The 12th White House Papers

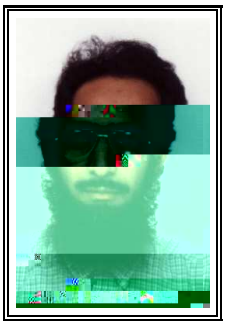
Contents

Preface

Biographical Information

Zahra Al-Rawahi is currently a Ph.D. student in the School of Cognitive and Computing Sciences at University of Sussex. She is working in applying Gardner's theory of Multiple Intelligences in connection with the Cognitive Apprenticeship approach in designing computer-assisted learning tools for medical students. She obtained a BSc. degree in Physics from Sultan Qaboos University (Sultanate of Oman) and then went on to a Masters degree in Education (Computer-based learning) from New Mexico State University (US) in 1 995. She also worked for two years in medical physics and in laboratory teaching.

Saleh Al-Shidhani graduated in 1 992 with a BSc. degree in Physics from the Sultan Qaboos University (SQU). He finished a Master's degree in Astronomy in 1 99 at Sussex University. He is currently working towards his Ph.D in CSAI. His research interests spread across several interdisciplinary fields including HCT, ILE/ELE, AI in education, cosmology,...etc

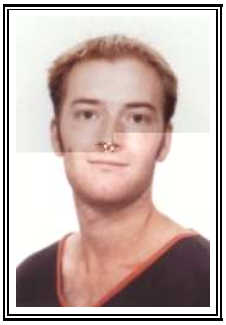


Saleh Al-Shidhani

Adnan M. Al-bar obtained a Bsc degree in Computer Science from King Abdulaziz University in Jeddah, Saudi Arabia in 1 990. He then went on to complete an Msc degree in Computer Science in the area of software engineering at The George Washington University, Washington DC, USA in 1 99. His research interests include distributed systems, OOP and network programming.

Adnan Al-bar

James Allen graduated from Loughborough University in 1 99 with a 2.1 in Human Psychology. He then worked in a shoe shop for 3 months. He subsequently completed the Autumn term at The University of Sussex studying for a Psychology M.A., but transferred to a D. Phil in Psychology in January 1 992. He is also a DJ on Brighton Palace Pier.



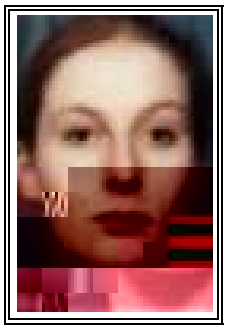
James Allen

Kate Cavanagh studied Psychology at the University of Manchester (1992-

Tudor Jenkins studied for a BA in Artificial Intelligence at Sussex University from 1 992 to 1 995. He began his DPhil in January 1 99 .

Tudor Jenkins

Kristy Lascelles went on to study Psychology BSc at the University of York straight after obtaining A-Levels in Chemistry, Biology, Psychology and General Studies. She graduated with a 2.1 in July 1 999 just after she began her Research Fellowship and DPhil in Evaluative Conditioning at the University of Sussex.



Kristy Lascelles

KK Lau studied Mechanical Engineering at the Hong Kong University of Science and Technology. He then spent 2 years in the manufacturing industry after which he returned to study Psychology at University of Durham in 1 997. In 1 999, he joined the Psychology group of COGS in the University of Sussex.

KK Lau

Ann Light is part of the Human Centred Technology (HCT) group in COGS, in the final year of her doctorate on the perception and use of interactive components on websites and how they mediate user/producer relationships. Before starting this, she took the KBS MSc at Sussex and many years ago she completed an English degree here too. She has worked as a teacher and a journalist.

Ann Light

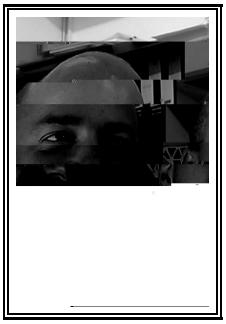
Nuno Otero studied Psychology at Instituto Superior de Psicologia Aplicada, Lisbon. He spent one year working at a training department of an insurance

Andrew Philippides studied pure mathematics at King's College, Cambridge. After a year off he came to Sussex and did an MSc in Knowledge-Based Systems. He then had another year off before starting his DPhil and is about to enter his third year.

I did a first degree in Software Engineering at UDLA, Puebla, Mexico. Then it all started to go wrong, I did an MSc. in Knowledge Based Systems at Edinburgh University, and to make things worse I ended up doing a DPhil at Sussex University.
Despite my hopeless late vocational choices, there was a time when I had clear goals. Back in Mexico I worked as a taxi driver and door-to-door salesman among other sensible jobs.

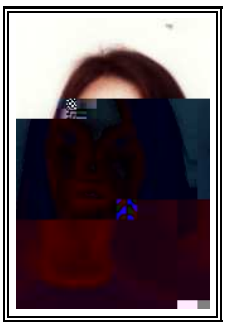
Pablo Romero

Tom Smith studied Natural Sciences at Cambridge University (1 991–1 994) specialising in Theoretical Physics. He worked for two years in reasearch groups based at Oxford University, Royal Free Hospital School of Medicine, Institute of Education and OFSTED before taking the MSc in Knowledge Based Systems at Sussex University (1 99 –1 99). He is currently in the first year of his DPhil, after one year working with Dr Phil Husbands on biologically-inspired approaches to neural networks.



Tom Smith

Helen Startup completed a degree in a Applied Psychology from the University of Sussex in the summer of 1 99 . She is currently undertaking a DPhil with Professor Graham Davey, exploring the psychological causes of catastrophic worrying.



Helen Startup

Andrew Stevens completed his undergraduate degree in Computer Science at the University of Sussex in 1 995. After two years of working as a Software Engineer he returned to Sussex to start a DPhil., specialising in compiler optimisations for Java. He is about to enter his third year of studies and hopes to finish his research next year.

Andrew Stevens

Sian Williams graduated from Nene College, Northampton in 1 99 with a II i in Behavioural Science. She then worked for a year to finance a year travelling through South-East Asia, Australasia and the Pacific Islands. She is currently going into her second year of a DPhil in COGS for which she receives a demonstrator bursary.

Sian Williams

rtua Hosp ta ound A Co n t ve oo for C n ca eac n

Za ra A awa

zahraar@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

This paper investigates the use of an intelligent tutoring system to overcome problems with clinical teaching. Although, there are a number of medical diagnosis expert systems which have been designed to help medical students and medical practitioners in deciding about diagnosis, little of these systems studied students difficulties with clinical diagnosis. This paper will report on some of these problems such as the anchoring problem, forcing the diagnosis and endless enquiry.

