RAL

DESIGN & DISCOVERY
Open Days July 1990
RUTHERFORD APPLETON LABORATORY
SCIENCE AND ENGINEERING RESEARCH COUNCIL

Design Division

An Overview

Informatics Department

Introduction:

Software used by the academic engineering community has a number of characteristics: the code tends to be large and complex; it is produced from a variety of sources (in-house developments, from academic institutions and from commercial organisations); and a major focus is upon the graphical/pictorial presentation of output. The position is further complicated by a diversity of hardware platforms together with a variety of software tools and techniques from different engineering disciplines. Effective provision of software for working engineers has to operate within a number of contexts: recasting existing routines and integrating them into more manageable systems; taking advantage of new developments in technology; and developing and exploring new ways of interacting with programs and with data. These are not static targets: development and its associated research and assessment has to be continuous to be able to offer state-of-the-art (i.e. best current practice) products to the engineering community.

An area of major interest is facilities for emerging areas such as co-operative design.

The overall aim is to let the engineer concentrate upon the *engineering*: that is to free the working engineer from the necessity of becoming a programmer

Background

Design Division (DD) has a number of influences on its role. There is a strong engineering background associated with CAD, CAE and CIM. This has given an interest in areas such as control engineering, energy systems for buildings, electromagnetics, engineering databases and their associated problems. Another influence arose from a combination of the Science and Engineering Council (SERC) Common Base Programme together with the UK Alvey initiative. Help in the co-ordination and support of the MMI Directorate was undertaken together with technical work on user interface design support for high-power single-user systems. Overall the direct manipulation paradigm was exploited together with a consistent style of user interface to provide tools with a natural feel. Object-oriented programming techniques are emerging as a major interest for the DD. These UK-funded activities have been complemented by funding from various European Community programmes (notably ESPRIT).

Work of DD

DD consists of three Groups. The major role and objectives of each Group are:

Applications Integration Group - the development of data-base facilities appropriate to the engineer, to provide interfaces between these databases and the application, and to provide flexible support mechanisms for the transfer of information between phases of the design process.

User Interface Group - most engineering design will, in the future, be carried out using high-powered, single-user workstations. It must be possible to prototype such environments and assess their applicability to the anticipated user. There is thus a need to provide facilities for the design and implementation of user interfaces (User Interface

Management Systems (UIMS) and associated tools), appropriate interactive graphics systems (such as PHIGS), as well as techniques to assist both with the design of and the assessment of the effectiveness of such systems (Human Factors).

Systems Interface Group - the provision of an appropriate supporting structure for the application, the engineering programmer and the end-user. This requires exploration of the available tools and their development, integration and customization for an engineering environment. With current systems it is not possible to provide a complete environment with all the desired features. A two-pronged approach is being used:

- development of tools and techniques for use by application programmers (note that these do not of themselves form an environment

  - window managers and toolkits

  - novel interfaces

- experimentation with state-of-the-art environments for specific application area development and integration.

The DD's Current Activities include:

New Techniques (R&D)

- Data exchange methods and specifications associated with the ISO STEP Standard (Standard for Exchange of Product Data)

- The application of databases to product model storage (Currently investigating INGRES and Oracle)

- Development of Innovative Interfaces - principally Extensible Graphical Programming

- Provision and assessment of computer-supported distributed co-operative working

- An object-oriented software integration framework for mobile office systems and a software harness for a high-power graphics workstation application [ESPRIT-II Projects] - with associated user interface design and evaluation.

Development work

- Enhancements of and extensions to window-management systems and associated toolkits

- Co-operation on the production of the ECSTASY control engineering environment.

- Development of the Energy Kernel System (EKS) for the Building Community.

- Provision of additional programmer support tools

Evaluation & Assessment

- Assessment of user support tools such as UIMS (available under X)

- Investigation of window-management systems and associated toolkits

- Evaluation of novel input / output devices

- Assessment of PHIGS implementations and associated programmer support toolkits

Training and Awareness

- Awareness, training and standards activities associated with CAD/CAE

- Awareness and training activities associated with X, support tools such as UIMS, ECSTASY, User Interface Design

- Development of Courseware initially developed under the European Community COMETT initiative - "Human Factors Aspects of User Interface Design"

Future Plans

DD's background coupled with the range of activities outlined above and an active R&D environment leaves us well placed to assist with the current Engineering Applications Support Environment (EASE) programme of the SERC's Computing Facilities Committee.

For further information, please contact Dr Mike Jane, Head of Design Division, Informatics Department, RAL. Tel No: (0235) 445408