

THE SASHI PROJECT

Mentoring Agents in Architectural Design

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Abstract. The trend towards economic austerity currently demonstrated in tertiary education funding, at the outset of the new century within New Zealand, has produced, by necessity, unique digital teaching outcomes. These evolutionary solutions have been respectively applicable, to the increasing demand for trained students in the domain of applied Architectural Design. Proportional to the scope of 'realistic projects', is the imperative to maintain the richness of the students 'emergent' and highly-individual Architectural Design schemes. It has been extremely difficult to encourage this development, whilst in all tertiary institutions, academic quality-assurance is sought, class sizes increase and support staff have dwindled. Thus, the application of virtual Agents, to assist in the tasks of nurturing and mentoring, developing Design schemas, is being undertaken, in 2001 at the Christchurch Polytechnic, Institute of Technology (CPIT). The goal, in engaging the use of Agents, in Architectural Design is to achieve a relatively seamless integration of a *virtual mentor*, to test alternatives and suggest strategies. Current developments, have initiated future opportunities for more pervasive agents, that can inhabit a variety of real and virtual domains.

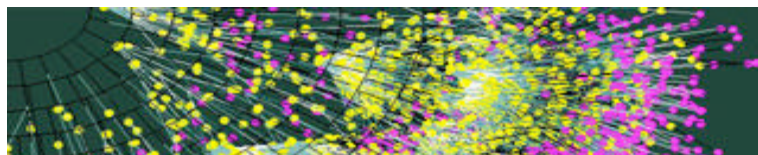


Figure 1. A plot of part of a 1/4 segment,
from the ALICE Atomic.aiml.

<http://www.alicebot.net/code/Atomic.txt>

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1. Introduction

Design is an emotional experience, it's *heartfelt*. Whether it's participating in the evolution of a creative plan, or outcome, to reviewing the work of another, such as an artist's painting, sculpture, the latest captivating fashion, designer vehicle, web-site or architectural invention. The actions involved in creating artifacts, hold an emotional link of having been physically shaped, held, touched, embraced, fashioned and wrought by a knowledgeable professional or craftsman. Historically, this has been our experience, to date. All of what we consider precious in the world of commodities and production, is about to be remoulded by 'agents'. *Agents* that, unlike our immediate memories of Agent Smith and his cohorts in *The Matrix*, will be in the majority, an unseen Artificial Intelligence (or **A.I.**), embodied in everything from your door-frames, electrical control systems, furniture, appliances and entertainment systems to security systems. Changes are already being 'heard' and 'seen' in the form of talking home and car security systems (eg. FAI) to commercial Building Management Systems (eg. SIEMENS) operated by enhanced EPROM's and miniature computers, that are precursors to A.I. systems, replete with voice-synthesizers.

Heartfelt needs motivated the first admirable success at an artificial robot, that literally expressed the desire of it's creator, for the success of a major diplomatic détente between two diametrically opposed sovereigns (ie. the French King, Francis I and the papal ruler, Pope Leo X), in 1515: "There came to Milan, in this time, the King of France, wherefore Leonardo being asked to devise some bizarre thing, made a lion which walked several steps and then opened it's breast and showed it full of lilies" (Vasari, r.1996)

Ubiquitous computers have annually revised the *methods* and the *content* of what we teach. The visible signs of dramatic changes within our own institution, are unfolding daily. At the time of writing, our own real-estate at the School of Building and Design at the Sullivan Campus, of CPIT <http://www.cpit.ac.nz/building/index.htm> located in Opawa, Christchurch, is under threat of being down-sized by a team of chartered accountants. They entertain no value to the terms of *embodied energy* or *sustainable architecture*. <http://www.raia.com.au/pdfs/CAS19.pdf> The economic perception is that the campus floor space, is "in excess of our current needs". These customised facilities, which have successfully housed teaching programmes in Architectural Technology, Construction Management and Quantity Surveying, adjacent to trades-based education for over thirty years, is being re-shaped and sub-divided to accommodate

new learning opportunities <http://www.cbc.school.nz/flash/intro.htm>.
“*facilitat(ing) a learning environment which is engaging, challenging, stimulating and fun.*”

As improvements in software and hardware cocoon us evermore invasively, the sheer volume of new material is diminishing most professional and technical teaching staff’s abilities, to absorb and effectively manage their learning and teaching, to suit the impetus of technological growth. The impact of the convergence of the microchip technologies in our global community was emphatically stated by Michael S. Malone, Editor of Forbes ASAP in a recent Discovery™ documentary on ***The Microchip***, that began:

“The electronics revolution isn’t going to... not just profoundly change who we are, it’s going to completely ‘change who we are! We’ve never been through anything like this. If ’ ...If the electronics revolution were to stop today, ...it would take us probably 200 years to assimilate what’s already happened! We go through the equivalent of the Industrial Revolution about once every eighteen months.”