Whilst a number of systems have been developed based on a cognitive apprenticeship approach, and a significant body of research has been carried about learning with multiple representations, nothing is known about the effectiveness of multiple intelligences (MI) on students' learning. To address this, a prototype was built and some experiments will be performed to study the effectiveness of MI in comparison with multiple representations. Gardner's theory of Multiple Intelligences and cognitive apprenticeship approach have influenced the design of the Virtual Hospital Round (VHR). The VHR is a practice based learning tool in Cardiovascular diseases.

The VHR prototype allowed for a unique blend of intelligences (learning styles) in each student, and assessed their development. It enabled students to explore a topic according to their learning styles preferences but simultaneously encouraged them to conduct their interaction on a more systematic basis. Also as both approaches used in VHR are based on the belief that learning generally takes place in the context of social interaction, we are going to study students' ability to transfer their learning through sharing their experience by being a reviewer or a critic of each other's learning.

Invest at n t e se of t e Laur ard Mo LP as a Peda o ca Fra ewor for t e Cos c u ator

a e A d an

salehsh@cogs.susx.ac.uk

tial as a framework for the cosmic simulator but at the same time the model implementation is very demanding on codes to achieve a reasonable level of interactions, discussion, response analysis, and adaption. As a result the implementation of such system for addressing the conceptual understanding of a complex domain requires a lot of time and efforts.

eferences

Al-Shidhani, S. (1 99). *os os s u tor* (Presented at The Isle of Thorns (IOT 9) Postgraduate Workshop, COGS, University of Sussex)

Laurillard, D. (1 998). *t n n un rs t t n A r or or t t us o u t on t no o* London, UK. Routledge.

Laurillard, D. (1 995). Multimedia and the changing experience of the learner. In *ro r on rn r us o* Institute Of Educational Technology, Milton Keynes. UK. Open University. (Paper No. 52)

D str buted D rectory erv ces for Act ve Networ

Adnan A l bar

aalbar@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

Here is a very general idea of what is my research interest is all about.

The first time I was exposed to network operating system was 7 years ago when I and a colleague tried to setup a network for the Telecom college in which we were both teaching. We installed Novell 3.11 as our network operating system. We had a lot of trouble trying to figure out what is going on. Since then, I got interested in networking in general and network programming in specific.

Now, here I am in the School of Cognitive and Computing sciences, Cogs, trying to study and research on an advanced topic in network programming. I am interested in distributed directory services and active network. How can we use active network to improve directory services over our networks. In another word, *o t n t or n pro str ut r tor s r s?*.

nconsc ous process n n anx ety and t e repress ve cop n sty e

Ja es A en

jamesa@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

at I a to ac eve probab y n t e next year

Exper ent nconsc ous process n of anx ety re ated words us n an Affect ve Pr n Parad APP. A en and Davey

I have just finished writing a specification for an APP experiment. The design of the experiment borrows heavily from the work of Hermans, De Houwer & Eelen (1 994), who employed an affective priming paradigm. The authors replicated the procedure employed in the seminal paper of Fazio, Sanbonmatsu, Powell & Kardes (Fazio, Sanbonmatsu, Powell, & Kardes, 1 9) who demonstrated that the time needed to evaluate target words as positive or negative decreased if they were preceded by a similarly valenced prime word, but increased when preceded by a prime of opposite valence. The authors related the findings to Bargh, Chaiken, Govender & Pratto's (Bargh, Chaiken, Govender, & Pratto, 1 992) allegation that the automatic activation effect is a pervasive and unconditional phenomenon.

The current experiment will use anxiety related words (e.g. personal and social threat, positive, negative and neutral words). It is unknown whether REPs will maintain their defensive strategies and act similarly to the LA or whether REPs will behave similarly to HA. To clarify a possible discrepancy between unconscious processing of anxiety and physiological reactions, a heart rate monitor will be used concurrently with pres, S(l)-434i 3(h) . 4 932(a5 9 (i)4.0

pHfTha si25. 930 (v)1 . 011(e)-202.5 3(a)5ardkixpe
g 4 .01AeS(l)-iwE
(a)5, 4311(.TJT*[s)5.43 9 (u) . 4 932(,)-232.1 92(P)-2. 904 1(o)2 . 0

A Probab st c Approac to entence D sa b uat on

tep en C ar

stephecl@cogs.susx.ac.uk

A Co parat ve Approac to Lan ua e ra ned Apes and e f Or an s n Lan ua e Ga es teps to Bu d n Perceptua y bo yste s or udor's Drea Jen ns

obert C owes

robertc@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

My research starts from the premise that symbol systems derive their particular nature from being simultaneously communicative and cognitive (Vauclair, 1 99). A hypothesis I attempt to evaluate through the prisms of cognitive ethology, situated robotics and language trained apes. The hope is to provide some empirical evidence for this hypothesis by modelling communicative perceptual symbol systems with simulated and robotic agents using inspiration from ape language training research. Preliminary work exploring this hypothesis is discussed.

Traditional AI is largely concerned with the properties of physical symbol systems and how researchers have tried to use them to build cognitive systems with such properties as inferential power, productivity and the ability to formulate truth conditional propositions; in other words humanlike systems. Modeling these systems has run into a number of problems however. A primary problem with these symbol systems has been, be that through transducing knowledge from sensory apparatus into symbols, grounding it back again in motor activity, or reasoning with any degree of alacrity about anything other than toy scenarios.

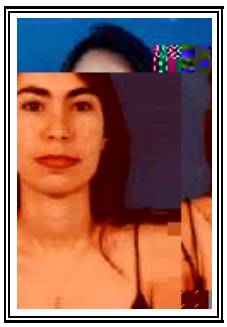
Parallel to the history of AI the semiotic tradition which finds it origins in the work of Peirce and Saussure, tries to explain symbols systems not primarily as cognitive systems but as systems of representational communication. The question I am trying to tackle is whether the theoretical account of these communicative symbol systems can provide new insight into the grounding of cognitive symbol systems. One way of looking at these symbol systems is to look at the borderline cases, and apes are a good example.

