HCT – 2001

INFORMATION TECHNOLOGIES AND KNOWLEDGE CONSTRUCTION: Bringing together the best of two worlds

PROCEEDINGS

5th Human Centred Technology Postgraduate Workshop

26th and 27th September 2001

Brighton, U.K.

Organisers: Ben du Boulay, Claudia Gama, Miguel Garcia, Louise Hammerton, Anna Lloyd, Jonathan Matthews, Nuno Otero, Pablo Romero, Benjamin ZayaS

Sponsored by:

University of Sussex, School of Cognitive and Computing Sciences

Human Centred Technology Group

FOREWORD

This is the fifth in an annual series of workshops held in Brighton in the late autumn. They bring together PhD students from around the UK and from mainland Europe with a common interest in Human Centred Computing Technology. The diverse and interdisciplinary nature of this area can restrict opportunities available to students for peer review, feedback and discussion of the their work or the process of completing a thesis. These workshops give such students a chance to discusstpe5e

PEOPLE

Day One

How can Information Technologies influence the acquisition and organization of knowledge?

Guest speaker

To the Dynabook and Beyond − Designing Mobile Technologies for Learning
Professor Mike Sharples
School of Electronic and Electrical Engineering
University of Birmingham

Invited discussant

Professor Eileen Scanlon
Institute of Educational Technology
The Open University

Day Two

In which ways can models of knowledge inform the design and uses (or tendencies) of Information Technologies?

Guest speaker

Designing for Accessibility
Mr. Adrian Howard
QuietStars

Invited discussant

Dr. Kim Issroff
Higher Education Research and Development Unit
Education and Professional Development
University College London

CONTENT

How can Information Technologies influence the acquisition and organization of knowledge?

SESSION 1

SESSION 2

In which ways can models of knowledge inform the design and uses (or tendencies) of Information Technologies?

SESSION 3

SESSION 4

Session 1

How can Information Technologies influence the acquisition and organization of knowledge?

Pen-Based Digital-Document Technology

Timothy S. Butler

Science and Technology Research Centre,
University of Hertfordshire, Hatfield, AL10 9AB, UK
http://homepages.feis.herts.ac.uk/˜bt7al/
t.s.butler@herts.ac.uk

Abstract

This paper highlights the ways in which current computer interfaces impair the capture and refinement of knowledge. It defines an interaction paradigm "informal interaction", and proposes that pen-based interfaces designed around the concept of informal interaction have the potential to overcome the current impediments. Finally, it identifies specific areas of research required to develop informal interaction pen-based interfaces.

Background

Knowledge work is dominated by the use of paper especially when capturing, organizing, and refining information [6][8]. Recent studies show that despite the recognized benefits of using a computer such as prototyping, document duplication, and error checking, computer literate professionals still prefer to capture and refine their ideas on paper. There is a gulf between the way humans express and manipulate ideas, and how computer interfaces require users to structure and interact with data [4].

An author's primary task is to express ideas. Computer interfaces require authors to explicitly define and structure their knowledge as they expressed it. These demands are premature and cognitively demanding, focussing the author on the interaction, not the idea. Consequently, many authors reject computer use and return to pen and paper.

Pen and paper constitute a mature and familiar interface for the capture and refinement of knowledge. Analyzing and identifying specific reasons for the use of paper will guide the development of computer interfaces that overcome current interface restrictions [8]. Introducing computer assistance to traditional pen and paper tasks can increase the efficiency of these processes [5].

The resemblance of pen-based computers to pen and paper suggests that these devices are ideal for implementing paper-like interfaces. Unfortunately pen-based computers currently fall a long way short of this goal. Pen-based computers commonly employ traditional WIMP-style interfaces, use handwriting recognition or on screen keyboards to replace typing, and follow the pen tip round the screen to simulate a mouse. The resulting interface is often cumbersome. Handwriting is slower than typing, recognition is far from perfect and requires frequent mediation, and a user's hand may conceal on-screen information when pointing with the pen. These interfaces also ignore the natural strengths of the pen: precision control; immediacy of expression; and direct manipulation.

Successful pen-based interfaces will be significantly different from familiar desktop computer interfaces. They will exploit the natural characteristics of the pen. Special attention must be given to *when* and *how* such interfaces will be used, or they will remain subordinate to paper.

Initial Findings

The creative phases, of capturing and structuring information and ideas, are not supported by commercial computer interfaces [4][9]. The capture of information is characterized by sketching and note-making activities, whether assimilating new information or transcribing mental knowledge [1][6]. The representations generated embody the most important concepts of the information and delay the specification of explanatory detail. Before an author invests time in producing a detailed description of his knowledge, he will try out, explore, and restructure his initial ideas and arguments. Commitment to a particular expression of his knowledge may come late in the authoring process.

We require computer interfaces that allow us to express and capture our ideas immediately. We need the ability to build on these ideas incrementally, reworking, restructuring, and reinterpreting them throughout the authoring process. We want to add detail and define formalisms step by step until we have captured and presented our knowledge in a refined and ordered way. This is the concept of "informal interaction".

Informal interaction was first defined by Moran et al. in 1997 [7]. Informal interaction is characterized by a modeless interface which combines freedom of expression with structured editing capabilities, and does not overtly engage the user in recognition mediation. Informal interaction occupies a conceptual void between free-form and formal interaction. Free-form interaction covers applications like a simple paint package that handles user input only on the level of a coloured bitmap of pixels, it may have many painting tools but their use has no semantic effect. Applications such as word processors are representative of formal interaction. Words are all members of a language set, and have other attributes and relationships to each other, such as titles, lists, and numbered paragraphs.

Informal interaction is founded on the assumption that during the phases of capturing and refining knowledge, an author can perform the tasks they want to with only a small set of general formalisms over the information they have expressed. As an author interacts with their creation, they can add more detail, and define and redefine their own formalisms. As the level of formalism increases, so does the logical merit of the information. Eventually a point is reached where a creation can be automatically imported into a formal application. This concept has been recently demonstrated in work by Gross and Do [3].

There appears to be a consensus in literature that the pen is the most natural tool for informal interaction, including both diagramming [2][3][5][6][7], and writing tasks [1]. Research has established pen-based informal interaction as a sound concept. This has taken place within the confines of specific applications. However there remain a number of challenges to be tackled to create a cohesive system that implements the informal interaction paradigm. These include, but are not limited to:

- Identifying and implementing basic sets of formalisms;
- Providing unobtrusive mechanisms toto:

data and mechanisms for doing this will be investigated.

