

Simulating a Global Brain
using networks of international associative activity

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Abstract: The paper reports systematic information collection by the UIA of international non-profit organizations, their activities, concerns and values — within an expanding knowledge base currently of some 360,000 entities and one million hyperlinks. This constitutes a focal sub-system of whatever is to be understood by an emerging global brain: the organizations, for example, might be understood as activity centres in different parts and levels of the brain; their focus on problems as neuroses; their meetings as temporary excitation events.

Implemented features to improve the use and semantic content of this “networked knowledge base” are described. These include (1) dynamic self-organizing visualizations, and sound equivalents, to show for example the “knowledge-working networks” within which organizations develop strategic responses to problems; (2) shifting the level of analysis, and representation, from isolated entities to their feedback loops, such as “vicious loops of world problems”; (3) hyperlink editing tools and knowledge management approaches through which more coherent patterns of meaning can be held in the light of often significantly and incommensurate data and incompatible perspectives. The objective of these features is to maximize the degree to which providers of information can interact with the resulting knowledge patterns, evoking an ever-richer patterning of the “synaptic” hyperlinks.

Addressed also is the conceptual difficulty of providing information — formed, ordered and limited according to user preferences (bias) — whilst maintaining a non-intrusive cognitive framework where coherence, and facilitating its emergence, is fundamental. Metaphorically this activity reflects the wider concern of gaining consensus and concrete global response — of achieving a fruitful dynamic between the diversity of (often strongly held) preferences for meaningful knowledge representation and the need for (often overly simplistic) coherence.

These challenges raise questions about integrating intelligent sub-systems into a global brain, especially if some entities and their networks are sub-intelligent from a global perspective.

Introduction

Historians of information management such as Boyd Rayward [1] recognise Paul Otlet (1868-1944) as the first to conceptualise what has become known as hypertext. His pre-computer efforts gave form to his vision of a "collective brain" [2] [3] through the organization of some 15 million filecards.

Paul Otlet was one of the founders, in 1910, of the Union of International Associations (UIA) and it is possible that UIA was originally envisaged as a virtual organization and practical experiment in global brain simulation¹ [4]. The focus of the UIA since the 1950s has been on profiling international non-profit organizations in every field of human activity (some 800 subject classifications). This work was computerized from the mid-1970s.

The "UIA knowledge base"² — so named because it attempts to capture and interpret meaningful patterns and sequences of information — is a series of relational databases maintained through interaction with the providers of the information. Links between profiles of international organizations are made, as well as links to other profile types (some highlighted here in italics), since *organizations* are usually associated with *strategies* on *problems*, articulated in *meetings*, in the light of *values* and in pursuit of some understanding of *human development*. In all the UIA knowledge base holds around 360,000 profiles³ and almost one million hyperlinks.

Reflections on the meaning of "global"

Another portion of the UIA knowledge base contains some 600 integrative, transdisciplinary and unitary concepts, a subset corresponding to the various meanings of "global". Broadly grouped, in the context of the global brain, they are:

- **global in the sense of "world"**: This focus is on encompassing preoccupations from around the world — worldwide — as in "globalization" and "global traveller". Global ordering here usually emphasizes the multiplicity of bilateral connections around the geographical world as a set, without any explicit sense of their meaningful organization. Global "networks", for example, are most often understood as a pattern of bilateral links, with some significant hubs.
- **global in the sense of "unitary"**: This is about the unity the world, as symbolized by a photograph of Earth from space or the notion of Gaia. The unity is taken as a given, posing no conceptual challenges. Attention to the oneness tends to mitigate any urgency to deal with the complexity and diversity from which that unity is understood to emerge. This focus is a basis for reflection and campaigns about Earth as a whole. The phrase "think globally, act locally" is associated with it, as are notions of "planetary consciousness" and Teilhard de Chardin's "noosphere" [7].
- **global in the sense of "integrative"**: This relatively obscured sense emphasizes degree of integration — in the mathematical or systemic sense of a

global, rather than a local, solution. Such a connotation is characteristic of higher degrees of order, whether embodied in cybernetics, theories of complexity, complex organizations or wise (mature, well-integrated) people. It raises fundamental questions about how any higher orders of brain are achieved and how integration is recognized and understood, the most radical being whether a global brain should at some stage also reflect non-human intelligence⁴.

Insights for global brain deriving from UIA procedures

The UIA process for information collection is integrative in the first sense of "global", namely interrelating perspectives from different parts of the world. It unites these within a single knowledge base that is "global" in the second, unitary, sense. UIA's current research concern is to build features into the knowledge context that respond to the third sense of "global" — especially the challenge of coherence as suggested by the need for interdisciplinarity and comprehension of complexity [8], [9], [10], [11]. In addition, the web now provides an interesting bridge between all three understandings of "global" [12].

