MARCH 2007

- MICS opens up to new industry partners.  
  Page 2

- To facilitate collaboration and exchange between projects, a team of the ETH Zurich has developed a Sensor Network Platform Kit.  
  Page 3

- Forecast the future with Marmix. This website enables to predict the outcome of various MICS projects.  
  Pages 4

- When physics meet sensor networks at the Audiovisual communications laboratory of EPFL.  
  Pages 5 & 6

- Christina Fragouli, a young woman fascinated by network coding.  
  Page 7

- Nominations & awards, new publications, events to come.  
  Pages 8-10
MICS WELCOMES NEW ILP MEMBERS

*MICS Centre opens up to new industry partners. Interested? Apply now!*

During its first phase, the NCCR MICS has set up collaborations with eleven partners through an Industrial Liaison Program (ILP): Deutsche Telekom, DoCoMo, IBM, Intel, Microsoft, Samsung, Shockfish, Siemens, ST Microelectronics, Swisscom and Whitestein Technologies joined the program. In 2006, the Centre started its second phase, focusing on future applications. It is therefore important to have a realistic feeling of the market and of the business potential. To provide appropriate tools to the right customers, close relationships with the industry are necessary. This is why MICS is opening up to new and relevant partners: technology or service providers, but also end-user companies.

Although MICS fields of application are quite broad, the Centre foresees that three of them will top the others in the coming years. The first one is related to human activity in general (telecoms, entertainment, health). The second deals with infrastructures (buildings, transportation, security, logistics). The third one relates to environment (climate, water, pollution). MICS is already providing a new generation of tools to environmental scientists, in order for them to be ready to face the upcoming world challenges.

_Florence Luy_

*Information on ILP Program:*  
[http://www.mics.org/ILP](http://www.mics.org/ILP)

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*Three questions to Max Monti, industrial liaison officer:*

- Why a company would like to become a MICS partner?  
The NCCR MICS has six years of experience. It is one of the world largest academic programs on mobile information and communication systems. It is supported by a motivated network of industries and it is recognized as being a key player in this research area. MICS is “the” place to be!

- Do you think the Centre is sufficiently well-known to be that popular?  
All major actors in this field know about MICS. On the other hand, the population knows little about it, but we are preparing some very visible events that should change this situation!

- The Swiss national centres of competence have a limited life expectancy. Therefore, is it worth to start a partnership with MICS?  
The Centre is expected to continue until 2011. But its field of research being one of Switzerland’s priorities, all the efforts provided until now will be surely carried on, according to the economical needs and based on strategic partnerships.

*Contact:* max.monti@epfl.ch or +41 21 693 69 77.
The Sensor Network Platform Kit is for all MICS projects wishing to implement a low-power wireless sensor network application, based on distributed data gathering and delivery to a central location. It also allows MICS partners to share and integrate their work through a common technology.

A number of projects within the NCCR MICS target real-world wireless sensor network deployments. While some of them, like SensorScope or CommonSense, have already developed prototypes and gained experience in deployment, others, like PermaSense or Ozone Monitoring, have only started working on sensor network platforms. However, they all have similar requirements regarding the basic hard- and software components and the system architecture.

To facilitate collaboration and exchange between these projects, a Sensor Network Platform Kit (SNPK) has been developed. It is a “sensor network application out-of-a-box”, enabling a fast and reliable jump-start of junior researchers, accelerating the learning curve. In addition, a support service is offered to MICS application projects dealing with mote-scale platforms, application deployments and tools.

The first pre-release of the SNPK consists mainly of state-of-the-art industry components and results from the MICS research projects (phase 1 and partly phase 2). Future releases will focus on the system integration of versatile known-to-work components derived directly from the projects.

The modular concept of the SNPK concentrates on the needs of a basic low-power environmental monitoring application. It consists of low-power wireless sensor nodes (MSP430 based) and a server with a centralized data storage, long-haul communication and methods for standardized access. The wireless sensor nodes run a simple, extensible data gathering demo application based on TinyOS 2.0, augmented by efficient and easy-to-use deployment and testbed support. The SNPK is a robust and reliable technology basis, answering the researchers’ needs. Its first revision was launched at the MICS fall Review 06 in Zürich. The second revision is expected for June 2007.