It has been noted that text written directly onto a computer screen can be difficult to read. Handwriting recognition is not an option here since mediating the recognition process will distract the author and working with handwriting is inline with the informal nature of the interaction paradigm. Consequently work is progressing in the beatification of handwritten text. Experiments will provide a quantitative evaluation of algorithms to improve handwritten text legibility. Word segmentation algorithms will also be evaluated. Feedback to facilitate interaction may be given by applying legibility enhancement to segmented words.

Finally, working with large numbers of handwritten documents will require solutions to problems such as indexing, searching, and sorting. Algorithms that search handwritten text currently rely on searching an entire corpus for best-matches, or on recognizing words and then searching alphabetically. Both approaches are impractical on large amounts of handwritten data. Experiments are planned to evaluate algorithms that classify and match handwritten words. This will allow standard sorting and searching techniques to be employed on handwritten data.

References

[1] Patrick Chiu and Lynn Wilcox. A Dynamic Grouping Technique for Ink and Audio Notes. In *UIST 1998, Symposium on User Interface Software and Technology*, pages 195–202. ACM, 1998.

[2] Christian Heide Damm, Klaus Marius Hansen, and Michael Thomsen. Tool Support for Cooperative Object-Oriented Design: Gesture Based Modelling on an Electronic Whiteboard. In *CHI 2000 Conference Proceedings, Conference on Human Factors in Computing Systems*, pages 518–525. ACM SIGCHI, 2000.

[3] Mark D. Gross and Ellen Yi-Luen Do. Drawing on the Back of an Envelope: a framework for interacting with application programs by freehand drawing. *Computers & Graphics*, 24:835–849, 2000.

[4] Frank M. Shipman III and Catherine C. Marshall. Formality Considered Harmful: Experiences, Emerging Themes, and Directions on the Use of Formal Representaions in Interactive Systems. *Computer Supported Cooperative Work*, 8:333–352, 1999.

[5] James A. Landay and Brad A. Meyers. Sketching Interfaces: Toward More Human Interface Design. *Computer*, 34(3):56–64, March 2001.

[6] James Lin, Mark W. Newman, Jason I. Hong, and James A. Landay. DENIM: Finding a Tighter Fit Between Tools and Practice for Web Site Design. In *CHI 2000 Conference Proceedings, Conference on Human Factors in Computing Systems*, pages 510–517. ACM SIGCHI, 2000.

[7] Thomas P. Moran, Patrick Chiu, and William van Melle. Pen-Based Interaction Techniques For Organizing Material on an Electronic Whiteboard. In *UIST 1997, Symposium on User Interface Software and Technology*, pages 45–54. ACM, 1997.

[8] Abigail Sellen and Richard Harper. Paper as an Analytic Resource for the Design of New Technologies. In *CHI 1997 Conference Proceedings, Conference on Human Factors in Computing Systems*, pages 319–326. ACM SIGCHI, 1997.

[9] I. M. Verstijnen, R Stuyver, J. M. Hennessey, C. C. van Leeuwen, and R. Hamel. Considerations for Electronic Idea-Creation Tools. In *CHI 1996 Conference Companion, Conference on Human Factors in Computing Systems*, pages 197–198. ACM SIGCHI, 1996.

An Investigation into the Use of Mobile Computing Devices as Tools for Supporting Learning and Workplace Activities

Jenny Waycott
Institute of Educational Technology
The Open University
Walton Hall
Milton Keynes
MK7 6AA

J.L.Waycott@open.ac.uk

1. Introduction

Information technology devices are becoming increasingly portable, powerful and affordable. The use of computer technologies is no longer confined to desktop and office settings. Users now have access to highly portable and personal computing appliances, such as palmtop computers or personal digital assistants (PDAs), which they can carry around and use 'anytime, anywhere'. Such devices have a variety of functions; for example, they can be used to record data, to access information resources, and to communicate with other people. It has been argued, therefore, that mobile computing devices could be useful tools for supporting learning and workplace activities (Fung, Hennessy, & O'Shea, 1998; Hennessy, 1997, 2000; Sharples, 2000b; Soloway et al., 2001).

The central concern of my research is to determine how mobile computing devices, such as PDAs, can mediate learning and workplace activities, with the aim of identifying the benefits and limitations of using mobile technologies as learning tools. The research is grounded in activity theory, which provides a useful framework for examining and understanding the context in which a technological tool is used. A central tenet of activity theory is the notion that all human activity is mediated by the use of tools, both conceptual tools, such as language, and physical tools, such as technological devices (Vygotsky, 1978). The notion of tool mediation has particular relevance to this research project, and has been emphasised by activity theorists in the field of human computer interaction (e.g., Bannon & Bodker, 1991; Kaptelinin, 1996b). This paper will give a brief outline of activity theory, with an emphasis on the concept of tool mediation, followed by a description of initial empirical work that is currently being undertaken.

2. Activity Theory and tool mediation

Activity theory originated in Soviet psychology (Leont'ev, 1978; Vygotsky, 1978). The Russian equivalent of the term activity has connotations of 'doing in order to transform something' and it is this sense of the term that forms the basis of activity theory (Kuutti, 1996). According to Axel (1997), activity needs to be examined "in the broader context of how human beings in activity transform the world according to their needs and their needs according to the world." (p.129). In the case of computer tools, people transform the world by developing and using new technological devices that help to meet the goals of the

activities they undertake. In addition, users may modify their needs and goals according to the capabilities and limitations of the technical tools they use. A primary aim of this research project, then, will be to examine users' perceptions of the benefits and limitations of mobile technologies, and to determine how activities, goals and user needs are restructured through the use of mobile computing tools.

The tool mediation perspective also emphasises the sociocultural context in which tools are developed and used (Vygotsky, 1978). The ways in which tools are used, and the settings in which they are used, are not static but instead evolve over time. Artefacts are shaped by previous experiences and constantly changed through activity (Bannon & Bodker, 1991). This developmental process is defined by Carroll

(b) An evaluation of PDAs in a distance education context

This study will focus on the potential use of PDAs for reading electronic text. The primary aims of the study are to identify the benefits and limitations of using mobile technologies for reading, and to ascertain how the use of PDAs impacts upon the way in which reading activities are carried out. Open University students undertaking a Masters course in educational technology are participating in the study. Students have been supplied with a Palm PDA, with e-book reading software, and course materials for one study block have been made available for use through the PDA. Students' use and perceptions of the usefulness of the PDAs are being assessed through pre- and post-questionnaires and follow-up interviews. In addition an electronic discussion forum is being used to record students' comments about their use of the PDA during the evaluation.

The presentation will report initial findings from these studies and will conclude with an outline of issues raised for further investigation.

References

Axel, E. (1997). One developmental line in European Activity Theories. In M. Cole, Y. Engestrom, & O. Vasquez (Eds.), *Mind, Culture, and Activity: Seminal Papers from the Laboratory of Comparative Human Cognition* (pp. 128-146). Cambridge: Cambridge University Press.