Interrelating different kinds of conceptual entity: A range of quite distinct, and specifically defined, conceptual entities are handled in the UIA databases. By making explicit their purposeful interrelations, can these entities be assisted to become to a degree "self-reflective" and "self-aware", so becoming more effective in contributing to world system responses?⁵

These entities may be viewed as follows:

insert Table 1

Social structure > Brain structure: To the extent that the universe of international bodies reflects deliberately organized responses to the complete range of human preoccupations, these bodies constitute focal nodes in a form of global brain through which facets of human social reality are perceived, defined and given relative significance. As with any encyclopaedic undertaking, whether this is to be understood as one precursor of some larger understanding of a global brain or a subset of a global brain is clearly a matter of discussion.

Hypertext editing > Synaptic editing: A major challenge for the UIA is to provide links between entities whose relationships may be neglected or represented only in secondary literature. Problems arise where link information is crudely given in the literature. An example would be if Entity A is described as directly linked to Entity D in one source when other sources make it clear that this link is actually via Entity B and Entity C. Resolution of the class of challenges within the context of the global brain is a process of synapse editing.

Hyperlinks > Associative links: Every UIA profile is named with titles rich in keywords, which facilitate internal indexing (hard to medium links) and enable external query links to web search engines (soft links). Keywords are also used to "pull" into the profile hyperlinks to entities in other parts of the knowledge base. Such links can be temporary and vanish when the display is cancelled; if

hardwiring is needed, often the links are made by computer in batch mode with subsequent "intelligent" (ie human brain) filtering, reinforcement or elimination. With respect to the global brain, these methods raise interesting issues about the value of associative links, how they are made and judged to be relevant or irrelevant, of temporary or permanent value.

Multi-media > Multiple sensory inputs: The quantities of information in the UIA knowledge base, and the manner in which the system is normally used in text mode, raise concerns about it simply reinforcing the tunnel vision of the user. Hyperlinks point outside the user's immediate domain of preoccupation, but may still be insufficient for a broader overview. The use of a single language (English) is a further limitation⁶. To counter this, several experimental approaches with visual and auditory displays have been designed to mimic the contextual and multi-dimensional evolution of advanced organic brains.

Current research and development

Visualization⁷

Virtual reality: Complex networks are projected onto different kinds of structure that can be explored using virtual reality browser plug-ins. The structures are generated online on request. Important here has been the design metaphor of the surface onto which nodes and relationships are projected: sphere, spiral, etc.

Spring maps: Links are defined mathematically as springs allowing any network to self-organize over a given surface⁸. After a period of turbulence, a rest state is reached suggesting harmony, sleep or meditation. Various exploration tools are then offered (zooming, panning, etc), to drag and freeze parts into meaningful positions, or to redisplay the structure with another central node or with other colour codes, link properties or boundary conditions. As with the virtual reality maps, the display acts as a visual index for obtaining text profiles.

Network displays: Data sets have also been ported into proprietary display packages such as Decision Explorer and Netmap⁹.

Insert Figure 1 anywhere in relation to above para

Sonification

By associating tones and music with spring maps, a soundscape is produced to "match" the visualization. The enquiry is how users can associate sound effects with complex structures in order to sustain integrative understandings of complexity¹⁰. Similar efforts have been made by computational biologists, under the term "protein music" or "genetic music", to associate tones with features of DNA structures¹¹.

Feedback loops

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The major emphasis on hyperlinking conceptual entities in the UIA knowledge base means it can be explored for internal structures and semantic networks. This shifts the level of analysis and understanding beyond entities in isolation or as simple parts of an unordered set¹², adding extra meaning to basic data. This technique is relevant, for example, to understand the interrelationships and root causes of systemic problems, such as environmental degradation.

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A feedback loop represents a chain of consequences that produces a dynamic outcome either by feeding off itself and becoming more exaggerated (positive feedback) or by controlling itself and dwindling in intensity (negative feedback) [16].

A feedback loop is an entity in its own right and in international affairs typically will be an important strategic issue. Organisational strategies and programmes that focus on a single issue in a looped chain often fail because the cycle has the capacity to regenerate itself.

A "vicious" loop, then, is a chain of problem entities, each aggravating the next, and with the last looping back to aggravate the first in the chain. An example is: *Man-made disasters > Vulnerability of ecosystem niches > Natural environment degradation > Shortage of natural resources > Unbridled competition for scarce resources > Man-made disasters*¹³.

Insert Figure 2

An indication of the numbers of loops detectable in the UIA knowledge base is given below for the case of problem entities linked by the "aggravating" relationship (namely Problem A aggravates Problem B) to form "vicious loops":

Insert Table 2

Inevitably, individual "vicious problem cycles" interlock through common elements, forming tangled skeins of global problems; practically this implicates single problems within complexes of multi-sectoral issues. Without the means to untangle the relationships, the response to a social challenge may be ineffective, self-defeating or even harmful. There are interesting analogies with instinctual, psychological and emotional cycles mediated by the electrical and chemical centres of the brain (Goleman 1995); also with the ways human minds interfere with relationships, as dealt with by the psychologist R.D. Laing in his book *Knots* [17]¹⁴.

