Three Dimensional Legal Logic and Standarisation of Legal Knowledge Engineering Instructions

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QUICK COURT PROGRAMS

Intelligent computer programs, which simulate the provision of legal services, can now be built. In Queensland, since 1997, selected Legal Aid offices provide quick court facilities, which the public can use in private to obtain certain automated legal services and advice. The programs are multi media, with a lawyer on video acting as a guide to the user, touch screen menus, a keyboard for the user to type in instructions, and a set of relatively small, discrete modules of legal services which produce written advice and legal documents. These services commenced in a limited way and only in a few areas of law: family law, domestic violence and small debt claims. A user can obtain an application for a divorce speedily, and thus far at no cost. The facilities do not incorporate the bulk of legal expertise in each of the fields of law or the way in which these fields overlap. Mining of the depths of case law in each of the fields is not available. Nevertheless quick courts have broken ground and point the way ahead to a more accessible, affordable and intelligent system of law. Programs could be developed to provide a much fuller range of quick court legal services.

The initial Queensland quick court systems were constructed in about eight months by a team of two, an American script writer and a software engineer, in the employ of InfoBrisbane, the Australian arm of the Californian company, North Communications. The team worked in consultation with a panel of Queensland legal experts. North Communications built the first quick courts, which appeared in Arizona in the early 1990's, and were installed inside court buildings with the full support of the judiciary. Since then, other states, Utah and California, have also introduced the technology. These facilities have become increasingly popular, and queues now wait to use them, in much the same way as auto banks are now used. A video guide is available in several languages. Small charges are made by the American Quick courts, which accept credit cards. In 1999, the National Australia Bank plans to make smart cards available, so that electronic payment can be further facilitated. There may be other Australian Banks with similar plans.

It is interesting that in Australia, it is a state legal aid service, whereas in America it is the judiciary, which has paved the way for this technology. Quick courts certainly reduce the costs of court processing. They could also potentially contribute significantly to the revenue available for running the courts, and the minimisation of costs of litigation.

STANDARDISATION OF LEGAL KNOWLEDGE ENGINEERING INSTRUCTIONS

In order to automate the large, complex body of law, for advanced quick court facilities, standardised legal knowledge engineering methodology is required. Just as solicitors provide briefs to barristers, legal knowledge engineers must provide recognisable legal knowledge engineering instructions for programmers and communications experts. Attached is an extract from a draft legal expert system brief in the field of the Contract for the International Sale of Goods (CISG) Convention. The process of collaboration between the programmer, the interface writer, and the legal expert, even for small modules, is expedited, and therefore cheaper, when legal knowledge engineers provide standardised instructions.

The standardisation of legal knowledge engineering instructions requires a thorough and sound system of jurisprudential analysis and design. In accordance with knowledge engineering practice, rules of law must first be mapped or visualised to represent a rigorous detailing of the legal logic and its various modes of discourse. On the basis of this mapping, the instructions should be written as programming instructions to suit any of the range of computer languages or intelligent shells, which could be used to construct a legal expert system. Ad hoc knowledge engineering methods, which use decision trees, illustrated in *Figure 1*, as the basis of the system design, and programming, may be suitable for small independent modules. They are not suited for the design of systems that can process more complex and massive legal problems. It is too easy for the legal knowledge engineer, the programmer and the interface builder to get lost in the trees.

A thorough and sound system of jurisprudential analysis and design is the system of three dimensional legal logic, which was used in the preparation of the attached CISG instructions. See the two dimensional graphics which represent compressed three dimensional logic in *Figures 12-14*. Further, three dimensional legal logic provides a standardisation generic to the range of relevant

intelligent computer languages and shells. It is particularly suited to the recent object-oriented languages, such as Java, which allows the construction of legal expert systems on the World Wide Web. The new generation of intelligent languages, which will communicate internationally, have an internal communication of their own, with a diversity and flexibility which more closely simulates the diversity and holism of human intelligence. This internal communication is thought of as distributed intelligence; it is a bit like the division of labour. It is effected by notional agents interacting with each other, according to predetermined constraints. Related agent routines constitute an object that performs a function in the program. These functions ultimately serve some user purpose.

The common legal expertise has been created and used by many lawyers over many centuries, for many different user purposes. It is largely coherent, and as such it is an holistic body of law. The coherence is maintained through a number of discrete routines of legal reasoning that may interact. Through the theory of three dimensional legal logic, the discrete, related and interacting routines of legal experts can be identified. The body of law can be duly programmed as a collection of interacting objects operable for some user purpose.

The theory of three dimensional legal logic assumes that statements of law, or routines of legal reasoning, may be classified as rule statements or non-rule statements. Further, law is hierarchical in the sense that it has hierarchical classifications or routines: general principles or rules are detailed in case facts. There are also adversarial classifications or routines, in that there are firstly, converse principles also detailed in case facts, and secondly, uncertainty principles by virtue of the potential for new cases, sometimes referred to in obiter dicta, the speculation of judges in their reasons for a decision. For all the statements of legal information there are two further classifications or

routines: the minimum points required to establish a case and the optional additional or alternative points.

The visualisation of a field of law, which has these and other routine characteristics, requires three dimensional metaphysical or cyber space. Three dimensional thinking enhances legal intelligence. It also assists the design of legal expert systems because it allows an understanding of the whole of the law in regard to any user purpose, and also a closer understanding of any area of law relevant to a user purpose. Three dimensional graphical representations of law also assist identification of the order of processing and where notional interacting agents, carrying out routines according to predetermined constraints, might provide efficient processing. Three dimensional legal logic is a thorough and sound basis for system design, standardised legal knowledge engineering instructions, and programming.