Bannon, L., & Bodker, S. (1991). Beyond the Interface: Encountering Artifacts in Use. In J. M. Carroll (Ed.), *Designing Interaction: Psychology at the Human-Computer Interface* (pp. 227-253). Cambridge: Cambridge University Press.

Carroll, J. M., Kellogg, W. A., & Rosson, M. B. (1991). The Task-Artifact Cycle. In J.M.Carroll (Ed.), *Designing Interaction: Psychology at the Human-Computer Interface* (pp. 74-102). Cambridge: Cambridge University Press.

Fung, P., Hennessy, S., & O'Shea, T. (1998). Pocketbook Computing: A Paradigm Shift? *Computers in the Schools, 14*(3/4), 109-118.

Hennessy, S. (1997). *Portable Technologies and Graphing Investigations: Review of the Literature.* (CALRG Technical Report 175). Milton Keynes: Institute of Educational Technology, The Open University.

Hennessy, S. (2000). Graphing investigations using portable (palmtop) technology. *Journal of Computer Assisted Learning, 16,* 243-258.

Kaptelinin, V. (1996b). Activity theory: Implications for human-computer interaction. In B. A. Nardi (Ed.), *Context and Consciousness: Activity Theory and Human-Computer Interaction* (pp. 103-116). Cambridge, MA & London: The MIT Press.

Leont'ev, A. N. (1978). *Activity, Consciousness, and Personality*. Englewood Cliffs: Prentice-Hall.

Saljo, R. (1999). Learning as the use of tools: A sociocultural perspective on the human-technology link. In K. Littleton & P. Light (Eds.), *Learning with Computers: Analysing Productive Interaction* (pp. 144-161). London and New York: Routledge.

Sharples, M. (2000b). The design of personal mobile technologies for lifelong learning. *Computers & Education, 34,* 177-193.

Soloway, E., Norris, C., Blumenfeld, P., Fishman, B., Krajcik, J., & Marx, R. (2001). Log on education: Handheld devices are ready-at-hand. *Communications of the ACM, 44*(6), 15-20.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA & London: Harvard University Press.

support advanced knowledge acquisition. It can best do that by providing environments and thinking tools that engage constructivistic conceptions of learning" (1993, pg. 236).

Constructivism is "a collection of theories and ideas about different issues in pedagogy that are informed by a range of philosophical / epistemological outlooks" (Reibel, 1994, pg 1). There are different schools of constructivism but "a consensus would be that learners arrive at meaning by actively selecting, and cumulatively constructing, their own knowledge, through both individual and social activity" (Biggs, 1996, pg. 348). It is generally acknowledged that Web and Internet-based technology can be used to support this activity. For example, communication tools facilitate discussion and collaboration and it is possible to provide wider access to resources. Constructivism has elements in common with a student-centred approach to teaching which "sets out to start from wheoi/8h3.8(o) examplw.8(-3.8(-11)-3.8(w(o) exi)-7.8(h

Session 2

How can Information Technologies influence the acquisition and organization of knowledge?

Searching for WISDeM, the Holy Grail of Intelligent Distance Education

W.A.Janvier and Claude Ghaoui, School of Computing & Mathematical Sciences,
Liverpool John Moores University, Byrom Street, Liverpool L3 3AF, UK
Email: cmswjanv@livjm.ac.uk & c.ghaoui@livjm.ac.uk

1. Introduction

This paper reports on an MPhi/PhD research project (end of its 1st year) into 'Virtual Universities' by the co-author W.A.Janvier B.Sc.(Hons). Initial research looked at current Distance Learning Tools (DLT) and Intelligent Tutoring Systems (ITS). It aims to bring together both areas for developing a KISS (Keep It Simple Stupid) generic Distance Learning Interactive Intelligent system. This project is a continuation of an ongoing research and development into Online Flexible learning since 1997 and builds on an earlier prototype [1].

2. The Ideal DLT

This project postulates that the ***'Ideal DLT'*** should be 1) a **W**eb **I**ntelligent **S**tudent **D**istance-education **M**odel (***WISDeM***) tool, 2) emulate learning 'in-situ', 3) support both the tutor and the learner by being able to replicate the tutor's advice and direction and 4) be able to function at some remote time every hour and day of the year. The system should exhibit benefits required by the 3 major stakeholders (Administrator, Author/Tutor, Learner) and offer the necessary Artificial Intelligence (AI) whilst maintaining at all times the KISS NLwhiparm at withj 0 Tc 0 -0 Tf -
Adleacs ft on, at idt int

consequently what a learner needs to develop. The ES can take action autonomously or by request. It may, for instance, suggest that a learner go over additional specified materials or seamlessly introduce additional material into the current lesson.

I-Search: A Meta-tool for Novice Web Searchers

Anna Lloyd [annall@cogs.susx.ac.uk]
School of Cognitive and Computing Sciences, University of Sussex, UK

Metacognition can be defined as 'cognition about cognition', or thinking about thinking (Flavell, 1979). Various workers have proposed that the application of metacognition is particularly useful for learning 'higher-order' skills such as reading, writing, maths, and general reasoning and problem-solving (Resnick, 1987, Gama 2001). When learning such higher-order skills, students can be taught metacognitive techniques - for example, monitoring one's own understanding, imposing one's own meaning and structure, asking questions about the presented material, and so on (Resnick, 1987), and these may improve their performance on the target skill.

Looking for research-related information, whether it is on the Web or in traditional libraries, can be regarded as another 'higher-order' skill, for which metacognitive techniques may be useful; users can be shown how to reflect on, and become more aware of, their own cognitive role in the information-seeking exercise, to modify their thought processes and actions accordingly, and to develop their own repertoire of useful search strategies for their own domains of interest. However, one of the ways in which the Web and traditional libraries differ is that, through being well-established in culture and society, the library has had many tools developed to help the novice user - for example, verbal communication with librarians and teachers, cataloguing methods, library catalogues, floor plans and shelf maps, signposts and labels, reading lists, teaching materials, and so on. Assistive technologies for using the Web now need to be similarly developed:

> "The immediate overriding constraint of the Internet is the fact that few users have learned how to manipulate Internet tools with the same confidence that they can manipulate a library... The implications for instruction and performance technology in this context are obvious. Most of us learned how to use the Library when we were in school, and we learned by doing -- doing research. In the process of solving research problems we had the scaffolding of librarians and the coaching of good teachers. We suggest that Internet skills deserve a similar treatment. The power of Internet resources remains latent to those without the skills to use them. But who are the librarians in this virtual library? Who will provide the scaffolding and coaching for the unskilled researcher? Who will undertake the task of conjoining people and knowledge...? Who will classify knowledge and information? These tasks don't go away in the virtual environment, but the agency of librarianship shifts from the center to the periphery. The role of virtual librarian is distributed. In the virtual library there is no central keeper of knowledge, only curators of particular views .... The role of organizing and classifying knowledge is passed to each user." (Ryder & Wilson, 1996)

4. More Detailed Description of *I-Search*

I-Search consists of a number of web pages written in html and php, with java and/or javascript where necessary. The graphical overview in the left of the window is a representation of four interlocking cycles of activity. The outer cycle represents the process by which a user constructs, and obtains an answer to, a particular research question; inside this is a cycle representing the formulation and refinement of keywords and construction of a syntactically correct query; next, there is a cycle which represents the browsing of web pages in a results list presented by a search engine; and finally the innermost cycle represents the following of interesting-looking links from one of the web pages in the results list. Each cycle can be repeated as many times as required. From all stages in all cycles the user can click on a 'STOP-search abandoned' box, or a 'STOP - search satisfied' box, or an 'Any Problems?' box.

