IEEE

First Announcement

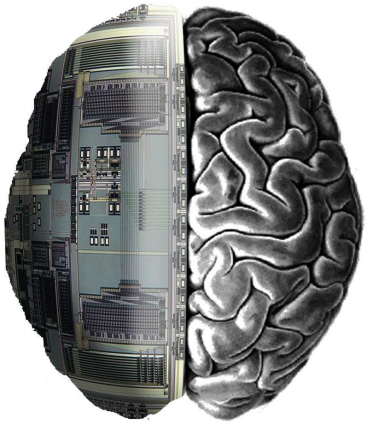
Technology Management Council Germany Chapter

First IEEE TMC Workshop on

Artificial General Intelligence (AGI) Nanotechnology and the Singularity

10th October, 2008, Grosswallstadt, Germany

Attendance limited!



Can computers become intelligent on a human level?

Understand the basic approaches to achieve AGI either by reverse engineering the human brain or from computer science theories and other methods.

Learn about the prospect for graphene as a new electronic material substituting silicon and the current status and future of brain-computer interfaces.

Experience renowned speakers from computer science, robotics, neuroinformatics and electron device research together with distinguished AI experts.

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Discuss future directions of AGI research and the feasibility and practical implications for your domain with leading experts and engineering professionals.

brain **computer interface** **singularity** **reverse engineering** **upload** **superhuman** **consciousness** **graphene electronics** **human-level intelligence** **learning machine** **autonomous systems** **robotics** **exaflop computing** **convergence**

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Artificial General Intelligence (AGI) Nanotechnology and the Singularity

Within the next or so decade the computational power and storage capacity of a computer will rise to the equivalent computing and storage power of the human brain, which is estimated to be between the petaflop and exaflop range. This astonishing hardware development is driven by Moore's law is still ongoing and will probably continue with newer nanotechnologies, like graphene electronics.

Artificial Intelligence research now teams up with the advances in the neurosciences to create truly Artifical General Intelligence (AGI) software programs and machines, trying to achieve complex goals in complex environments, much like human beings.

It is currently not clear when and if this goal can be achieved. There are two main approaches to AGI: Understanding how the brain works on the cellular and functional level and emulating these findings on a computer. Second, to build up intelligent programs from fundamental computational and mathematical theory.

If AGI programs can be developed successfully, they will run much faster, than the human brain could ever do. The technological Singularity is denoted as the point in time when an AGI system will be able to improve itself. Also, these systems would be easily replicable or even self-replicable. This could lead in a runaway condition to a hard takeoff and very quickly lead to ultra intelligent or superhuman machines with profound consequences in technology, economics and social life.

This workshop is intended to give an overview of the field of AGI, brain computer interactions and the technological Singularity together with the enabling factors to the community of engineering professionals and to open up this field for a broader discussion.

To probe further: www.spectrum.ieee.org/singularity

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AGI, Nanotechnology and the Singularity

Workshop - Program

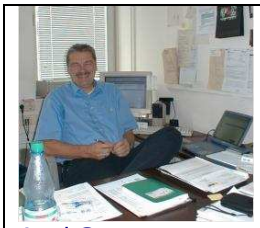
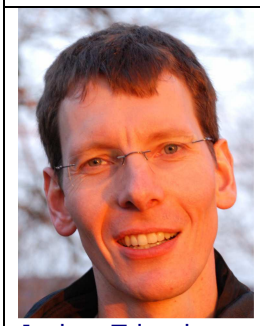
10th October, 2008