Insert Figure 3 anywhere in relation to above para

The first use of feedback loops in the UIA knowledge base is to draw attention to defects in the pattern of relationships in the data. It is possible for some loops to be the result of incorrect relationships rather than being representative of genuine feedback, and so "accidental" loops appear.

Detection of loops is therefore in the first place an editorial tool for hyperlinkage within a relational database (echoing the role of psychiatry in synaptic editing). It raises questions as to the appropriateness of certain links which otherwise may go unquestioned – links perhaps comparable with brain phenomena induced by indoctrination, denied memories or cycles of violence, addiction, co-dependency and other denied or unconscious dysfunctional patterns. It also sharpens the discussion on how distinctions are made, using verbal categories and definitions, and how system boundaries are drawn grouping what is represented in this way.

Insert Figure 4 and Table 3

Reflections of the UIA knowledge base onto a global brain

Real-world preoccupations: By using international organizations as its prime source, the knowledge base of the UIA endeavours to hold the widest possible spectrum of perspectives on matters and dimensions of concern to the world. It can at any time be "confronted" with new entities in knowledge space for inclusion within whatever hyperlink framework is appropriate. The result is relatively compact and internally ordered in a way that is to some degree self-organizing.

This raises interesting questions about the way any global brain mirrors reality. Clearly the UIA knowledge base is both a limited map and a distorted one. Clearly it is itself not the brain but a reflection of entities in knowledge space that perform brain-like functions through their interaction with one another. It might perhaps be likened to an ECG readout or a CAT scan.

Perceptions vs Facts: With respect to several kinds of entity included in the UIA knowledge base, notably world problems, the emphasis is more on perceptions of reality rather than on objectively verified assumptions about reality. "Invasion by extraterrestrials" is a problem profile because there is a constituency acting as though the issue is an important dimension of its members' psychosocial reality. Also perhaps unreasonably, equivalent attention is given to "rust", "refugees" and "wrinkles" (cosmetics), acknowledging the far greater economic significance accorded the first and the last.

With respect to a global brain, to what degree might it be designed only around "facts" if major constituencies have significant doubts about those facts and articulate their concerns as though "non-facts" were effectively "facts"? This has been well illustrated recently in the dubious articulation of "facts" by political and scientific communities regarding BSE, foot-and-mouth disease, GM products, weapons of mass destruction and other such emanations now known as "spin". Perceptions have proven to be just as significant as facts in the judgements of the international community [18], and on the internet it is virtually impossible to distinguish between one and the other.

Exaggerated claims and contradictory statements: Several kinds of entity in the UIA knowledge base have a database field dedicated to hold, in authentic language and feel, assertions that particular constituencies may make on controversial issues (for example, sexism or abortion). Equal effort is made to

include counter-claims denying the significance of such claims — or of the issue itself — or of the misrepresentation of such claims. This is to give some feel for the dynamics of the perceptions around particular issues — and the radically opposed opinions that may be active in society.

In other words, the system is designed to handle statements that may be considered highly biased and inaccurate from some other perspective. These perceptions, and perhaps mutually reinforcing clusters of them, may be usefully understood as indicators of collective beliefs, neuroses, phobias, denial-mechanisms, and the like. Dysfunctional or not, collective opinions are as significant to the global community as are personal opinions, obsessions and delusions to the individual. It might therefore be asked how exaggerated perceptions – considered misleading from other perspectives (possibly otherwise biased) — are to be handled so as to reflect the dynamics and dilemmas to which a global brain might aspire to provide a coherent response¹⁵.

Non-closure and incompleteness: The UIA knowledge base is designed to avoid closure. No profile is considered complete: profiles continue to be modified in response to clearer articulations or recognition of errors; entities may at any time be split or combined; the hyperlink context may be significantly amended at any time. Priority may be given to improving the content of relatively insignificant entities where these enlarge the scope and range of the knowledge base; conversely entities may be sparsely populated with text, especially if they are already covered by many linked websites and libraries of information elsewhere.

With respect to a global brain, UIA practices raise issues about incompleteness, ignorance, learning and erosion of collective memory [20] [21] [22] [23]. Openness and closure is strikingly exemplified by the challenge of modern libraries with respect to archival material and the degradation of media; also in a different way by the abandonment of promising lines of research in favour of conceptual bandwagons¹⁶. Will loss of collective memory be viewed in the light of memory disorders in the global brain; will closed belief systems lend themselves to diagnosis as seriously spastic; will infection by memetic viruses be suspected in instances of cultural homogenization?

Global modelling and simulation: The 1970s and 1980s saw much enthusiasm for global modelling of a particular kind. The value of such models has now been played down and their success is acknowledged only where they are applied to rather specific domains (trade, climate, etc). Such models are in almost all cases equation-driven. In contrast, the UIA knowledge base is essentially topological in nature and calls for the use of techniques from that discipline¹⁷. Its visible outputs are not graphs in the statistical sense but cognitive representations in which design to facilitate comprehension of complexity is a significant factor.

