

# RAL

## DESIGN & DISCOVERY

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**RUTHERFORD APPLETON LABORATORY**  
SCIENCE AND ENGINEERING RESEARCH COUNCIL

## Systems Engineering Division

### An Overview

## Informatics Department

#### Introduction

Systems Engineering Division (SED) was created in July 1988. The main function of SED is the development of software and knowledge engineering techniques of interest to the programme of the Engineering Board of the Science and Engineering Research Council (SERC).

The major objectives of SED are:

- Software Engineering — the development of new methods and tools, based on formal mathematical principles, for the expression of software specifications and designs.
- Knowledge Engineering — the development of new methods and tools for the construction of knowledge bases and expert systems. This includes the development and critical evaluation of applications for real users. Attention is given to the life-cycle for knowledge based systems development.
- Software and Knowledge Engineering Environments — the evaluation of current methods, tools and processes for systems building and maintenance. All the Engineering Board's Committees have an interest in modern information processing system production techniques, and SED has responsibility for computer aided software engineering environments, tools for software integration and knowledge based tools applicable to a wide range of engineering activities.

#### Background

The SED has its origins in 1977 when SERC launched its first national information technology programme, the Distributed Computing Systems (DCS) Programme. The DCS Programme was co-ordinated by the Rutherford Appleton Laboratory (RAL) and received both management and technical support from it.

The success of RAL's involvement led to it co-ordinating the next national programme, the Software Technology Initiative, launched in 1981.

This background explains RAL's subsequent major role in designing and directing the Alvey Software Engineering and Intelligent Knowledge Based Systems (IKBS) Programme.

The technical support work for these Programmes established the basis for the SED collaborative research activities, forming a blend of management, support, research and technology transfer activities.

With the closure of the Alvey Programme, the SED has run down its management and support of national programmes, though it does continue to provide Monitoring Officers for projects funded by national programmes and has built up its research and technology transfer roles. In particular, its research provides a technology input to the Engineering Applications Support Environment (EASE) programme.

The SED is thus currently organised around two main research themes of Software and Knowledge Engineering, with a third strand of evaluating Integrated Project Support Environments (IPSE),

methods and tools candidates for the EASE programme.

### The Work of SED

SED consists of two groups, Knowledge Engineering and Software Engineering.

#### Knowledge Engineering Group (KEG)

The concern of knowledge engineering is to "write down descriptions of the world in such a way that an intelligent machine can come to new conclusions about its environment by formally manipulating these descriptions" (Brachman and Levesque). A machine which communicates effectively with a variety of humans will have to use information about what people can be expected to know in various circumstances. Progress towards these goals has led to increased interest in knowledge engineering techniques in recent years for all manner of application domains, from science and engineering to finance. The particular interests of KEG are in the development of methods, tools and techniques in:

- explanation in Knowledge Based Systems (KBS)
- knowledge representation
- knowledge acquisition
- representation of problem solving strategies
- reusability of knowledge
- user modelling

These interests are being pursued through a variety of collaborative projects, ranging from international interdepartmental work, through inter-laboratory

technology transfer, to formal collaborative projects with UK and European academics and industrialists. The major projects in which the group is involved are described in separate sheets in this series.

#### Software Engineering Group (SEG)

SEG is concerned with the development of techniques and methodologies for the specification, construction and maintenance of software systems. Systems engineering is mainly about achieving quality and the overall theme of the Group is "Quality Certification of Software Products". SERC's Engineering Board has a practical requirement for better systems engineering in many of its Programmes.

The main interests of the group are in:

- formal methods
- quality certification
- formal specification
- mechanically assisted verification
- project support environments

Education and awareness activities, in the area of software engineering methods, tools and environments are undertaken for the Engineering Board's research community and the Group is contributing to the specification and development of the EASE environment.

The interests of the group are also pursued through a range of collaborative projects, which are described in other sheets in this series.

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