Final Remarks MAM 2015

Volker Saile

February 3, 2015
MAM 2015, 6th Edition

Same Concept, Same Venue, Same Quality
mAm 2013
mAm 2014
The Concept

Background

Microsystems have now entered the age of high volume production for consumer applications, especially mobile phones, ICT and medical disposable devices. The issues associated with the production of these are of continued interest to manufacturers. These include tooling in high volume fabrication of precision parts, making highly efficient and reliable automated assembly lines and test systems for microproducts. There is a fast growing market for such components and products.
The Programm
Monday 2 February 2015

09:00-09:30  Welcome Session

Danick Bionda, Secretary General, Micronarc

Prof. Dr. Volker Saile, Chief Science Officer, Karlsruhe Institute of Technology, President, Mancef

David Tolfree, Vice President – Europe, Mancef

Yvan Dénéréaz, Office for Economic Affairs, Canton of Vaud

Jean-Michel Stauffer, Innovation adviser in Microtechnologies, Innovaud


Wearables.

6.5 bn connected to internet. Everywhere sensors – connected – everything will be analyzed. Connected devices platform.

More than hardware: Standards, ownership of data, business models.

Energy consumption

Sensor node – gas sensing – microphones ..... for IoT.
Humans ... subjectivity, quantification?
Industrial vision.
Approach: Feature extraction and classification, example: intensity and gradient.
Multiple features.
Camera and software.
Dedicated lighting, automated lighting (robot).
Classifiers – separate classes, learning phase.
Implementation.
Other applications: watch acoustic signals.
Mechanical: 1% of world market but 50% of value.
Si: why?
  Mechanical properties, amagnetic, corrosion, design freedom, precision, batch, tribology.
Spiral spring – SILINVAR for thermal compensation.
Photolithography and MEMS processes.
Patek Philippe.
Disruptive escapement mechanisms with Si.
High quality factor: watch runs for 1 month rather than for 2 days.
*Hybridation:* Si + metal (LIGA).
New materials (SiC). Miniature atomic clock.
Si-technology, Bosch process
Function of mechanical watch.
Properties of Si … watch components
Manufacturer: SIGATEC SA, Sion/CH
Spring, escapement.

Exhibitor elevator pitch (3 min) – IcoFlex

IcoFlex and EPFL.
Microfabrication – Glass and ceramics.
Watch industry, electronics, biomedical.
4-8“ wafers, 500 to 5000 wafers per year per project.
Victim of a flu – see you next year
Probing – touching, feeling, smelling
Cantilever arrays – artificial nose.
Elastic response: tumor cells vs. healthy cells.
Biochemistry and microfabrication.
Cantilever arrays and cell arrays probed by force spectroscopy.
Nanomechanical biosensing. Breath. Teaming up with ARTIDIS for biopsies.
Stiffness of tissue is different for cancer tissue.
Nanoscale dispensing NADIS. Penetrate cell membrane.
Bioindenter. Healthy vs. repaired tissue. CSM Instruments.


Optics, fluidics, transportation, energy, bio-chip fabrication.
ST Micro: 9 bn MEMS last year. First billion-dollar MEMS company. Beyond motion MEMS!
9-axis MEMS: acceleration, gyro, magneto.
Ultra: low-power, high-performance, high-capabilities,...
Sensors and microactuators. Smart.
IoE: Internet of everything (IoX).
Wearables, smart home, smart city, smart car.
Brain – communication – interfaces.
Distribution network – Ecosystem.
Diversification: Motion, environment, optics,
Printing and stenciling: PVD + shadow mask – 75 nm, record 15 nm.
Nanowires and nanodots, magnetic nanostructures.
Blurring effects in stenciling.
Etching through stencils --- photonic nano-antennae.
Inkjet: microlenses.
Combination of stencil and inkjet: micro-mirrors.

Military: many threat agents.
Fast, mobile, independent devices.
SFORA project: Collection, isolation/identification, validation.
Mobile platform – laboratory (container) – real time PCR and gel electrophoresis.

Digital holographic microscopy.
Actuators in liquid, microphone (stitching).
Resolution: 1 nm in-plane, 5 pm out-of-plane.
COMS 2015
Kraków, Poland

20th Conference on Commercialization of Micro- Nano Systems
September 2015
Kraków
POLAND

www.coms2015.eu
Industry 4.0 and microsystems.
German initiative: Factory of the Future.
R&D projects, FESTO Didactic, Learning Factory in new FESTO Technology Plant.
FESTO products: component supplier.
Development of mechatronic systems to CPS.
Product examples.
Miniaturization: Space. Piezo, housing, MID.
Fully automated assembly line.
Strategic fields: Smart and Intuitive.
Industry from 1.0 - 4.0

Revolution through: technical innovation / know-how / qualification

**I 1.0**
Mechanical production
Mechanization
End 18th century

**I 2.0**
Mass production based on division of labor
Industrialization
Beginning 20th c.

**I 3.0**
Electric automation
Automation
20th c., 70ies

**I 4.0**
Integrated automation
Cyber-Physical Systems (CPS)
21st century
Feeding and palletizing parts <40 mm.
Feeder with vibration. Custom platform surface. Intelligent vision system.
Robots: delta robots – precision, accuracy.
EU project PASTA for textiles.
PRIME – system integration toolbox.

