

The University of Edinburgh, Division of Informatics Research Programme in SLI¹

Advances in silicon technology offer the prospect of billion-transistor chips by the second half of this decade, and has created a new field of research - System Level Integration (SLI). SLI will make possible new forms of system, integrating transduction, computation and communications on a single chip. The design, analysis and correct implementation of SLI devices presents new research challenges.

The timing of this Programme is unique. SLI is *not* VLSI design on a larger scale - it requires a “paradigm shift” to harness the true potential of the billion transistors. This Programme aims to provide a focus for this research, and to bring the relevant expertise within Informatics to bear on selected problems in this area.

The aims of the SLI Programme are

- to be a catalyst for co-operation between research groups in different Institutes. This can take place at different levels of activity, such as:
 - joint supervision of doctoral students, and undergraduate/postgraduate projects
 - organisation of study groups in cross-disciplinary research themes
 - submission of joint proposals to Research Councils
- to coordinate a laboratory of design automation tools as a resource for SLI research
- to be a window for research collaboration outwith the Division; for instance, with the Electronic and Electrical Engineering department and the Institute for System Level Integration
- to enhance education in system level integration at all levels

The programme will address selected research issues in the following broad areas:

- Novel architectural structures for computation in deep sub-micron silicon
- Logical models for reasoning about the properties of SLI devices
- Design frameworks for the engineering of Systems-on-a-Chip
- Linking applications to the underlying technology

¹The programme was officially established on 9th February, 2000.

This proposal has the support of the following academic faculty members who are drawn from the different Institutes within Informatics:

- David Willshaw (*Institute for Adaptive and Neural Computation*)
- Ewan Klein, Alexander Holt
(*Institute for Communicating and Collaborative Systems*)
- DK Arvind, Gordon Brebner, John Gray, Roland Ibbett, Michael O'Boyle, Roopa Rangaswami (*Institute for Computing Systems Architecture*)
- Robert Fisher, John Hallam (*Institute for Perception, Action and Behaviour*)
- Alan Bundy (*Institute for Representation and Reasoning*)
- Stuart Anderson, Paul Jackson, Perdita Stevens, Colin Stirling
(*Laboratory for Foundations of Computer Science*)

We have industrial links with ARM, BT, Cadence Design Systems, Hitachi Europe, Motorola, Sharp Laboratories Europe, and Xilinx. We view such links as important to encourage the two-way flow of ideas and results between academia and industry. In the long-term we will encourage spinning off research results into industry.

DK Arvind
Programme Coordinator

What is Informatics?

Informatics is the study of the structure, behaviour, and interactions of natural and artificial computational systems.

Informatics studies the representation, processing, and communication of information in natural and artificial systems. It has computational, cognitive and social aspects. The central notion is the transformation of information - whether by computation or communication, whether by organisms or artifacts.

Understanding informational phenomena - such as computation, cognition, and communication - enables technological advances. In turn, technological progress prompts scientific enquiry. The science of information and the engineering of information systems develop hand-in-hand. Informatics is the emerging discipline that combines the two.

In natural and artificial systems, information is carried at many levels, ranging, for example, from biological molecules and electronic devices through nervous systems and computers and on to societies and large-scale distributed systems. It is characteristic that information carried at higher levels is represented by informational processes at lower levels. Each of these levels is the proper object of study for some discipline of science or engineering. Informatics aims to develop and apply firm theoretical and mathematical foundations for the features that are common to all computational systems.