iSLI

Research and Technology Transfer for Smart-MEMS and Wireless Sensor Networks

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Overview

- iSLI
- Technology Group
- MEMS
- Wireless Sensor Networks

About the Institute…

- iSLI was founded in 1998 at the Alba Centre, in Livingston, Scotland
- iSLI was the world's first centre of excellence to concentrate on postgraduate education and research in the methodology and applications of system-on-chip design, system level integration and related software and hardware technologies
- The Institute is a unique academic collaborative venture of four of the UK's leading universities: Edinburgh, Glasgow, Heriot-Watt, and Strathclyde, and with links to Paisley and Lancaster Universities who bring key skills in the use of MEMS technology
- iSLI draws on the academic expertise of the university departments of computer science, electronic and electrical engineering and informatics to deliver leading edge research as well as first class postgraduate lecturing
- Funding for iSLI is underpinned by a financial commitment from Scottish Enterprise, Scotland's economic development agency


The Alba Centre, Livingston, Scotland

University of Glasgow
University of Strathclyde Glasgow
HERIOT WATT UNIVERSITY
LANCASTER UNIVERSITY
Associate Member of iSLI
UNIVERSITY of PAISLEY
Associate Member of iSLI
Scottish Enterprise

Mission & Markets

"iSLI sits at the critical interface between the academic and commercial engineering worlds..."

MISSION

- To produce highly skilled Design Engineers & Researchers to meet the needs of the rapidly changing global Microelectronics Industry
- To produce World-class Education & Training in System Level Design.
- To offer research in "cross-over" technology
- To offer technology transfer to industry

MARKETS

- Worldwide Design, Research and Education Community

Flagship Products - EngD

Engineering Doctorate (EngD)

EPSRC
Engineering and Physical Sciences Research Council

- The EngD is the flagship doctoral qualification of the UK government-funded Engineering & Physical Sciences Research Council (EPSRC).
- It is designed to appeal to ambitious and able graduates who aspire to managerial positions in industry.
- The EngD is a four-year programme, placing emphasis on research within an industrial context. Students (known as Research Engineers) combine a research project, based with a UK sponsoring company, with accredited technical and business training.
- EPSRC funding is available to students meeting UK residency criteria.

FACTS

- Since 1999, iSLI's EngD centre has enrolled 65 Research Engineers and worked with 41 industry collaborators throughout the UK, ranging from start-ups to multinationals.
- To date, iSLI's EngD Research Engineers have had over 80 papers accepted in academic journals and major conferences, and several have won academic prizes.
- Successful students of the EngD graduate with a joint degree from all four partner universities.

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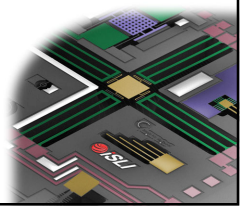
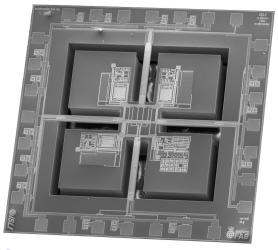
The iSLI Technology Group



Technology Group Skills

- Team drawn from industry *wherever possible*
  - Texas Instruments, Cadence, Agilent, Motorola, Fujitsu, Cypress, National Semiconductor, Alcatel, GEC, Avanex plus others
- Diverse skills
  - **Analogue** design
  - **ASIC** development
  - **FPGA** development
  - Embedded **Software**
  - **MEMS** – *Major growth market*
  - **Wireless** systems and sensors
  - Project **Management**



- **Sensitive to the needs of industry**

R&D

Research & Development

Through its in-house design team and access to academic experts, iSLI provides assistance with the development, transfer and commercialisation of MNT technology. The combination of skills available at iSLI provides significant value-add to highly integrated and heterogeneous technology challenges.

iSLI has…

- State-of-the-art design tools with…
  - Extensive capability in mechanical, electrostatic, damping, fluidic and other domains
  - Experience of the commercial design cycle
  - Tight links to fabrication suppliers - from prototype to production volumes
- Involvement in long-term academic research activity through the partner universities and development agencies
  - Research areas include: Si MEMS, Photonics, Micro-Fluidics, Integrated Control, Smart Structures, Biomedical Devices, Metrology & Chemical Synthesis
- Extensive linkages into other organisations at all points in the supply chain
- An extensive technology scoping capability in areas including:
  - Current state of the art
  - Market competition analyses
  - Application-specific tools recommendation
  - Manufacturing technology evaluation