Victim of a flu – see you next year

Cluster: Region – 360 partners.
Focus: Smart - Health, - Production, - Mobility, - Energy.
Special interest groups.
Microtechnics Alliance.
3D-printing, also maskless lithography. UV-resist and NIR laser. Between e-beam and direct laser writing.
38 employees, 8 open positions. Systems manufacturer. Dielectrics and metals.
Examples: Photonics, optical waveguides, mechanical structures, bio-templates,...

11 people from 10 countries. Hot AFM tip for local evaporation of polymer. Fast, pattern and inspect, 3D, pattern transfer. PPA resist. Ideal for rapid prototyping: 20 mm/s, 8 nm.
„We are good in making non-useful things“. Optical micro cavities, archival data storage, pattern transfer with RIE, graphene patterning. Comparison with e-beam.

KNMF: Free access for research (publications), 50 experts, proposal procedure.

Höganäs: Big company – powders. Here powder-glue-powder-glue... stacks for 3D Structures. Processing at room temperature!
Teardrop analyzer.
Bionic eye.
Validation of processes.
Direct machining, injection moulding, sputtering.
Robotics and automation.
Visual inspection vs. automated QC.
Dr. Alexander Colsmann, **Head of Organic Photovoltaics Group, KIT** (DE)

**Fabrication of Organic Solar Cells from Eco-friendly Solvents**

OPV-modules – applications. Printing!
Layers of organic PV; bulk heterojunctions.
Efficiencies ... tandem solar cells.
Vision vs. reality.
Flexibility, environm. friendly solvents, printing.
Concepts are applicable to OLEDs.

**Olivier Theytaz**, Engineering Director at **Logitech** (USA / CH)

**From lab to fab: taking lab innovation to mass production**

Tracking on glass? ... Darkfield.
Glass is always dirty.
Size and cost reduction. Nano-receiver with plug and forget. Pico-receiver 3mm.
2D sensor.
Mice: 9 batteries/year to now 0.5 batteries per year.
MEMS in mouse for gaming: 2D sensor + gyro + acceleration). FAST!

**Exhibitor elevator pitch (3 min) – EXPRESS**

FP7: Smart system integration in Europe. Gain global leadership. Ecosystem.
Micro manufacturing, micro electronics, Moore’s law for downsizing.
Rel. precision for IC is 5% - terrible but digital electronics is tolerant.
Atomic precision = 0.3 nm. Analog fabrication but atoms are quantized.
Precision +- 1 atom, no error accumulation.
New exponential trend: larger volumes! Moore – down, here – up.
Scaling up and maintaining absolute precision.
DNA origami.
ZYVEX: CNT for boats, nanoprobes, atomic precise manufacturing.
Si, Si+H,... Litho results: 3 nm squares.
ZYVEX control systems are sold as products.
Applications: Standards, DNA sequencing, dopant atoms in Si, qbit devices, quantum comp.
Hards masks: 10 nm lines and spaces. Nanoimprint templates.
Smart MEMS scanner.
16:15-16:30  **Final Remarks**

**Prof. Dr. Volker Saile**, Chief Science Officer, **Karlsruhe Institute of Technology** (Germany), **President**, Mancef

**Danick Bionda**, Secretary General, **Micronarc**
mAm 2015 is organised by Micronarc, in collaboration with Mancef.

Organising Committee

- **Edward Byrne** – Micronarc; Project Manager FSRM
- **Prof. Dr. Volker Saile** – Chief Science Officer, Karlsruhe Institute of Technology; President, Mancef
- **David Tolfree** – Vice President Africa/Europe, Mancef
- **Danick Bionda**, Secretary General, Micronarc
- **Philippe Fischer** – Director, FSRM (Swiss Foundation for Research in Microtechnology); General Advisory Board Mancef Africa/Europe
- **Dr. Sikha Ray** – International Affairs Coordinator, Karlsruhe Institute of Technology / Mancef European Office
- **Suzanne Schwendener** – Micronarc
Thanks
Thanks
Commercialization of Micro Nano Systems Conference

COMS 2015

Kraków | POLAND  13-16 September

www.coms2015.eu

CALL FOR PAPERS:
30.05.2015


Organized by:
Wrocław University of Technology,
Faculty of Microsystem Electronics and Photonics

Together with:

[Logos of various institutions]
SEE YOU AT MAM 2016

VILLAR-SUR-OILLON

JANUARY 31 – FEBRUARY 2, 2016
The Threat of Microfabrication