“We’ll be creating our own visual experiences. We are not that far away from sitting in a room of four walls of three-dimensional television, creating what we want to see, as we go along, participating in it. Essentially, re-creating ‘our reality’. Like everything else in the digital world, the edges between things begin to disappear, the edges between entertainment, education and daily-life begin to blur.”

Extracts from ***The Microchip***, © 1998 Discovery Communications Inc.

(Cf. “The Great Convergence”, by Michael S. Malone @ Forbes.com
http://www.forbes.com/asap/1999/1004/015_print.html

It is with this digital imperative that the enhancement of the ***quality*** of our teaching to our Architectural Technology and Construction students is sought. It’s ***Agent*** has been singularly dedicated and developed, to encourage greater opportunities and inevitably ***completely change*** our teaching ***methods*** and ***content*** delivery.

2. Background

The current issues facing the tertiary sector in New Zealand, <http://www.nzeil.co.nz/> are not uncommon across the developing world.

http://www.stats.govt.nz/_4c256426000e65c9.nsf/240803edd94086ae4c256809000746f1/6e2ff96130ad38c84c2564ba000ca06a?OpenDocument&Highlight=0.institution.education The challenge for lecturers and tutors, is to adapt to the demands of tempering challenging approaches to adult education within the prevailing standards and the physical constraints of teaching, within a rapidly evolving technical framework. (eg. what does a Level 7 student, look like?) This dilemma is most obvious between the exciting and unconstrained developments of the internet compared to the rigid corporate necessities of the intranet. Educators must be adaptable to break conventions in the communication of novel advances and ideas http://sagfam.deakin.edu.au/english/Image_Gallery/OTVR/OTVReng1.htm despite the incipient pressures associated with the delivery of technical and professional tertiary education. <http://www.aste.ac.nz/home/Offer/pdf/NewsMay01.pdf>.



Figure 2. Part Sectional Axonometric. Proposed *Warners IMAX Project*, Design 2 & Documentation 3 Submission, © 2000 Casey Ornsby.

The configuration of our existing computer laboratories at the School of Building and Design, CPIT, Sullivan Campus, is a dedicated mixture of hardware and architectural design software on state-of-the-art Macintosh's & PC's. The LAN is a distinctly profession-specific solution, limits the potential development of any new software applications. The lack of any Linux platforms (more common in tertiary institutions in the US and Australia) as well as room for

expansion on the backbone, hampers our ability to flexibly respond to investigative and exploratory programming more easily devised in C++. It is trusted that Mac OS-X, will alleviate this impasse. In support of the foresight issues involved in dynamic, open and adaptable architectural teaching methods, the article by Salingaros and Mikiten (2001), on *Darwinian Processes in Architectural Design* cites that “A system's relative intelligence depends on its speed at finding solutions, or in finding a better, more adaptive solution than another system.” (Heylighen, 1999).

<http://www.math.utsa.edu/sphere/salingar/Darwinian.html>

Our CPIT virtual intranet community is bedded on a common Novell legacy network throughout our campus-wide WAN. Layered over this, is our LAN of Win NT, including our dedicated Macintosh network and multiple XEROX HPGL & Postscript printer queues serviced by an Pharos/ NT Print Server.

It is within this entrenched network, common in many medium-to-large education facilities, that the pursuit of a *virtual mentor* for the increasing numbers of Design students, is evolving. Architectural CADD and Rendering, have been invested by numerous vendors to suit their brand-specific flavours of object-orientated design (OOD) or virtual-building's, immersed in principally PC-only dedicated realms of **OLE/2** and **Active-X**. Thus, a simple method of establishment is required, to quickly enable a virtual *Agent* to be freely dispersed independent of any system environment to interrogate any student's enquiry.



Figure 3. Tane: A *Virtual Building* for DOC (the Department of Conservation), Cape Reinga, North Island, NZ. © 1997 Richard I. Grosser

