

# NEWSLETTER

**SEPTEMBER 2007**



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# A WORKSHOP TO INCREASE THE DEGREE OF KNOWLEDGE

***The MICS Workshop took place in Neuchâtel on 2-3 July, under the chairmanship of Rachid Guerraoui and David Basin (program), and of Pascal Felber and Peter Kropf (local chairs). The goal of this event was mainly MICS-internal, aiming at increasing the degree of knowledge of the other groups' activities among the young researchers, as well as at discovering common research interests and possible collaborations. 120 participants attended the 2 days.***

In order to reach this goal, 60 MICS PhD students presented their research in short talks (typically 10 min.). At the end, one randomly-selected student per cluster summarized the activities of the cluster. Posters of all presentations were

available for more detailed discussions during breaks.

The presentations were of amazingly high and homogeneous quality, with most of the students being able to transmit the essence of their research topic in the short allocated timeframe. No need for the session chairs to intervene sharply to keep with the clock! It was a really good opportunity to get a detailed overview of the MICS research projects. At the end of the event, the four summarizing presentations allowed to get a pretty good view of each cluster's activities.

In introduction to the workshop, Robert Gallager presented an interesting and somehow provocative talk about how to do research, based on the example of Shannon and the information theory domain.

His view was that the final goal of research is to find the simple way to look at technological problems, by focusing on underlying issues, rather than on mathematics per se or on problem details. Graduate students should not solve complicated problems, but find simple ones that simplify the theoretical structures.

JACQUES BOVAY



# TURNING WIRELESS SENSOR NETWORKS INTO A SCIENCE GRADE INSTRUMENT

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***UBasel participates in MICS with the PermaSense and EMSR projects. In this article, the authors reflect on the maturity of the wireless sensor research field.***

There is plenty of wireless sensor hardware available, we have de facto standard software platforms like TinyOS; and when it comes to the algorithmic aspects and application reports, there is abundant scientific literature to read and apply. Helping geo scientists to use this technology for permafrost monitoring should be easy then, right?

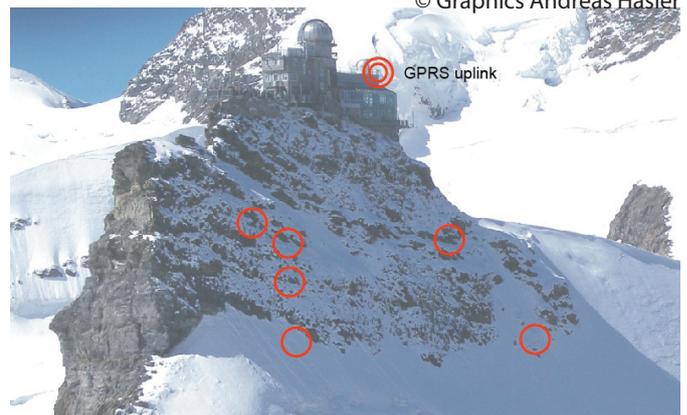
Well, it is not. Once you have connected some thermistors (temperature) and resistor bridges (conductivity as an indicator of rock water content) to your sensor node, you realize that much more is needed to turn a wireless sensor network (WSN) into an instrument for natu-

ral science measurements. If one criteria shall suffice here for this claim, then it is the observation that without patching both «standard» hard- and software, you will not be able to produce meaningful data. To stress the gravity of this assessment (and your computer scientist reaction to the «patching» word), you should consider an academic world where you had to resolder parts of your laptop and fix dozens of lines of kernel code before you would be able to use your word processor: you can't do your science if you have to fix standard tools first.

To lift existing WSN technology to science grade level was not an initial objective for PermaSense,

but has become a considerable concern that we have to address, otherwise the collaboration between UBasel (CS), UZurich (Geo) and FOEN (Federal Office for Environment) will not have produced the desired results. In a record time of 8 months, this consortium managed in 2006 to fabricate rugged sensor nodes and custom made 1 meter carbon tubes with the permafrost sensors, which were deployed near the Jungfrauoch research station.

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To hint at some of the problems that occurred during this time, we mention that initially both hard- and software issues prevented the out-of-the-box nodes to reach the specified low sleep mode currents, that radio range was much lower than expected, or that individual clock drifts were so big that per-node calibration was needed to compensate for this. Other problems relate to underestimating the effect of the extremely harsh environmental conditions: sensors on a sunny slope easily experience a

the path from off-the-shelf components to an operational scientific instrument.