THREE DIMENSIONAL LEGAL LOGIC

Three dimensional legal logic is an analysis of law, according to fifteen sequential paradigms of legal intelligence.

1. Units
2. Rivers
3. Nested Logic
4. Fans
5. Neutrality
6. Fishbone
7. Double Negatives
8. Strata
9. Triads
10. Spectra
11. Criss-crossing
12. Poles
13. Star
14. Rings
15. Legal Universe

These paradigms can be thought of as metaphors or models that enhance understanding and memory of the complex structure of legal information. They also assist in the visualisation and consequent mapping of the extensive complexity of the law. The common familiarity of the paradigms that link to each other holistically, is suited to human cognition and intellectual control.

The legal profession occasionally uses some of these metaphors in a loose sense in legal reasoning. Even though the body of paradigms is implicit in the structure of legal expertise, the legal profession has not developed a consciousness of this nature of their intelligence. There has been no theory of primal metaphors or models of intelligence in jurisprudence. Perhaps a holism of primal metaphors, would be regarded by many conservative jurists as unsuitable for the practice of law, making it too much like a cult than a cultural institution. But the profession has from time to time kept the trappings of a cult, such as their contemporary horse hair wigs, antiquated dress, and bits of ancient languages, which only relatively few people understand. Metaphors and acronyms shape the language of the modern computer culture, and are suited and essential to legal knowledge engineering. If they bring legal expertise closer to a common understanding, then there may be justification for using them in the development of the more scientific systems jurisprudence of legal intelligence

1. UNITS

The task of jurisprudential analysis or mapping begins with the identification of legal monads, that is, the single units of information or legal concepts that are the quanta of the visualisation of legal expertise. For instance, in contract law, the concepts of offer, acceptance, and consideration, are legal monads. This idea of monads is derived from the philosophy of Leibniz (1714). The division of legal information into discrete monads is a matter of legal expertise. Insofar as there are different

expert opinions about the division, these differences can be accommodated in a legal expert system and explained to the user.

2. RIVERS

Legal monads may be part of rule statements and/or non-rule statements. It is rule statements, which must be applied primarily in any client situation. Rule statements set out the circumstances, ordered as antecedents, in which a consequence arises in law. Insofar as legal monads are part of rule statements, they may be antecedents and/or consequences. Once the monads in a selected field of law are identified, they can be ordered as antecedents and consequences in rules of law. Once again, the characterisation of a monad as an antecedent, and/or a consequence in a rule, and the ordering of the monad as such, is a matter of legal expertise, and different expert opinions about this can be accommodated and explained.

Over many centuries, rules of law have been set out in judicial dicta and legislation, in many different literary styles. For the purposes of legal knowledge engineering, they can be formalized in the standard rule format:

* if (antecedent(s)) then (consequence)

The various forms of expression can be converted to this standard. For instance, a rule might be expressed in terms of 'where there is (antecedent(s)) then there shall be (consequence). Like 'where', the term 'whenever' may be used instead of 'if', and the term, 'then', may be implied rather than express. Sometimes rules are stated as 'must' commands: all/every/any (antecedent(s)) must (consequence). Where there is a 'may' rule, there is inevitably an antecedent of choice before the legal consequence arises. Provisos, clauses commencing with 'unless' or 'subject to', may also be standardized as antecedents with a consequence. Sometimes a consequence is stated before one or more of the antecedents. Reordering can place the consequence last.

Once rules are standardized, it can be seen that sometimes an antecedent in one rule is also the consequence in another rule. Rules overlap or interlock at these points. The result is a hierarchy of rules like a tributary river system, illustrated in *Figure 2*. The logic of the rules flows 'downstream'. At a point downstream, the flow from upstream may be assumed.

The tributary river system has a mainstream(s) rule, which runs from the first antecedent through the subsequent order of antecedents to the final consequence. Secondary streams may flow into mainstream antecedents where the consequence of a secondary rule is the same as a mainstream antecedent. The secondary rule is a particularisation of the mainstream antecedent. Tertiary, quaternary, quinary etc rules may extend the particularisation, as far as the black letter law actually goes. In this sense rules are hierarchical: the further upstream, the more extensive the particularisation. Case details arise in the watershed of the rules. The paradigm of a tributary system accommodates the interlocking of rules of law.

Some mainstream antecedents are particularised more than others. The more particularisation of an antecedent, the more abstract a concept that antecedent is likely to be. A rule may contain highly abstract antecedents as well as more concrete concepts. The concept of granularity is useful to delineate the range of concrete to abstract antecedents. It is useful to note the principle of Ockham's razor (Russell, pp. 462-3): only depart from the concrete to the extent necessary. Unnecessary abstracts can be pruned for more efficient processing, just as they are pruned by lawyers in taking instructions from a client.

The mainstream or most general rule in contract law provides that if there are:

a. parties with capacity,

b. consideration,

c. agreement,

d. compliance with form,

e. intention to create legal relations

f. no vitiating elements, and

g. compliance with statutory requirements, then there is

h. a valid contract.

Secondary rules of contract law may more closely define each of these mainstream antecedents: for instance, there are a number of requirements (notionally like i, j, and k in *Figure 2*) to establish that there is c - agreement. There may be certain negotiations, and there must be an offer and acceptance. In the mainstream rule, in *Figure 2*, c is an antecedent, and in the secondary rule it is the consequence. Tertiary rules might more closely define secondary antecedents (notionally r and s establish q in *Figure 2*), and so on. The final consequence, h, can be thought of as the end result of all the rules in the hierarchical structure. In order to establish the positive result, h, all the antecedents in *Figure 2* must be established.

