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CONNEXTION
THE NEWSLETTER FOR MEMBERS OF THE EU HITACHI SCIENCE & TECHNOLOGY FORUM
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Editorial note

The EU Hitachi Science & Technology Forum success depends mostly on your active participation and we look forward to active and stimulating discussions on water, its related technologies and their societal aspects.

We have been very pleased by the lot of interest generated by the visit of a Hungarian research center i.e. the Computer and Automation Research Institute – Academy of Sciences. This visit will make you better understand the importance of R&D in Hungary, which is a full member of the European Union's RTD framework programme. Recognizing that we are living in a knowledge-based economy, the Hungarian government, by establishing the Science and Technology Policy Council and issuing the Science and Technology 2000 programme, wants to give a greater impetus to research, development and innovation. This is illustrated by the article Dr. Mezei kindly prepared for Connextion.

You will find, sent together with this edition of "Connextion", a dossier on water which has been prepared by our office to give you a backgrounder on the theme to be debated in Budapest.

The topic to be addressed is a key ingredient of the Forum successful story. We will ask you, prior to the Forum, to let us have your ideas and suggestions for next year theme which will be finalized, after review by the Forum Fellows, in Budapest.

Norikiyo Koide
General Manager
Hitachi Corporate Office, Europe

Overview of science and technology in Hungary

István Mezei

The structure of the national R&D system

The Hungarian R&D system consists of the following five main components:
• institutions of higher education,
• research institutes belonging to the Hungarian Academy of Sciences (HAS) and the Academy's research groups based at universities,
• R&D institutes of the ministries,
• institutes of the Zoltán Bay Foundation for Applied Research,
• R&D facilities of companies.

The largest component of the R&D system is higher education. Since 1999 the strongly specialised universities have been transformed into integrated, multidisciplinary universities. This provided the opportunity to increase the number of students, broaden curricula, reach an intellectually critical mass, and establish research centres of international significance.

The Hungarian Academy of Sciences (HAS) was founded in 1825. Since 1994 the HAS is an independent, self-governed public body with the mission of cultivating, supporting and representing Hungarian science. At present the number of the ordinary HAS members is 214, the number of the corresponding members is 86. The HAS maintains 47 research institutes and 125, mainly university-affiliated research groups. The Academy's share in the R&D personnel of the country is 20%.

The capacity of the research institutes of ministries is relatively small. The 3 institutes of the Zoltán Bay Foundation were established at the beginning of the 90's in the field of applied research (biotechnology, material sciences, and logistics).
The highest science policy advisory and preparatory bodies are the Science and Technology Policy Council and its Science Advisory Board established by the Government in 1999. The Government agency, responsible for scientific research is the Ministry of Education.

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Resources of Hungarian R&D

In 1998 the number of researchers in Hungary was 11,731 (11 researchers per 10,000 citizens). More than half of Hungary's research capacity is concentrated in Budapest.

Between 1990 and 1998 the GDP related R&D expenditures dropped from 1.6% to 0.7%. More than 60 % of total R&D expenditure were provided from the state budget. The Government envisages that the total R&D expenditure should reach 1.5 % of GDP by 2002 and 2,0 % by 2006, while the expenditure of the private sector should increase to at least 50%.

In a number of fields of basic science and in applied research, top-quality research is done in the country. The knowledge transfer between academic research and industry needs further development, except for agriculture, food industry and forestry.

The main R&D financing institutions, providing public funding on competitive basis, are the National Science Research Fund (basic research) and the National Technological Development Fund (applied research).

Over the past decades a large number of international science and technology co-operation links have been developed. Hungary has become a full member in most pan-European research organisations and programmes. Hungary participates in the EU's 5th RTD Framework Programme with full rights. Hungary has opened her national research programmes towards the researchers of the member states of the EU and the candidate countries.

The latest development in R&D in Hungary

In 2000 the Government issued a policy document, called "Science and Technology Policy 2000". It summarises the science and technology policy actions necessary for achieving Hungary's overall objectives. It gives an overview of the present situation of human resources, institutional structure, financing, infrastructure, international relations, sets out the goals and the actions.

Based on this document, in August 2000 the Government launched the National Research and Development Programmes, which have become parts of the "Széchenyi Plan", a wide ranging plan for Hungary's economic revitalisation.

The main goals of the programmes are:
• To accelerate the evolution and strengthening of transfer institutions and R&D networks, that bridge the gap between research and business,
• To help domestic top tier research units participate in international projects,
• To accelerate the connection of the domestic research with multinational companies relying primarily on imported technology.