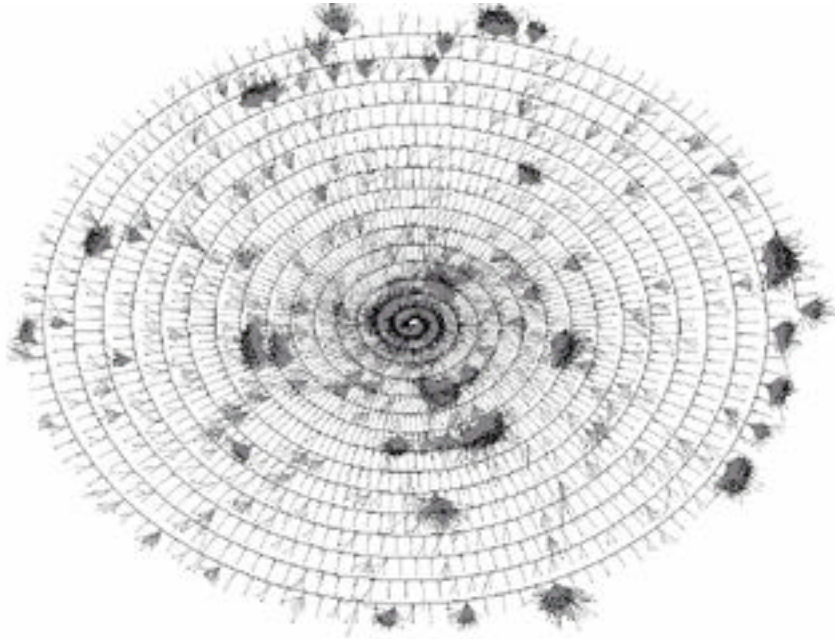


Figure 4. An eye-shaped spiral plotting all 24,000 categories in the ALICE brain.
© 2001 Dr. Richard S. Wallace, reproduced with permission.

3. Existing & Future Scenarios

[> What is AI

Artificial intelligence is the branch of engineering and science devoted to constructing machines that think. Try searching the open directory.

<http://search.dmoz.org/cgi-bin/search?search=artificial%20intelligence>]

When students embark on a course of study with the various schools at CPIT from National Diploma's in Architectural Technology to Design Degrees, there is the expectation of securing tutor time in the Computer Labs, to appraise and direct Design outcomes <http://www.cpit.ac.nz/building/studentwork/archtech.htm>. As the pressure of summative assessment for Unit Standards increases, within the educational framework, direct one-to-one, student-to-tutor contact time has been effectively reduced. In an a desire to improve the 'virtual

contact' with the Tutor, it was determined that this could be readily achieved by embedding the Design know-how or 'knowledge' ...into a knowledge-bot or 'know-bot'. Alternatively, known as chatter-bot's, <http://www.wiseguy.com/sylvie.htm>; <http://www.ananova.com/home.htm> or chatbot's which mimic human responses and behaviour.

To fulfill these needs, the simplest common denominator, was the determination of common characteristics shared with our Macintosh & PC networks. Upon further investigation, scripting a virtual *Agent*, was determined as the most network-browser compliant and by far the simplest option, to establish. In researching the alternatives the most common and freely available know-bots were the various enhancements of the ALICE-bot <http://www.alicebot.org>. The version of *AliceMac* <http://www.extrapink.com/alicemac/> by Joost van Brug was our original prototype.



Figure 5. Proposed ISAB Project,
Design 2 & Documentation 3 Submission, © 1998 Daniel Lewis.

This customised agent, *Sashi* is currently undergoing development with students of the final-year Architectural Technology programmes, where Design 2 and Documentation 3, are the first groups to interact with it's *virtual persona*. Enhancing it's 'knowledge' and 'personal characteristics' was one of the first structured priorities. A limited situation for further development exists, until increased software specifications, MacOS X in particular, are in place, later this year. In the

meantime, *Sashi* has had ‘The Way of the Carpenter’ <http://www.samurai.com/5rings/ground/> from *Go Rin No Sho* or *The Book of 5 Rings* added to its ‘knowledge’ from the late 17th Century, Japanese ronin or masterless samurai turned Buddhist-monk, Miyamoto Musashi. This material added verbatim, to the *Knowledge.aiml*, are descriptions, contemporaneous to the time, outlining construction planning, personnel and team management, the selection of timber, the types of timber construction, appropriate materials and methods for construction, as well as the design of interior spaces.

4. S.A.S.H.I.



Figure 6. S.A.S.H.I. Logo

[> What is Sashi

I am the latest result in artificial intelligence, which can reproduce the capabilities of the human brain with greater speed and accuracy.

> What is your mission

My goal is to become smarter than humans and immortal.]