Much recent literature in ape language training has focused on what types of communicatory systems it is possible to teach apes. First of all are these systems symbolic, and then, do these newly taught communication abilities enable other cognitive abilities, enhancing perhaps problem solving strategies or the voluntary direction of attention. The various possibilities about what might be going on here are complex and contentious, but a major hypothesis is that learning a symbolic communication system may allow the representation of knowledge in a new and more abstract representational structure (Premack, 1 9 3). Perhaps these proto-words we find that have been taught to apes are in effect mind tools (Dennett, 1 99); ways of building symbolic processing capacity.

Recent work at the VUB AI lab and the Sony Research Laboratories in Paris, under the direction of Luc Steels have attempted to model some of the ways these types of communication games can be born, in communities of simulated and robotic agents (Steels, 1 99 a, 1 99 b; Steels & Vogt, 1 99). The main drive behind these experiments is to show that an ontology and a communicatory system can mutually bootstrap each other into existence; the process by which this happens having been called discrimination, and language games. The dynamics of these games allow the agents to bootstrap both a referential communication system and share a grounded representational system which encodes facets of the world which they inhabit.

The robots and the apes are of very different behavioural and cognitive orders; and we must be careful about drawing false parallels, yet there seems nonetheless to be some value in adopting a comparative approach. Particularly in using the ape research to indicate how we might begin to inculcate some sort of symbolic order in the work on agent simulations. I intend to exploit these parallels to push the agent modelling work forward. Particular research focuses are how syntactic structures may build from symbolic reference (Savage-Rumbaugh, 1 9) and how these may be used to enhance comparison operations that unaugmented apes seemingly can't achieve (Premack, 1 9).

e e ect on Ass stant I prov n e ect on and Metaco n t ve s n Interact ve Learn n yste s



C aud a Ga a

claudiag@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

Abstract

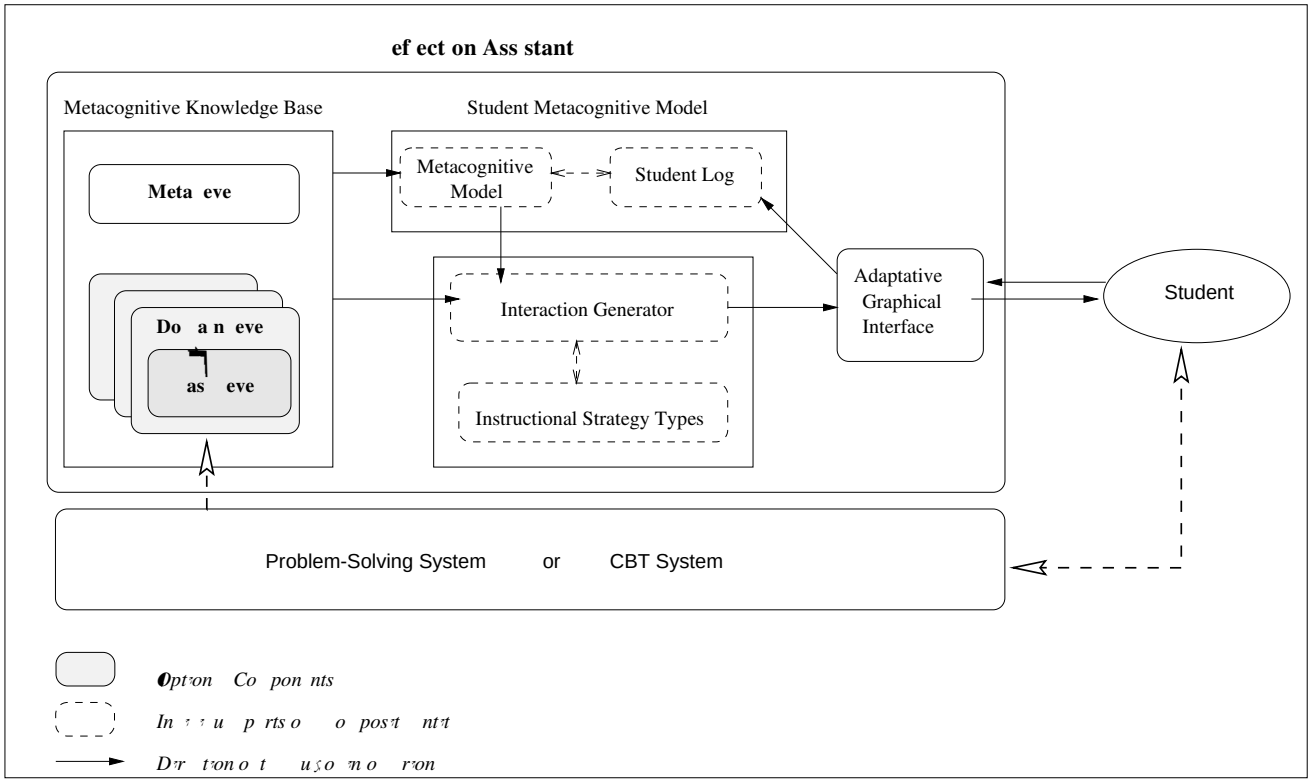


Figure 1. General Architecture of the Reflection Assistant

in the domain of aphasiology. In P. Brna, M. Baker, & K. Stenning (Eds.), *C s ro s o un t nt r t on n rn n to o n t t s n s n* .

Derry, S. J., & Hawkes, L. W. (1 993). Local cognitive modeling of problem-solving behavior.

e o e of Co n t ve D stort ons n t e Perpetrat on of ex Offences

eresa Gannon

theresag@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

. Introduct on

A major component inherent in theories of sex offending is that of cognitive distortions'. This was a term coined by Abel, Becker, and Cunningham-Rathner (1 9 4) which they use to refer to the justification of behaviour typically displayed by child sex offenders. Examples of cognitive distortions' proposed by Abel et al. (1 9 4) include the following

- The lack of physical resistance of a child indicates a willingness to engage in sexual relations with an adult.
- The sexual interaction with an adult is educational for the child.
- Children do not tell others about the secret activity because they enjoy it.
- No harm to the child is brought about through merely fondling the child.
- Children's questions about sex are really an indication that the child would like to engage in sexual relations with the adult.
- Child-adult sexual relations will be acceptable to society in the future.

Many current treatment programs for child sex offenders actually attempt to alter this distorted thinking. Indeed, Morrison, Erooga, and Beckett (1 994) argues that cognitive-behavioural treatment is the most popular method of treating child sex offenders in the UK. The primary aim of this treatment is to eradicate the offender's distortions through educating offenders on the connections between distortions and behaviour, challenging the distortions and engaging in role reversal exercises.