The programmes cover the following five fields (and sub-fields in brackets):

• Improving the quality of life (biomedical research with emphasis on application of techniques of molecular biology, new methods of health preservation and prophylactics and rehabilitation, pharmaceutical research using molecular techniques, functional genomics, social hygiene, health policy and economic aspects of healthcare, sustainable mobility),
• Information and communications technologies (integrated intelligent sensors, human language technologies, mobile and integrated telecommunication networks, analogue computation techniques and telepresence, molecular-level information technologies, telematics for intelligent transportation systems),
• Environmental and materials research (ecological research, detection and neutralisation of polluting materials, decreasing pollution, utilisation of raw materials, new energy resources and energy-saving technologies, new materials, environmental-friendly materials, nanotechnology, environmental aspects of transport and water management),
• Research on agribusiness and biotechnology (animal and plant breeding using molecular techniques, functional genomics, enhanced farming, forest and game management, animal hygiene and plant protection, competitiveness and effects of the accession to the EU in agribusiness, food industry technologies and food safety),
• Research on the national heritage and contemporary social challenges (Hungarian culture in international integration, regional and local particularities, the state of the Hungarian language, the national minorities issues, mental and moral state of society, social habits and identity, physical and intellectual values in the cultural heritage, their publication to a broad public, integration of Gypsies into society).

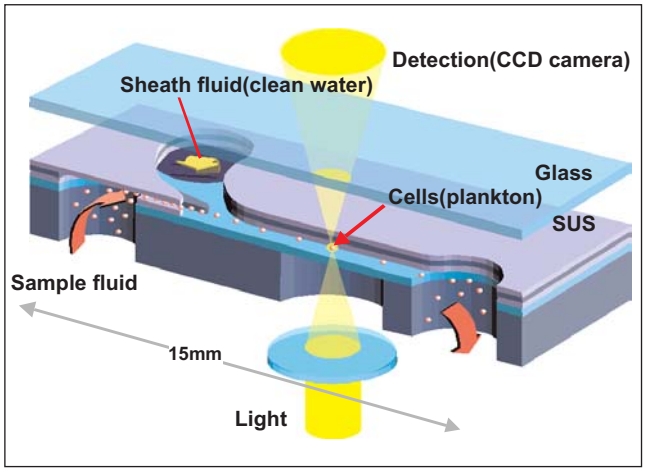
Dr. Istvan Mezei is counsellor for Science & Technology at the Mission of the Republic of Hungary to the European Communities, Brussels.

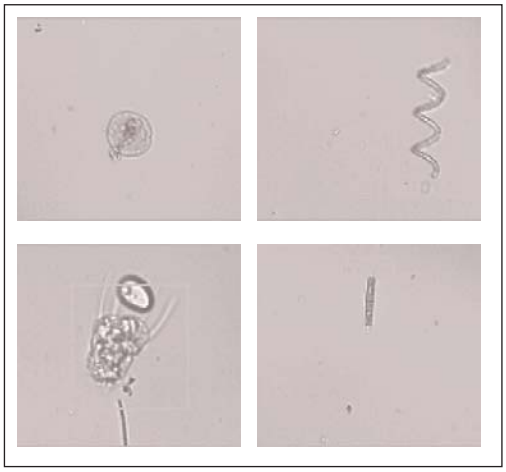
Hitachi's Developments in Sustainable Water Management

Koichi Tsuzuki

The Hitachi Group contributes to building sustainable water management systems for customers through its products and services, including systems such as GIS (Geographic Information Systems), monitoring systems, pump systems and water treatment systems.

GIS: GIS, with simulation software to predict water quality and quantity in rivers and lakes, is a powerful tool in water resource management.
Hitachi has recently begun a remote sensing service. High ☛





Plankton Monitoring System: *images taken by system.*

spatial resolution images, taken by an earth observation satellite (Quick Bird 2), are distributed and the image data analyzed, making it easier to up-date the GIS's geographical data.

MONITORING SYSTEMS: Continuous water monitoring is crucial for water resource management, and Hitachi devotes much of its R&D effort to developing technology to enable continuous sensing in the field of what otherwise could only be measured in a laboratory. The Plankton Monitoring System continuously counts the number of algae per volume of water. A water sample is taken from a river or lake, and put in a glass cell where the sample water flow is surrounded by a clean water flow. These flows are carefully controlled to keep them steady and laminar, so that the CCD camera outside the cell can take clear images of the algae in the sample flow. The algae are sorted into six categories according to their shape, and the number of algae in each category is counted. The sample flow never touches the glass wall of the cell, so the wall remains uncontaminated.
Another promising technology for monitoring chemical concentrations in water is a micro reactor system integrated on a small chip. This technology is already commercially available as a compact system for analyzing the quality of drinking water. The system measures the water's residual chlorine concentration, by optical absorption after mixing the water and a reagent, and also monitors the turbidity and color at the points of use. A mixer and absorptiometer are integrated onto a 10mm x 20mm cell.
Monitoring toxic chemicals in water is a pressing concern, and bioassay technology has been commercialized for this purpose. A TV camera monitors the behaviour of fish or shrimps, which are very sensitive to acute toxic chemicals. TV camera images are viewed to identify any hint of unusual behaviour.

MAGNETIC SEPARATION SYSTEM WTH SUPERCONDUCTING MAGNET: Hitachi uses a super-conducting magnet to separate flocs magnetically, instead of the conventional flocculent setting process. A few ferrite particles are added to make the floc magnetically separable. The superconductor's strong magnetic field can complete the separation very quickly (less than five minutes, including the flocculation). This system is also much smaller than the conventional flocculent setting process, and can be part of a very compact water recycling system in combination with a membrane separator.