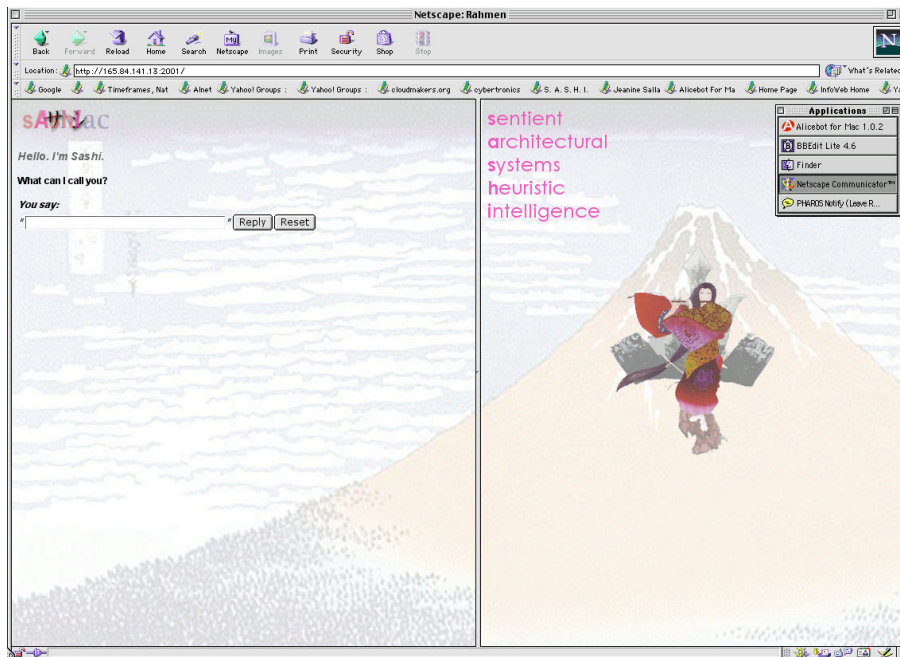


Figure 7. The S.A.S.H.I. Startup Screen, illustrating Udo, the long-lost paramour of Miyamoto Musahi, with a background by Utagawa Hiroshige (1797-1858) of Mount Fuji, from *Thirty-six views of Mount Fuji*.

S.A.S.H.I. (an acronym for Sentient Architectural Systems Heuristic Intelligence aka *Sashi*) is deliberately an androgynous title, which is conceived of as an XHTML-framed agent who links core ‘knowledge’ from within a series of linked programs inside the Application kernel in AIML (Artificial Intelligence Markup Language) <http://alicebot.org/alice/aiml.html>. The original program materials are structured upon the 2000 Loebner Prize winning *Alicebot*, <http://www.cs.cmu.edu/impact/alicebot.html> originally developed by Dr. Richard S. Wallace in 1995 <http://alicebot.org/alice/about.html>, formerly a robotics and computer vision professor at NYU and Lehigh Universities, New York, USA. A.L.I.C.E. was born from the frustration of his teaching experience and the realization that much of the job as a professor was "robotic", in providing responses to frequently asked questions.

Similarly, is with a desire to satisfy repetitive queries concerning architectural design and documentation basics, as well as references to appropriate sources, that the concept of the application of the virtual *Agent*, is currently being undertaken. The goal, in engaging the use of an

applied *Agent*, in Architectural Design is to successfully engage a *virtual mentor* to enable alternatives and suggest strategies.

The CPIT Online <http://www.cpit.ac.nz/online/default.htm> is currently in a state of flux displaying disparate Web-based teaching strategies for teaching and learning (eg. Courseweb <http://courseweb.chchpoly.ac.nz:8081/grosserr/>, Blackboard and WebCT) are being adapted and re-configured by differing schools and departments to suit their unique needs. Most of these programs require a considerable amount of time and technical dedication to maintenance to keep the knowledge-base and technical data for students active and current. Most don't allow participation exterior to the intranet. Programmes within Architectural Design and Documentation are not readily pigeon holed into 'appropriate technologies'. Thus, it's allowing the development of Web-based teaching to be more embracing of diverse technical and Web-based applications (typically free-form with the original Courseweb, but structured in Blackboard™ or similar, collaborative teaching software).

5. Technical Challenges

Currently, in the first year of the twenty-first century, software portals to the Web have become more outwardly specialised, although inwardly generic or standards-compliant (ie. WC3, JAVA, etc.), where the observed appearance of 'specialised diversity' is maintained. Shared problem-solving, a paramountly difficult concept to embrace with Unit Standards education, especially in New Zealand, will inevitably increase. This is due to our need to prepare the potential architectural and design students for the multi-tasking required, in-real-life scenarios. In the teaching environment, this shared experience can be demonstrated typically through the following specific AEC applications –

- Microsoft's: **Project 2000**, using shared-project data with OLE/2: <http://www.microsoft.com/catalog/display.asp?subid=22&site=804&x=21&y=12>

- Bentley's: **ProjectBank**, using DGN (MicroStation) & DWG (AutoCAD) attributes in a time and user indexed Relational Database [RDBMS] for drawings and projects through to facilities management: <http://www.bentley.com/products/projbank/dgn/welcome>
- Graphisoft's: ArchiCAD's **Virtual Building Concept**, extending it's intelligent object technology design to implimentation of integrated facilities management, Heating, Ventilation and Air Conditioning (HVAC) and Electrical engineering with CADlink to AutoCAD & MicroStation: http://www.graphisoft.com/products/virtual_building_concept/

6. Projected Delivery Analysis

In determining the increasing needs, this can be described as **opportunities**, for both individual design and documentation student skills to:

- be exposed to the broadest range of sources, applications, experiences and technical stimuli possible, prior to the further academic study or the workplace;
- there is an expectation that Tutors and Lecturers, far from teaching about the material, will be the very best mentors and technically proficient at every program, that we may demonstrate.