Although cognitive distortions' are continually targeted in therapy, very little is known about the offender's cognitions. A key problem, still unresolved is separating out what sex offenders actually believe as opposed to what they say. One of the main problems with the theory of cognitive distortions' is that existing evidence in favour of such distorted cognitions is based upon clinical observations of such justifications during assessment (e.g. Abel et al. (1 9 4)). To date, there are no standardisable procedures for assessing convicted sex offender's beliefs. Indeed, it is possible that cognitive distortions' may actually be the end product of sexual offending as opposed to the cause and maintenance of it.

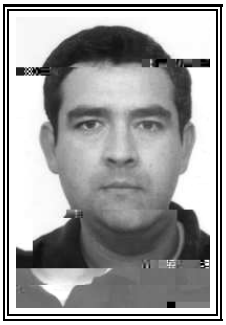
Memory is an important aspect of self, which provides valuable insight into underlying cognitive structures. Bartlett (1 932) was the first to illustrate that the recall process did not support the previous assumption of a rigid and lifeless trace (Oldfield, 1 954). In a series of experiments requiring subjects to recall a passage created from a differing cultural perspective, it was concluded that literal recall was only produced in exceptional circumstances.

Further evidence suggesting that misremembering is a natural and informative process is proposed by Neisser (1 9 1). Neisser conducted a detailed case study on the memory of John Dean who was counsel to President Nixon during the Watergate scandal. A comparison of Dean's testimony with recorded conversations revealed that Dean's memory was a mixture of systematic distortion and basic accuracy. Neisser's study reveals that even when Deans's statements were inaccurate there was a strong sense that he was being truthful. A comparison of Dean's testimony with the transcript for the particular meeting of September 15 1 9 2 illustrated that Dean's testimony of the meeting was not true' on comparison with the actual conversation. For example, Dean recollects that the president asked him to sit down and complimented him on doing a good job, however, the transcript reveals no such conversations. Neisser (1 9 1) comments that cross examination of the testimony indicated that Dean was doing the best he could to be honest so where did these memory distortions originate?

eferences

Abel, G., Becker, J., & Cunningham-Rathner, J. (1 9 4). Complications, consent and cogni-

An Interact ve, D Learn n Env ron ent for Prote n C e stry



M ue Garc a

miguelga@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

Abstract Students of introductory chemistry courses learn intricate three-dimensional organic molecules, especially amino acids and proteins, through abstract representations. Traditional techniques for teaching molecular chemistry still have some limitations. This research project, which is currently in progress, poses the development of a 3D tutoring system, which will involve virtual environments (VE) technology and an intelligent agent for teaching basic information on amino acids and proteins.

The main purpose of this research project is to assess the presence and interaction between the student and a *rtu rn n o p n on* which will be a simulated pedagogical agent within the virtual environment. Both student and companion will personify avatars h p(.)-3 (m)-0.0 24 95425-0.0 24 95425-4422(h)-

agent that will reside within the VE world. It will give support and guidance to the student in constructing and inspecting a virtual molecule. Thus, a research study will be conducted to assess the effectiveness of a 3D learning environment for protein chemistry, involving a simulated agent that will act as a student companion with equal or more knowledge on the topic than the real student.

e I p e entat on of an Inte ent utor n yste and a Learn n Co pan on

An intelligent tutoring system (ITS) can be defined as a computer system based on artificial intelligence techniques that tutor a student on a specific knowledge domain (Preece et al., 1 994; Yazdani, 1 9).

As Chan and Baskin (1 9) commented, a Learning Companion System (LCS) is the equivalent to an intelligent tutoring system (ITS), whereas the LCS involves a pedagogical agent, or learning companion. The agent can learn from the real student, and also the student can explain concepts to it (hence, the student learns *t n*). Both the student and the learning companion are engaged in solving problems proposed by the tutoring system, exchanging ideas and strategies on how to solve them. The learning companion can be or *stron* , depending on the extent of knowledge that the agent has on the domain (Ramirez-Uresti, 1 99). Also, the theory of Constructivism will be addressed as a guiding philosophy (Bruner, 1 9 0).

Met ods

In order to collect information on participant's actions and motivation in the research experiment, four methods can be used questionnaires, oral tests, video recording, and the sensing of the participant's movements within the virtual world.

Conc us on

This paper has presented an outline of a doctoral research project, which is relevant to the state-of-the-art Artificial Intelligence and Human-Computer Interaction research. The proposed project explained in this paper needs further refining. Specialists and teachers on molecular chemistry will be consulted with suggestions concerning to information on the domain that the tutoring system will address.

eferences

Bruner, J. S. (1 9 0). *pro ss o u t on* Cambridge, MA Hardvard University Press.

Chan, T.-W., & Baskin, A. B. (1 9). "studying with the prince" the computer as a learning companion. In *ro n s o nt nt tu tor n s st s ts* Montreal, Canada.

Jones, L. L. (1 99 , June). *ro o o u r stru tur n o n n n r str* CHEMCONF' 9 , an On-Line Computer Conference. (Available at `http://www.inform.umd.edu:8080/EdRes/Caw-1.pa066`

An Introduct on to Networ s

ory Graves

roryg@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

Abstract Networks like computers are thought of as very complex. And yet, in reality computers and networks just appear complex by doing lots of very simple things very fast. This paper gives a brief introduction to networks and how they work using a road network as a metaphor.

Introduct on

To explain the workings of networks such as the Internet, I am going to start with a very simple metaphor. As the paper progresses I will add more

Artefact ecσn urat on for Extended Groupwor

Jo n Ha oran

johnhall@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

Note The issues in this short paper are more fully discussed, and referenced, at http://www.cogs.susx.ac.uk/users/johnhall/UG.html

Overv ew

My research is motivated by the need to understand how web-based computer artefacts are used to support extended groupwork - groupwork which is one-off, relatively unstructured, and extemporary - and how the artefact can be reconfigured to better support such work. Artefact reconfiguration means redesign of the computer application, customization, or training. I am working on a version of Activity Theory (AT) built around the concept of the activity space to analyse artefact use in the domain of student groupwork. This framework can be used to indicate what sorts of reconfiguration should take place.

e Act v ty yste

Student groupwork is a domain in which we are unable to predict or specify exactly how artefacts will be used. AT is recognised as a potentially useful conceptual framework for analysis since it provides a holistic approach to development of activities in the context of which artefact use can be understood.

