-film electronic circuits and commercial integrated circuits with plastic stripes that can be woven into textiles using a commercial manufacturing process (Fig. 2).

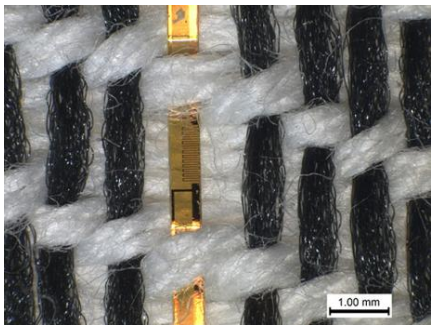

Figure 2:
A thinfilm temperature sensor woven into a textile

Personal e-Health

The envisioned pervasive computing infrastructure makes healthcare available everywhere, anytime and to anyone. In several projects, we are researching pervasive computing technologies towards paving the way for a pervasive, user-centered and preventive healthcare model. Wearable technology also has potential for sports applications. Body parameters and movements of the athletes can be monitored to provide feedback and thus help to improve technique (Fig. 3).

Figure 3: In collaboration with the Swiss Ski jumping team we analysed data of the Olympic champion Simon Ammann during competitions, including his double Olympic victory.

Cooperative Context Recognition in Complex Sensor Networks

Thanks to technological advances, sensors are now embedded in objects, in our environments, and even in our clothing. They are available in ever larger quantities, and, in a few years, sensing will be pervasive. This transformation from formerly sensor-poor environments into sensor-rich environments changes the paradigm for activity recognition. Rather than thinking about which sensors to deploy for a given recognition task, the question is now how to best make use of available resources. Thus, we investigate:

- Frameworks and programming models for the efficient distributed execution of context recognition algorithms
- Distributed and cooperative algorithms for context recognition
- New applications arising from sensing possible on a large scale.

For more information visit www.wearable.ethz.ch