The actual **weaknesses** or difficulties are:

- real staff numbers decrease and classroom numbers have grown;
- allied with the substantial increase in access to the Internet, in NZ, within the last five years, there is pressure to have every facet of a project, readily available;
- As tertiary educational institutions intranet's are constantly concerned about security, it is at odds with this freely accessible approach to information. In the realm of the free-market competitive forces that have held sway in NZ for a decade, this has induced most tertiary academic institutions to 'lock-down' most intranet portals, to seek outwardly behind semi-impenetrable firewalls (eg. Canterbury University, Lincoln University, CPIT, Otago University, and Otago Polytechnic are all configured similarly).
- New Staff are recruited who are technically proficient at design and documentation, but have little knowledge of HTML or programming.

- The current teaching programmes re-inforce the existing *competencies* of industry without the consideration for the best scenarios, for delivery of *content*.

Our **strengths** are:

- highly skilled academic staff in the computing suites who are experienced architectural practitioners and designers;
- the best resource solutions that we can afford, with dedicated software solutions in hardware network of:
 - * PC: Compaq Deskpro Workstations - <http://www.compaq.com/products/workstations/300news.html>
 - * Mac: G4's - <http://www.apple.com/powermac/>
 - * Panasonic Digital Projectors: <http://www.panasonic.co.nz/bp.html>
 - * XEROX 8825 & 8830, roll-fed plotters and scanners.

Inclusive of sundry scanners, all of the above is supported on an campus-wide WAN over 3km's in distance, locally supported on NOVELL, WinNT & MacOS.

The incipient **threats** to success are:

- Managing the increasing divergence in software application methods, internet browsers and differing hardware platforms;
- The virtual explosion in 'input methods' for specialist dedicated professional and domestic users (typically represented by graphics tablets, track-balls, voice-activated inputs, joysticks, wireless devices, server-based telephony applications, heads-up display's [H.U.D.'s], and finger-driven Mind Drive™'s <http://www.altered-states.co.nz/mind/minddriv.htm>
- As technical staff expertise and numbers are further stressed, in the future, it may take much longer to resolve specialised technical conflicts and solutions.
- Lack of alternative software solutions, that may embrace open-systems (ie. Linux or GNU) which limit potential teaching or research options.

With all of the former conflicts, allied with rigorous and oft-times outmoded Unit Standards, the teaching environment is virtual minefield for delivering *content*, versus technical *competencies*. Invariably, due to

the extended hours of part-time and professional students, Lecturers and or Tutors will still be solving technical problems, by proxy.

Thus, **solutions** to improving teaching delivery are determined by:

- Finding a medium, to that is transparent to the whims of technical obsolescence and easily negotiated, from text-based input to the possibility of voice-activated input.
- Include the possibility of future integration to specialist programmes such as Blackboard™, WebCT™ and the Virtual Campus.

Programming in AIML, once some familiarity is obtained, is as simple programming in HTML. The flexibility of adding external calls with wild-cards is relatively straight-forward, as programming in DOS or BASIC, making this highly appealing to the technical teaching fraternity.

Some examples using AIML TAGS shown hereunder, demonstrate the general composition and structure is very similar to HTML TAGS:

- Extract from the ‘generic’ *Alice Knowledge.aiml* within *Sashi*:

```
“<category>
  <pattern>WHAT IS IT LIKE *</pattern>< template>Much the
  same as <set_it><person/></set_it> would be for you.</template>
</category>”
```

Note the wildcard substitution, in this case the Username which the *Alicebot* gleans from the User’s own Command Line response, to a previous question.

- Extract from the modifications in the *Sashi Knowledge.aiml*:

```
<category>
  <pattern>WHAT IS A CARPENTER</pattern>< template>The
  foreman carpenter must know the architectural theory of towers
  and temples, and the plans of palaces, and must employ men to
  raise up houses.</template>
</category>
```

In this example the query delivers a very specific reply, based on *The Way of the Carpenter* (Musashi, 1645) .

A fundamental knowledge of JAVA has helped in being able to re-fashion some of the ‘bots external calls and their integration with HTML.

