MEMS devices for the next generation of sensors

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Key points and motivations

• **Sensors** allow electronic systems to gain awareness of the surrounding environment

• The lack of **sensors** with adequate characteristics limits the development of innovative electronic systems

• **Sensors** are several generations behind the present stage of electronic HW and SW
New sensors should:

• Expand the range of physical and chemical quantities that can be reliably detected

• Improve miniaturization and reduce power requirements for superior mobile device and WSN compatibility

• Reduce fabrication costs, to facilitate diffusion
Sensor know-how at DII

Modeling

SENSORS

Interface design

Technology

Knowledge Acceleration and ICT

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Technology: the post-processing approach

Standard, low cost IC – technology (Silicon Foundry)

Metal deposition
Photolithography
Anysotropic etching
RIE dry etching
Packaging

Micromachining

MEMS Sensors

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Example I: smart flow sensor

Electronic interface

Sensors

Products

Multi-channel flow sensor

Directional anemometer

Double channel MEMS flow sensor

X-Section

Y-Section

Knowledge Acceleration and ICT

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Example II: Acoustic particle sensor

- Detection of the local velocity induced by the sounds on the medium
- Suitable for sound source localization
- Fully compatible with low-cost CMOS technologies

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Example III

MEMS (SiGe) Resonant Biosensors

- Application: disposable, very low cost biosensors for POCT applications
- MEMS-over-CMOS technology
- Robust towards surface tension
- Electrical readout
- Sensitivity enhancement (perforations)

Response to biotin
Example IV: NEMS sensors

- E-BEAM Lithography
- Unique properties of nanostructures with macroscopic capture areas
MEMS-NEMS group at DII

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The group includes also 3 Ph.D. students and 1 research fellow.