Inside the Internet: A resource for teaching young people about the Internet

Steph Holland, Jon Rimmer & Rose Luckin
School of Cognitive and Computing Sciences
University of Sussex
Falmer
Brighton BN1 9QH

stephh@cogs.sux.ac.uk

Introduction

Alongside the ever-increasing prevalence of computers in today's society comes an implicit rise in the number of people using the Internet. This rise brings with it a more diverse group of users, which of course, includes children. In recognition of this, the Government's scheme (the Na rec2m'bJT0 3T0 Tc0 Tc-0.0005

Phase 1 - Fieldwork

The purpose of this user study was to elicit information from the prospective user group of this resource regarding their knowledge and experience of computers and the Internet. To obtain this information, an investigation of children's mental models of the Internet was done by means of drawings and a simple questionnaire. It was hoped that by examining children's mental models of the Internet, a more detailed insight into their knowledge of the Internet would be obtained, as well as an indication as to where the gaps in their understanding exist. Drawing was chosen since it is a wholly more appropriate method for use with children. For them, drawing is more enjoyable and enables them to express themselves without being restricted by the barriers of language, or intimidated by the pressure of the being 'tested'.

Denham (1993) successfully used children's drawings of computers to investigate their mental models. She asserts that it is children's lack of understanding of what computers are, and how they work that is preventing them from attaining the standards outlined by the Government for Information Technology (IT). She believes that children's insufficient comprehension of computers has detrimental effect on their ability to use them efficiently and effectively. In support of this, and with relation to the Internet, Luckin, Rimmer and Lloyd, (2001) suggest that if children have an deficient understanding of the fundamentals of networked computing, they are likely to be less effective users of the Internet.

Example drawing from one of the young people.

Internet Afternoon

As an addition part of research of the users I attended, participated and observed an 'Internet Afternoon' as part of the Great Adventure Project (G.A.P.) for children over the summer holidays. Children spent the afternoon experimenting with a variety of both software and hardware. This enabled me to gain an appreciation of how comfortable and confident young people are with computers, and yet observe that, with respect to the Internet, children do not have a firm understanding as to what it is, never mind how it works!

Their conception of the Internet is very high-level, and appears to be based on the physical image that they see in front of them when they use the Internet. Their models of the Internet tend to comprise a stand-alone computer, with perhaps a website on the screen, or a desktop icon labeled 'Internet'. Other field trips were made and interviews undertaken with young people, teachers and even network experts in order to gather both user information as well as technological knowledge.

Phase 2 - LoFi Prototype

Having collected a plethora of information during the fieldwork phase, this information could now be used to develop a lofi prototype of the resource. The prototype testing showed that the fundamental design of the resource was successful. However, as expected there were amendments to be made. It became very clear that children need direction and a focus from the outset. Some pages of the prototype had activities on them such as correctly labeling a diagram, or solving a problem using the pictures given. Children preferred having small goals like this throughout, rather than just reading text and looking at a picture. The prototype will be presented during the talk, along with the main findings and future work.

References

Denham, P. (1993) Nine- to fourteen-year-old children's conception of computers using drawings. Behaviour and Information Technology, 12 (6), 346-358.

National Grid for Learning (1998). http://www.dfee.gov.uk/grid/challenge/govern.htm Visited 07/08/01.

Sheeran, L., Sasse, M. A., Rimmer, J. & Wakeman, I. (2000a) How Web Browsers Shape Users' Understanding of Networks. In Proceedings of 2nd Annual Conference on World Wide Web Applications, Johannesburgh, South Africa. South African Journal of Information Management. Vol. 2(2) ISSN 1560-683.

Sheeran, L., Sasse, M. A., Rimmer, J. & Wakeman, I. (2000b) Back to Basics: Is a Better Understanding of the Internet a Precursor for Effective Use of the Web? In Proceedings of NordiCHI, 23-25th October 2000, Stockholm, Sweden.

Thatcher, A. & Greyling, M. (1998) Mental Models of the Internet. International Journal of Industrial Ergonomics, 22, 299-305.

Luckin, R., Rimmer, J. & Lloyd, A. (2001) "Turning on the Internet": exploring children's conceptions of what the Internet is and does. School of Cognitive and Computing Sciences, University of Sussex.

Te tin the Effe tivene of Sonifi ation for Learnin Mole ular Bondin and Stru ture in a Virtual Environ ent

Miguel A. Garcia- uiz
E-mail: miguelga@cogs.susx.ac.uk

School of Cognitive and Computing Sciences
University of Sussex, Brighton, BN1 9QH, England

1 Introdu tion

This paper describes an ongoing research about developing and testing a multimodal virtual environment intended for learning abstract concepts in molecular biology.
Most chemistry students have great difficulty in learning abstract concepts in molecular biology, such as bonding and

sense of touch, and receiving informative feedback through vision and sound. Early studies of Sciencespace reported increased students' attention and engagement.
This research suggests that presenting visual and auditory information at a multimodal virtual environment is an e ective way to convey molecular bonding.
The purpose of using sounds in this research is twofold:

- Using sonification mapping sound properties of pitch, timbre and amplitude onto scientific data) as feedback on building a virtual molecule.
- Using earcons or auditory icons abstract or natural sounds that convey a message) to encode extra information on bonding.

Both ways of presenting sound accomplish the same objective: To provide the student with complementary information to visualisation of bonding and structure properties, as an attempt to make bonding more understandable.

2 Rationale

This research is based on previous studies about applications of multiple channels of information within virtual environments used for learning in science education Dede et al., ; Byrne, 1996). It has been proposed that multimodal VEs ease the interaction between the student and the computer interface by providing visual, auditory and tactile feedback. Also, the interface can present extra information in more than one information channel i.e. vision, hearing and touch), with the objective to reinforce, complement or supplement information from one channel to another. This multimodal integration could facilitate the distribution of attention and engagement when students perform activities within the virtual environment Dede et al., ; inn, 1993; oungblut, 1998).