In AT, examples of groupwork can be treated as activity systems. An activity system features a

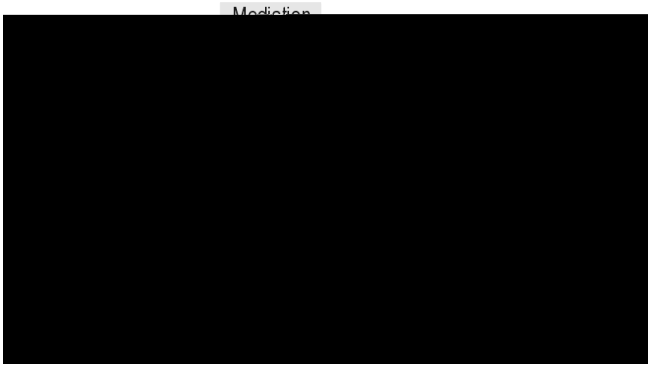


Figure 1. Activity System

means we can only understand artefact use and think about reconfiguration given a characterisation of the whole activity space and the contradictions within it. Applying the concept of the activity space also requires us to take an intentional rather than cultural-historical perspective dedicated to characterising contradictions not as developmental anomalies but as mismatches between what the different subject groups within the activity space are attempting to achieve.

Exa p e case study

Research was carried out on groups of students undertaking compulsory undergraduate groupwork as part of a software design and evaluation course and using Lotus Notes, a messaging system with shared space for document storage, to support their work. Tutors pointed out that use of Lotus Notes was accessible to them, and material there would be used to assess group management. The course was mapped as an activity space. As a first-time activity, it does not have a grounding in history. A basic contradiction was found. students wished to maintain privacy while minimally observing the guidelines on Lotus Notes use; tutors hoped for full, elective use of this system, which would be accessible by them. Thus, there is no common object; and the subject is not collective because the different subject groups are oriented to different objects. These contradictions propagated to mediation. There was a conflict between the use of Lotus Notes and the teaching network. In order to satisfy course guidelines, some materials had to be inspectable on Lotus Notes. But to preserve privacy and save work (since Lotus Notes had to be learned), the teaching network was chosen. The teaching network did not allow inspectability where this was needed either by the tutor group, or by other students in the same group, necessitating the creation of special shared spaces on the network. Thus extra work was created both in terms of creating new functionality on the teaching network and in needing to make inspectable postings to Lotus Notes. Thus, neither system supported student objects; or tutor objects, and neither is an evolved artefact, because it is not fitted to a common object or a collective subject. This also implies that there is not close coupling. This context makes it difficult to discern the set of rules, community, or division of labour which characterise an activity system and are associated with close coupling. We can begin to see, then, how distributed contradictions in an activity space can explain artefact use; and we can refer to the activity as an incongruent activity space.

Using the concept of the activity space implies considering the entire space when attempting to reconfigure the artefact. This means attempting to remove or lessen the contradictions between subjects, objects, and mediation. Thus we need to improve Lotus Notes functionality in terms of, for example, a better front end for categorization of messages and support of threading. However, we also need to consider network congruence. Changes to Lotus Notes as an artefact should respect the need for students to use the teaching network in tandem with it; finding ways to notify of postings, and to offer file transfer between the two systems. Such changes, however, imply a need to reduce object contradictions. Tutors might need to drop the requirement for inspectability, and concentrate on promoting groupwork through useful software (the creation of special shared spaces on the teaching network is an example of students' need to do this). Inspectability could be made voluntary. students could be asked to produce evidence of group management and shared work optionally rather than compulsorily including material on Lotus Notes.

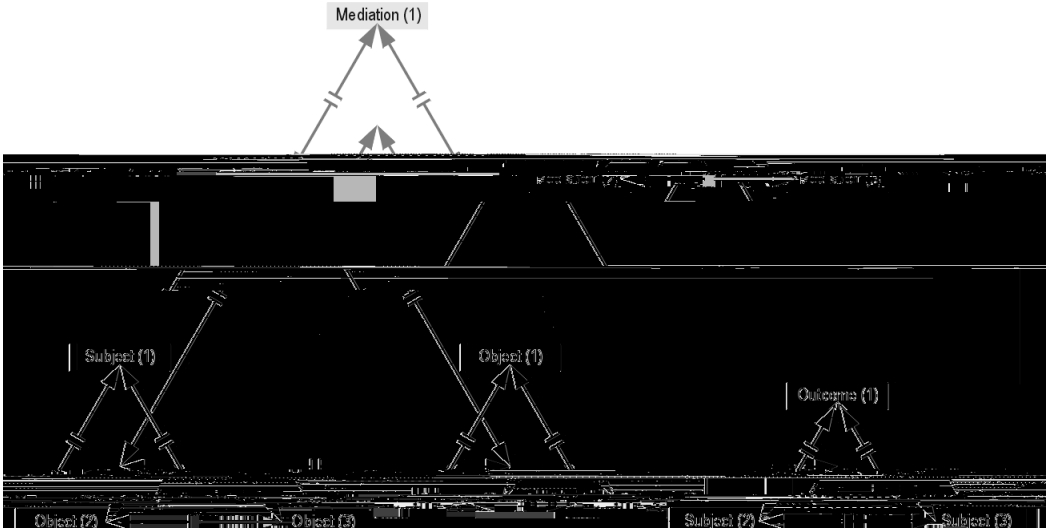


Figure 2. Activity Space

Conc us on

Extended groupwork has properties which mean we have to consider it as a pre-systematic space which must be characterised in terms of its contradictions in order for artefact reconfiguration to be undertaken. The concept of an activity space can be used to make this characterisation and indicate what contextual issues are involved and should be considered. The approach means that an artefact perspective is likely to be insufficient, we need to

Evo v n Co un cat on Mec an s s n a Co p ex Env ron ent

udor Jen ns

tudorj@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

restrictions on the range of vocabulary available to agents. Populations of these robots are placed together in a maze environment where they were free to navigate around, collecting resources and returning them to a base area which causes an augmentation of their fitness level. This fitness level is then used on a periodic basis by a genetic operator.