The representation of the rules of law is devised by an expert rationalisation of the collective of rationes decidendi, obiter dicta (noted as such) and statutory provisions. In legal knowledge engineering, this rationalisation must provide for all possible cases. The result for any possible user case must be indicated in the representation. Where there are gaps in the stated law, these must be noted to complete the logic. The user can be advised of gaps. If the gaps can be filled by logically necessary extensions of stated law, then the user should be advised accordingly. Sometimes rules are stated in positive terms, sometimes they are stated in negative terms, and sometimes obiter dicta discuss the gaps or uncertain cases. Logical irregularities in the judicial and the legislative statements of law must be streamlined for legal expert systems.

Because law is adversarial, there is a corresponding set of hierarchical rules or river system for the negative case. In contract law, namely the

negative case is that there is no valid contract. Monads opposite to the positive monads, make up the negative case. Thus, in contract law, if there is one or more of the following:

a.   a party with no capacity,

b.   no consideration,

c.   no agreement,

d.   no compliance with form,

e.   no intention to create legal relations

f.   vitiating elements, or

g.   no compliance with statutory requirements, then there is

h.   no valid contract.

The strongest negative case occurs if all the antecedents in the negative river system are established. This is the wholly negative result. Prima facie, the negative mainstream also has a set of secondary, tertiary, quaternary, quinary etc streams corresponding to those in the positive river system.

In the real world, before a case is finally decided by a court, there may be uncertainty about the existence of any antecedent and/or its final result. Thus, there is a third set of hierarchical rules or corresponding river system which represents the possible factual or legal uncertainties in a case. These rules are heuristics of legal expertise, representing the issues of fact and law which must be managed by lawyers in the conduct of a case. Uncertain monads make up the uncertain case. If all antecedents are uncertain, then there is the strongest uncertainty, the wholly uncertain result pro tem. Each uncertain monad must be noted with the two matters of burdens of proof, namely whether the positive or negative party carries the burden and whether it be the civil (on the balance of probabilities), the criminal (beyond a reasonable doubt), or some statutory burden.

For the positive mainstream in contract law, the corresponding uncertain mainstream is as follows:

If there is one or more of the following:

a.   a party with uncertain capacity,

b.   uncertain consideration,

c.   uncertain agreement,

d.   uncertain compliance with form,

e.   uncertain intention to create legal relations

f.   uncertain vitiating elements, or

g.   uncertain compliance with statutory requirements, then there is

h.   uncertain valid contract.

The strongest uncertain case occurs if all the antecedents in the uncertain river system are established. This is the wholly uncertain result.

In order to illustrate graphically the three tributary structures, the positive, negative and uncertain river systems, in their corresponding positions, they must be set out as a three dimensional structure. (*Figure 3*)

There are differences between the positive and negative cases. Prima facie, all the antecedents of the positive case must be established in order to reach the positive result: as long as a positive antecedent has not been established, the positive result cannot be claimed. However, if one negative antecedent is established, for example if there is no consideration, then the negative case will succeed. There may be a partially negative but conclusive result. Thus, there are partially negative rules for each negative antecedent: for example, if there is no consideration then there is no valid contract. Each negative antecedent is followed by a consequence of a partially negative but conclusive result. All partially negative rules share a common consequence, which must be represented separately from the wholly negative consequence.

Uncertainties have to be decided according to the appropriate burden of proof: on the balance of probabilities in civil matters and beyond a reasonable doubt in criminal matters. In criminal matters,

the positive case is likely to be the case for the prosecution.

Thus, ultimately, an uncertainty supports the negative case, unless the onus of proof rests on the party with the negative case. Certain defences usually place the onus of proof on the party claiming the defence, usually the party with the negative case. However, if there is any antecedent in the positive case in respect of which the onus of proof lies on the party with the positive case, and that antecedent is pro tem uncertain, the positive result cannot be established, even if there are uncertainties in respect of antecedents that carry an onus of proof on the party for the negative case.

Each uncertain antecedent carries the pro tem consequence of partial uncertainty.

There are partially uncertain rules, which share the common consequence of pro tem partial uncertainty, and there are tributary rules of uncertainty which collectively make up the pro tem wholly uncertain result. The partially uncertain pro tem result must be represented separately from the wholly uncertain pro tem result.

Thus there are five sets of rules in a field of law:

1.   those which lead to the positive result,

2.   those which lead to the partially negative result,

3.   those which lead to the wholly negative result,

4.   those which lead to the partially uncertain result,

5.   those which lead to the wholly uncertain result

The positive result is mutually exclusive of the remaining four possible results. A cumulative partially negative result can amount to the wholly negative result just as a cumulative partially uncertain result can amount to a wholly uncertain result. The wholly negative result and the wholly uncertain result are mutually exclusive. However there may be a mix of partial negatives and

partial uncertains, either or both of which produces partial positives. However, there can be no partial but conclusive positive result. Where there is both a partially uncertain and partially negative result, the partially negative result will prevail as the final result.

3. NESTED LOGIC

With legal information explosion and implosion, often the extent and complexity of a river system is massive is massive. The graphics become too dense to be useful. (*Figure 4*) To suit the constraints of human perception and cognition, the notion of zoom levels is required. Thus the river hierarchies are broken up and arranged as nested logic in a zoom spectrum from macrolevels through to microlevels. Each level should represent no more than a mainstream through to a tertiary stream. Zoom or pan access to adjacent nested levels is via the antecedents at one level which are also interim consequences for the adjacent microlevel. This is illustrated in the 3D Law video (Gray & Gray, 1997).