09:00 – 09:05	Welcome	Dr. Gerald Heimann ZENTEC
09:05 – 09:30	Introduction	Dr.-Ing. Axel Richter IEEE TMC
09:30 – 10:15	Mathematically Optimal Universal Artificial Intelligence and the Convergence of History	Prof. Dr. Juergen Schmidhuber Dalle Molle Institute for Artificial Intelligence, Lugano, CH Computer Science, TU München, D
10:15 – 10:30	Coffee break	
10:30 – 11:15	Human Level AGI and Beyond	Ben Goertzel, Ph.D. Artificial General Intelligence Research Insitute, Rockville, USA Novamente LCC, Washington, USA
11:15 – 12:00	Graphene The new Silicon?	Dr.-Ing. Max Lemme Harvard University, Boston, USA
12:00 – 13:30	Lunch	
13:30 – 14:15	Modelling of the Human Brain	Dr. Lars Schwabe Brain-Mind Institute, EPFL, Lausanne, CH
14:15 – 15:00	Brain-Computer Interfaces	Prof. Dr.Ing. Axel Gräser Institute For Automation, University of Bremen, D
15:00 – 15:15	Coffee break	
15:15 – 16:00	Neural Codes and Consciousness	Prof. Jochen Triesch Frankfurt Institute of Advanced Studies, Frankfurt, D
16:00 – 17:00	Panel Discussion	All speakers

Speakers & Abstracts

 Juergen Schmidhuber	Juergen Schmidhuber is Co-Director of the Swiss Institute for Artificial Intelligence IDSIA since 1995, Professor of Cognitive Robotics at TU Munich since 2004, Professor SUPSI, and also adjunct Professor of Computer Science at the University of Lugano, Switzerland He obtained his doctoral degree in computer science from TUM in 1991 and his Habilitation degree in 1993, after a postdoctoral stay at the University of Colorado at Boulder, USA. He helped to transform IDSIA into one of the world's top ten AI labs (the smallest!), according to the ranking of Business Week Magazine (US). His research grants have yielded more than 200 peer-reviewed scientific papers on topics ranging from machine learning and mathematically optimal universal AI and artificial recurrent neural networks to adaptive robotics and complexity theory, digital physics, and the fine arts.	Until 2000 or so, most AI systems were limited and based on heuristics. In the new millennium a new type of provably optimal universal AI pioneered at the Swiss AI lab IDSIA has gained momentum. It combines theoretical computer science and probability theory to derive mathematically optimal behaviour for learning robots and other rational agents embedded in unknown environments. We put the recent developments in a broader historic context spanning 40,000 years of continually accelerating technological breakthroughs that seem to converge around 2040. Or is this impression just a by-product of the way humans and their society allocate memory space to past events?
 Ben Goertzel	Ben Goertzel is CEO and Chief Scientist of AI firm Novamente LLC, and bioinformatics firm Biomind LLC. He is also Director of Research of the non-profit Singularity Institute for AI. He was a research faculty for 8 years in several universities in the US and Australasia. He was the Program Committee Chair for AGI-08, the First Conference on Artificial General Intelligence and is the Conference Chair for AGI-09 which will be held in March 2009 in Washington DC. Dr. Goertzel has authored eight technical monographs in the computing and cognitive sciences, notably “AGI” published by Springer. He has also published over 80 research papers in journals, conferences and edited volumes, in disciplines spanning AI, mathematics, computer science, cognitive science, philosophy of mind and bioinformatics; and has developed AI-based sw systems for stock trading, language processing, bioinformatics data analysis and data mining.	A broad view is given of the future of AGI, taking into account recent developments in the AGI field and also in allied disciplines such as neuroscience, computer hardware, cognitive science, virtual worlds and robotics. The argument is made that, due to combined advances in all these fields, the AGI field is ripe for dramatic progress during the next 5-15 years. Indications of convergence between previously disparate AI paradigms such as neural networks, logic-based, probabilistic and evolutionary AI are discussed, and the integrative approach to AGI is held out as potentially the most pragmatic path to rapid progress. The embodiment issue is discussed, and a case is made that a combination of robotic and virtual embodiment with a focus on natural language learning may be maximally efficacious given the current technological situation. Finally, some specific AGI systems are reviewed, with a focus on virtually embodied and integrative systems, including the presenter's own Novamente and OpenCog AGI architectures, which are being used to control intelligent agents in online virtual worlds. It is suggested that, with an adequate infusion of talent and funding, the AGI community could potentially advance these sorts of ideas sufficiently rapidly to achieve human-level AGI within the next decade. Finally, the potential path from human-level AGI to dramatically superhuman AGI via software self-modification is analyzed, and it is argued that this transition may be faster than most people expect.