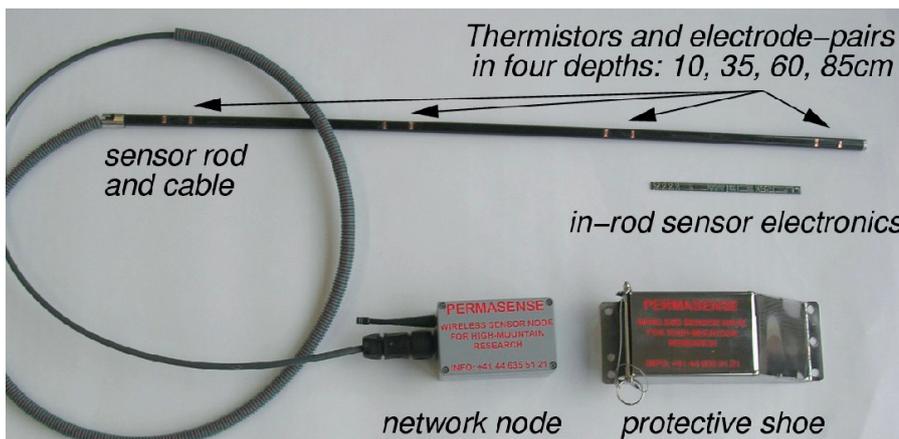
As many problems were tracked to the standard extension board to which the sensors are attached, a revision of this part was started. In 2007, MICS and FOEN provided additional money to help in the design and production of a new «sensor interface board» (SIB). The result of this companion EMSR project («Environmental Measurement Support Resource») will hopefully

a deployment at a second site in 2007 and the upgrade of the sensor nodes at the Jungfrauoch.

Permafrost is a key indicator for global warming in the Kyoto treaty. Perhaps PermaSense will become an indicator for when WSN technology has reached science grade level. Too many aspects of our research field have more the status of hypotheses rather than proven theories, including algorithms and software tools. And as knowledge can only come from positive affirmations (according to positivism), we have a warm feeling about our project.

CHRISTIAN TSCHUDIN AND IGOR TALZI

**For more information:**  
<http://cn.cs.unibas.ch/projects/permasense/>



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40 degrees higher operation temperature than their neighbors in the shadow, stretching our synchronization algorithm beyond its adaptivity. Ultimately, this first deployed network produced virtually no useful data to the geo partner although it was essential for all of us to understand the problems in

make it into the Sensor Network Platform Kit to the benefit of the whole MICS community. The group of Prof Thiele at ETHZ participates in this effort also for learning more about the process of customizing WSN technology to a particular measurement problem. The SIB effort is ongoing and will enable

**PermaSense Profile**

HW+SW: TinyNode running TinyOS 1.x and 7000 lines of custom nesC code, detachable sensor rod with ID chip and 20 data channels, multihop forwarding and in-network buffering, Internet attachment and end-to-end ack.

Performance: 0.3% duty cycle, one year operation with one Li-SOCl2 battery, 100 to 250 m wireless range.

# A STRONG CONNECTION TO RADIO FREQUENCY

*Invited in 2005 to attend a workshop on the ultra-wide band technology, Catherine Dehollain joined the MICS family a year later, as a «Maître d'enseignement et de recherche», collaborating with Prof. Jean-Yves Le Boudec on the «very low radiated power UWB communication» project. During the last MICS scientific conference in Zurich, her team (including electrical engineer James Colli-Vignarelli) even performed the best demo on «An impulse radio UWB tesbed with interference».*

Although she was born in Paris, Catherine Dehollain is a long-time member of the EPFL community. After her diploma in electrical engineering, she pursued with a PhD in the same area of study. In 1995, she joined the Electronics Laboratory (LEG) and became responsible for radio frequency activities. In particular, she works on a UWB hardware platform in discrete components. She is supervising the PhD student Prakash Thoppay. The design of the platform is flexible to allow testing new research ideas as well as receiver algorithms. "The platform was presented at the MICS meeting in 2006 and it was awarded", says Dehollain proudly. The synchronization algorithm has been tested in the presence of two UWB transmit-



ters and one UWB receiver.

Now, the platform is in the process to be improved in order to test the synchronization method in the presence of a larger number of concurrent UWB transmitters.