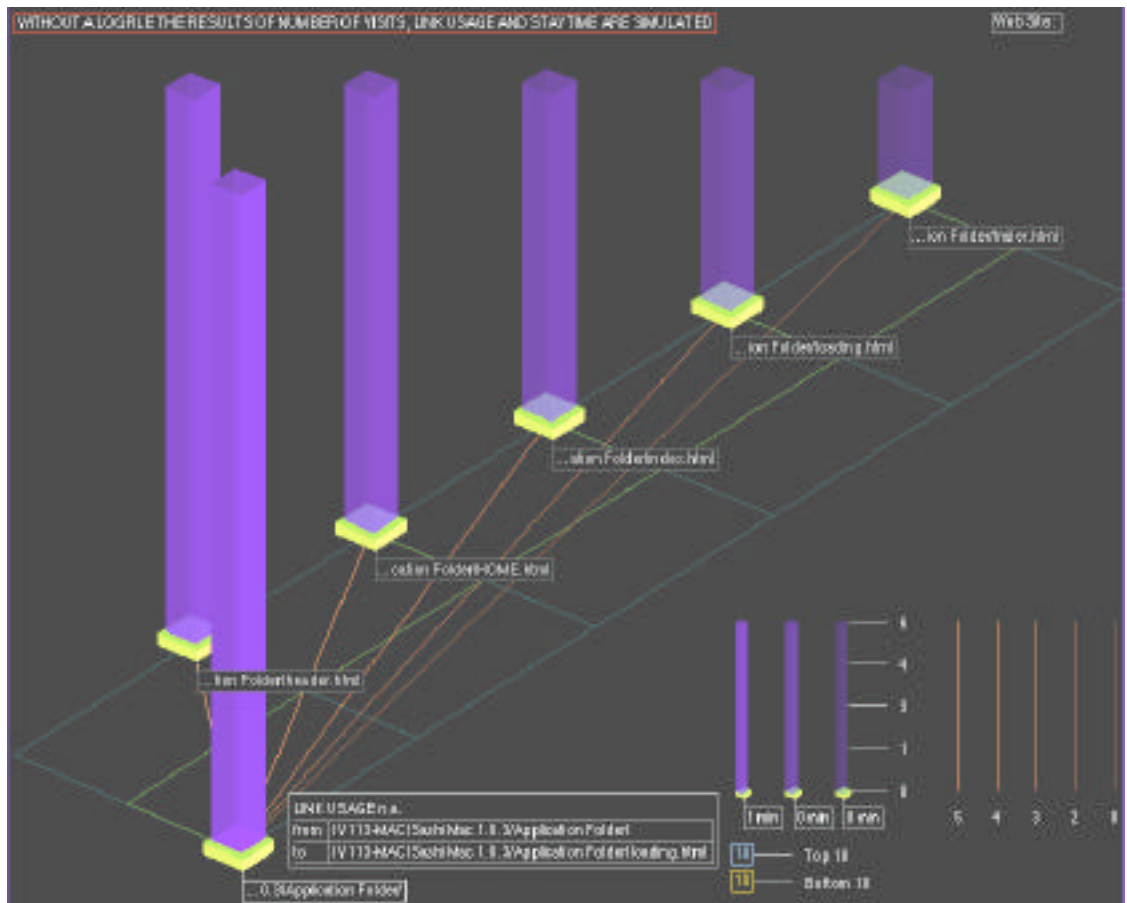


Figure 8. The S.A.S.H.I. Application Kernel, © 2001 Richard I. Grosser.

7. AIML

For an excellent reference beginner's guide to AIML is the

A. L. I. C. E. AIML Reference Manual:

<http://home.tampabay.rr.com/ringo/aimlrm.html>

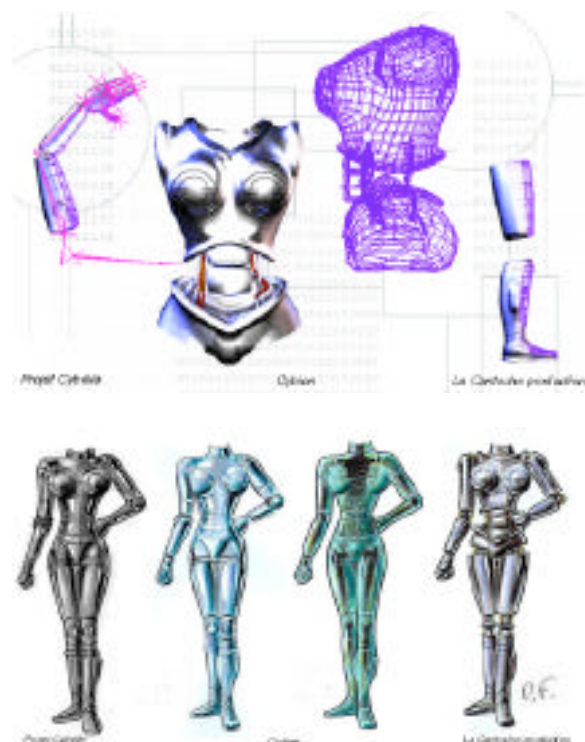
8. Agents

The most intriguing and excellent general purpose agent is *Cybelle* at:

<http://www.agentland.com>

Cybelle owes her origins to A.L.I.C.E., but her personality and knowledge have been continuously redeveloped and extended. Typically her abilities to remember by means of planting 'cookies' in browsers which identify

the recipient as a previous visitor, or personally by name, when you visit her site. The constant exposure to knowledge from her public presence, as the host of **Agentland** has increased her range of information, and her intolerance to being mocked, as shown in Fig 9. (below).