 Max Lemme	Max Christian Lemme received his Dipl.-Ing. degree in EE from the RWTH Aachen University in 1998. He joined AMO GmbH in Aachen in 1998 to work on non-conventional nano-CMOS devices, including Triple-Gate SOI-MOSFETs, novel gate dielectrics and novel metal gate electrodes. In 2003, he received his PhD (Dr.-Ing.) from RWTH Aachen University. He became manager of AMO's Nanolab in 2001, Head of AMO's Nanoelectronics group in 2004 and head of the technology department in 2006. In 2006 he received the "NanoFutur" award from the German Ministry for Education and Research (BMBF) for his project on graphene. In 2007 he received a Lynen fellowship from the Alexander von Humboldt Foundation to join Harvard University in Cambridge, USA, which he took up in July 2008 . He has managed several nationally and EU funded research projects, has authored or co-authored over 45 peer reviewed journal papers and is a Senior Member of IEEE.	Graphene, a recently discovered electronic material based on carbon, has evoked great excitement in the electronic device research community. Graphene is just one atomic layer thick, and experiments have revealed properties that exceed those of silicon by far. The mobility of electrons, for example, has been shown to be more than 1000 times greater in graphene than in silicon. In addition, graphene can potentially carry more current than copper or aluminium. In this respect, graphene is very similar to carbon nanotubes, but since it is a two dimensional material, it may potentially be processed just like silicon. The question therefore is whether graphene will one day live up to its potential and replace or boost silicon technology. A brief introduction to state of the art graphene technology will be given in the talk, followed by an overview of recent device related results. Finally, an attempt at evaluating the realistic potential of graphene technology will be made.
 Lars Schwabe	Lars Schwabe is a postdoc fellow of the German Science Foundation at the Lab for Cognitive Neuroscience at the Brain Mind Institute of the EPFL, Lausanne in Switzerland He held postdoc positions at the Univ. of Utah, and was a visiting student at the MIT. He was organizer of the International Neuroscience Summit in Berlin in 2002 and teaching assistant in the group of Prof. Obermayer, TU Berlin, Dept. of Computer Science and Electrical Engineering Before his graduate studies he was a software engineer and worked on projects for model based software development according to the UML and designed and implemented a case-based reasoning system to handle requests of customers files in a call-tracking system	The human brain, in particular the neocortex, demonstrates that a large ensemble of apparently sluggish and noisy elements can jointly solve problems, which are still beyond the scope of even the most sophisticated machine learning algorithms. Like, for example, visual object recognition under varying environmental conditions, or controlling the human body in order to perform complex sensory-motor tasks as playing tennis. Therefore, reverse engineering the brain to uncover the underlying computational principles might be a promising approach to building truly intelligent machines. In the field of computational neuroscience, researchers are developing mathematical models of the brain and of brain functions. However, the field is still rather immature, which is evident by the multitude of different approaches. The presentation will give an overview of models of sensory processing, sensory-motor integration and decision-making, and I will point out how they are linked to experimental data from behavioural experiments, monkey physiology and human brain imaging. I suggest that the most promising approach for modelling the human brain and brain functions is a combination of the two above extremes, where principles borrowed from, for example, machine learning are used to derive -- and hence predict -- the dynamics of realistic neuronal systems.