4. FANS

Sometimes different antecedents share a common consequence. This means that there may be alternative ways to establish an interim or final consequence. For instance, b, consideration, may be established in several alternative ways: by means of property, services, promises, or some combination of these three forms. This choice can be represented as a fan structure in the river system. (notionally represented in *Figure 5*).

Prima facie, each fan on the positive river has a corresponding fan on the negative and uncertain rivers. The failure of one antecedent in one positive fan will not prevent the positive result. Fans can be categorized according to the jurisprudential meta-rules, which determine the nature of the choice, which they permit. For instance, some fans permit a choice of one fan only - the alternatives are mutually exclusive. Others permit a choice of

one or more of the available alternative fan rivers. Some fans are conditional, whereby the selection of one alternative precludes the selection of others, or whereby the non-selection of one alternative allows the selection of others.

Usually there must be a failure of at least one antecedent in each of the fan rivers for the positive result to fail.

Fan meta-rules qualify the usual rule that every negative antecedent has a partially negative but conclusive result and the usual rule that every uncertain antecedent has a partially uncertain pro tem result.

5. NEUTRALITY

Sometimes a positive antecedent has no corresponding negative or uncertain antecedent that prevents the positive result. The three possible cases represented normally by the positive, negative and uncertain antecedents, are all consistent with a positive result. They can be thought of as neutral. An example of this is an enquiry to clarify the meaning of some term in an offer. It is not necessary to make this enquiry to establish a valid contract: there is no rule of contract law that requires the offeree to clarify meaning in this way. If no enquiry is made, a valid contract can still arise. A contract of this sort may be defeated by another rule such as a rule of mistake. Even if it is uncertain whether or not an enquiry has been made, this will not, per se, defeat the positive result: if resolution of the uncertainty finds that a counteroffer not an enquiry was made, then the positive result will be defeated by the rule that treats a counteroffer as a rejection.

Neutral antecedents can be located as a fan on the positive river with no corresponding fan on the negative or uncertain river systems.

6. FISHBONE

If the positive, negative and uncertain tributary structures are unplugged and reconnected in a two dimensional plane, then the resulting linear structure looks like a fishbone.

We can no longer see the hierarchy of rules, but we can clearly see any neutral sector. (*Figure 6*) The fishbone is useful as it represents the order in which antecedents will be considered or presented. It may mix the hierarchical level of rules, depending upon whether:

- a series of antecedents will be presented before stating their consequence, or

- a consequence will be presented before stating the antecedents which establish that consequence.

Fishbones are also useful for the graphical representation of the partial consequence of a fan of rivers. A mutually exclusive (mutex) fan will have only one river, the last in the left to right arc spread, which can trigger a partially negative but conclusive result for all the alternatives in the fan. All alternatives in the negative fan must be established before there can be a partially negative but conclusive result. There will be a similar graphical representation for a multiple choice fan, and a conditional fan. Arcs can be labelled with the fan type.

7. DOUBLE NEGATIVES

The law has a jurisprudential negative as well as a factual negative: for example 'no peppercorns' is both a jurisprudential negative as well as a factual negative. However, no rejection of an offer is a jurisprudential positive as well as a factual negative. The association of jurisprudential and factual positives and negatives in regard to each monad is a matter of legal expertise, which is essential for legal knowledge engineering.

8. STRATA

Lawyers reason in rules. However, there are other modes of legal reasoning, pertaining to the rules. These other modes may be visualised as strata which sit beneath the river structure.(*Figure 7*) Examples of other modes of reasoning are as follows:

* Definitions of concepts used as antecedents: synonyms, distinguished from antonyms.

* Authorities for rules: binding and persuasive precedent cases and legislation.

Where one case is authority for various parts of the tributary structure, it should be possible to plot the points of a case through the river systems in order to consider the importance of the case and the exact extent that it might be overruled. Two cases so plotted can be seen to have similarities and differences. The end result of each can be related to these similarities and differences.

* Commentary on the rules in terms of rights and duties.

* Moral, social, economic etc justifications for rules derived from dicta, legislative commentary, or elsewhere.

* Critical comment on rules etc.

* Legal expectations and strategic advice.

9. TRIADS

The three corresponding antecedents, the positive, the negative and the uncertain, can be linked as a triad of alternatives. This is illustrated in *Figure 8*

10. SPECTRA

A triad structure may in fact constitute a spectrum with three sectors that cover all known possibilities. There may be a fine line between each possibility. By reference to this spectrum, it can become easier to determine gaps in the law, and how possible things can fill these gaps.

For instance, there is a rule in contract law that a peppercorn is sufficient consideration. The peppercorn spectrum runs from the negative sector, namely no peppercorn to the positive sector, which is from one to any number of peppercorns, and then into the clearly delineated uncertain sector, which is less than one peppercorn to the smallest grain of pepper. The uncertain sector is a gap

in the law, which may be filled by reference to the characteristics of the positive or negative antecedents. Although there is no specific case where 20 peppercorns were held to be consideration, it is clear that the rule of one peppercorn can be extended along the spectrum to any number. The inherent value of pepper, namely its taste, may be a basis for extending the positive sector further into the gap.

Uncertainty may be due to the gaps in the law or it may be due to factual uncertainty. If it is due to factual uncertainty, then the onus of proof determines the case that an uncertainty supports. If uncertainty is due to a gap in the law, then the party who has the onus of factual proof must also show that the gap is absorbed by her/his sector of the triad. Thus, the positive contract case with 15 grains of pepper only, something less than a peppercorn, must show that this is sufficient consideration: that nominal consideration extends below one peppercorn to 15 or more grains of pepper. The positive marker must be expanded to reduce the uncertainty zone by an even finer distinction.