3 Hypothe i

The hypothesis of this research is that using auditory display and visualisation techniques for representing bonding properties in a virtual environment is an e ective way to facilitate students' understanding of molecular bonding and structure.

4 Propo ed Virtual Learnin Environ ent

A Desktop virtual environment is being dev

5 Con lu ion

This paper briefly described an ongoing research about testing a m

Choosing a challenge: Exploring learners' ability to reflect on their own needs.

Louise Hammerton & Rosemary Luckin
School of Cognitive and Computing Sciences
University of Sussex
Falmer, Brighton,
BN1 9QH, UK
Email: louiseh@cogs.susx.ac.uk rosel@cogs.susx.ac.uk

Introduction

Traditionally software scaffolding has been employed within interactive learning environments (ILE) to offer a means of enabling the learner, or group of learners, to achieve success beyond their own independent ability. A vital feature of successfully scaffolded interactions is that the learner can recognise but not produce the goal. In order for this to be realised the system must make provision for the amount of support it gives the learner to be reduced or *faded* once she is able to work more independently. The importance of this is integral to the Vygotskian theoretical foundations underpinning software scaffolding [1]

Whilst the importance of being able to fade scaffolding is clear, the best means to achieve this successfully are less well understood. Such fading can only be brought about by the system either maintaining a model of the learner and making the fading decisions based upon this or by the system providing learners with enough and appropriate information to enable them to fade the support for themselves. Allowing the learner more control encourages independent learning and reflective awareness, it also recognises the difficulty of building effective, efficient and appropriate models of learners [2]. An approach which attempts to design adaptable interfaces which offer learners guidance and the tools to make decisions for themselves also addresses the importance of maintaining the fine balance between system guidance and learner control [3]. This balance is difficult to achieve, not all learners are good at assessing their needs or finding and using help for themselves. In particular, evidence from previous research into learners' use of scaffolding assistance has indicated that less able and knowledgeable learners are ineffective at selecting appropriately challenging tasks and seeking appropriate quantities of support and guidance [4] [5].

The Ecolab

The Ecolab is an interactive learning environment that presents children aged 10-11 years old with a simulated Ecology Laboratory. The software in its current form offers the

Research Aim

The aim of our research is to combine the Vygotskian theory that underpins scaffolding with participatory design to address the development of young learners' metacognitive skills, focussing on how we can make learners more effective at reflecting on their own needs, at choosing challenges and suitable assistance.

Early Studies

When using design techniques that involve the users of the actual system being developed it can be difficult to communicate thoughts and ideas, especially when the end users of the system are children. Children are often easily intimidated and can feel that they are being tested. We have been very fortunate to have a good relationship with a local primary school and have been working closely with a class of year 6 children since autumn 2000.

We have used a participatory design approach, integrating a variety of techniques to assist and involve the learners in the design process. Much of our early work concentrated on making the children feel comfortable talking about their attitudes to, and knowledge of the need to take on a challenge and to ask for help when they need it.

Focus on help

Analysis of our early research was useful for indicating the way in which the children accessed help and at what points within a task they required help [6, 7]. However, the studies were always run within the domain of food chains and food webs. Although this is the context provided for our research, individual children may react differently in different contexts and as our aim is to develop a metacognitive framework we designed a study to take into account differences in children's help seeking behaviour within different domains.

Pen and paper tasks were used to gather information in two parts. The first part of the study required the children to answer a questionnaire designed to illustrate their attitudes to help in general, not specific to a context. In the second part of the study, specific examples of tasks from different disciplines were collated. For each task the children were shown the answer and were given 5 different clues that they had to rate in helpfulness. The clues were developed following Wood's contingent strategy of 5 levels of control [8]. The helpfulness was rated using a 5-point Likert scale, ranging from 1: *Not very helpful will need another clue,* to 5*: Very helpful will get the answer*.

The results from the help attitude questionnaire revealed that almost an even number of children liked/did not like to ask for help (55%/45%). The reasoning behind their preference varied. Three quarters of the children who liked asking for help said that it was because they wanted to improve their own performance speed, the quality of their work, or the completeness of their work. Of those children who did not like asking for help just under a third (31%) preferred to try and work on their own. Just under half of the children who did not like asking for help (47%) gave personal reasons such as shyness, embarrassment when asking for help, worry about how asking for help looks to other people.

The most popular forms of help were 'general encouragement', 'something that gives you confidence' and 'clue that will help me get the answer on my own'. The majority of the children wanted help to be on hand: *'when I don't understand what I am being told to do'*.

Although the helpfulness ratings given to the 5 clues varied slightly depending on the domain of the task given to the children the 4th clue was rated as the most helpful overall (all 4th level clues identified the specific elements of the task solution). The results from both parts of the study showed consistency as the ratings chosen for a clue were related to the type of clue that the children had said that they preferred.
Further explanations and details of the findings will be presented at the workshop.

Representation

In our most recent study, we have switched our focus to the question of how best to represent the help, challenge and task selection options on screen. The study is paper based and offers children alternative representations for activity selection, challenge selection, accessing help, help selection. The representations vary in terms of their use of colour, shape, number, letter, text, positioning of elements, etc. Our analysis of these results will be discussed in the presentation.

Acknowledgements

We would like to thank the pupils and members of staff at Blacklands Primary School for providing us with the opportunity to carry out our research.

References

1. Wood, D.J., J.S. Bruner, and G. Ross, *The role of tutoring in problem solving.* Journal of Child Psychology and Psychiatry, 1976. **17**(2): p. 89-100.
2. Self, J., *Bypassing the intractable problem of student modelling*, in *ITS*, C. Frasson and G. Gauthier, Editors. 1990, Ablex: Norwood, N.J. p. 107 - 123.
3. Jackson, S.L., et al., *A learner-centred tool for students building models.* Communications of the ACM, 1996. **39**(4): p. 48-50.
4. Luckin, R., *'ECOLAB': Explorations in the Zone of Proximal Development*. 1998, School of Cognitive and Computing Sciences, University of Sussex.
5. Wood, H.A. and D. Wood, *Help seeking, learning and contingent tutoring.* Computers and Education, 1999.
6. Hammerton, L.S. and R. Luckin. *You be the computer and I'll be the learner: Using the 'Wizard of Oz' technique to involve children in the software design process*. in *Artificial Intelligence in Education*. 2001. San Antonio, Texas USA.
7. Hammerton, L.S. and R. Luckin. *How to help? Investigating children's opinions on help*. in *Help Provision & Help Seeking in Interactive Learning Environments Workshop*. 2001. San Antonio, Texas USA.
8. Wood, D.J., H.A. Wood, and D.J. Middleton, *An experimental evaluation of four face-to-face teaching strategies.* International Journal of Behavioural Development, 1978. **1**: p. 131-147.