With respect to the global brain, this raises questions about the contrast between an equation-driven brain (following the style of chess programs) and one based on structures of semantic associations [24]. To what extent are structural and functional brain characteristics — brain enfolding, specialization and the bicameral brain of higher animals — relevant to discussion of a global brain (see for example

[25])? Can right and left-hemisphere functions be identified and can they to be integrated to achieve higher consciousness¹⁸? What about less detectable system-wide functions?

Subject matrix: In an effort to provide an integrative emphasis to subject organization, the knowledge base items of the UIA are classified in terms of a matrix of subjects¹⁹ rather than a nested hierarchical structure as is typical of much knowledge organization. This sets the stage for exploration of interdisciplinarity and transdisciplinarity as patterns of links between cells across the matrix²⁰.

Humour: A humour database²¹ is associated with particular entries in several of the UIA databases. The rationale is that humour appears to be intimately related to the deprived or stressed social circumstances documented — and often seems to be engendered by them. The vital role of humour has been recognized for people in oppressive regimes, conditions of social deprivation, prisons, ill-health and monotonous occupations, namely diminished quality of life. Humour may therefore provide integrative insights and patterns of association otherwise unobtainable. This raises the question as to how humour might be associated with a global brain (a topic occasionally explored in science fiction).

Challenges for UIA in relation to global brain

Mathematical limitations: Because of its institutional and financial setting, the UIA has been unable to bring to bear on the knowledge base the quality of mathematical expertise that the data structure could merit. Priority has been given to an integrated solution that results in user access to results generated with generic software rather than to laboratory analysis of data sets using tailored software. So, for example, the following investigations are mathematically primitive and more akin to proof of concept:

- analysis of loops
- identification of meaningful network properties and sources of potential error (redundancy, etc)
- algorithms to generate virtual reality frameworks to interrelate entities.

See [26] for a discussion of some relevant mathematical challenges for systems scientists.

A related concern arises from the fundamental conceptual challenge faced by the international community concerning territorial conflicts (Kashmir, Northern Ireland, Middle East, etc), namely dilemmas over the division of bounded space between two or more claimants. Responding in new ways to these challenges would be fundamental to any assessment of the value of a global brain — and its "global" attributes. It has been argued that the kinds of integration required can only be based on application of more complex mathematical techniques [27] — following the principle of Ashby's Law.

Sound as a meaningful integrative tool: There is a major issue about how to present knowledge base complexity to a user. This stimulates investment in

knowledge visualization techniques, however it is unclear to what degree some of the more interesting questions and possibilities are being addressed. Many of the more interesting packages are targeted to high-budget organizations. It is for these reasons that the UIA is exploring use of sound in relation to visualizations, as noted earlier.

As Hofstadter first suggested, music is a natural medium for expressing the complex patterns of proteins and their encoding DNAs. Both consist of a linear sequence of elements whose real meaning lies in their combinations. Given the interest in memes as a semantic equivalent of genes (eg [28]), there is a strong case for exploring the relevance of arguments made for "genetic music" as they might apply to "memetic music" as a means of comprehending knowledge complexes within a global brain. This suggests a "memetic reading" of the points made in M A Clark's review of genetic music sources²² which he introduces as follows:

"In his landmark book *Gödel, Escher, Bach* [29], Douglas Hofstadter comments on similarities between genes and music. The analogy is explicit in the following quote:

'Imagine the mRNA to be like a long piece of magnetic recording tape, and the ribosome to be like a tape recorder. As the tape passes through the playing head of the recorder, it is "read" and converted into music, or other sounds...When a "tape" of mRNA passes through the "playing head" of a ribosome, the "notes" produced are amino acids and the pieces of music they make up are proteins. (p. 519).'

"Hofstadter also discusses how meaning is constructed in protein and in music:

Music is not a mere linear sequence of notes. Our minds perceive pieces of music on a level far higher than that. We chunk notes into phrases, phrases into melodies, melodies into movements, and movements into full pieces. Similarly proteins only make sense when they act as chunked units. Although a primary structure carries all the information for the tertiary structure to be created, it still "feels" like less, for its potential is only realized when the tertiary structure is actually physically created. (p. 525).'

Clark continues with suggestions that are of great potential interest to comprehension of the high order conceptual complexes that might be a characteristic of a global brain:

"Musical renditions of DNA and proteins are not only interesting as music, but as an alternative mode of studying genetic sequences. It might be argued that the folding patterns (tertiary structure) of proteins are the most conserved elements of living organisms. The genes and the primary protein structure (amino acid sequence) that underlie the protein folds and the diversity of the species that house them seem to be free to vary, so long as the protein continues to fold in a way that allows it to serve its function. Protein folding depends on the interaction among the amino acids and between the protein and its immediate environment. With a few exceptions, the specific identity of the amino acids seems less important than the preservation of the correct relationship. I believe that music is a way of representing those relationships in a type of informational string to which the human ear is keenly attuned."