11. CRISS-CROSSING

Sometimes antecedents in different rules are part of one spectrum - an inter triad spectrum. An example of this is the enquiry-counteroffer spectrum mentioned above. It is useful to delineate these spectra so that antecedents can be carefully distinguished and located in the appropriate rules with attendant consequences. This criss-crossing of principles may be plotted as spectrum lines linking monads in different parts of the river system.

Criss-crossing may be four dimensional. This usually happens in equity rivers: an antecedent may be positive in the combination of antecedents in one case and, with a change of antecedents in another case, it may become negative. Antecedents move from the positive to the negative river, according to the movement of other antecedents: they are

potentially four dimensional because they can move within the static framework of rules. Discretion can carry the flexibility of jurisprudential four dimensionality. This arises where all the circumstances of the case are to be taken into account in making a determination. For instance, the Family Court has this flexibility in determining, by reference to a list of factors, entitlement to maintenance and property.

A movie of equity can be constructed by showing the river position of antecedents in one case and their changed river positions in another case. If there are inconsistencies in the exercise of the discretion, the alternative movies for the same set of monads can be plotted. Alternative movies can then be argued by reference to some coherence that might appear in the non-inconsistent part of the movies. In equity, the combinatorial explosion is managed through movies.

12. POLES

The adversarial features of the law can be said to polarise the parties. There are two ways of opposing the positive case: by denial or by doubting of the positive monads. In *Figures 3 and 6* the positive case is central, because the partially negative and uncertain rules, called pole rules, are appended to the negative and uncertain rivers. No such appendages are required for the positive river.

The partially negative rules with their common consequence can be represented graphically as the partially negative but conclusive cone with a pole like the north pole of the earth representing the common partially negative but conclusive result. There is a corresponding cone representing the partially uncertain rules, with a common partially uncertain pro tem result like the South Pole.

These opposing poles which are illustrated in the fishbone permit an evaluation of the strength of a case. The number of positive, negative, and uncertain monads established in a user case allow the calculation and

comparison of points in favour of each party in a dispute.

The poles are also a judicial method of controlling the combinatorial explosion that might arise when real cases constitute various combinations of antecedents from the three tributary structures. The significance of each monad is directed to the prima facie five possible end results: positive, wholly negative, wholly uncertain, partially negative and partially uncertain.

Like the expanding physical universe, the legal system ensures the growth of law ad infinitum. Every year parliament puts out new legislation, to vindicate the changing political platforms of adversarial democracy. With increased efficiency in judicial business, precedent cases accumulate faster. Computer technology, which extends and assists human memory, supports this expansion of information and maintains its viability and profitability. About 14 million documents per week are added to the online database, Lexis-Nexis (Butterworths Catalogue, 1997, p.4.) As the judiciary embraces integrated databases that permit speedy cut and paste judgments, mixing extracts from black letter law with extracts from transcripts of evidence and legal argument, the legal system is likely to flirt with chaos and complexity that defies the consistency, orderliness and coherence of justice. Spaghetti access to the law through Boolean search may ultimately produce a dense and knotted law, at the mercy of language use statistics rather than the reasoning of prioritised substantive principles.

13. STAR

When the positive, wholly negative, wholly uncertain, partially negative and partially uncertain rules are locked together with their triads links, they can be seen to form a star shape.(*Figure 9*) The poles of the star represent, at the north, the partially negative, but conclusive result, and at the south, the partially uncertain pro tem result, which will support the positive or negative case depending upon which has the onus of proof.

14. RINGS

Legal expertise also uses presuppositions and postsuppositions, circular concepts, and moral motivations. For example, when Lord Atkin laid down the rules of negligence in the unforgettable and lovable case, *Donoghue v Stevenson*, he founded these rules on the presupposition of one of the ten commandments of the Bible: love thy neighbour, the prevailing feature of Christianity. It is not a positive antecedent that the defendant failed to love the plaintiff; nor is it a defence to an action in negligence that the defendant loved the plaintiff. As Christianity was the dominant religion of Britain at the time of *Donoghue v Stevenson*, the presupposition of love as stated by Lord Atkin acted as a moral motivation for social acceptance of the radical new development in law. Such presuppositions can ensure a level of voluntary compliance that makes the law viable. As a postsupposition of the new law of negligence a vast insurance industry grew up to cover negligence liability, and this industry provided compensation payments, which ensured a standard of human welfare in the technology era.

Love is a circular concept. It belongs on a paradoxical spectrum, which has gradations through love, and its opposite hate. It is a subjective state belonging to the realms of human emotions, and difficult to identify and prove as a fact. At any given time, a person might feel the full circular spectrum, both love and hate for another. It may be used by the law as a justification, but it is not suitable as part of the rules determining legal liability.

The fundamental circular set of presuppositions to a star of rules is that there is a beginning to the system of rules, namely the first triad of antecedents, and five possible ends, being clockwise, the partially negative result, the wholly negative result, the positive result, the wholly uncertain result, and the partially uncertain result. This ring of boundary logic is added to the star to

form a sphere of legal knowledge in *Figure 10*.

15. LEGAL UNIVERSE

The legal system has many fields of law which can be represented in spheres like a legal universe.(*Figure 11*) Sometimes these spheres are linked. For instance there is a link between the star of contract law and the star of tort wherever alternate remedies arise. Travelling through the legal universe provides a visualisation of the vast collective, potentially immortal, intelligence of the legal profession - good practice for the individual to understand the detailed holism of the contemporary collective and how to develop the future collective.

