SYMPOSIUM @ SISTA
2013 Honorary doctorates 'brainstormers'

Tuesday February 5th, 2013 – Leuven, Belgium

Prof. Tamás Roska - Prof. Leon Chua

Program

Welcome

08h30 Breakfast and Welcome by Joos Vandewalle (invitation only)

@ Salons Auditorium Arenberg Castle

09h00-10h00 Guided Tour and short individual discussions with SISTA ZAP corps

KU Leuven is honoring prof. Chua and prof. Roska, who have collaborated with one another intensively over many years, with a shared honorary doctorate for their groundbreaking insights into electronics and information technology. Their work has enabled the design of technology that emulates the workings of the brain. They have opened the way for a variety of visual, tactile and other applications that will lead the revolution in communication between man and machine.

Symposium

10h00-12h00 '**Cellular Wave Computing for (artificial and natural) Visual Processing'**

Prof. Tamás Roska, Pazmany P. Catholic University, Budapest and the Hungarian Academy of Sciences

@ Auditorium Arenberg Castle

Abstract:

The Cellular Wave Computing paradigm is based on two roots: the standard Cellular Neural/nonlinear Network (CNN) Dynamics and the two fundamental brain related inspirations: laterality and receptive fields.

The elementary instruction of a Cellular Wave Computer is a spatial-temporal nonlinear wave. This is generated by a cellular dynamical system described by a cell array, the cells are placed on a grid, each cell is mainly locally connected. These dynamical system cells, as well as the local interaction patterns are programmable. The various elementary instructions are combined in space and time, fully parallel. The algorithm, described by a so called alpha-recursive function operating on topographic flows, opens new vistas in spatial-temporal computing and programming. Some specific versions of the related new computational infrastructure have been implemented in connection with various visual microprocessors. Special cases describing various neuronal constructs in the brain, mostly for the visual pathway, will be highlighted

Three typical applications are shown, high speed manufacturing inspection, surveillance on high speed scenes, and a wearable navigation device: the bionic eyeglass.

Two new directions will be highlighted: the Oscillatory CNN architecture for spintronic devices, and the spatial-temporal event detections without frame by frame analysis.

It is foreseen that cellular wave computing principles will spread in many areas of nanoscale technology, as well as in neuromorphic modeling of parts of the brain. A new way of algorithmic thinking will prevail considering the algorithmic actions in space and time, establishing prototype physical and virtual cellular machines and related algorithmic techniques.

About the speaker:

Tamás Roska (born 1940) is Professor of Information Technology at the Pázmány Péter Catholic University in Budapest. Building on Chua's theory, he was instrumental in developing the Cellular Neural Network Computer (CNN) and achieved major breakthroughs in real-time image processing. After the Cold War, he played a leading role in re-establishing the Faculty of Information Technology at his university.

12h15-14h00 lunch (invitation only)

14h00-16h00 '**Memristor, Hodgkin-Huxley, and Edge of Chaos'**

Prof Leon Chua, University of California at Berkeley, CA, USA

@ Auditorium Thermotechnisch Instituut

Abstract:

This lecture shows that, from an information processing perspective, brains are made of memristors. Moreover it will resolve two mystifying anomalies of the Hodgkin-Huxley neuron. It will also identify the elusive nonlinear dynamical mechanism which gives rise to the brain's action potential to be the same as the heretofore unresolved mechanism which gives rise to Alan Turing's morphological phenomenon, and to Stephen Smale's reaction-diffusion paradox, namely, a sub-critical Hopf bifurcation originating from the "edge of chaos", a conceptual pearl extracted from the "principle of local activity."

About the speaker:

Prof Leon Chua obtained his PhD from University of Illinois at Urbana-Champaign in 1964. He was Assistant Professor and then Associate Professor at Purdue University from 1964 to 1970. He joined the University of California at Berkeley in 1971, where he is currently Professor Emeritus of Electrical Engineering and Computer Sciences. Prof Chua's current research interests include cellular neural/nonlinear networks, nonlinear circuits and systems, nonlinear dynamics, bifurcation theory and chaos theory. Prof Chua is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and was the President of the IEEE Circuits and Systems Society, and Founding Editor and Editor-in-Chief of International Journal of Bifurcation and Chaos. He

was elected a Foreign Member of the European Academy of Sciences (Academia Europea) in 1997. In the electrical, electronic and computer engineering community, Prof Chua is widely dubbed as the "father of nonlinear circuit theory and cellular neural networks", and his Chua's circuit family has now become standard textbook material in some electrical engineering curricula.

Prof Chua was the first recipient of the 2005 Gustav Robert Kirchhoff Award, the highest IEEE Technical Field Award for outstanding contributions to the fundamentals of any aspect of electronic circuits and systems. He was also awarded the prestigious IEEE Neural Networks Pioneer Award in 2000 for his contributions in neural networks. He has received many international prizes, including the IEEE Browder J. Thompson Memorial Prize and the IEEE W. R. G. Baker Prize, the Frederick Emmons Award, and the Mac Van Valkenburg Award twice. Recently, he was awarded the prestigious Guggenheim Fellowship in 2010 and the TUM Distinguished Affiliated Professorship by Technische Universität München in Germany.

Prof Chua was awarded seven US patents and nine Honorary Doctorates from major European universities and Japan. He was a recipient of "the top 15 cited authors in engineering" award in 2002, chosen from the Current Contents (ISI) database of all cited papers in all branches of engineering disciplines in the citation index from 1991 to 31 October 2001.

16h00-18h00 Reception
@ Machinezaal Thermotechnisch Instituut

"Scientific research is about understanding how Nature works. Scientists try to unravel the fundamental principles from which they can analyze the experimental evidence they obtain and even predict phenomena that are not obvious intuitively.

But engineers go one step further: they do not confine themselves to analysis, ultimately they want to use the insights obtained to design technical or biological systems that will change the way we live, that will lead to better health care, to a longer life, to better food production, or in summary, to more welfare, wellbeing and all in all a higher quality of life in general.

One could state that engineers only really understand how something works, when they can produce, construct or make it. So the design and development of new systems, beyond mere analysis, that's the driving force behind engineering". Prof. dr. ir. Bart De Moor

-Registration click here