Maybe the traditional notion of the "music of the spheres" is of significance to discussion of the design of any global brain. David Rosenboom's [30] arguments as a musician are relevant to many of the epistemological challenges and traps. The bibliographical and other references of the International Community of Auditory Display²³ provide a strong rationale for this approach.

Quality intelli-work and enabling fruitful input from external parties: As with work on expert systems, maintaining and extending a knowledge base requires a level of continuing professional attention to detail which is usually associated only with the setup phases of knowledge base development. Institutionally the continuity of attention required calls for distributed editorial research work and facilities to manage the relationship between the interventions of contributors with differing skills and priorities. Specifically there is a challenge of ensuring that careful work on systems of hyperlinks is not inadvertently wrecked by careless new contributions; in this respect the Wikipedia²⁴ initiative of collaborative editing is especially interesting.

Integrating multimedia tools into the hyperlink editing process: Constructing useful links in a knowledge structure in the light of patterns of information supplied from other sources — what amounts to synapse editing — calls for software and visualization tools to enhance the conceptual capacity of the editor, somewhat along the lines of the tools now being envisaged for brain surgeons. The question is what kinds of tools would facilitate the task of a researcher.

One experimental approach envisaged would make use of 3D virtual reality representations, based on a gardening metaphor, to allow knowledge structures to be cultivated and gardened, perhaps with the aid of musical cues [31]. The elastic interval geometry software technology under continuing development by Gerald de Jong and the Struck Community²⁵ has already been adapted by him to 3D dynamic displays, notably in relationship to construction of virtual worlds. There are interesting further possibilities using elastic angle geometry. UIA data has been parsed into XML as a basis for populating such constructs. The question remains what design metaphors might increase the cognitive dimensions of such habitats so as to emphasize meaningful integration. This is necessarily some stages beyond Douglas Englebart's early vision [32].

Role of metaphor: Appropriate metaphor is increasingly and explicitly appreciated as fundamental to design advances in software. As noted above, some of the design constraints for knowledge structure representation are associated with geometric metaphors. However it is also clear that there is vast scope for use of design metaphors based on other aesthetics — whether colour, smell, sound, shape, dynamics, or any combination [33] [34].

Insert Figure 5 anywhere in this section

A particular challenge is the use of geometric metaphor to address polarized issues involving intractable incommensurables [35] [36] [37]. Their handling in

a global brain is especially problematic, echoing traits such as uncertainty and prevarication and mental disorders like schizophrenia.

It can be readily argued that the brain uses metaphor to provide coherent patterns of associations as a framework for knowledge²⁶ [38]. It might well be supposed that this would also be true of any global brain. The question is what metaphors might be useful to what end, and how might users be offered facilities enhanced by such options. Would such use of metaphor be an attribute of the right-hemisphere of the global brain?

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Table 1

<i>Entities</i>	<i>Explanation</i>	<i>Global brain relevance</i>
international organizations	non-profit intergovernmental or nongovernmental organizations	globally connected distributive knowledge systems
world problems	identified as preoccupations by international organizations and other constituencies. Such entities are distinguished from topics of study, and there is a requirement that they be well-named with negative-value descriptors (eg literacy is not a problem, illiteracy is)	collective phobias, neuroses, intellectual handicaps, mental disorders, attitudinal defects etc
global strategies	advocated by international organizations or other constituencies in response to world problems. These are named with action-oriented descriptors to avoid confusion with topics of study or interest.	collective procedures, accumulated know-how, best practices
human values	values implicit in the recognition of things problematic, or in strategic responses to them, or exemplified by human development	collective attractors / repulsors
international meetings	organized by international organizations in response to problems, to articulate strategies or to celebrate values	binding moments within global brain; focal neuronal activity

<i>Entities</i>	<i>Explanation</i>	<i>Global brain relevance</i>
human development	concepts of human development and modes of awareness as an important objective of many strategies and embodiment of values	goals & processes to be facilitated by global brain
integrative knowledge	understandings of transdisciplinary, integrative, unitary and global concepts	articulations of coherence patterns of global brain
bibliographical references	written records, whether the products of international organizations, about them, or about the issues with which they are concerned	links to external archives or long-term storage areas of global brain
biographical profiles	key executives of international organizations	focalizer or symbol of integrative activity within global brain; neurotransmitters