## SHORT DISTANCE TRANSMISSION

The electrical engineer is also interested by new solutions of micropower wireless data transmission over short distance. She is part of a team of ten people studying this technology at the Electronics

Laboratory. As for teaching, she is in charge of courses in the area of radio frequency circuits, electric filters and CAD tools.

Last, but not least, Catherine Dehollain is involved in a number of European projects, among which MINAmI, dedicated to radio frequency identification systems (RFID), and performed in collaboration with Nokia and ST Microelectronics. The research aims at developing short range, high data rate, wireless memory tags using the passive RFID principle. «The idea is to link a wireless device, for example a cell

phone, to small electronic circuits», explains the scientist.

Financed by the Swiss National Science Foundation, another one of her works concentrates on high speed analogical/digital data conversion. Several converters are put in parallel so as to increase the speed. The technique used is the decomposition of the input analog signal, based on the Walsh-Hadamard functions. The result foreseen? «An integrated circuit», answers Catherine Dehollain.

## BIOMEDICAL APPLICATIONS

At the time she had to decide of her studies, the young Catherine Dehollain was strongly influenced by the conquest of space. Today, the experienced engineer tends to be particularly attracted by biomedical applications. In that context, she contributes to finding a solution to monitor and study brain activity, as well as to assist patients suffering from degenerative brain diseases or to aid limbs amputees. The technological answer could be an implanted electronic system with a radio link for recording neural activity.

FLORENCE LUY

## WHAT DID THEY BECOME?

***While studying in Switzerland, they contributed to MICS Center. What are they doing now and where are they? For the first episode of this series, we traced Prasenjit Dey.***



***- Prasenjit, what is your nationality?***  
Indian.

***- What was the reason for choosing your field of study?***

Because of my interest in a career in research.

***- What is your academic background?***

I have a B.E. in electronics and communication, an M.Tech in communication and signal processing, and a PhD. in communication systems and information theory.

***- Why did you choose EPFL?***

The place is known for having great professors, an excellent infrastructure. Furthermore, Lausanne is a

great place to study.

***- What were your expectations after graduating?***

I wanted to join an industrial research lab and work on applied research, which I am now doing at HP Labs in India.

***- What are the advantages or disadvantages to have studied at EPFL?***

The advantages: I could get an excellent guidance from professors very well known in their field. All the labs are well equipped, and there is a good research atmosphere.

The disadvantages: I did not receive much help in terms of obtaining an employment. I found that everyone was pretty much on his own.

***- Describe your actual activity...***

I am working as a research scientist in Hewlett-Packard Labs in India, in the area of image processing and retrieval.

***- What are your hopes regarding your career?***

I am happy with the place I am working in now and I have good hopes to grow within HP for a research career.

INTERVIEW BY FLORENCE LUY

## MARMIX: A WHOLE RANGE OF NEW CONTRACTS

***In our last Newsletter, we talked about MarMix, a website that enables to predict the outcome of various MICS projects. By the end of the year, the MarMix prediction market will offer a whole range of new contracts to detect the new research streams within the scientific community.***

*Resulting from an effort to center the activity of MarMix on the needs and interests of the MICS community, MarMix will introduce a new type of contracts, no longer based on particular projects, but on general research fields. Thus, the market should predict the evolution of the various fields, especially the emergence of new trend setters.*



*Cédric Gaspoz, Research Assistant at HEC Lausanne presents the new contracts:*

### ***Sensor networks, Web semantic, UWB: has been or future trend setters?***

*To detect the declining or raising fields, MarMix prepares new 6 and 12 months predictions claims to assess the evolution of these fields in the short and long term. Based on various indicators such as number*

*of publications, conferences, patents,... these contracts will enable to detect new trends at an earlier stage. A typical contract will be: will the indicators on UWB increase in the next six-month period? As soon as all indicators will be collected, MarMix will allow you to trade on the future of the MICS research area.*

*Currently you can submit the research fields that you would like to be introduced on MarMix, filling the form on <http://marmix.mics.org/new>.*

## ACTIVITIES FOR WOMEN IN SCIENCE

This fall, the Equal Opportunities Office at EPFL offers activities specially developed for undergraduate, master, PhD female students and post docs. These activities are also open to all women involved in MICS projects. On the agenda:

**September:** Course on assertiveness.

**September:** Lunch-debate on fellowships manual.

**9-10 October:** Lunch-debate with ABB Industry.

**End October/Nov.:** Round table on "Preconceived ideas for a successful career".

**November:** Industry visit to Du Pont de Nemours International.

**December 7:** Course on "How to make a comprehensive portfolio for an academic career".

**January 2008:** Course on leadership and negotiation.

**Info on <http://egalite.epfl.ch/page67106-en.html>**

**Contact and registration: [nicole.berseth@epfl.ch](mailto:nicole.berseth@epfl.ch)**

## NEW PUBLICATIONS

### AWARD FOR THE 1000TH MICS PUBLICATION

The MICS Management Committee has decided to award the 1000th MICS publication, which happens to be: Distributed Applications through Software Modularization, by Jan S. Rellermeier, Gustavo Alonso and Timothy Roscoe (Middleware 2007, Newport Beach, 26-30 Nov).