LEGAL CHOICE MAPS

One of the significant features of the theory of three dimensional legal logic is that it maps legal choices. The choices are represented by the triads, spectra, fans, strata, the five final results, and the interstellar links. As such the theory can be used in many ways in legal practice and as the basis for design of a legal expert system to provide these legal services:

1.   Any antecedent or final result may be adopted as a goal. The path to this goal is then clear. If client goals are identified in this way, clients may be advised how to achieve the goals by reference to the tributary paths of antecedents. This is useful for commercial as well as litigation cases.

2.   The risks of litigation can be evaluated by reference to the number of positive, negative and uncertain points supporting the case for opposing parties. In this way, there is a framework for agreeing antecedents not in issue, and for focussing on the issues and difficulties in establishing a case.

3.   In arguing a point of law, the gaps can be identified and the spread of authorities through the whole structure of rules can be evaluated. Conflicting

authorities can be represented as alternate antecedents or alternate rules.

4. In arguing conflicts in evidence, the consistency of evidence can be plotted through the temporal order of antecedents. Opposing evidence might be refined so that it can be moved across from one sector in a triad to a more favourable sector.

5. The complexity of a case can be rated by reference to the number of relevant antecedents, and the number of zoomlevels that have to be mined, for the purposes of estimating costs.

Agents in the program may make choices of antecedents and consequences in a sequence of choices from alternatives as they arise in the streamlining and adversarial polarisation. Routines may be developed for agents according to the classification of choices and any meta-rules pertaining to the classification. These routines and meta-rules may be invoked according to user input.

LIL - LEGAL INTELLIGENCE LANGUAGE WITH 3D GRAPHICS TRACE

The three dimensional model of legal expertise is the basis for specifying an object-oriented computer language, LIL, so that legal services can be automated. The attached standardised draft legal knowledge engineering instructions in respect of part of the Contract for the International Sale of Goods (CISG) Convention are based on the compressed river graphics illustrated in *Figures 12-14*. The graphics and the instructions condense the three dimensional model by collapsing the positive, negative and uncertain rivers into a legal helix structure which can spring open at choice points to allow questions to be put to the user. Then input, namely the user's selected answer, can be processed in accordance with the categorisation of alternative answers as jurisprudentially positive, negative, or uncertain. Triads can be

categorised according to whether the jurisprudentially positive answer is the factual yes, no or uncertain. Whatever is established as the jurisprudential positive answer, entails the jurisprudential negative answer is the opposite. If jpos=no, then jneg=yes. Occasionally this is not so. A triad may be neutral. Always juncert=uncert.

Where there is a fan structure, the condensation of rivers can be thought of as a double helix, as there is a compression of both the alternative rivers in the fan as well as the positive , negative and uncertain rivers of each fan alternative. The double helix springs open with fan options as well as antecedent options. The line of nodes from start through path to stop, represents the sequence of triads in a compressed system of positive negative and uncertain rivers.

Wormholes are used for time and assumption changes in the language of the questions. They are an essential part of the question and answer logic in the communication system. Other conventions used in the sample standardised knowledge engineering instructions are the sign, %, indicating information for the programmer as distinct from the program information, zlevel indicating zoom level in nested logic, and simplified triad classification indicating the combination of jurisprudential and factual positives etc.

Reasoning routines differ for helix and doublehelix river systems, and for different triad classifications.

If virtual reality graphics are constructed by LIL, as well as compressed graphics, as an anticipatory and retrospective trace, then the services which are automated might be accompanied by the graphical representations of the stars or parts of stars in the legal universe relevant to the user's case. Three things become possible:

1. It will be possible to scale up to large legal expert systems. The graphics act as a map in the expansion and

maintenance of the system, as well as to assist user cognition.

2. It will be possible to build transparent legal expert systems. The three dimensional graphics can be thought of as the artificial legal mind in cyberspace, that can be viewed as it works. Intelligent programs will not become cheap rulers with covert reasoning processes. Automation may personify the immortal collective intelligence and be designed so that it is not an autocratic system of law, but rich interactive reasoner.

3. The legal profession will have a computer aid, which will permit more systematic management of the collective legal intelligence. Lay learning of a legal expert system can be assisted by the reference points of the graphical mapping. It should be possible for lay users to inform themselves of the requirements of the law before they consult a lawyer. The service may make access to the law cheaper and quicker - more affordable and effective.

4. The construction and maintenance of quick court programs for clients, including public sector clients, may become a significant part of legal practice. Programs may also be constructed to capture and rationalise for future use, the expertise of specialist lawyers in the firm before their retirement.

5. The nature of legal intelligence may evolve significantly.

CONCLUSION

The theory of three dimensional legal logic indicates that human intelligence is three dimensional and can be represented in the cyberspace of a virtual mind. The visualisation of the structures of legal expertise can be used without computer aids to develop more systematic methods in legal practice - ones that can bring under control the vastness and complexity of legal information. With

the interactive visualisation of 3D legal expert systems, the legal universe can be charted and travelled interactively. Lawyers may yet be the space travellers of the metaphysical legal universe - a training ground for the language and culture of real space travel.

CONTRACT FOR THE INTERNATIONAL SALE OF GOODS CONVENTION

Article 14

(1)   A proposal for concluding a contract addressed to one more specific persons constitutes an offer if it is sufficiently definite and indicates the intention of the offeror to be bond in case of acceptance. A proposal is sufficiently definite if it indicates the goods and expressly or implicitly fixes or makes provisions for determining the quantity and the price.

(2)   A proposal other than the one addressed to one or more specific persons is to be considered merely as an invitation to make offers, unless the contrary is clearly indicated by the person making the proposal.

Article 15

(1)   An offer becomes effective when it reaches the offeree.

(2)   An offer, even if it is irrevocable, may be withdrawn if the withdrawal reaches the offeree before or at the same time as the offer.