Investigating the Effects of Training in Metacognition in an Interactive Learning Environment: Design of an Empirical Study

Claudia Gama
claudiag@cogs.susx.ac.uk
School of Cognitive and Computing Sciences
University of Sussex, BN1 9QH, Brighton, UK

Abstract: This paper describes the design of an empirical study that investigates students' interaction with a problem−based learning system that

for new problems in another domains. Then, the working hypothesis put forward for this study is:

Students in an experimental group using reflective tools will increase their metacognitive skills and performance whereas students in a control group without such tools will keep their metacognitive skills in the same level, but possibly will increase their performance.

will be observed. It is believed that two types of changes will be noticed on students: quantitative and qualitative changes. The quantitative changes expected are related to the amount of time spent on reflective activities, on planning, on evaluating their un

Session 3

In which ways can models of knowledge inform the design and uses (or tendencies) of Information Technologies?

Knowledge Management in Virtual Environments

Stavros Kammas
s.kammas@rhul.ac.uk
SANE research team, School of Management, Royal Holloway, University of London
Egham, Surrey TW20 0EX,UK

Keywords: Knowledge Workers, Knowledge Representations, Distributed Organisations, Computer Mediated Communication (CMC), Computer Supported Cooperation in the Workplace (CSCW), Shared Understand Or

But why do we want to manage knowledge? Because Knowledge is Power (F. Bacon). It is the main capital of an organisation. And why do we want to manage this knowledge, the knowledge that comes from what people experience from communication? Because the only source of knowledge is experience. (A. Einstein).

A part of organisation's knowledge is experience. But "*an organisation's knowledge walks out of the door every night – and it might never come back.*" So, In order to acquire this kind of knowledge we need help. And the help in this case comes from technology. So, the main research question is "How can technology help distributed organisations extract knowledge from human communication among mobile knowledge workers?"
There are some

Vir

factor ANOVA showed no significant difference between groups on any of the performance measures and, no significant interaction between group and trial.

Discussion: All four methods showed significant improvements in performance across trials and there was no significant skill loss over the period of no practi

Comparing The Effects Of Different Part-Task Instruction And Practice Methods, On The Acquisition And Retention Of Laparoscopic Knot Tying Skill.

June Blain

Dept.Obstetrics and Gynaecology, School of Medicine, Queens University Belfast.
Email: juneblain@hotmail.com
Contact Address: Dept. Obstetrics and Gynaecology, Institute of Clinical Science, Royal Victoria Hospital, Grosvenor Road, Belfast, BT12.

Background: Laparoscopic surgery is becoming increasingly popular, reducing expense and trauma of procedures and, allowing previously non-feasible procedures to be performed [1]. Yet, there is uncertainty as to how to promote the psychomotor adaptation and learning of skills required, as they differ to those of open surgery. Satava viewed laparoscopic surgery as a transition technology that marked the beginning of the information age revolution for surgery [1]. Knowledge of how humans learn and content quality must make best use of the more sophisticated tools available. This study forms part of a series that considers psychological principles of learning, in designing the training of laparoscopic knot tying skill. The use of virtual reality trainers and simulators is becoming increasingly popular in medical education and knowledge of human learning of appropriate tasks is worthy of consideration in the design of such technology. Laparoscopic knot tying is a difficult skill to master but,

shared the highest S score as groups 1 & 2 (mean 7.1, SD 0.45). Group 1 had the next best scores for all measures, followed by group 4 on T(a), but by group 2 on T(b). Within each block, group 3 always had the best mean scores. The fifteen trials were grouped into three blocks of five for closer analysis of changes over trials (1-5= early acquisition; 6-10 = late acquisition; 11-15= retention). Only group 3 improved in all performance measures from block 1, to 2, to 3. Group 3 also had the best scores in each block, for all measures. A two-factor ANOVA and greenhouse-geisser test showed significant within group differences over the fifteen trials, for each of the four measures. A one-factor ANOVA and Kruskal-Wallis test showed some significant differences between groups within individual trials for various measures but no particular pattern emerged. A two-factor ANOVA showed no significant difference between groups on any of the performance measures and, no significant interaction between group and trial. A one-way ANOVA showed significant differences between groups for time taken to complete the part-task practice before knots were tied ($f(3, 31) = 6.276$; $p<0.01$) and, group 3 took least time of all groups.

Discussion: All four methods showed significant improvements in performance across trials and, there was no significant skill loss over the period of no practice. Group 3 led to the best result's although not significantly so. It took significantly less training time than the other methods. This could be beneficial in time constrained conditions such as training courses and, in theatre – giving equal or better returns for time spent training.

References:

1. Satava RM. Emerging Technologies for Surgery in the 21st Century. Archives of Surgery, 1999; 134:1197-1202
2. Melvin WS, Johnson JA, Ellison C. Laparoscopic Skills Enhancement. The American Journal of Surgery, 1996; 172:377-379.
3. Sutton CJG. 1995. Advanced Laparoscopic Surgery. London:Baillaire Tindall.

Interfacing experience: An activity theoretical approach to HCI for online grocery shopping, through consideration of the salient sensory attributes of products.

Salvatore Giulio Fiore
MPhil student at Umist
Salvatorefiore@hotmail.com
26 Globell Court, Radcliffe Park Crescent, Salford, M6 7WQ. Lancs.

Abstract: The way people can evaluate product characteristics on the Internet, varies considerably from the ways people observe, handle and try in physical environments. This is due to the lack of interaction with the product, which cannot be evaluated on-line, as consumers cannot use their senses to physically inspect the product. This research seeks to illustrate the implications of the sensory activity of shoppers on-line, starting from an analysis of shopping for food from an Activity Theory Perspective.

The activity of shopping for food, is one which has developed over recent centuries and the ways in which people experience this process have changed considerably within their cultural, social, economic and historical contexts. A great deal of academic and market research has sought to understand and even shape these experiences and the activity of shopping itself. Important aspects of these experiences, are the ways in which people use their senses and experiences as knowledge, to evaluate and choose products. Indeed, the use of the senses is prevalent in determining the very nature of the grocery shopping experience, with salient product attributes providing a source of sensory stimulation to the shopper.