Further information: http://www.btnode.ethz.ch/Projects/NCCR-MICSWG2
**FORECASTING THE FUTURE WITH MARMIX**

*Do you believe that a robot can be faster than a human to detect a ringing phone? Play and bet on the outcome of MICS projects and enter the world of predictive markets with Marmix...*

Marmix is a website that enables to predict - with a strong probability - the outcome of various MICS projects. Based on the theory of the predictive markets, it has been conceived within the framework of a research project of the Faculty of the HEC of the University of Lausanne. Similar to stock market games, it lets participants trade on claims concerning mobile information and communication systems.

“After having designed Marmix to predict the results of all sorts of future events in the world, we wanted to see if we could use it for R&D issues”, explains Cédric Gaspoz, a PhD student at the Institut des systèmes d’information of the HEC, who designed the website. Marmix was therefore adapted to the NCCR MICS, proposing “contracts” on four topics related to the Centre: avalanches, robots, vehicular networks and intelligent buildings. Two other contracts concern the RFID technology and mobile payments.

Launched at the MICS Conference in October 2006, Marmix counts around thirty traders today. “We hope to increase this number with a better information on this game and on its purpose”, says Cédric Gaspoz. Compared to other studies, the interest of this predictive market is its low cost and its capacity to forecast the most promising technologies and applications. It can be an extremely useful decision-making tool for the MICS community.

The website is only open to the scientists involved in the MICS Centre. Traders remain totally anonymous. The more the player knows, the more likely he is to predict correctly and win. His objective is to maximize the value of his portfolio by trading the contracts on the market with a starting capital in a virtual currency. The process is then equivalent to those existing in the traditional financial market. The result is a permanent poll of experts who foresee what will happen next!

Florence luy

*Marmix allows to bet on the future of a project just like at the stock exchange*

Further information:
cedric.gaspoz@unil.ch
Marmix website:
http://marmix.mics.org/

In each one of the next MICS Newsletters, we will select a contract and present its trends, commented by a scientist.
**WHEN PHYSICS MEETS SENSOR NETWORKS**

Quantities such as sound pressure, light, temperature, and wind flow, can be better sensed when the nature of the physical phenomena is taken into account. Traditionally, signal processing relies on the assumption that signals have a low-pass (or a band-pass) character. This assumption on the frequency behavior is in most of the cases acceptable and allows sampling, processing, and reconstructing the signals perfectly. However, when we perform measurements by using a sensor network, the position of each sensor plays a role and the acquired quantities should be considered as a multidimensional signal, i.e. a function of space and time. As in the case of one-dimensional signals, one can generalize the concept of bandlimited signal to multiple dimensions and apply the same techniques for sampling and interpolation.

However, this approach is often suboptimal. In fact, multidimensional signals present often a redundancy related to the physical phenomenon that generates the measured quantity. Such a redundancy can be taken into account in order to obtain more efficient sampling and interpolation schemes and to reduce the complexity of the processing element.

An important research activity conducted at the Audiovisual Communication Laboratory concerns the study of the fundamental signal processing principles underlying multidimensional signals acquired by a sensor network. In particular we are interested in studying and exploiting the constraints imposed by the physical phenomena that generate the signals. Typical examples of the measured quantities are sound pressure, light intensity, temperature, humidity, etc.

The questions that we are trying to answer concern first the sampling scheme that we use to ac-

![The first prototype for tomographic measurement of wind flow and temperature (left image). Ultrasound emitters and receivers are placed on a ring surrounding the measurement region. The right image shows the temperature distribution measured when a flame is placed below the ring.](image)
quire the physical phenomena. For example, how many microphones are required to completely characterize the sound field in space and time? What is the error obtained on the reconstructed acoustic signals when sampled at a particular spatial sampling frequency?