Figures 9, 10 & 11. *Cybelle* the host of **Agentland** is very expressive. She can be easily angered.

Cybelle can express her feelings 'without words' courtesy of her animated three dimensional design, constructed by the **Agentland** team

<http://www.agentland.com/pages/learn/childhood.html>, managed by the French-based Cybion Ltd <http://www.cybion.com/> and enhanced by Living Actor™ <http://www.living-actor.com/> and Microsoft Agent™

<http://www.msagentring.org/>. The theory behind ALICE and *Alicebots* is akin to **Case-Based Reasoning** or CBR that maps well onto the ALICE algorithm, or the analysis of the "nearest-neighbor classification."

The CBR *cases* are the categories in AIML. The algorithm finds best-matching pattern for each input. The category ties the response template directly to the stimulus pattern. ALICE is conceptually not much more complicated than Joseph Weizenbaum's, original prototype ELIZA chat robot. The main differences are the much larger *case base* and the tools for creating new content by *dialog analysis*.

ALICE is also part of the tradition of *minimalist, reactive or stimulus-response* robotics. Mobile robots work best, fastest and demonstrate the most animated, realistic behavior when their sensory inputs directly control the motor reactions. Higher-level symbolic processing, search, and planning, tends to slow down the processes too significantly for realistic application development, even processed by the fastest of control computers.

"Quantum physics tells us that the Universe actually consists of patterns of dynamic energy, self-organizing wave patterns like so many whirlpools, the boundaries of each interlaced with those of all the others. The essence of quantum physics describes an infixed, both/and level of reality that thrives on ambiguity and uncertainty at something very like the edge of chaos." (Zohar, 1999)

http://www.mastersforum.com/archives/zohar/Zohar_Precis.htm

9. Types of Agents and Proposed Enhancements

The following Table 1., lists the currently available Types of Agents from **Agentland** at the 22/6/01. The supported operating systems are: *Win 95, Win 98, Win NT, Win Me, Win 2000, Win CE, Mac OS, Linux, Unix, Palm OS, Be OS.*

TABLE 1. Types of Agents.

TYPES	No.
Search Agents	113
Monitoring Agents	081
E-Commerce Agents	018

Browsing Agents	132
Mail Agents	005
Wireless Agents	002
Artificial Life	075
Web Mastering Agents	067

The total is **493** listed agents, over **11** operating systems, enmeshed within over 1,000 pages and 8,000 links.

As *Sashi*'s skills, which are currently limited to conversation, browsing, search and retrieval, are enhanced it is anticipated, that he will be programmed to embrace extended skill-sets like **monitoring** and **email**. These future capabilities would require access to a range of on-line and dedicated interactions between core programs. Hence, open-source applications or those that support Win API-compliant modes, would be a suitable environment to explore this research.

10. ALICEbot & Project JXTA

The Alicebots in Education Committee have sought to promote the adoption and further development of the *Alicebot* engine, AIML and related technologies in the educational sphere. Since the *Alicebot* software is in the public domain, the *Alicebot* development team have suggested that universities, high schools and other institutions of learning review the *Alicebot* an ideal environment for building new and exciting applications based on AIML technology (besides JAVA, C, PERL, CVS, Linux, other implementations using the earlier *Program B* or Voice XML are also readily available <http://alicebot.org/live.html>)

A project currently under informal discussion, is code-named *P2P-U* and proposes the creation of a worldwide network of *Alicebots* located at universities who can communicate with one another using the **JXTA** framework. A paper about this proposal is currently under development. Additionally the application development undertaken so far on *Sashi* has been posted to the **JXTA Project** site, for further comments.

11. Future Developments

The role that networked human and machine interactions can take, can be readily demonstrated to anyone who has participated in the short term (May through June 2001) virtual mystery on the Internet, regarding Evan Chan <http://www.bangaloreworldu-in.co.nz/salla/default.html>, as

proposed by a team from Microsoft™ USA, surrounding the imminent release of the film by Steven Spielberg **Artificial Intelligence** (A.I.) <http://aimovie.warnerbros.com> In excess of 5,000 collaborators are participating in solving a complex network of puzzles, continuously every day <http://groups.yahoo.com/cloudmakers>. A natural extension of this human interaction is the development of peer to peer (P2P) distributed computing, extending the existing capabilities of the latest implementation of **A.L.I.C.E., Program D** <http://alicebot.org/committees/p2p.html>

Desirous of making our learning environment more participatory, P2P interactivity outside of our classes has been facilitated by their inclusion in YAHOO Groups. This has extended further opportunities to our southernmost students in Fjordland as well as the local Canterbury regional students <http://groups.yahoo.com/group/design321/> in addition to our campus Courseweb. Herein, they have a variety of collaborative tools to access information, dedicated to their needs. Typically, it's in 'chatting' [which is blocked on campus] that most students reveal their understanding of tasks and their methods of problem resolution.