Dr Koichi Tsuzuki is Department Manager at the Mechanical Engineering Research Laboratory of Hitachi Ltd. He will also give a presentation on Hitachi's activities in the field of water at the next Forum.

MTA-SZTAKI: The Computer and Automation Research Institute

The visit, on Friday 24 May, will be to the Computer and Automation Research Institute of the Hungarian Academy of Sciences (SZTAKI). Dr. Csaba Rekeckzky who is Senior Research Fellow at SZTAKI – gives us some more information on the research center and its activities.

SZTAKI was founded in 1964 and has today over 300 full-time employees. The fundamental task of the Institute is to perform basic- and application oriented research in an interdisciplinary setting in the field of computer science, intelligent systems, process control, wide-area networking and multimedia. Contract-based target research, development, training and expert support for domestic and foreign industrial, governmental and other partners are important activities at the Institute, as well. For more information you are welcome at our website: http://www.sztaki.hu

At the visit of the HITACHI Forum, you will hear about the institute's main projects and about the present IT situation in Hungary. You will also see a number of short demos, including the most promising activities related to the analogical computing based CNN projects.

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AnaLogic and Neural Computing Systems Laboratory:

This research is focused on a new original computing paradigm (the analogic CNN Universal Machine or CNN Computer) based on spatio-temporal elementary instructions. These instructions are defined on a continuous time, continuous valued, mainly locally connected processor array; the processors are placed on a spatially discrete regular grid. The analog spatio-temporal dynamics is combined with local and global logic (analogic array computation). Our work contains interdisciplinary aspects, namely, and mainly, neurobiology is a motivating area.

The main directions of the activities within the AnaLogic Laboratory are as follows:
• CNN based analogic algorithms embedded in the CNN Universal Machine architecture; architecture-variants to host space variant, adaptive, and/ or variable-resolution, dynamic, spatio-temporal algorithms and solving dynamic pattern formation and detection as well as synchronization problems;
• hardware and software implementation of CNN computers (in international cooperation); application and chip development systems research and their system integration; theory and practice of fault tolerant analogic computing; testing and emulated digital systems design and implementation.
• nature-inspired, especially neuromorphic, CNN based computing models for sensory and perception tasks in vision and auditory systems; plasticity models of the nervous system; emergent computation and pattern formation, synchronization ;
• complex spatio-temporal detection tasks (e.g. the "binding " problem); application of analogic CNN algorithms; development of prototype systems for computing-intensive medical imaging and diagnosis systems, multispectral image fusion, multimedia telecommunication, etc.

HITACHI NEWS

Hitachi Powers the European Commission's First IPv6 Internet Exchange Network

Hitachi Internetworking, the leading provider of hardware based, next-generation Internet Protocol version 6 (IPv6) infrastructure systems, announced on 11 March 2002 it is providing hardware based IPv6 solutions to the European Commission's recently launched Euro6IX project. Euro6IX is the largest research project ever funded by the European Information Society Technologies programme. It is a Pan-European initiative aimed at supporting the rapid introduction of IPv6 in Europe.

As early as 1997, Hitachi pioneered IPv6 with the deployment of the world's first address translation IPv6 router in Japan and Europe. In June 2001, Hitachi was first to announce and deliver a hardware IPv6 gigabit router performing at wire-speeds of up to 2.4Gbps.

The rapid growth in demand for Internet access has caused a shortage in conventional IPv4 addresses. The increase in address space from 32-bits to 128-bits will accommodate any device wishing to connect to the Internet.

Hitachi and Mitsubishi Electric to Integrate System LSI Businesses

On 18 March 2002, Hitachi, Ltd. and Mitsubishi Electric Corporation reached an agreement to go ahead with discussions to integrate their system LSI businesses. Both companies are examining the option of shifting their system LSI operations, which include microcontrollers, logic, analog and discrete devices, to a new joint venture to be established approximately a year later.

By leveraging the respective core strengths of Hitachi's and Mitsubishi Electric's system LSI products, especially in microcontrollers (MCUs), the new company will strive to become the world's top system LSI supplier, and concentrate especially on taking the foremost position in mobile, network, automotive and digital home electronics application areas.
The new company will form an independent and stable management structure and act as the nucleus of Hitachi's and Mitsubishi Electric's respective semiconductor organizations.

Hitachi holds the world's top market share for 16-Bit MCUs and its IC Card MCUs enjoy a strong market presence. Hitachi will be the first to introduce 300mm wafers and a new single wafer processing method (this is a method of processing one wafer at a time).

Mitsubishi Electric is also a strong contender in the 16-Bit MCU market, where its lineup is renowned among users for world-class noise resistance capabilities, programming efficiency, low-power-consumption CPU processing and solid software support.

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Hitachi, Ltd.
Hitachi Corporate Office, Europe
Avenue Louise 326, Bte 11
1050 Brussels, Belgium

Tel: +32 (2) 643 48 88
Fax: +32 (2) 640 08 98

Email: hcraen@cm.px.head.hitachi.co.jp
HIVIPS Homepage:
http://www5.wisnet.ne.jp/~htcpa/hivips/