 Axel Graeser	Axel Graeser started his industrial career with the company Lippke in Germany, a leading manufacturer of process measurement and control systems for the pulp and paper industry. He was head of the control and software department and developed measurement and control algorithms especially for cross profile control of paper machines. From 1988 until 1994 he was Professor for Automation and Control with the University of Applied Sciences in Koblenz. Since 1994 he is head of the Institute of Automation at the University of Bremen. His main research interests are in the field of ❖ Robotics esp. rehabilitation robots for the support of disabled and elderly people. ❖ Feedback structures in image processing ❖ Brain computer interfaces ❖ Augmented reality	Brain Computer Interfaces (BCI) are new and promising direct interface channels between the brain of a user and a computer. The computer may then control any technical device like a robot arm based on the measured brain activity. There are invasive and non invasive BCI known and in recent years many applications have been reported, ranging from speller devices for disabled patients to robot arms for completely paralysed people up to rehabilitation devices for stroke patients. Non invasive BCI measure the electrical activity (EEG) of the brain in different sections and translate it to computer commands. The main approaches consist of Steady State Visual Evoked Potential (SSVEP), P300 and motion imagery (ERD/ERS). Existing BCI reveal that the information transfer rate (ITR) is very slow, compared with other information channels of a healthy human. The best known BCI information transfer rates are in the range of 60 bits per minute, which is far to low to control e.g. the motion of a robot arm direct via BCI. To overcome the disadvantage of the low ITR a shared control concept is used for robot control via BCI. Shared control allows the combination of human and artificial intelligence for an optimal control. In the presentation the main methods of BCI will be discussed as well as the control of a rehabilitation robot by a BCI. Also a projection to the near future of BCI`s will be given based on the present status and the distinguishable developments.
 Jochen Triesch	Jochen Triesch is a cognitive scientist with a background in physics. His research interest spans a number of different areas and disciplines, including: Neural Computation/Computational Neuroscience, Computer Vision, Machine Learning, Visual Psychophysics and Developmental Psychology as well as Robotics. Jochen Triesch is Johanna Quandt Research Professor and Senior Fellow at the Frankfurt Institute for Advanced Studies and J.W. Goethe University, Frankfurt. He was an assistant professor at the Dept. Of Cognitive Science at UC in San Diego.	An overview is given on how cognitive phenomena can arise from the collective interactions of relatively simple neural elements. In particular how the brain's networks and subsystems can self-organize their information processing to give rise to intelligent perception and action. The presentation focuses on building computational models of various aspects of visual perception, action, and learning, but also on testing specific implications of computational theories in visual psychophysics experiments and by testing the usefulness of different approaches in computer vision applications. By studying the organizational principles of neural information processing through computational modelling, we can further our understanding of brain function and organization and also make progress toward building a new generation of intelligent artificial information processing systems with potentially profound social and economic implications. The long term goal is the development of an embodied computational account of the developing human visual system, a system that autonomously learns to perceive, understand, and interact with its environment with relatively little external supervision.
 Axel Richter	Axel Richter is Chairman of the IEEE Technology Management Council in Germany. In this context he wants to advance the field of management sciences applicable to individuals engaged in or overseeing the management of engineering, technology, innovation, and strategy in a global environment. He received a Ph.D. in Electrical Engineering from the Technical University in Munich in the area of MEMS design. He was active as a researcher and department leader in the area of micro fluidic and MEMS systems at the Fraunhofer-Society in Munich, before joining an industrial carer as director of R&D in several multinational companies. Currently he is the managing partner of a technical consultancy firm. He has published about 50 research papers, has been granted over 20 patents and is an IEEE senior member.	Will the Technological Singularity happen? Will super smart machines let us live forever or render us obsolete? No other topic in engineering currently can be more ambivalent and conflicting, and no other technology is set out to have such a profound impact on all areas of our life. Can it happen? Experts opinion in the field range from complete bogus to realization somewhere in 2030. Are we again close to a fundamental paradigm shift like in Copernicus times? Only a better knowledge of the underlying concepts and scientific findings will allow the professional community to discern between science fiction and science facts. The basic ideas and concepts of Artificial General Intelligence and the Singularity will be shortly introduced, preparing the field for the experts presentations and the final panel discussion.