SMC

photonix
The Photonics Facility

SEME FAB

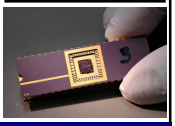
optocap

Design Services for Industry

Support Services to Industry

As well as offering education and training services, iSLI is also a hub of complex silicon systems design & high functionality MEMS enabled silicon system design. This is augmented by iSLI's considerable skills in mixed signal, embedded systems and reconfigurable electronics. All these skills are made available to the commercial sector, from large multinationals down to pre start ups, on a commercial contractual basis.
Activities offered include…

- Engagement with small start-ups to multinationals, offering:
  - Consultancy
  - Design services
  - Research commercialisation
  - Prototype development
- Technology transfer & development
- Providing low cost access to design tools for small to medium sized companies
- Contributing to working parties/ economic development activities
  - Embedded Software steering group
  - FPGA/High Performance Computing Alliance
  - Analogue Skills Initiative



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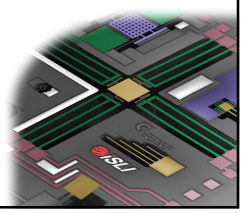
MEMS



MEMS - Prototyping

- UK MNT Network volume prototyping facility
  - Open access for UK, leveraging £15M direct investment
  - Deliver Integrated MEMS & CMOS solutions
    - From 1st prototype to volume market sampling
- Research
  - Access university capabilities *not* individuals
- Design
  - Commercially focused design & development provision
  - iSLI motivated by commercial success *not* RAE publications
- Manufacture
  - Fully integrated relationship and tool chain
  - Non-exclusive; now working with Qudos & Inex

Scottish Enterprise

HERIOT WATT UNIVERSITY

UNIVERSITY OF STRATHCLYDE

SEME FAB

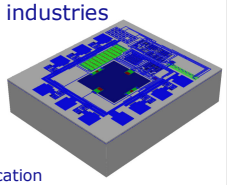
BERR | Department for Business Enterprise & Regulatory Reform

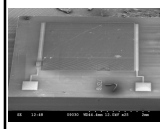
Strategic MEMS Research

- *Scottish Collaboration in Integrated Micro-Photonic Systems*
  - 4 year, £1.4M commitment marker
  - Si-MEMS, micro-fluidics, photonics, integrated con
  - Dedicated ISLI personnel
    - Operating *within* the research community
    - Enabling KT through iSLI commercial links
    - Next generation optical / fluidic applications
- Additional basic materials research
  - UWS micro-scale sensors group
  - Piezoelectric materials and applications
  - Potentially disruptive applications in fluidics

Wireless HMaP / HUMS

- Key technology for growth sector industries
  - Renewable energy, medical & aerospace especially strong
  - Driver for cost / safety / maintainability
- Strong application pull
  - MEMS enabled systems for sensing
  - Power (∴integration) key for many application

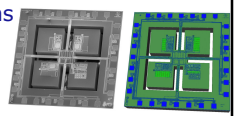




- Natural system architecture application
  - Multi component, multi-technology solution
  - iSLI / Partners have significant capability in all required

Moving from Sensors to Smart Sensors

- Open-loop ➔ Closed-loop
  - Increased bandwidth, better performance,reliability,…
- Combining multiple sensors to one unit
  - Example : Inertial Measurement Unit
- Towards "Plug-and-play" sensors
  - General impression of system integrators is "all the sensors we need are out there but they all need to be addressed differently"
  - ➔ Move towards common sensor interface
- Sensors including wireless comms
- Self-powered sensors (energy harvesting)
- Sensor networks



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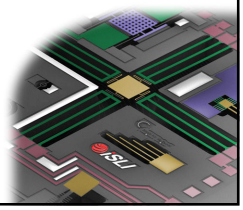
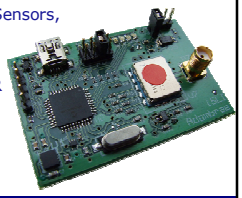
Wireless sensors / systems



Wireless Work

- Ultra BCF (SEEDA) – lead in project
  - "Adambrae" 433MHz platform – gen 1 SMD
  - Multi-hop self healing ad hoc network approach
- TSB project partner – WiTNESSS
  - iSLI is the principal wireless expertise partner
  - With TRW Conekt, Rolls-Royce, GE Sensors, Airbus, BAE, Agusta Westland…
- Exploitation opportunity for Scottish IPR
  - Specknet,



Areas of expertise / interest

- MEMS areas of expertise / interest
  - Smart sensors / Systems
  - Monolithically integrated CMOS/MEMS
  - Ultrasonics in MEMS
  - MEMS-Microoptics-integration
  - MEMS electronics interfacing
- Wide range of sensors developed
- Expertise in process development and material property characterisation
- Rapid MEMS-prototyping ➔ State-of-the art design tools
- Wireless mesh networks

Thanks for your attention.

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