SMART Medtech

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Biography
Coming Soon

Intersecting Paths: Uniting Moore's Law and Biology Through Bioconvergence

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Abstract
Intersecting Paths: Uniting Moore's Law and Biology Through Bioconvergence
For more than 4 billion years, nature has been perfecting its biological systems, developing solutions that scientists and engineers are just beginning to grasp and utilize. Leveraging synthetic biology, a myriad of applications - ranging from antibiotic development to laundry detergent enzymes, even to DNA data storage - have come to fruition.
Biological systems inherently possess the ability to self-assemble, self-repair, and self-replicate. This gives them an edge that critically affects capacity, precision, and cost-efficiency, metrics highly relevant in the material science as well as manufacturing process.

Recent technological developments allow us to read (sequence) and write (synthesize) DNA with greater ease and accuracy. This exponential advancement in our ability to 'program' DNA propels a technological revolution mirroring the computer surge of the 20th century and impacting manufacturing on a scale reminiscent of the 19th-century industrial revolution.
In the domain of synthetic biology, two fundamental design principles particularly stand out - the concept of reusable parts and the engineering design cycle. The engineering design cycle, also applied in the semiconductor industry, simplifies the engineering process into three stages: design, build, and test. This structure's ability to scale exponentially implies that we are now able to function within the framework of Moore's Law. This principle, established in computer manufacturing, indicates that capacity successfully doubles approximately every 2 years over extensive periods.

Moore's Law's relentless pace has become the benchmark for significant, long-term industrial progress. This pace is now attainable in gene synthesis. As we transition from conventional manufacturing to 'smart' manufacturing, we are harnessing the incredible compute power that Moore’s Law has provided for image and pattern recognition and massive data set analysis to drive manufacturing efficiency.

Biography

Laura Braeuninger-Weimer is a Director in the team of Dr. Steven Johnston, Vice President Technology Scouting and Enablement of the Science and Technology Office at Merck.
Laura is responsible for enabling and driving cross-sectoral collaboration and innovation at Merck among the 3 business sectors. Her tasks include advancing the strategic bioconvergence activities, identifying and launching disruptive technology and new business growth programs that span the electronics, health care, and life sciences ecosystems and product areas.
Prior to her role within the Technology and Ecosystem Enablement function, Laura was part of the M Ventures leadership team. As the Head of Operations of the Corporate Venture Fund she was responsible for general operational excellence, and furthermore strategically building and extending the Israel Innovation platforms for early stage funding strategies across the Merck investment fields. This included representing MV on the board of companies and consortia. She started her career at Merck within the Healthcare division as an Associate in the Business Development, Oncology function. Laura holds a Master in Economic History & Economics from the University of Zurich and a Bachelor in Management, Philosophy & Economics from the Frankfurt School of Finance.

Prior to becoming Chief of Staff, Nina has been driving corporate innovation as Biotechnology Lead of a synthetic biology innovation project, Senior Manager responsible for the creation of strategic alignment as well as building and management of high performing teams and finally as Associate Director responsible for targeted sourcing of innovative ideas, with the goal to generate new businesses.

Nina has a PhD in Biology from the University of Tuebingen, Germany. She has worked as a researcher in Europe and the USA at Yale University prior to joining Merck KGaA, Darmstadt Germany in 2016.

MEMS Devices and Manufacturing for Medical Applications

E. Corduwener
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PHILIPS

Abstract

An overview is given of the platform used for the fabrication of cMUT ultrasound imaging devices, developed at Philips.
The wafer-level manufacturing process is explained, as well as the flex-to-rigid (F2R) micro assembly in catheter tips and the integration on CMOS devices. The same assembly technology enables the manufacturing of highly miniaturized optical modules for high-speed data transmission between the catheter tips. Furthermore, micro-needle arrays can be realized for 3D imaging of neural activity.

Ultrasound imaging is a non-invasive method for visualizing and measuring a patient’s health. It enables the creation of images and functional information. Efficient mobile ultrasound systems are extending the use beyond radiology, cardiology, and fetal applications to a wide range of medical specialties. The Philips cMUT (Capacitive Micro-machined Ultrasound Transducer) arrays enable smaller form factors and higher levels of system integration, while ensuring similar imaging quality as traditional piezoelectric transducers.

Biography

Erik Corduwener is a seasoned professional with over 35 years of experience in the semiconductor industry. During his career, Erik has been working in customer service, business development, marketing, and sales account management at reputable semi equipment companies, being employed throughout Europe, Asia, and the USA. He’s currently active as key account manager at Philips MEMS & Micro Devices, leading the strategic relationships with its major customers, as well as developing new key accounts.
Erik has a BSc in precision mechanical engineering from the HU University of Applied Sciences Utrecht.

Machine Learning Supported Self-Sensing Micropump to Detect Air Bubbles to Improve Dosing Accuracy

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Abstract

When administering drugs with microdosing systems based on micropumps, air bubbles, which cannot be avoided, are a huge disturbance of the micro dosing. On the one hand, bubbles replace the liquid to be dosed, on the other hand the compressibility and surface tension of the bubble can influence the dosed volume of the micropump. Bubble and pressure sensors are commonly used to detect those events, increasing system complexity and cost significantly, which is a hurdle for disposable applications like drug delivery. To detect bubbles, a radically new approach is taken without any additional sensor and without modifying the micropump, just detecting and analyzing the driving signal: indirect piezo effect is exploited to generate stroke volume by a periodic electrical driving signal. Parallelly, direct piezo effect is used: the piezo displacement changes the pump chamber pressure, which moves electrical charge to the piezo and is detected as “sensor current”. This time dependent signal is like a “fingerprint” of the pump cycle. It is processed by the system controller, without influencing the drive signal of the piezo. The data processing is extended by machine learning algorithms (ML algorithms) and integrated on the STM-microcontroller (edge device). The ML algorithms are trained with measurement data in a measuring station.

Biography

Since 2001, Martin Richter is managing the department Microdosing Systems at Fraunhofer Institute for Electronic Microsystems and Solid State Technologies (EMFT) in Munich. Before, he studied Physics at the Technical University in Munich, and achieved his PhD in the field of microfluidic systems in 1998. His mission is to industrialise microdosing systems, based on micropumps, for various industrial applications with a focus to medical applications.