Article 16

(1)   Until a contract is concluded an offer may be revoked if the revocation reaches the offeree before he has dispatched an acceptance.

(2)   However, an offer cannot be revoked :

  (a) if it indicates, whether by stating a fixed time for acceptance or otherwise, that it is irrevocable; or

  b) if it was reasonable for the offeree to reply on the offer as being irrevocable and the offeree has acted in reliance on the offer.

Article 17

An offer, even if it is irrevocable, is terminated when a rejection reached the offeror.

Article 18

(1)   A statement made by or other conduct of the offeree indicating assent to an offer is an acceptance. Silence or inactivity does not in itself amount to acceptance.

(2)   An acceptance of an offer becomes effective at the moment the indication of assent reaches the offeror. An acceptance is not effective if the indication of assent does not reach the offeror within the time he has fixed or, if no time is fixed, within a reasonable time, due account being taken for circumstances of the transaction, including the rapidity of the means of communication employed by the offeror. An oral offer must be accepted immediately unless the circumstances indicate otherwise.

(3)   However, if, by virtue of the offer or as a result of practices which the parties have established between themselves or of usage, the offeree may indicate assent by performing an act, such as one relating to the dispatch of the goods or payment of the price, without notice to the offeror, the acceptance is effective at the moment the act is performed, provided that the act is performed within the period of time laid down in the preceding paragraph.

Article 19

(1) A reply to an offer which purports to be an acceptance but contain additions, limitations or other modifications is a rejection of the offer and constitutes a counter-offer.

(2)   However, a reply to an offer which purports to be an acceptance but contains additional or different terms which do not materially alter the terms of the offer constitutes an acceptance, unless the offeror, without undue delay , objects orally to the discrepancy or dispatches a notice to that effect. If he does not so object, the terms of the contract are the terms of the offer with the modifications contained in the acceptance.

(3)   Additional or different terms relating, among other things, to the price, payment, quality and quantity of the goods, place and time of delivery, extent of one party's liability to the other or the settlement of disputes are considered to alter the terms of the offer materially.

Article 20

(1)   A period of time for acceptance fixed by the offeror in a telegram or a letter begins to run from the moment the telegram is handed in for dispatch or from the date shown on the letter or, if no such date is show, from the date shown on the envelope. A period of time for acceptance fixed by the offeror by telephone, telex or other means of instantaneous communication, begins to run from the moment that the offer reaches the offeree.

(2)   Official holidays or non-business days occurring during the period for acceptance are included in calculating the period. However, if a notice of acceptance cannot be delivered at the address of the offeror on the last day of the period because that day falls on an official holiday or a non-business day at the place of business of the offeror, the period is extended until the first business day which follows.

Article 21

(1) A late acceptance is nevertheless effective as an acceptance if without delay the offeror orally so informs the offeree or dispatches a notice to that effect.

(2) If a letter or other writing containing a late acceptance shows that it has been sent in such circumstances that if its transmission had been normal it would have reached the offeror in due time, the late acceptance is effective as an acceptance unless, without delay, the offeror orally informs the offeree that he considers his offer as having lapsed or dispatches a notice to that effect.

Article 22

An acceptance may be withdrawn if the withdrawal reaches the offeror before or at the same time as the acceptance would have become effective.

Article 23

A contract is concluded at the moment when acceptance of an offer becomes effective in accordance with the provisions of this Convention.

Article 24

For the purposes of this part of the Convention, an offer, declaration of acceptance or any other indication of intention "reaches" the addressee when it is made orally to him or delivered by any other means to him personally, to his place of business or mailing address or, if he does not have a place of business or mailing address, to his habitual

SG - PART II

preliminary=introwormhole + text 'Welcome to the LILI (Legal Intelligence Language Interpreter) system which advises on the United Nations Convention on Contracts for the International Sale of Goods (known as the Vienna Convention).

SYSTEM GOALS It is assumed that you are investigating a real or

hypothetical transaction in order to determine whether or not:

(1) there is a contract for the international sale of goods and/or

(2) parties to the transaction have rights, obligations or remedies under the United Nations Convention on Contracts for the International Sale of Goods.

SYSTEM MEANS The system will lead you through a series of questions in order to take your instructions on your case. Generally, three alternative answers to each question will be put to you in a constant order:

(1) generally, the first answer will support a negative result - there is no contract, no rights, no obligations and no remedies.

(2) generally, the second (middle) answer will support the positive result - there is a contract, right(s), obligation(s) and remedies.

(3) generally, the third answer will draw on the system's resources to resolve uncertainties in your case.

You will be advised of any exceptions to this order.

USER GOALS AND MEANS The standard pattern of answers is designed to assist you to select your personal goals and understand the significance of each of your answers accordingly. Your personal goals may be a negative result or a positive result, and in addition, theresolution of uncertainties.'

CISG - PART II

preliminary=introwormhole + text 'Welcome to the LILI (Legal Intelligence Language Interpreter) system which advises on the United Nations Convention on Contracts for the International Sale of Goods (known as the Vienna Convention).