These problems have been addressed by Thibaut Ajdler in his thesis: “The plenacoustic function and its sampling,” completed at the end of 2006. In the field of imaging, Patrick Vandewalle studied the problem of sampling of images. In his thesis “Super-resolution from unregistered aliased images” (June 2006), he proposes algorithms to combine multiple sets of samples in order to obtain a high resolution image.

DISTRIBUTED CODING

When we consider the problem of processing the signals acquired by a sensor network, often the cost of transmission has to be taken into account. In this case, the spatio-temporal correlation structure can be exploited to reduce the amount of information transmitted by the sensing devices. Robert Konsbruck studies the theoretical limit of the necessary transmission schemes. These techniques can be applied to the case of hearing aids. In fact, these systems can be considered as small sensor networks composed of the two devices that are placed on the ears of a hearing impaired person. In the current technology, each device is acquiring, processing and reproducing the sound independently of the other one. Nevertheless, the availability of a wireless communication link would allow better-performing algorithms, such as beamforming, in order to enhance the rejection of interfering signals.

However, the wireless link has a cost in terms of consumption and battery duration. The research carried on by Olivier Roy addresses the computation of the optimal trade-off between the coding rate of the wireless link and the beamforming gain provided by the collaboration between the two devices.

TOMOGRAPHIC SENSING

Sensor networks can also be used to measure a quantity indirectly, by taking advantage of interactions between physical phenomena. For example, sound propagation is influenced by temperature and air flow; therefore, one can use sound to measure temperature and wind in a certain region.

This method is studied by Ivana Jovanovic in her research on acoustic tomography. The work addresses the theoretical and practical problems of sensing temperature and wind in a region surrounded by ultrasound emitters and receivers.

The tomography method offers an attractive alternative to classical meteorological methods, since they allow non-invasive measurements with a significantly smaller number of sensing devices. In fact, the information acquired by processing signals transmitted and received at multiple locations allows to acquire a global knowledge about the measured field. This is in sharp contrast to the one-sensor one-measurement setup provided by traditional sensor networks.

The first prototype installed in the laboratory consists of 24 emitters and receivers and has been tested on temperature measurement. The promising results allow to envision the construction of a larger experiment that includes wind measurement.

LUCIANO SBAIZ

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PORTRAIT OF A NETWORK CODING RESEARCHER

A Pink Panther welcomes the guest in her office, a place she has made hers. Christina Fragouli, SNF assistant professor at the School of Computer and Communication Sciences of EPFL, feels well in her life and professional environment. However, this young lady speaks modestly about herself.

She left her native country for the United States where, after a PhD obtained at UCLA (she received the Outstanding PhD Student Award 2000-2001), she moved to a consultant position with AT&T Research Labs. But her European background attracted her back to the Old Continent. At EPFL.

AT THE RIGHT PLACE

In Lausanne, she recently started as an SNF assistant professor for the project «Information flow and management in resource constrained networks». Her research evolves around both computer science and communications. «The School of Computer and Communication Sciences is the right place for my area of interest», she says. More specifically, she is interested in network coding and information flow. This is a new area in network information flow that promises to revolutionize the way we manage, operate, and understand organization in networks, and foretells a deep impact on diverse areas such as reliable delivery, resource sharing, efficient flow control, network monitoring, and security.

Within the framework of her SNF mandate, Christina is also beginning a collaboration with MICS, from which she will receive funding for half a postdoc position. «A problem in engineering is the low percentage of women. I am particularly delighted that the Center makes efforts to address this problem», she observes.

HELIOS MADE IN SWITZERLAND

Although the Helvetian sun does not shine so often as Helios (with the exception of this last winter), the young scientist appreciates Switzerland. Apart from the natural beauty, she finds the inhabitants «accustomed to diversity». Swimming, reading and classical music are her main hobbies. At EPFL, she enjoys the professionally stimulating and warm atmosphere that surrounds her.