Table 2

Table 2: Progressive refinements of vicious problem loops

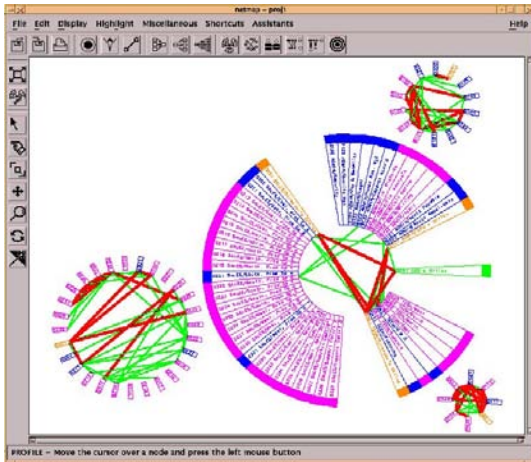
Date	1995	1999	2000
Machine	386/486	486	Pentium III
Processing time	many weeks	some days	500 hours
Chains tested	9,519,722	15,000,000	1,239,769,768
Profiles	-	-	12,397
2-loop	0	-	5
3-loop	35	-	173
4-loop	115	-	230
5-loop	527	-	473
6-loop	3,058	-	1,163
7-loop	3,568	-	3,473
8-loop	excluded	excluded	10,600
9-loop	excluded	excluded	35,438
Total	7,303	6,000	51,555

Table 3

Table 3: Frequency distribution of problems in "Deforestation" cluster of loops

A	379	Deforestation
B	241	Environmental pollution
C	128	Global warming
D	25	Forest decline
E	24	Urban slums
F	21	Toxic metal pollutants
G	20	Indiscriminate economic development
H	18	Marine dumping of wastes
I	17	Unsustainable population levels
J	13	Marine accidents
K	13	Failure of green politics
L	12	Bad weather
M	12	Insufficient environmental legislation
N	11	Acidic precipitation
O	9	Inhospitable climate
P	9	Restrictive environmental policies
Q	9	Doom-mongering
R	8	Environmental hazards from logging
S	8	Foreign exchange reserve shortages
T	8	Burden of servicing from foreign public debt
U	7	Environmental warfare
V	7	Criminal offences against the environment
W	7	Instability of the commodities trade
X	6	Social hardships of economic reform
Y	6	Risk of eco-accidents
Z	4	Deficiencies of developing countries

Figure 1 COULD BE LARGER



**Figure 1: Network display of UIA knowledge base through the application
NetMap**

<http://www.uia.org/projects/finarept/image26.htm>

Copyright © 2000 NetMap Solutions, Pty Ltd. (Australia)

<http://www.netmap.com.au/>

Figure * (no figure number, best placed alongside relevant para)

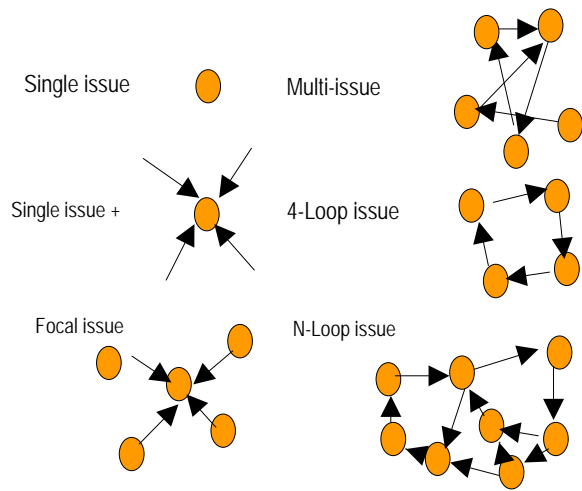


Figure ** (no figure number, best placed alongside relevant para)

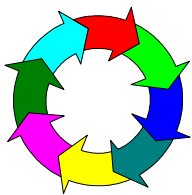


Figure 2 COULD BE LARGER

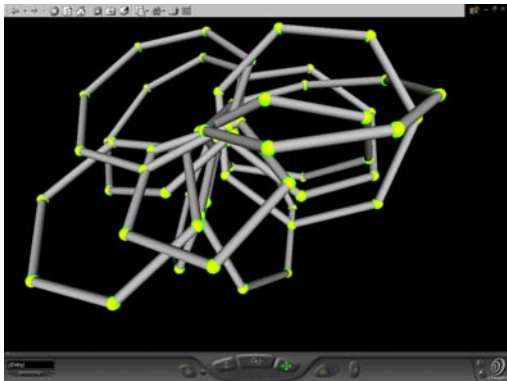


Figure 2: 3-D display of loops for the Problem "Deforestation"

<http://www.uia.org/projects/finarept/image23.htm>

Each node is a problem; problems common to two or more loops join them into knots of loops (performing a structural function similar to particular amino acids sequences in folded proteins, which are coincidentally associated with many well known brain diseases, such as Alzheimer's, Mad Cow (BSE), CJD, ALS, and Parkinson's disease. eg

Folding@Home <http://www.stanford.edu/group/pandegroup/folding/>.