The emergence of new ways of shopping over recent decades, impacts on this sensory activity, thus far relied upon. The Internet, as one such new mode of shopping, does not allow for direct sensory evaluation of products. As such, numerous studies have examined the multitude of issues to be considered when the interaction process moves from the physical shopping environment to a virtually represented electronic one, as well as the important issues surrounding the attributes of products when they are sold on-line. Thus, the question arises of how to present sensory

therefore been extremely valuable in highlighting the following summary findings. The senses are used unconsciously and automatically during evaluation, choice and consumption of oranges and apples; oranges and apples are evaluated according to standards and parameters of quality and preferences built over time; in the absence of the possibility to assess a particular attribute of the fruit, people use their senses to detect other characteristics of the fruit and infer attributes based on their previous experience and knowledge; associations made over time between attributes can be so consistently maintained as to become stereotypical; the ability to perceive and determine the relevance of attributes is shaped over time and shared and developed between members of a community.

Purposefully, an Activity Theoretical framework has been laid out, in order to help this study in analysing the sensory evaluation of food, by emphasising the experiences of shoppers and the historical and cultural context in which such activities are carried out.

Depending upon the purpose that a shopper may have when setting out to buy apples, be it to buy fruit a for a child's lunch box, apples for a pie, or perhaps to make apple juice, to name some examples, they seek to find the apple that is right for a specific purpose. Whether it is only to satisfy hunger or to buy the latest cross-species variety, mental activities are carried out oriented towards the achievement of objectives. The achievement of such objectives, which should satisfy the motives of the overall activity of buying apples, is reached through intermediate action goals. Recalling the previous discussion on the shopping activity and sensory evaluation of food, it should be stressed that shoppers evaluate the attributes and other information provided about a fruit, when choosing apples to buy. The sensory evaluation activity, is supported by specific tools which people have built throughout their lives and which they continuously change and renew, taking with them experiences of the past. Particularly, psychological tools are brought into play with the support of operations. The choice of an apple, including the visual inspection of it, the touching and manipulation in the hands, the smelling or perhaps tasting of the fruit, are all targeted towards the satisfaction of the buyer's ultimate objective.

Throughout time, people, who in this specific case are considered as consumers, perfect such tools and operationalise particular actions. In circumstances where, not only the sensory evaluation is involved, but other factors, such as the brand, price and mode of purchase are considered during the shopping activity, it is possible to speak of risk reduction strategies. Current and past literature is replete with such terms. Activity Theoretical practitioners might identify these risk reduction strategies as psychological tools which carry with them the experiences of the people who use them, but at the same time should be seen within the context in which they are conceived. Buying fruits in a southern region in Italy, can be an experience that is noticeably different from other social-cultural contexts. Buying a watermelon during the summer season in this context, often involves the seller taking a core sample from the melon for the shopper to inspect before deciding to buy the fruit or not. The individual might seek a guarantee that the melon is of the right quality, observing attributes such as the colour, juiciness, firmness and likely ripeness of the flesh. Such activities may not take place in other cultural contexts. Nonetheless, other tests of a melon's attributes might be observed in both contexts, such as knocking on the exterior of the melon.

Further, what the psychological tools of sensory evaluation of food and risk reduction strategies mentioned within current literature, have in common, are the attributes of a product itself, which are cited more generally in the consumer research literature, as product information. In the case of the former, mental activities through the use of tools, manipulate the reality. In the latter, it is accepted to speak of human information processing. Both consider anyway, the context and the experiences of the consumer as central to either the risk reduction strategies or the development of tools. Briefly summarising the above discussion, it can be said, that people carry out sensory

User Adaptive Information Visualization

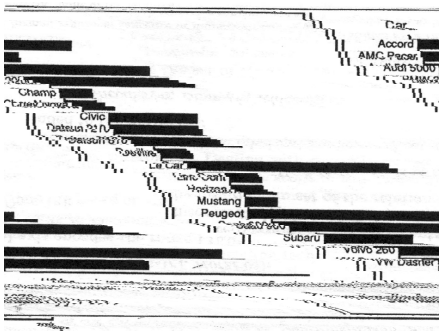

Figure 1 APT: incorrect use of a bar chart

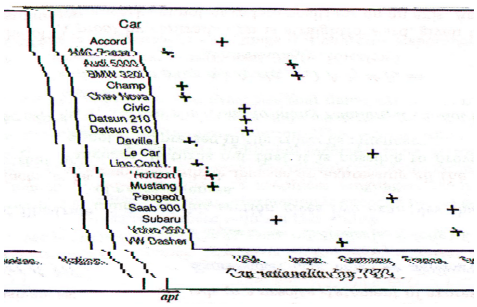

Figure 2 APT: correct use of a plot chart

the semantic properties of the representation.

Conclusion

Developments in intelligent automatic visualization systems have shown that considerable advances have been made over time; beginning with systems which use bar, pie and line charts, through APT that included a composition algebra and primitives to create a wider range of designs, SAGE which extended APT's graphic design issues, to BOZ which included a task-analysis approach.

Information and task goals go some way towards matching representations to tasks and users, but users also differ in terms of individual differences in representational preferences and familiarity with particular types of external representations. Hence, the next phase of intelligent information visualization system research should address adaptivity to individual differences between users. User modelling is one technique to do this. The knowledge about how users make decisions and find a solution for their required task in an external representationd should be included in a user model.

Ideally, a system should accommodate information and task goals and also be adaptive to the user's representation preferences.

References

Casner, A. M. (1990). *A task-analytic approach to the automated design of information*

When using technologies for the first time to innovate traditional ways of teaching and learning, lecturers and students have a strong resistance to change. This was pointed out as one of the main difficulties in the process of adapting Lotus Notes as a way of interaction between lecturers and students, in the face-to-face mode. Lecturers felt they had been pushed out of their position in the centre of the lecture room. Students felt they had too much work and had to assume an extremely responsible attitude toward their own learning process. But as students get used to the use of technologies, this resistance diminished. As one student phrased it: "At the beginning there was a lot of opposition towards the use of Lotus Notes. But in reality, when I began using Lotus Notes I think it was much better than I had anticipated" (CL).
For those students at the hybrid teleconferencing-online instruction model, the resistance to change was expressed as a fear of not been able to see the lecturer inside the lecture room. As one student rather angrily commented: "Sometimes we make comments among ourselves but such comments stay in the classroom and will never reach the lecturer" (RH). This fear was emphasized when the distant lecturer does not respond to students' e-mail messages and/or students' questions left on the course website. As one student confessed "Unfortunately, the interaction between lecturers and students is not that good sometimes. We send them an e-mail and they do not reply immediately only after 3 days. I know this is not our fault or their fault if they receive 200 or 300 e-mails daily". (DA)

Changing roles
A major challenge for lecturers and students in both models (the face-to-face and the hybrid mode), was the transformation of their role. One lecturer suggested that it was extremely difficult for him to motivate his students to play a different role within the lecture room, a more active role where they did not come to be lectured but to learn by themselves. This idea was emphasized by another lecturer

lecture room. On the other hand, lecturers emphasized the different attitudes that students can take when using technologies for learning. Some of them get involved fast and some are very reluctant to any change in their traditional passive role inside the lecture room. As one of the lecturers phrased it "There are still some students who are afraid of not knowing how to use Lotus Notes" (RV).