Florence Luy
AWARDS:

Thomas Henzinger honoured

The Association for Computing Machinery (ACM) recently honoured Prof. Thomas Henzinger for his contribution to formal verification and hybrid systems. The EPFL professor became one of the 2006 ACM Fellows.

The ACM Fellows Program was established in 1993 to recognize outstanding members for their achievements in computer science and information technology and for their significant contributions to the mission of the ACM.

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NEWS FROM ABROAD

Steffen P. Walz, PhD student at ETH Zurich and MICS member, co-led two invited, week-long workshops on serious pervasive game design in January. One workshop took place at Tsinghua University, in Beijing, the other at Shih-Chien University, in Taipei. In both workshops, students explored the design space of pervasive games that serve non-entertainment purposes. The goal was to prototype cutting edge and near future mobile phone based urban serious pervasive games, for example for the areas of tourism, city marketing, citizen involvement or health.

Apart from these workshops, Steffen Walz has been named a member of Forum Nokia Champions, a recognition and reward program for top mobile developers worldwide. Forum Nokia Champions are a select group of outstanding individuals, honored because of their skills and devotion to the Forum Nokia community.

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NOMINATION

ComCom: appointment of a new member

The Federal Council appointed Professor Jean-Pierre Hubaux member of the Federal Communications Commission (ComCom). He replaces Professor Pierre-Gérard Fontolliet, who withdrew from the Committee at the end of 2006. Jean-Pierre Hubaux is a professor at the School of Computer & Communication Sciences, of EPFL and a MICS member. He is 49-year-old.

With Jean-Pierre Hubaux, the ComCom counts again seven members. In charge of making decisions about the telecoms market’s regulation, it arbitrates the disputes which arise between the suppliers and it attributes the concessions of mobile telephony and the concession of the universal service.

COMM. DETEC
TWO NEW PROJECTS

In order to reflect the development of the activities around the sensor network platform kit and the environmental monitoring applications, the NCCR MICS has decided to create 2 new projects:

The «Platform Kit» project (read also on page 3) is placed under the responsibility of Dr Jan Beutel. Jan received his PhD in Electrical Engineering from ETH Zurich in 2005 and is currently working as a senior researcher at the Computer Engineering and Networks Lab (TIK) of ETH Zurich.

His research interests lie in the development, deployment and fast prototyping of sensor network applications, integrated application protocols for adhoc networks and local positioning algorithms. He has been lead architect of the BT-node project.

Dr Andreas Wombacher is taking over the responsibility of the MICS part of the «Swiss Experiment» project. Andreas received his PhD from the Technical University Darmstadt and is now a senior researcher at the Distributed Information Systems Laboratory (LSIR) of EPFL. His research interests are in cross-organizational workflows as a basis of service composition and multilateral collaborations from a data integration and workflow perspective as well as the related electronic commerce aspects.

Jacques Bovay
NEW PUBLICATIONS

Journal papers:


Conference papers:

• René Müller, Gustavo Alonso, Donald Kossmann, SwissQM: Next Generation Data Processing in Sensor Networks, Third Biennial Conference on innovative data systems research (CIDR 2007), Asilomar, 7-10 Jan.


UPCOMING CONFERENCES

3rd IEEE International Workshop on sensor networks and systems for pervasive computing (PerSeNS), White Plains, NY, March 19 - 23.

EuroSys, Lisbon, Portugal, March 21 - 23.


Information Processing in Sensor Network (IPSN), Cambridge, Massachusetts, April 25 - 27.

Call for papers, info on http://www.cse.wustl.edu/ipsn07.html.

International Workshop on data intensive sensor networks (DISN’07) In conjunction with MDM’07; Mannheim, Germany, May 11.


First International Workshop on wireless mesh and ad hoc networks (WIMAN 2007) in conjunction with ICCCN 2007, Turtle Bay Resort, Honolulu, Hawaii, USA, August 16.

Paper submission: deadline March 23.

Call for papers, info on http://www.inss-conf.org/cfp.html.


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