Figure 3 COULD BE LARGER

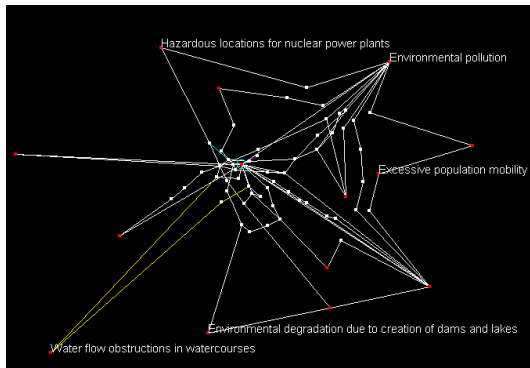


Figure 3: Java spring map display of loops for the Problem "Deforestation"

<http://www.uia.org/projects/finarept/image22.htm>

As with the 3-D virtual reality images, the image is a visual index to the knowledge base. Clicking on a node opens the problem profile in the browser.

Figure 4

Table 1	▶	▶	▶	▶	▶	▶	▶	▶	◀
Loop 1	_A	AV	AC	AB	AE	_Q	_P	_K	_M
Loop 2	_A	AC	AB	AE	_Q	_P	_K	_M	
Loop 3	_A	AC	AB	AK	AE	_Q	_P	_K	_M
Loop 4	_A	AC	AB	AK	_Y	_Q	_P	_K	_M
Loop 5	_A	_C	_L	AJ	_J	_H	_F	_B	
Loop 6	_A	_C	_L	AA	_J	_H	_F	_B	
Loop 7	_A	_C	_L	_J	_H	_F	_B		
Loop 8	_A	_C	_L	_J	_H	AU	AT	_N	_D
Loop 9	_A	_C	_L		_W	_T	_S	_R	
Loop 10	_A	_C	_L		_W	_T	AI	_S	_R
Loop 11	_A	_C	_L		_W	_T	_X	_V	_B
Loop 12	_A	_C	_O	_Z	AH	AS	AR	_E	_B
Loop 13	_A	_C	_O	_Z	AH	AQ	AP	AD	_I
Loop 14	_A	_C	_O	_Z	AG	AG	AN	AF	_U
Loop 15	_A	_C	_O	_Z	AG	AM	AL	_G	_B

Figure 4: Loop display for the Problem “Deforestation”

Each cell is a problem profile. The rows are loops. Those depicted here all contain the same problem, which begins the row.

Table 3 gives the names of the problems in the individual cells; items are listed in decreasing order of frequency of occurrence.

These tables were adapted from: <http://www.uia.org/projects/finarept/image21.htm> and <http://www.uia.org/projects/finarept/image20.htm>

Figure 5

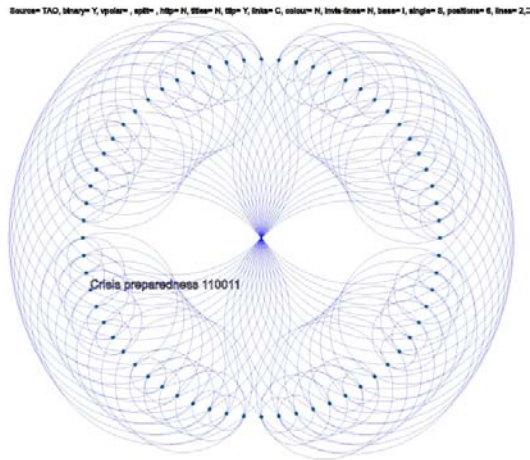


Figure 5: One image in a series generated experimentally from one of the UIA databases to explore the binary pattern of coded ordering that inspired Leibniz and Jung — namely the *I Ching* — as a means of interrelating contrasting conditions of change and the transformations between them. The technique uses scalable vector graphics (SVG) and other variants track these transformations dynamically. Note the resulting bicameral form.

FOOTNOTE

¹ Otlet's initiative (more ambitiously articulated in 1935 in *Monde: essai d'universalisme*) subsequently provided a framework for the databases of UIA's *Encyclopedia of World Problems and Human Potential* (1976 and subsequent editions) <http://www.uia.org/encyclopedia/home.php>. As a historical footnote to the "global brain" theme and H G Wells' early pointers to it [5][6], it is perhaps no coincidence that after WWII, the editor of UIA's *Yearbook of International Organizations* (1951-52) — following approval of UIA's initiative by UN ECOSOC in 1950 — was Peter Hunot, Wells' former personal secretary.

² UIA knowledge base: <http://www.uia.org/services/databases.php>

Relevant papers on knowledge organization:

<http://www.laetusinpraesens.org/themes/aadocnd4.php>

Refer to the UIA website <http://www.uia.org/> for statistics and general and specific commentaries on issues arising from this work.

³ Around 55,000 international non-profit organizations, 56,000 perceived world problems, 33,000 advocated action strategies, 4,800 modes of human development, 160,000 international meetings and 3,000 human values, to cite the major databases.

⁴ Howard Gardner [9] has suggested seven types of intelligence and learning style that merit consideration in relation to a global brain and how it might learn (or fail to learn): musical, bodily-kinesthetic, logical-mathematical, linguistic, spatial, interpersonal, and intrapersonal. Also relevant is emotional intelligence, as popularized by Daniel Goleman [13]; there is now a research consortium on this matter <http://www.eiconsortium.org/>.