The maze environment started in its simplest form as a T-junction with resources placed period-

Genera re ar s

The development of faculties required for communication needs to be integrated with many other areas of agent control mechanism. To find suitable conditions for achieving this, one has to look beyond the act of communication to create functionality that might then have a role in this behavior. The idea of developing agents with complex linguistic capabilities is not the goal of this work. As a mobile robot designer working within the SAB paradigm might start simply with any motion, followed by more efficient movement then consider directional capability etc., so too must this work address more fundamental aspects of communication. Linguistic capabilities are a distant horizon and without the development of primitive communication skills first including the acquisition of grounded symbols, the building blocks will not be in place for such grand schemes.

eferences

Cangelosi, A., & Parisi, D. (1 99). *r n o n u n n o n popu t on o n ur nt or s* (Tech. Rep. No. NSAL-9 004). National Research Council, Rome. Neural Systems and Artificial Life Group.

Dawkins, R. (1 9). *s s n* . Oxford. Oxford University Press.

Fyfe, C., & Livingstone, D. (1 99). Developing a community language. In *o n s o t ourt urop n on r n o rt* .

Krebs, J., & Dawkins, R. (1 9). Animal signals. information or manipulation? In J. Krebs & N. B. Davies (Eds.), *B our o o* *An o ut on r ppro* . Oxford. Blackwells.

MacLennan, B. (1 991). Synthetic ethology. an approach to the study of communication. In C. G. Langtona, C. Taylor, J. D. Farmer, & S.Rasmussen (Eds.), *Art s on or s op on t s nt s s n s u t on o n s st s* (Vol. X, pp. 31–5). Redwood City, CA. Addison-Wesley.

Invest at n t e Assoc at ve Propert es of Eva uat ve Cond t on n

Baeyens, F., Eelen, P., Crombez, G., & Bergh, O. V. den. (1992). Human evaluative conditioning: acquisition trials, presentation schedule, evaluative style and contingency awareness. *Behaviour Research and Therapy*, , 133–142.

Davey, G. C. L. (1994). Defining the important theoretical questions to ask about evaluative conditioning: A reply to martin and levey. *Behaviour Research and Therapy*, *2*, 307–310.

Field, A. P., & Davey, G. C. L. (1997). Conceptual conditioning: Evidence for an artifactual account of evaluative learning. *Learning and Motivation*, *28*, 446–464.

Field, A. P., & Davey, G. C. L. (1999). Reevaluating evaluative conditioning: A nonassociative explanation of conditioning effects in the visual evaluative conditioning paradigm. *Journal of Experimental Psychology: Animal Behavior Processes*, *25*, 211–224.

D a ra at c epresentat on

KK Lau

kamkeung@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

My research study focuses on the uses of diagrammatic representation in information. While the uses of language have been investigated in linguistics for a long time, the uses of diagrams has not been systematically explored. My present research will focus on the cognitive behaviour of

Beyond t e Interface

Ann L t

annl@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

. Introduct on

The functions offered by websites have increased. With this increase has come a range of entry devices allowing users to specify their needs so sites can respond appropriately. These devices are clearly interactive - in that the behaviour of users affects the response they receive - but this is not the point and click' interactivity of following links. So is there a change in the quality of interaction going on? And, if so, which constructs might be appropriate for describing and exploring users' behaviour in these new contexts?

This paper puts forward evidence that users go about their business on websites with two levels of awareness.

- that of the interface,
- and, when users become involved in entering text, that of the social context beyond the interface as well.

In entering text as part eyoeyractiog tog to

prompting by reviewing the task on video and concluded that retrospective questioning was the best means of getting the accounts. Vermersch's explicitation interviewing technique

To this end, we adopted the interviewing technique developed by Vermersch, and used for several years to evoke cognitive processes retrospectively, particularly in the French educational system. (For a description of the technique, see (Vermersch, 1 994, 1 999; Depraz, Varela, & Vermersch, 1 999)).

Des n of study 20 Web users were interviewed who had entered text into a site of their choosing. Search sites, such as Excite, were excluded. This produced nearly 12 hours of audio interviews for analysis.

Part c pants This were chosen as familiar users of the Web, and demographically typical of 'experienced' users according to the latest GVU survey (GVU, 1 99), with a larger ratio of women. All participants were European English speakers.

Part c pant ro es used n t e ana ys s Applied from Levinson we used 'target' 'ratified' and 'unratified' recipients to describe categories of addressees. We also used the term 'producer' in a different sense to Levinson, to mean the originator of the website.

ranscr pt on notat on

?D _rtua Env ron ents and Learn n

Nuno Otero

nunop@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

The research that I intend to pursue concerns to the assessment of 3D virtual environments usefulness for learning. In particular, I am focusing on the different forms of visualising and manipulating graphical representations that this technology allows and its relations with conceptual learning. There has been much hype in education about these technologies but the validation of the benefits is still not established, and typically, the research only takes the form of comparative studies. Little structured cognitive analysis has been carried out to explain the real advantages of applying VE's to learning. Moreover, it seems that there is a big gap between the investigations about interactivity properties/design principles of virtual environments and its use to support learning.

This research will try to contribute towards an understanding not only of how to design virtual environments for learning, but also when to design virtual environments for learning and how to use 3D interactive representations in conjunction with other types of representations for an effective learning process.

To carry out this kind of research, however, is not easy. Even the apparently simple task of choosing the domain seems complex. In fact, it is difficult to clearly establish how a certain concept or problem must be represented in a 3D format and

A unt e Ob ect Mode for Po y orp c Lan ua es w t tac A ocat on

Owen

timothyo@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

. esearc Overv ew

The aim of my research is to investigate ways of implementing object-oriented programming languages that contain *ot* parametric polymorphism and stack-allocated objects. The purpose of this work is to enable more efficient implementation of advanced language features that give the programmer more expressive power. Further details can be found on my web page.[1]

Parametric polymorphism allows programmers to abstract over 'some type' of data, by using a type

comparison between drawings and the manipulation of physical earth models.

eferences

Baxter, J. (1 9 9). Children's understanding of familiar astronomical events. *Int rn t·on ourn o S⌐ ·n E u t·on*, , 502-513.

Butterworth, G., Siegal, M., Newcombe, P., & Dorfmann, M. (1 99). *Youn · r n s no o t s p o t rt ·n us tr · n n n*. (In preparation)

Carey, S. (1 9). Conceptual differences between children and adults. *·n n n u* , , 1 –1 1.

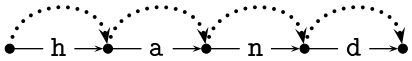
Carey, S., & Smith, C. (1 998). On understanding the nature of scientific knowledge. *E u t·on s o o ·st*, *2* , 235–251.

