Keynotes

Dr. Ing. Gerd K. Heinz, *GFaI Berlin, Germany*

Gerd Heinz received a first diploma-degree (Dipl. Ing.) for electronics-technology from Technical University Dresden (GDR) in 1976. In 1978, he received a second, post-gradual diploma for microelectronics at TU Dresden.
His industry carrier started at Institute for Telecommunication (INT) Berlin-Schoeneweide in a team realizing first microprocessor systems within eastern Berlin, basing on Intel's i8008.
With the design of the first integrated circuit (IC) in the Berlin territory, a PCM30/32 PCM-regenerator with 120 transistors, he got 1979 first scientific tribute. Following he become a group leader and department leader for full-custom design of integrated circuits for telecommunication. 1988 he received the doctorate-degree (Dr.-Ing.) in microelectronics from Humboldt-University Berlin for a work about non-linear delay dynamics of digital gates.
Since 1987 within GDR-Academy of Sciences (AdW), Institute for Cybernetics and Information technology (ZKI) his team worked in the field of fast data path architectures. He developed basic concepts for fast pipelining architectures basing on trees, today implemented in most modern microprocessors. Since 1993 he works for the industrial research institute GFaI, an outsourcing company from AdW.
For inventions and findings he got different German awards, like the 'Nations Award Class 2' (GDR/1987), the 'Otto von Guericke Price' (2001), the 'Berlin/Brandenburg Innovation Price' (2003). His Acoustic-Camera team was nominated for the 'German Future-Award' 2005 and he got the 'DVS/Abicor Innovation Price 2008' for the first real-time, spectral controlled welding machine (in team).

Keynote: Two Decades of Interference Network Research

Heinz found in 1992, that small impulses in the range of milliseconds combined with slow velocities in the range of centimetre per second can produce mirroring projections in nerve nets comparable to optical lens systems. In the "thumb experiment" he found 1992 the predicted wave properties. Not known and not to implement in Artificial Neural Network theory (ANN), his finding demanded a very different approach to simulation and analysis of nerve nets, called Interference Networks (IN).
Basing on synchrotopy of time-functions, time function waves and interference integrals, IN show unknown aspects of signal theory: if signals are not permanent available, if they appear and disappear within short times, and if they need delay time to bridge any space, enhanced concepts of signal processing become necessary.
Systematic experiments with IN showed him general properties of interference integrals like movement, zoom, holomorphy or conjunction/disjunction. These properties bring a new principle of 'non-locality' into signal processing. Known from Karl Lashleys experiments with rats "In search of the engram", interference nets show potentially the behaviour to verify his results. Especially for information processing systems with very limited life-time of all elements, the general holistic property of IN can create redundant circuits with higher surveillance of the whole system compared to the elements.
Cross-interference mapping shows, that IN generate holistic properties always, allowing holistic data processing or memorization. Dividing between self- and cross-interference the concepts of "to see" and "to hear" become transparent.
An application of IN in acoustics showed first acoustic images and movies between 1995 and 1996, resulting in the so-called "Acoustic-Camera" technology. Within the last 19 years, a generalization of the IN-approach to Radar, Sonar, GPS, optics, acoustics and integral transformations shows, that IN-theory has much more impact for engineering sciences then believed in 1992. Today IN-theory combines signal-processing together with static techniques (ANN, Boolean algebra, fuzzy sets). New applications for traffic simulation, noise decomposition, sensor-interaction or video motion tracking are future challenges for IN.
Find papers about IN on homepage http://www.gfai.de/~heinz.