SMARTx - SMART MedTech

R. Dekker
Principal Scientist
Philips, Eindhoven, Netherlands

Biography
Ronald Dekker received his MSc in Electrical Engineering from the Technical University of Eindhoven and his PhD from the Technical University of Delft. He joined Philips Research in 1988 where he worked on the development of RF technologies for mobile communication. Since 2000 his focus shifted to the integration of complex electronic sensor functionality on the tip of the smallest minimal invasive instruments such as catheters and guide-wires. In 2007 he was appointed part time professor at the Technical University of Delft with a focus on Organ-on-Chip and bioelectronics medicines. Since 2013 he has been the initiator of a number of large European initiatives that all have in common the development of open technology platforms for electronic medical devices. In 2018 he initiated the ECSEL joint undertaking Health.E lighthouse. He published in leading Journals and conferences and holds in excess of 70 patents.

Gas and particle sensors, electronic noses in healthcare sector - a new momentum

J. Mouly
Team Lead Analyst Sensing & Actuating
Yole Développement, Photonics & Sensing,
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Abstract
The quality of the air we breathe remains a major global issue for the health and safety of people. The World Health Organization links 4.2 million deaths per year to pollution issues and exposure to toxic or dangerous gases. The cost of pollution is also a significant economic impact. The World Bank estimates it to be 4.8% of global GDP. Covid-19 pandemic has accelerated the adoption of indoor air quality detectors in which gas and particle sensors are at the heart of the systems, analyzing CO2 concentration in public closed areas, classrooms, or offices, and many countries are now regulating air quality in these areas. In the medical sector, gas sensors are used for capnography applications since a long time, but new use cases are into development or exploration status: cancer biomarkers in air we breathe for early diagnostics, inflammation detection for patient suffering from Asthma. The presentation will describe applications of gas and particle

sensors in the healthcare sector and emerging use cases. You will learn more on the innovative technologies from NDIR to MOx or photo acoustic based gas sensors, and which kind of technology is well adapted to which application regarding selectivity, lifetime and other major criteria for healthcare applications. Not only gas could be measured, but also more complex odors that need to the use of artificial intelligence or the concept of electronic nose. The presentation will introduce electronic nose devices and status of development as well as the ecosystem of players.

Biography

Jérôme Mouly is Team Lead Analyst in the Sensing & Actuating team within the Photonic & Sensing Division at Yole Développement (Yole).

Jérôme manages the expansion of the technical expertise and market know-how of the team. He actively supports and assists in the development of a dedicated collection of market & technology reports as well as custom consulting projects.

He has conducted more than 100 marketing and technological analyses for industrial groups, start-ups, and institutes in the field of MEMS and sensing technologies.

Jérôme has been also deeply engaged in Yole's finance activities with a dedicated focus on the commercial exploitation of smart system technologies and access to funding opportunities.

Application-Specific Integrated Circuits Pave the Way to New Innovative Electro-Therapies for Cardiology and Neurology

E. Bernard-Moulin
Marketing Manager
IC'Alps, Meylan, France

Abstract
Cardiology is the second-biggest medical device area by sales on account of rising prevalence of cardiovascular diseases (CVDs) – number one cause of death worldwide –, favorable reimbursement policies, growing geriatric population and increasing cost of CVD management. EvaluateMedTech estimates that the cardiology market could hit a valuation of nearly $75 billion worldwide by 2024, dominated by few medtech companies.

When drug based therapies of cardiovascular diseases are not sufficient or do not have enough care efficiency, one growing curative approach of patients is to use dedicated Active Implantable Medical Devices (AIMD) leveraging Application-Specific Integrated Circuits – so called ASICs –. Trends to watch in ASIC-powered medical devices include energy harvesting and battery management for long-term care, less invasive technologies for patient comfort, machine learning for predictive analytics and personalized treatment, simultaneous and continuous monitoring of biosignals for simpler and accurate diagnostics, and cybersecurity for patient safety. As these novel approaches enter the market, we are seeing HealthTech startups tackling heart failure with innovative products such as leadless pacemakers, cardiac contractility modulation devices or cardiac micro-current devices.

Microelectronics and Application-specific Integrated Circuits (ASIC) could not only broaden the competitive landscape in cardiology, they are also revolutionizing our medical approach to neurology: spinal cord, vagus nerve or peripheral nerves neurostimulation, brain fine monitoring and electrostimulation, etc.

Relying on advanced design techniques developed through decades of experience in the downscaling of power consumption coupled to the highest integration level, IC'Alps proposes custom integrated circuits embedding nanopower electrogram (ECG/EGM/EEG…) with very limited Bill of Material (BoM), ultra-efficient Power Management Units (PMU), power optimized neurostimulation stages and many more blocks to build a customized electronics for AIMD manufacturers. Such disruptive IC design architectures have proven their effectiveness in improving quality of healthcare and patient's lives in many applications.

In the near future, implantable devices based therapies that have never been envisioned will be possible with our technology.

Biography
Elsa is Marketing Manager at IC'Alps since 2019.

She is currently responsible for market analysis, global promotion of IC'Alps' design expertise, stimulation of the ecosystem, identification of new business & partnership opportunities and supports R&D topics.

She started her career in the semiconductor industry in 2008 and covered different topics ranging from silicon IP blocks, semiconductor equipment and ASIC design & supply services.

Opportunities and challenges of high-throughput 3D metrology equipment for semiconductor process control

H. Sadeghian
CEO
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Abstract
In the semiconductor industry, Moore's law comes with increasing and complex demands and the need for advanced process control metrology. Traditional metrologies like OCD or CD-SEM lose sensitivity due to diminishing interaction volume. A metrology technique that thrives in this regime is Atomic Force Microscopy (AFM).
AFM is a technique currently used in process and integration development because it can provide reference-level local imaging and metrology. Unique strength over competing metrology techniques includes the potential for undistorted, local high-resolution information. Two factors are currently limiting deployment of AFM tools for inline process control: 1) ability to fully resolve deep, narrow structures and 2) throughput compatible with other metrologies currently deployed in High Volume Manufacturing (HVM). Here, we discuss the advantages of a multi-head AFM system with miniaturized high-speed AFMs working in parallel. In addition, we extend traditional AFM techniques to selective imaging and metrology of subsurface 3D structures and show a path to enabling Overlay metrology through opaque hard mask layers.

Biography
Dr. Hamed Sadeghian

Co-Founder, President and CEO of Nearfield Instruments

Hamed Sadeghian received his PhD (Cum Laude) in 2010 from Delft University of Technology. Four years later he received an MBA degree from the Vlerick Business School in Belgium. He is the founder (2001) of Jahesh Poulad Co., a manufacturer of mechanical equipment.

Hamed worked as a system architect and leaded a team of thirty researchers in nano-optomechatronics instrumentation at TNO in Delft from 2011 to 2018. In 2016 he co-founded Nearfield Instruments and is currently president & chief technology officer at this scale-up that recently sold its first metrology instrument to a high-end chip manufacturer.

Hamed Sadeghian is a part time associate Professor at the Technical University of Eindhoven. He holds more than 70 patents, and published over 100 peer-reviewed technical papers. He is currently also a principal scientist and Kruyt member of TNO.