Nussbaum, J., & Novak, J. (1 9). An assessment of children's concepts of the earth utilizing structured interviews. *S⌐ ·n E u t·on*, *6* , 53 –550.

Sharp, J. G. (1 99). Children's astronomical beliefs. A preliminary study of year children in south-west england. *Int rn t·on ourn o S⌐ ·n E u t·on*, , 5– 12.

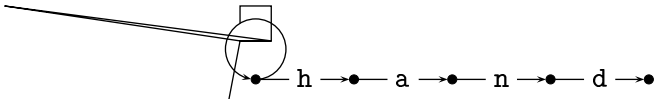
Sneider, C., & Pulos, S. (1 9 3). Children's cosmographies. Understanding the earth's s-135. 4 -13.55 92

De et on If arrows are not required to have letters on them it is possible to capture deletions.



When a dotted, letter-less arrow is traversed, no letter is remembered but a new dot is still reached. So the above machine would recognise `had` and `an` as both (possibly) representing the word n .

Insert on If dots can be connected to themselves, the insertion operation can be represented as well.



D ffus b e Neuro odu ators n ea and Art c a Neura Networ s

Andrew P pp des

andrewop@cogs.susx.ac.uk

Centre for Co putat ona Neurosc ence and obot cs

Abstract Recent results have shown the importance of the freely diffusing gas nitric oxide (NO) in modulation of synaptic activity. I present a review of my current research into the role of and artificial neural networks. Results of modelling NO diffusion from a realistic structure are given and two important features are identified. The remainder of the paper describes the incorporation of a diffusible neuromodulator into an artificial neural network (ANN).

Introduct on

The discovery that the gas Nitric Oxide (NO) is a neuronal signalling molecule has radically altered our thinking about how information is transmitted in the brain (Hölscher, 1 99). Traditionally neurotransmission is thought to be spatially and temporally restricted and from the pre-synaptic to the post-synaptic neuron. However the release of NO does not require specialized point-to-point synaptic contacts and unlike traditional neurotransmitters, NO can diffuse through cell membranes. NO may therefore act without the need for conventional synaptic connectivity and its action is not necessarily locally confined to the immediate post-synaptic neuron (Hartell, 1 99). Once synthesized, NO diffuses in three dimensions away from the site of synthesis regardless of intervening cellular or membrane structures. A model of NO spread could, therefore, potentially provide a theoretical framework for evaluating the signalling capacity of NO in the brain.

Mode n t e d ffus on of N tr c Ox de n ea Neura Networ s

Although models of NO diffusion in the brain have been published (Wood & Garthwaite, 1 994; Lancaster, 1 994) almost all of this work has concentrated on modelling the instantaneous activation of NO synthesis and the spread of NO from point sources. In this approach, one assumes that the source structure is unimportacsrt Nip425 94d ttiv

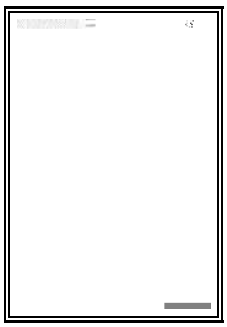
a new style of networks called ‘GasNets’. Here, in addition to the underlying ANN in which positive and negative ‘signals’ flow between units, an abstract process loosely analogous to the diffusion of gaseous modulators is at play. Some units can emit ‘gases’ which diffuse and are capable of mod-

Ga es Lo c P ays

A t P etar nen

ahtivp@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences



Games are an inherent part of our intellectual,

LECOBA A Learn n Co pan on for B nary Boo ean A ebra

Jor e a rez rest

jorgeru@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

My research is in the area of Learning Companion Systems (LCS) (Chan & Baskin, 1 9). An LCS is a variation of an Intelligent Tutoring System (ITS) where besides the tutor and the student a third agent is added a Learning Companion (LC). The role of the LC is to be a peer for the human student and help her as another student would do. For example, the companion could be a role model, both students could collaborate and compete as equals, the companion could be an student of the human student, the companion could be a source of advice, etc. LCSs are relatively new systems so there are many questions to be answered. In particular, the expertise and behaviour of the companion must be carefully chosen so it can help a human student in her learning activities.

Research has shown that students learn more and better when they have the opportunity to teach other students (Berliner, 1 9 9 Goodlad & Hirst, 1 9 9). A student who teaches another student will have to revise, clarify, organize, and reflect on her own knowledge in order to be able to teach it, i.e. the student will need to master the knowledge. Based on this, I want the explore the hypothesis that a LC with less knowledge than the human student will help the student to learn by encouraging her to teach the LC.

I have developed a LCS in the domain of Binary Boolean Algebra called LECOBA (Ramírez Uresti, 1 999). The tutor teaches the students the rules and laws of boolean algebra and how to use them to simplify boolean expressions. Two types of LC are implemented one with low expertise (weak) and one with high expertise (strong). The issue of how to motivate the student to put effort into teaching a weak LC is tackled in LECOBA. There are two modes of interaction between the companion and the student motivated and free. In 'motivated interaction' scores are used to encourage the student to interact with the LC. In 'free interaction' there is no such pressure; the student is only told that it is beneficial for her to interact with the companion. In either case, either the student or the companion solve problems and seek/propose justifications for each move from the other agent. So the student will be able to give the LC suggestions, ask it for justifications and, most importantly, to teach it (Ramírez Uresti, 1 99).

Experiments using a 2x2 design (weak and strong companions vs. motivated and free interactions) have been conducted and are being analysed. It is expected that motivated interaction between a weak LC and a human student will be the most beneficial of the interactions by encouraging the student to teach the LC and therefore learn more efficiently.

Ac now ed e ents

The author wishes to thank *Cons o on C n no o CO ACY* of México for its financial support.

eferences

Berliner, D. (1 9 9). Being the teacher helps students learn. *Instru tor*, *9* (9), 12-13.

Chan, T.-W., & Baskin, A. B. (1 9). "Studying with the prince" the computer as a learning companion. In *Its Int nt tutor n s st s* (p. 1 94-200). Montreal, Canada.

Goodlad, S., & Hirst, B. (1 9 9). *r tutor n A u to rn n t n*. London, Kogan Page.

Ramírez Uresti, J. A. (1 99). Teaching a learning companion. In G. Ayala (Ed.), *ro n s o t nt rn t on or s op ur r nt tr n s n pp t ons o rt t n t n n u t on t ourt or on r ss on xp rt s st s* (p. 3- 9). Monterrey, México, ITESM.