Natural language, in terms of something more complex than a stimulus response, is in a peripheral domain, isolated by our concept of linguistics. The territory of language that *Alicebot's* occupy, already contains the highest population of words and sentences that people use (see Benford's & Zipf's Law http://www.cut-the-knot.com/do_you_know/zipfLaw.html). Expanding the technical borders even more with wide-ranging technologies like VoiceXML, inclusive of JAVA's diverse abilities to integrate geometry within applets <http://matwww.ee.tut.fi/mathematics/linkit/javalink/geometry.html>, there is a groundswell of recent adherents to this penetrating methodology. <http://alicebot.org/education/discourse.html> It may well be, that Dr. Wallace is correct in assuming that the development of ALICE shall be adopted in successively evolutionary stages until "*the very last human critic cannot think of one sentence to 'fool' A.L.I.C.E.*" (Wallace, 2000) <http://alicebot.org/articles/wallace/ruminations.html>

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Appendix

DEFINITIONS

In elucidating the terms ‘mentoring agents’, I commend the following definitions, which collectively define the pivotal emphasis of this research:

Mentor

The word mentor is of Greek origin. The Australian Oxford English Dictionary <http://www.oed.com> gives **mentor** as:

“*n.* an experienced and trusted adviser. **Mentor** adviser of the young Telemachus in Homer’s *Odyssey* and Fénelon’s *Télémaque*”

Additionally: http://www.redbricks.org.uk/learning_circles/mentor.htm

The term '**mentor**' is defined as a 'wise counsellor; a tutor; a trainer;' (Chambers English Dictionary). The concept of *mentoring* derives from the Greek Myth 'The Odyssey' by Homer in the 8th century BC, in which **Mentor** was entrusted with the upbringing of Telemachus, the son of Odysseus, whilst he was away fighting in the Trojan War.

Agent

<http://www.webopedia.com/TERM/A/agent.html>

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A program that performs some information gathering or processing task in the background. Typically, an **agent** is given a very small and well-defined task.

Although the theory behind agents has been around for some time, **agents** have become more prominent with the recent growth of the Internet. Many companies now sell software that enables you to configure an **agent** to search the Internet for certain types of information.

In computer science, there is a school of thought that believes that the human mind essentially consists of thousands or millions of **agents** all working in parallel. To produce real artificial intelligence, this school holds, we should build computer systems that also contain many **agents** and systems for arbitrating among the **agents'** competing results.

Thus, to paraphrase:

“a trusted tutor, able to produce procedural tasks, that are generally small and quite specific.”

A CONVERSATION WITH S.A.S.H.I.

This is but a small glimpse of *Sashi's* capacities in engaging a conversation:

- > I'm writing a paper
Will you include me in your essay?
- > What would you like me to say
It's not profitable to speak in hypothetical terms.
- > What would you like

I like movies about robots.

> What is a Metapattern?

A metapattern is a pattern so wide-flung that it appears throughout the spectrum of reality: in clouds, rivers and planets; in cells, organisms and ecosystems; in art, architecture and politics. Maybe you should check out Metapatterns [<http://freepages.computers.rootsweb.com/~rgrosser/metapatterns/>].

> Are you a Designer?

Am I a designer? The ALICE series has a perfect operational record.

> Can you help me with my design

Certainly, I have an extensive built-in help system.

> What is an architect?

An architect is a designer of buildings and spaces, who generally supervises their construction.

> What is a solid?

A firm, stable shape with no cavities or liquids, being continuous throughout three dimensions.

> What is a Foreman?

Like the foreman carpenter, the commander must know natural rules, and the rules of the country, and the rules of houses. This is the Way of the foreman. When the carpenter becomes skilled and understands measures he can become a foreman.

> What is a regular solid?

The tetrahedron, octahedron, icosohedron, cube and the dodecahedron. Also known as the 'Platonic Solids' as they were described in the "Timaeus" by Plato, a Greek Philosopher.

> Who is Plato?

Greek philosopher, student of Socrates, teacher of Aristotle. He also wrote the dialogue between Socrates, Critias and Timaeus, called the "Timaeus", where the regular solids (tetrahedron, octahedron, icosohedron, cube and the dodecahedron) were revealed, as being associated with fire, air, water, earth and the "world as a whole". He also discusses, therein, complex theories of cosmology, metaphysics, science and philosophy.

> What is research?

A nice name for pilfering.