### Journal papers:

- Marc Heissenbüttel, Torsten Braun, Markus Waelchli, Thomas Bernoulli, *Evaluating the Limitations of and Alternatives in Beaconing*, Ad-Hoc Networks (Elsevier), Volume 5, Issue 5, July 2007.
- Jan Ondrus & Yves Pigneur, *Cross-industry Preferences for Mobile Payments Development in Switzerland*, Electronic Markets, Vol. 17, No. 2, May 07.
- M. Flury, R. Merz and J.-Y. Le Boudec, *Managing Impulsive Interference in Impulse Radio UWB Networks*, ST Journal of Research, vol. 4, no 1, May 07.
- Christophe Ancey, *Plasticity and geophysical flows: A review*, Journal of Non-Newtonian Fluid Mechanics, Volume 142, Issues 1-3, 16 Mar 07.

### Conference papers

• Beat Gfeller, Elias Vicari, *A Randomized Distributed Algorithm for the Maximal Independent Set Problem in Growth-Bounded Graphs*, 26th Annual ACM Symposium on Principles of Distributed Computing (PODC 2007), Portland, 12-15 Aug 07.

• Subhash Suri, Elias Vicari, Peter Widmayer, *Simple Robots with Minimal Sensing: From Local Visibility to Global Geometry*, Proceedings of the 22nd Second Conference on Artificial Intelligence (AAAI), pages 1114-1120, 2007. Vancouver, Canada.

• Jérôme Rousselot, Amre El-Hoiydi, Jean-Dominique Decotignie, *Performance evaluation of the IEEE 802.15.4A UWB physical layer for Body Area Networks*, IEEE Symposium on Computers and Communications.

• M. Wöhrle, C. Plessl, J. Beutel and L. Thiele, *Increasing the Reliability of Wireless Sensor Networks with a Unit Testing Framework*, 4th Workshop on Embedded Networked Sensors

(EmNets 2007), Cork, 25-26 June 07.

• Igor Talzi, Andreas Hasler, Stephan Gruber and Christian Tschudin, *PermaSense: Investigating Permafrost with a WSN in the Swiss Alps*, 4th Workshop on Embedded Networked Sensors (EmNets 2007), Cork, 25-26 June 07.

• Chao Tian, Suhas Diggavi, *On Scalable Source Coding With Decoder Side Informations*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

• Sibi Raj Bhaskaran, *Broadcasting with Feedback*, IEEE International Symposium on Information Theory, ISIT 2007, Nice, 24-29 June 07.

• Satish Babu Korada, Nicolas Macris, *On the concentration of the capacity for a code division multiple access system*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

• Satish Babu Korada, Shrinivas Kudekar, Nicolas Macris, *Exact solution for the conditional entropy of Poissonian LDPC codes over the Binary Erasure Channel*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

• Jeremie Ezri, Andrea Montanari, and Ruediger Urbanke, *A General-*

ization of the Finite-Length Scaling Approach Beyond the BEC, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Dinkar Vasudevan and Etienne Perron, Cooperative Source Coding with Encoder Breakdown, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Suhas Diggavi, Michael Mitzenmacher, Henry Pfister, *Upper Bounds on the Deletion Channel Capacity*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Emre Telatar, David Tse, *Bounds on the capacity region of a class of interference channels*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Shu-ping Yeh, Olivier Leveque, *Asymptotic Capacity of Multi-Level Amplify-and-Forward Relay Networks*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Iryna Andriyanova, Jean-Pierre Tillich, *A family of non-binary TLDP codes: density evolution, convergence and thresholds*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Vishwambhar Rathi, Ruediger Ur-

banke, *Existence Proofs of Some EXIT Like Functions*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Anand Dhulipala, Christina Fragouli, Alon Orlitsky, *Single versus multiple rounds for distributed function computation*, IEEE International Symposium on Information Theory, Nice, 24-29 June 07.