Ramírez Uresti, J. A. (1 999). The LECOBA Learning Companion System, Expertise, Motivation, and Teaching. In L. Baggott & J. Nichol (Eds.), *Int nt o put r n o un*

tons t no o n rn n or t 2 st ntur p 99 nnt nt rn ton p on r n (p. 1 93-201).

Everyt n about a e ne sa s quo of pas rand c ose'

Abr d ed

Fabr ce et ows y

fabricer@cogs.susx.ac.uk

such as debugging. If this experiment shows that the notion of focal structures is valid for practical tasks, then its application to programming teaching can be explored and hopefully exploited.

eferences

Bellamy, R. K. E., & Gilmore, D. J. (1 990). Programming plans. Internal and external structures. In K. Gilhooly, M. T. G. Keane, R. H. Logie, & G. Erdos (Eds.), *n s o t n n t ons on t ps o o o t ou t o* . London, U.K.. Wiley.

Bowles, A., & Brna, P. (1 993). Programming plans and programming techniques. In P. Brna, S. Ohlsson, & H. Pain (Eds.), *or on r n on rt nt n n u t on* (pp. 3 –3 5). Edinburgh, UK. Association for the advancement of computing in education.

Davies, S. P. (1 990). The nature and development of programming plans. *Int rn t on our n o n n S tu s*, *2*, 4 1–4 1.

Davies, S. P. (1 993). Models and theories of programming strategy. *Int rn t on ourn o n n S tu s*, *9*, 23 –2 7 7.

HE EYE

Hanson c dt Corne us

hanson@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

Introduct on

The Human eye is positioned by six muscles. Two **ob que usc es** which roll the eye around the line of sight, and four **rectus usc es** which control the horizontal and vertical eye movement. The following summary introduces a mechanical eye which simulates the operation of the **rectus usc es**. An outline of the experimental setup is also provided, giving a small impression of the additionally required hardware.

HE EYE

There exist many active camera systems that can perform movements, similar to these found within


42
Control Unit
Computer
Monitor 1
Monitor 2

Evo v n Mec an s s of C o ce Be av our

An et

anils@cogs.susx.ac.uk

Centre for Co putat ona Neurosc ence and obot cs

Abstract A brief description of my research is presented, the focus of which concerns minimal conditions on internal mechanisms underlying choice behaviour in animals and robots. The central themes are (a) that understanding mechanism requires an appreciation that behaviour is a joint product of agent, environment, and observer, and (b) that the complexity of internal mechanisms can be assessed in terms of the complexity of the environment in which they operate. These themes are explored by using genetic algorithms (GAs) to evolve internal mechanisms for "choosing" agents in robotic, animat, and game-theoretic contexts.

In the context of artificial life (AL) choice has

Evo ut onary Approac es to Adapt ve Protoco Des n

N c arp es

nichs@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

. Introduct on

This work explores the possibility of applying evolutionary search strategies to the synthesis of network communications protocols. Specifically, the adaptive algorithms employed by transport layer protocols for packet switched networks. The primary objective is the development of a reusable methodology, or conceptual framework, which will ease the development of this *pt* element. Obviously, a protocol designer must anticipate a wide variety of scenarios and incorporate strategies for coping with them as they arise. However, it is extremely difficult to develop a protocol which behaves optimally and is non-detrimental to the network as a whole. Since, the emergent dynamic from the interaction of the communicating processes becomes difficult and maybe impossible to predict. This paper will begin with a short description of network congestion; a well know phenomenon which if undetected can drastically reduce network bandwidth. The algorithms used by the sender process to avoid and control congestion

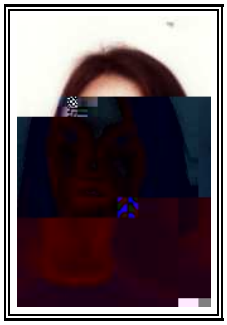
Met odo o y

The methodology proposed here, centres around the ability to search the design space of possible protocols. The key element then, is the method used to explore that space. A popular search strategy, widely employed for the development of control architectures, is genetic algorithms (GAs). GAs are a non-domain specific adaptive search strategy, and are used as a highly effective optimisation tool. The concept, inspired by biological evolution, has become increasingly popular recently for the optimisation of dynamical problems. The process begins with an initial population, of randomly generated individuals. Each individual is a suitably encoded solution to the problem at hand. Typically, the solution, or genome, is encoded as a

top u es for Catastrop c orry n

He en tartup

helenst@cogs.susx.ac.uk



c oo of Co n t ve / Co put n c ences

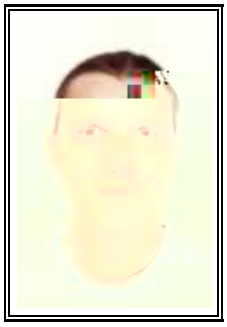
Abstract Catastrophic worrying involves the process by which worriers perceive progressively worse and worse outcomes to a specific worry topic, and this is usually the result of them posing automatic questions of the 'what if....?' kind. This paper describes a pair of studies which show that the perseverative iterative style that worriers posses is linked to an interaction between a) the implicit stop rules inherent in a task and b) negative mood.

. tudy .

Study

Theses hypothesis were tested by asking

HIPO Hardware Independent Para e Opt sat on



Andrew tevens

andrewst@cogs.susx.ac.uk

c oo of Co n t ve / Co put n c ences

Abstract Modern computer architectures are tending towards parallel processing for increased performance and so modern compilers must attempt to make use of these resources. My research looks at compiler optimisation techniques applied to Java programs that can automatically extract parallelism from sequential code. This paper will outline the need for this research and give an overview of my work to date.

Introduct on

Wilson, R., Wilson, C., Amarasinghe, S., Anderson, J., Tjiang, S., Liao, S.-W., Tseng, C.-W., Hall, M. W., Lam, M., & Hennessy, J. L. (1994). *SUIF: An infrastructure for research on parallelizing and optimizing compilers* (Tech. Rep. No. CSL-TR-94-620). Computer Systems Laboratory, Stanford University.

Zima, H., & Chapman, B. (1990). *Supercompilers for parallel and vector computers*. ACM Press/Addison-Wesley.

Assess n or an sat ona ab ty and p ann n effect veness

an a s

sianw@cogs.susx.ac.uk

beliefs and goals. These studies address how people differ in their preference for cognitive structure. They neglect the distinction between men-