One of the lecturers employed software simulators inside the lecture room and showed complete agreement with the idea of computers promoting student-centered approaches. He underlined the fact

Session 4

In which ways can models of knowledge inform the design and uses (or tendencies) of Information Technologies?

Learning with Interactive Graphical Representations: assessing the benefits of interactivity through the analysis of learners' video recordings.

Nuno Otero
School of Cognitive and Computing Sciences, University of Sussex
Email: nunop@cogs.susx.ac.uk

Introduction

- Are there any differences in type and number of actions between the period of "reading" the information and answering the questions?
- Are there any differences between subjects concerning the number and sequence of transitions between different areas of the ILE (areas are considered to be the textual part, the questions, or the diagrams)? What about type and number of actions in each transition?

The questions presented above helped us to form a story of each learner ILE exploration. However, the comparison between subjects (in our case 18) seems to be difficult if we start comparing all the subjects based on each individual story: too much detail can hide important aspects. An alternative is to try to condense the information gathered by using caricatures that capture the essential of an interaction pattern. The plan, then, is to find a caricature for each question presented above, classifying the subjects as if the caricature was a dimension and rank the subjects accordingly. The next step could be to form, say, 3 groups based on the

9 ; ,

+

" +

2

. 0

+

8 ;

Multimedia and multimodal systems: commonalities and differences

S. Anastopoulou, C. Baber, M. Sharples

computer interaction can have two perspectives: the human-centred and the technology-centred. According to the human-centred perspective, multimodal systems should support more than one sensory and response modality of the users. The technology-centred approach defines a multimodal system to be one that supports concurrent combination of (input)

inches and centimetres, etc. The procedures, however, have been internalised and are considered as one (Collins 1990). The experience has been unified and it is perceived as a whole. Another example of a unified experience would be how to drive a car. At the beginning, drivers need to think each procedure, e.g. to change the gear. As they gain expertise, the task become internalised and unified. Drivers then can do other things while driving a car, e.g. discuss.

To summarise, to what extent multimodal systems research should focus on supporting natural interaction as opposed to *effective* interaction is under question; where effective interaction is defined in relation to some task, e.g. the learning outcome (Lee 1996). A successful interaction with a multimodal system would be one that provides the user with procedures unified into an integrated experience. In the case of educational technology, a successful multimodal interaction would be one where users could overcome the difficulties they have while interacting with technology and are able to concentrate on the content of the information provided. In such an occasion the technology would fulfil its main aim to become the artefact that provides information/knowledge to the user. From the users' perspective, users could unify their experience of interacting with technology into an integrated one that would focus on learning.

4. Conclusions

This paper is focusing on differences between multimodal and multimedia systems. Multimedia systems refer to users' adaptation of a system's perceptual capabilities. Multimodal systems support users multiple ways of response according to their preferences and needs. Furthermore, assumptions of multimodal interaction are discussed to reveal shortcomings of current research. Initially the 'maximum' use of multimedia and multimodal communication is discussed, to expose the concept of the 'added-value' of technology. Subsequently, the concept of naturalness of communication is compared with the concept of the unified experience. It is argued that an experience that can be unified with expertise would lead to more effective human-computer interaction.

5. References

1. Baber, C., Mellor, B. (2001). "Using critical path analysis to model multimodal human-computer interaction." International Journal of Human Computer studies **54**: pp.613-636.
2. Bellik, Y. (1997).

2. 4. Y. (1801).I(asecus ol multimodal human) T24087.75 0 TD 0.0038 Tc 0 Tw (-) Tj 3.75 0

User discourse and technology design

Jon Rimmer
School of Cognitive and Computing Sciences
University of Sussex
Falmer
Brighton BN1 9QH

+44 (0)1273 877149
jonr@cogs.susx.ac.uk

Abstract

My research explores techniques adopted to capture and analyse the language employed by technology users and that within interfaces. It draws upon methodologies from social psychology and the field of human-computer interaction. Borrowing such techniques from more traditional discourse analysis it is possible to interpret the language of the user and better inform design. It has the potential to capture and utilise the words and phrases spoken and written by people, and ensure that designs reflect this appropriately. Examples of this in action could possibly be the choice of words within menus or within on-screen text boxes such as error messages.

Introduction

> *Heuristic: Match between the system and the real world*
>
> The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order. (Nielsen 1994).

The above is taken from Nielsen's ten heuristics used to evaluate a system's design and usability. This evaluation technique is the most popular of usability inspection methods. The aim of this evaluation is to find the usability problems in the design so that they can be attended to as part of an iterative design process. However there has been very little work on wTw(u procel4.32 0.48 -15.

shall present what I have carried out in order to translate the language of the users and their context in order to inform design. This research concentrates on observing users interacting with networked technologies (primarily Email and Web applications) and demonstrates how the use of language can either help or hinder the user in their interactions.

Useful References

Rimmer, J., Wakeman, I., Sheeran, L. & Sasse, M.A. (2000) Messages from a tangled Web. In Paris, C., Ozkan, N., Howard, S. & Lu, S. (Eds.) *Ozchi2000: Interfacing Reality in the New Millennium.*Sydney, Australia December 2000. CSIRO Mathematical + Information Sciences. P. 4-11. ISBN 0-643-06633-0

Rimmer, J., Wakeman, I., Sheeran, L. & Sasse, M.A. (1999) Examining users' repertoire of Internet applications. In M.A. Sasse & C. Johnson (Eds.) *Human-Computer Interaction INTERACT '99.* IOS Press: Amsterdam. P. 654-660.ISBN 0-9673355-0-7.

Rimmer, J. (1999) Design as text - From user repertoire to design discourse. In F. Retkowsky (Ed.) *Interacting through/with Technology: Increasing the Potential for Communicating and Learning?* University of Sussex Cognitive Science Research Papers, CSRP 511. ISSN 1350-3162

Sheeran, L., Sasse, M.A., Rimmer, J. & Wakeman, I. (2000) How Web Browsers Shape Users' Understanding of Networks. 2nd Annual Conference on World-Wide Web Applications: South Africa. Paper available online. South African Journal of Information Management. Vol 2(2) ISSN 1560-683

Sheeran, L., Sasse, M.A., Rimmer, J. & Wakeman, I. (2000) Back to Basics: Is a Better Understanding of the Internet a Precursor for Effective Use of the Web? NordiCHI, 23-25 October 2000, StockeMclm