- Matthias Ringwald, Kay Römer, *Deployment of Sensor Networks: Problems and Passive Inspection*, 5th Workshop on Intelligent Solutions in Embedded Systems (WISES '07), Madrid, 21-22 June 07.

- Patrick Stuedi, Gustavo Alonso, *Log-normal shadowing meets SINR: A numerical study of Capacity in Wireless Networks*, 4th Annual Conference on Sensor Mesh and Ad Hoc Communications and Networks (SECON), San Diego, 18-21 June 2007.

- Christian Frank, Kay Römer, *Distributed Facility Location Algorithms for Flexible Configuration of Wireless Sensor Networks*, 3rd IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS 2007), Santa Fe, 18-20 June 07.

- Matthias Ringwald, Kay Römer, Andrea Vialetti, *Passive Inspection*

of Sensor Networks, 3rd IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS 2007), Santa Fe, 18-20 June 07.

- René Müller, Jan S. Rellermeyer, Michael Duller, Gustavo Alonso, Donald Kossmann, *A Dynamic and Flexible Sensor Network Platform (demo)*, SIGMOD '07: ACM International Conference on Management of Data, Beijing, 11-14 June 07.

- M. Duller, R. Tamosevicius, G. Alonso, D. Kossmann, *XStream: Personal Data Streams (demo)*, SIGMOD '07: ACM International Conference on Management of Data, Beijing, 11-14 June 07.

- Fabian Kuhn, Thomas Locher, and Roger Wattenhofer, *Tight Bounds for Distributed Selection*, 19th ACM Symposium on Parallelism in Algorithms and Architectures (SPAA), San Diego, 9-11 June 07.

- Andreas Meier, Jan Beutel, Roman Lim and Lothar Thiele, *Design of a High-Reliability Low Power Status Monitoring Protocol*, 4th International Conference on Networked Sensing Systems (INSS 2007), Braunschweig, 6-8 June 07.

- J. Beutel, M. Dyer, R. Lim, C. Plessl, M. Wöhrle, M. Yücel and L. Thiele, *Automated Wireless Sensor Network*

*Testing*, 4th International Conference on Networked Sensing Systems (INSS 2007), Braunschweig, 6-8 June 07.

- Patrick Schaller, Srdjan Capkun, David Basin, *BAP: Broadcast Authentication using Cryptographic Puzzles*, International Conference on Applied Cryptography and Network Security (ACNS 2007), Zhuhai, 5-8 June 07.

- Markus Waelchli, Piotr Skoczylas, Michael Meer and Torsten Braun, *Distributed event localization and tracking with wireless sensors*, 5th International Conference on Wired/Wireless Internet Communications (WWIC '07), Coimbra, 23-25 May 07.

- Philipp Hurni and Torsten Braun, *Improving Unsynchronized MAC Mechanisms in Wireless Sensor Networks*, 1st ERCIM Workshop on eMobility, Coimbra, 21 May 07.

- A. Datta, R. Schmidt, K. Aberer, *Query-load balancing in structured overlays*, Seventh IEEE International Symposium on Cluster Computing and the Grid (CCGRID'07), Rio de Janeiro, 14-17 May 07.

- J. Rousselot, A. El-Hoiydi, J.-D. Decotignie, *On the Problem of Near-Far Interference with Impulse Ultra Wide Band Radios*, European ultra wide

band radio technology Workshop, Grenoble, 10-11 May 07.

## UPCOMING CONFERENCES

13th Annual International Conference on mobile computing and networking, Montreal, Canada, **Sept. 9-14.**

First International Conference on robot communication and coordination, Athens, Greece, **September 10-12.**

5th MiNEMA Workshop (Middleware for network eccentric and mobile applications), Magdeburg, Germany, **September 11-12.**

International Workshop on self-organizing systems (IWSOS), Lancaster, UK, **September 11-13.**

Embedded Systems Week (ES-WEEK), Salzburg, Austria, **September 30-October 5.**

International Conference on sensor technologies and applications, Valencia, Spain, **October 14-20.**

5th ACM Conference on embedded networked sensor systems (SenSys), Sydney, Australia, **November 6-9.**

3rd IEEE International Conference on e-science and grid computing, Bangalore, India. **December 10-13.**

Program on collective dynamics in information systems, Beijing, China, **March 1 to April 15 2008.**

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