Frontiers of Engineering Symposia-Exciting Research Areas

Engineers take abstract ideas and build tangible products from them. Engineers design products under constraint, means the product to function in an expected way. Engineers work in fields such as automotive, aerospace, machinery, biomedical, electronics, communication, robotics, electrical power, energy, computers, civil engineering and manufacturing to create new products that didn't exist before.

In the future, the present **smartphones** may evolve into personal mobile computers (PMC) and provide very powerful sense of surroundings through powerful sensors; the present **3G and 4G Wireless Broadband** may become thing of the past and personal mobile computers (PMCs) access to the cloud will be pervasive and ultra-fast at all times and each home will have devices like AT&T's 3G Microcell; With tomorrow's **cloud computing**, all of our personal information and the applications will be available to us at any time; the **information glasses (eye tracking)** transmit the object you're viewing and the words you speak to your PMC, which will interpret your intent, find and compute and then transmit the results back to you visually and/or verbally; in the future, **AR glasses** will project images onto the lenses using components that are barely noticeable. Your PMC will display information on your glasses much like a heads-up display (HUD), for instance, with symbols projected along the periphery. Look at a symbol and say something, and your PMC will act on the broadcasted message. Your PMC will also do a great job of minimizing the information displayed, limiting it to just what you need to know now; Social networking may also become more integrated with other components of our digital lives, like our calendars, address books and GPS. When going to a scheduled meeting with someone, you may be presented with recent and relevant posts that person made on Facebook to help prepare for small talk; **Computer-aided design (CAD)** products are popular among engineers, designers and students for creating 3D product designs. But the software is often too advanced for an average consumer to design his or her own products. In the future, however, CAD will allow an average consumer to design his own custom products that are both manufacturable and affordable. Consumers will be able to use simple software to combine predefined, configured product features. They'll be able to personalize further by adding their own colour palate, pictures, shapes and even personalized sizing; Today's cars are packed with a variety of driver assistance aids. You can get most any car today with GPS, but luxury car makers such as Audi, BMW, Mercedes and Volvo provide a whole lot more. Options now include active cruise control, lane departure warning/intervention, traffic info and blind spot warning. These cars can even brake on their own to avoid hitting an obstacle or pedestrian in front of the vehicle. In the future, we will have **autonomous cars**, where driver control will be optional. Even though the thought might seem scary, the cars will be safer than any car you'd pilot yourself. They will constantly evaluate their current environment with multiple sensors -- and they'll never get distracted by text messages.

These technologies are called cutting edge technologies or frontiers of engineering. To discuss the future cutting edge technologies, frontiers of engineering symposia are held. The Frontiers of Engineering (FOE) program brings together through 2-1/2-day meetings of a select group of emerging engineering leaders from industry, academe, and government labs to discuss pioneering technical work and leading edge research in various engineering fields and industry sectors. The goal of the meetings is to introduce these outstanding engineers (ages 30-45) to each other, and through this interaction facilitate collaboration in engineering, the transfer of new techniques and approaches across fields, and establishment of contacts among the next generation of engineering leaders in order to sustain and build U.S. innovative capacity. Funding for the FOE symposia is provided by foundation, government, and corporate sponsors. These currently include: The Grainger Foundation in Lake Forest, Illinois, National Science Foundation, Defense Advanced Research Projects Agency, Air Force Office of Scientific Research, Department of Defense Research and Engineering – Research Directorate, and companies such as Microsoft Research and Cummins Inc., as well as corporate and federal lab hosts.

There are four Frontiers of Engineering (FOE) meetings every year: the U.S. Frontiers of Engineering Symposium held each year and a rotating schedule of FOE meetings with Germany, Japan, India, China, and the European Union. Each Frontiers symposium covers four topics that vary from year to year. Examples from past symposia include: visualization for design and display, nanotechnology, advanced materials, robotics, simulation in manufacturing, energy and the environment, optics, intelligent transportation systems, MEMS, design research, bioengineering, counter-terrorism technologies, and quantum computing. The Frontiers of Engineering symposia are held either at The National Academies' Beckman Centre in Irvine, California, at corporate or federal labs, or in overseas locations selected by our bilateral FOE partners. Corporate or federal lab hosts have included GE Global Research, Ford, Microsoft, Alcatel-Lucent, Hitachi Global Storage Technologies, HP Labs, Sandia National Laboratories, Oak Ridge National Laboratory, and IBM. The bilateral meetings alternate location between sites in the U.S. and the partnering country.

The 2013 US Frontiers of Engineering was hosted by DuPont on September 19-21, at the Hotel DuPont in Wilmington, Delaware. The areas of discussion were: Designing and Analysing Social Networks, Cognitive Manufacturing, Energy: Reducing our Dependence on Fossil Fuels, and Flexible Electronics.

The 2013 German-American Frontiers of Engineering symposium was held April 26-28, 2013, in Irvine, California. The areas of discussion were Materiomics, Biomass Conversion, Additive Manufacturing, and Transport in Complex Systems.

The 2013 China-America Frontiers of Engineering took place in Beijing, China from May 15 - 17 . The areas of discussion Were Nanotechnology - Synthesis, Functionality, And Applications, The Future Internet and the Internet of Things, Bio-Mems and Solar Energy.

The 2013 EU-US Frontiers of Engineering was held November 21-23, 2013, at Hotel Dolce, Chantilly in Chantilly, France. The areas of discussion were: Nanosensors, Big Data, the Future of Transportation, and Wireless Broadband.

The 2014 Japan-American Frontiers of Engineering was held June 9-11, 2014, in Odaiba, Tokyo, Japan. The areas of discussion were: Field Robotics for Disaster Response, Power Unplugged: Energy Harvesting and Power Transmission, Noise Control Engineering in Healthcare Environments, and Bio imaging.

The 2014 Indo-American Frontiers of Engineering was held May 19-21, at the Infosys Centre in Mysore, India. The areas of discussion were: Biomaterials, Water Resource Management in the Face of Climate Change, Green Approaches to Communications, and Engineering in the Context of Big Data.

The material presented by each speaker is available at http://www.naefrontiers.org/

This article is basically to guide young researchers and students to the exciting and future research areas in Engineering.

The NAE also holds symposia on “Frontiers of Engineering Education”. https://www.nae.edu/

The bi-national Frontiers of Research Symposia bring together outstanding young scholars and scientists from Germany and the United States, Japan, United Kingdom, China, India, Israel, and Brazil. The symposia challenge them to rethink the boundaries of their disciplines. Together, they strive to reach new frontiers of understanding as they discuss recent advances, cutting edge research, and budding opportunities across disciplinary lines. At the same time, the bi-national symposia serve to establish and strengthen ties among future leaders of partnering countries. The symposia create avenues for an exchange of knowledge that is both international and interdisciplinary.

Each symposium is conducted by the Alexander von Humboldt Foundation under bilateral agreements with partner organizations in the United States, Japan, United Kingdom, China, India, Israel, Brazil and Turkey. The locations of the symposia alternate between Germany and the partner country. http://www.humboldt-foundation.de/web/frontiers-of-research-symposia.html

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