⁵ Redolent, though not so ominously, of: "At 0150 GMT on December 1, 1975, every telephone in the world started to ring", the start of the Arthur C. Clarke short story *Dial F for Frankenstein* in which the telephone system, with more switches than the fifteen billion neurons in the human brain and with radar tracking systems, satellites, television and electronic libraries as sense organs and storage media, becomes a supermind. [14]

⁶ There is an extensive literature indicating the particularity of western cultural styles of thought, closely linked with language [15]. For example, Maruyama [11] distinguishes four contrasting mindscapes each of which might suggest a different kind of global brain.

⁷ UIA information visualization experiments on-line at <http://www.uia.org/altermedia/home.php>

⁸ This approach, pioneered by Gerald de Jong, uses elastic interval geometry to resolve the basic problem of how usefully to distribute elements of a topological network over a restricted plane surface (what might be called the "automated subway map design problem"). Current browsers permit spring maps with about 2,300 nodes to be explored; see <http://www.beautifulcode.nl/>.

⁹ Decision Explorer enables extremely detailed analysis of networks from an adjustable decision-planning perspective. Netmap positions entities around the circumference of a circle, with links between them displayed as lines across the circle. A single circle thus provides an overview of the complete data set: one experiment with UJA data used 150,000 entities, but millions can be handled. Analytical features allow subsets of the data to be clustered and explored in a variety of ways meaningful to investigative decision-making.

¹⁰ Web resources include: <http://education.llnl.gov/msds/music/midi-dna.html>;
<http://www.whozoo.org/mac/Music/index.htm>; <http://ndb-mirror-2.rutgers.edu/NDB/archives/MusicAtlas/proj.1.html>. A useful discussion is at <http://www.whozoo.org/mac/Music/Sources.htm>; <http://www.aber.ac.uk/~phiwww/pm/>

¹¹ *Nucleic Acid Database Musical Atlas*

<http://ndb-mirror-2.rutgers.edu/NDB/archives/MusicAtlas/index.html>

¹² Discussion at <http://www.laetusinpraesens.org/docs/loops.php>

¹³ "Positive" and "negative", when applied to loops, are not value statements; depending on the nature of the entities and their relationships, positive loops can be good ("virtuous") or, more commonly, bad ("vicious"). Cycles, like the one mentioned here, are "vicious" because they are problematic, self-sustaining and worsening.

¹⁴ There is something I don't know / that I am supposed to know.

I don't know what it is I don't know / and yet I'm supposed to know, / And I feel I look stupid /
if I seem both not to know it / and not know what it is I don't know.

Therefore, I pretend I know it.

This is nerve-racking / since I don't know what I must pretend to know.

Therefore, I pretend to know everything.

I feel you know what I'm supposed to know / but you can't tell me what it is / because you don't
know that I don't know what it is.

You may know what I don't know, / but not that I don't know it, / and I can't tell you.

So you will have to tell me everything.

More excerpts from Laing's book *Knots* can also be found in the web pages *Ecology of Mind*

<http://www.oikos.org/psicen.htm>. Alzheimer's disease is clinically confirmed at autopsy by the presence of plaques of knotted proteins in the brain. See also *Knots on the Web*

<http://www.earlham.edu/~peters/knotlink.htm>

¹⁵ If greater coherence is a matter of concern, how are higher degrees of order to be introduced -- or better how is their emergence to be facilitated? This raises other issues, successfully explored by Ron Atkin [8] [19], concerning how people favouring different degrees of order perceive and understand those favouring other degrees and qualities of order. A special challenge derives from assumptions about the universality of relatively simplistic principles of order -- especially across cultures. Some of their problems are evident in the history of classification systems.

¹⁶ James Glanz wrote a description of the preoccupations of the annual *Seven Pines Symposium* with the heading *Turn down that Web, these scientists plead, so we can think* (*International Herald Tribune*, 20 June 2001).

¹⁷ see comparison with conventional global modelling at

http://www.uia.org/encyclopedia/encycom_bodies.php?kap=22

¹⁸ With reference to Gregory Bateson's "pattern that connects", is there a third type of function that will integrate designs of global brain that focus on left-brain understandings of logical order with others that focus on right-brain patterns of association?

¹⁹ <http://www.uia.org/topics/aaintmat.htm>

²⁰ see detailed review at <http://www.laetusinpraesens.org/docs/classif3.php>

²¹ <http://www.laetusinpraesens.org/docs/humour.php>

²² <http://www.whozoo.org/mac/Music/Sources.htm>

²³ <http://www.icad.org/>

²⁴ <http://www.wikipedia.org/>

²⁵ <http://www.critpath.org/idiaverse/struck/>

²⁶ Morgan identifies seven metaphors describing contrasting styles of organization which might be adapted to understandings of a global brain: GB as machine, organism, brain, culture, political system, psychic prison and/or instrument of domination.