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Organizer:

Organizer of this event is the German Chapter of the IEEE Technology Management Council – Institute of Electrical and Electronics Engineers. The IEEE is a non-profit organization and the world's leading professional association for the advancement of technology. Through its global membership, IEEE is a leading authority on areas ranging from aerospace systems, computers and telecommunications to biomedical engineering, electric power and consumer electronics among others. Members rely on IEEE as a source of technical and professional information, resources and services. To foster an interest in the engineering profession, IEEE also serves student members in colleges and universities around the world.

Registration:

Registration is open for all IEEE members, members of partner organizations and for all guests. The number of participants is limited. **Registrations will be processed in the order of incoming and payment**. **All registrations must be received by September 26th, 2008.** Registration is preferred by FAX to +49 6022 26 11 11. This is a non-profit event. The registration fee includes refreshments, coffee and a business lunch during the event and a printed hand-out. The registration fee is 240 € for guests, 160 € for IEEE members and partner organizations and 80 € for students, including VAT. A receipt will be issued at the event itself. The organizers reserve the right of programme changes.

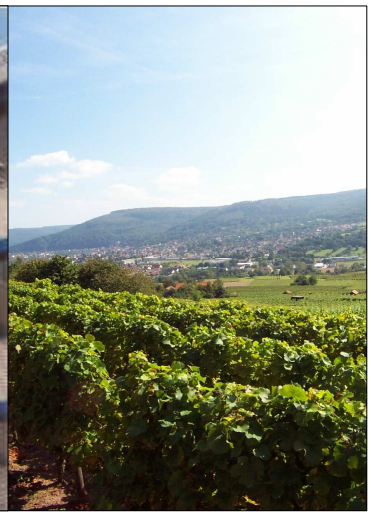
Cancellation / Transfer:

The transfer of the registration to another participant of the same booking group is possible. A full refund, less a 25 € processing fee, will be given for all cancellations if notification is received prior October 1st, 2008 only in written form to IEEE TMS, c/o PRAGNA SYSTEMS GmbH, Industriering 7, 63868 Grosswallstadt, Germany. Refunds will not be given for cancellations received after this date. Cancellation of the event by the organizer is reserved. In this case paid registrations will be fully refunded.

Venue:

The IEEE workshop will be held in the ZENTEC Centre for Technology in Grosswallstadt near Frankfurt/Main. The conference is accessible by car from Frankfurt Airport or Aschaffenburg main station. Local hotel accommodation is available. A pre-workshop and post-workshop evening event in a local winery is planned to allow for ample networking. For details please see the TMC Chapter web site: http://ewh.ieee.org/r8/germany/ems/.
Attendance is limited to about 100 participants. The organizer keeps the right to change the venue location in case of excess registrations.

Directions: Driving from Frankfurt and/or Würzburg. Leave the motorway A3 at the Stockstadt exit, drive towards Miltenberg on the motorway B469. Leave the B469 at the Großwallstadt exit. Take the first turning right Einsteinstraße / Industriering). The ZENTEC building is on the right, approx. 400 metres after the left hand bend.
Street address: Industriering 7, D-63868 Grosswallstadt



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Registration

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Artificial General Intelligence (AGI), Nanotechnology and the Singularity

October 10th, 2008
ZENTEC Centre for Technology
Industriering 7
63868 Grosswallstadt, Germany
Phone: + 49 60 22 26 11 18

Last name: …… Pre name: ……

Title/Function: ……

Affiliation: ……

Street: …… City/ZIP: ……

E-Mail: ……

Phone: …… FAX: ……

Registration fee:

☐ 240 € IEEE non-member

☐ 160 € IEEE member

☐ 80 € Student

For IEEE members and reduced registration fees:
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