

Organisational Overview: HCI at RAL

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ABSTRACT

Overview of HCI research at the Rutherford Appleton Laboratory.

INTRODUCTION TO RAL

The Rutherford Appleton Laboratory (RAL) is the largest of the three laboratories of the Council for the Central Laboratory to the Research Councils (CCLRC) employing about 1200 staff. The CCLRC is legally a research council but it does not distribute research grants. Most of its £120 million annual income comes as grants from other research councils to run large facilities that can be used by university grant holders, although about 20% of our funding comes from the CEC or commercial companies to undertake direct research.

RAL was founded in 1958 as the Rutherford High Energy Physics Laboratory, although it has expanded both in size and scope as other laboratories have been closed. Those merged into it include the Appleton Space Science Laboratory, the Atlas Computing Laboratory and parts of the Royal Greenwich Observatory. RAL hosts several facilities to investigate the structure of materials including the UK's most powerful spallation neutron source, pulsed laser, and nuclear magnetic resonance facility. RAL also provides design, building and testing facilities for satellites, and for experiments at other centres such as CERN. RAL acts as the UK liaison site for both CERN and ESA, while being the UK member in the European Research Consortium for Informatics and Mathematics (ERCIM) where it represents all UK computing research.

ARCHITECTURES FOR INTERACTIVE INTERFACES

The long running line of research has led to both tools and standards. In the 1960's the main developments involved projecting film onto desktops linked to computers and light pens in order to record experimental data. In the 1970's Bob Hopgood initiated the link up between ICL and the nascent Three Rivers' Corporation to develop the PERQ as one of the first personal workstations to become widely available in the UK academic community, for which the windowing system and several tools were developed at RAL. In the late 1980's the MMI² system demonstrated an architecture to support multimodal interaction including the use of multiple natural languages with gesture and graphics (Wilson and Conway, 1991). More recent work has taken this architecture as a basis for the Intelligent Multimedia Presentation System Reference Model (Bordegoni et al, 1997), and produced the ISO PREMIO standard for Presentation Environments for Multimedia Objects.

INTERFACE SPECIFICATION AND USER MODELLING

Conflicts during the ISO standardisation of graphics systems since the late 1970's showed David Duce the need for formal specifications to disambiguate descriptions. This led to the formal specification of the interfaces of several tools, which in turn showed the need to specify the user more formally than had previously been done in order to clarify design options. The result has been the Syndetic Modelling (Duke et al, 1998) technique which captures both user and system within a common formal specification framework, drawing on Interactive Cognitive Subsystems as the basis

of the user modelling. Currently this line of research is focusing on specifying continuous interaction technologies that will be required for smart environments and information appliances connected to information utilities.

UNIVERSAL INFORMATION ACCESS

RAL has been closely involved in the development of the WWW since the first server was established in 1992 to serve the UK High Energy Physics community. It was the first UK member of W3C, and hosts the UK Office of W3C. Also since its foundation in 1996 RAL has had a representative on the ERCIM User Interfaces for All working group, to direct European research towards universal information access. To this end we undertake work on internationalisation and adaptable user interfaces which generate information presentations from the interaction of the explicit semantic representations of information with user, communication and presentation device models to tailor information. This work has contributed a user model and tailoring mechanism to the W3C SMIL language for integrating multimedia. This in turn is being used by W3C as the basis of a general user tailoring module for all web technologies as they move towards a modular technology structure with presentation device, user, and communications profiles to select the appropriate modules.

CO-OPERATIVE SCIENTIFIC VISUALISATION

RAL uses its virtual reality facility to provide three main services in our VR-theatre auditorium, or distributed internationally across networks using personal workstations: engineering design prototyping and design review, simulation for training, and visualisation of scientific data. To support the facility RAL has a line of HCI research, to improve the range of interaction techniques in the virtual worlds, the match of interaction techniques to model affordance, and to develop intelligent agents within the virtual environments to enrich their behaviour. Since much of the use involves distributed interdisciplinary groups we also undertake research in distributed cooperative visualization, which aims to support multiparty interactive sessions in which users may communicate with each other directly using real-time audio video conferencing tools, and participate in interactive visualization and display of data sets (Duce et al, 1998).

THE FUTURE

The research outlined in this paper has been undertaken by a large and frequently changing team. All of the research is collaborative, usually with UK universities, although often also with commercial companies in the UK or Europe. RAL's future computing research plans rely on this co-operation with universities and industry to provide the computing infrastructure needed to support future science and engineering research in the UK. We welcome approaches for joint research proposals, for the industrial placement of undergraduates, for the joint supervision of postgraduates or for the independent use of our facilities. These lines of research towards usable scientific problem solving environments are continuing, and we hope they will gain immediate impetus from the £500 million funding recently announced for a new synchrotron at RAL, and the recent OST bid for £80 million to improve the UK infrastructure for e-science by establishing national Grids for the UK research community.

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