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[Note: Source code describing legal reasoning included following]

BIBLIOGRAPHY

Gray, P.N., *Artificial Legal Intelligence*, Dartmouth, Aldershot, 1997

Leibniz, G.W., *Monadology*, Routledge, London, 1714

Russell, B., *History of Western Philosophy*, George Allen & Unwin, London, 1961

River	Question	Triad	Authority
zlevel_1_helix_1_'Concluded CONTRACT' has			
[start='PERSONS'	Are there at least two persons who are parties to the transaction ?	jpos=yes	Article: 14 (1) and (2)
,path=['Effective OFFER',	Is there an effective offer in law ? Advice: If you select uncertain as your answer, you will be led through a series of questions which will establish whether or not there is an effective offer in your case.	jpos=yes	Article: 14 (1), 15 (1)
'Effective ACCEPTANCE']	Is there an effective acceptance in law ? Advice: If you select uncertain as your answer, you will be led through a series of questions which will establish whether or not there is an effective acceptance in your case.	jpos=yes	Article: 23
,stop='Concluded CONTRACT'.	Is there a concluded contract in law ?	jpos=yes	Article: 23

Advice:
If you select uncertain as your answer, you will be led through a series of questions which will establish whether or not there is a concluded contract in your case.

zlevel_1_helix_2_'PERSONS' has

[start='OFFEROR(S)'

Is there at least one offeror ?

jpos=yes

Article: 14 (1), 15 (1)

,path=['OFFEREE(S)']

Is there at least one offeree ?

jpos=yes

Article: 14 (1), 15 (1)

,stop='PERSONS'].

Article: 14 (1), 15 (1)

zlevel_1_doublehelix_3_ 'OFFEROR(S)' has
% 2 fans_mutex

Hypothetical - possible cases.

[fan=1
,start='ONE offeror']

Is there one offeror only ?

jpos=yes

[fan=2
,start='MORE THAN ONE offeror']

Is there more than one offeror ?

jpos=yes

Advice:
(1) If there is more than one offeror, you will need to process the case for each offeror separately.
(2) If the case for each offeror is identical, then the processing of one offeror's case will apply to all offerors.

,stop='OFFEROR(S)'].

zlevel_1_doublehelix_3_'OFFEREE(S)' has
% 2 fans_mutex

[fan=1
,start='ONE offeree']

Is there one offeree only ?   jpos=yes   Article: 14 (1) and (2)

[fan=2
,start='MORE THAN ONE offeree']

Is there more than one offeree ?   jpos=yes   Article: 14 (1) and (2)

Advice:
For all offerees who are concerned in the
transaction:
(1) If there is more than one offeree,
    you will need to process the case for
    each offeree separately.
(2) If the case for each offeree is identical,
    then the processing of one offeree's
    case will apply to all offerees.
(3) If there is more than one offeror, then
    the processing required is for each
    offeree in relation to each offeror
    separately.
(4) Where there are identical cases for a
    group of offerors and/or a group of
    offerees, processing for one of the
    group applies to all in the group.

,stop='=OFFEREE(S)'].   Article: 14 (1) and (2)

zlevel_1_helix_2_'Effective OFFER' has

|start='PROPOSAL by offeror(s)'

Is there a proposal by the offeror for concluding a contract ?

jpos=yes

Article: 14 (1)

,path=['ADDRESSED to offeree(s)',

Is the proposal addressed to the offeree (s) ?

Advice:
If the proposal is addressed to more than one offeree then one, some or all of these offerees may respond to it.

jpos=yes

Article: 14 (1)

'sufficiently DEFINITE',

Is the proposal sufficiently definite ?

Advice:
If you select uncertain as your answer, you will be led through a series of questions which will establish whether or not the proposal is sufficiently definite.

jpos=yes

Article: 14 (1)

'INTENTION to be bound',

Does the proposal indicate that the offeror intends to be bound by it on its acceptance ?

jpos=yes

Article: 14 (1)

%INTERIM REPORT ON WHETHER OR NOT THERE IS AN OFFER IN LAW

% Wormhole needed here to explain change of time and change of term from proposal to offer - therefore: proposal_offer=wormhole +

not jpos - text: 'Advice: The proposal for concluding a contract is not an offer in law. Do you wish to continue your instructions as if there was an offer in law ?'

or jpos - text: 'Advice: The proposal for concluding a contract is an offer in law. Further questioning will establish if the offer is effective and open for acceptance.'

%zlevel_1_helix_2_'Effective OFFER' has - path cont.

'REACHES offeree(s)',

Has the offer reached the offeree ?

If you select uncertain as your answer, you will be led through a series of questions which will establish whether or not the offer has reached the offeree.

jpos=yes   Article: 15 (1), 24

'OPEN']

Was the offer open at the time of acceptance?

Advice:
If you select uncertain as your answer, you will be led through a series of questions which will establish whether or not the offer was open at the time of acceptance. All of these questions require an answer by reference to the circumstances at the time of the actual or hypothetical acceptance in your case.

jpos-yes

Article:
15 (1) and (2),
16 (1) and (2),
17, 18 (2) and (3),
19 (1), (2), and (3),
20 (1) and (2),
21 (1) and (2)

,stop='Effective OFFER'].

zlevel_1_doublehelix_3_'PROPOSAL by offeror(s)' has
% 2 fans_mutex

[fan=1
,start='ONE proposal']

jpos-yes

Was there only one proposal for concluding a contract ?

[fan=2
,start='SERIES of proposals]

jpos-yes

Was there a series of proposals for concluding a contract ?

,stop='PROPOSAL by offeror(s)'].

series=zoomhole+

text='Advice: If there is a series of negotiations between the parties, a final offer may be preceded by any number of any of the following:

. invitation to make an offer
. initial offer
. counter offer
. enquiry to clarify an offer
. clarification of an offer'

zlevel_2_helix_4_'SERIES of proposals' has

Article: 14-21

Hypothetical - possible cases

Hypothetical - possible cases

,start='NEGOTIATIONS'   Were there negotiations ?   jpos=yes

,path=['FINAL OFFER']   Was there a final offer ?   jpos=yes

,stop='SERIES of proposals'].
zlevel_2_doublehelix_5_'NEGOTIATIONS' has
% 5 fans_any_at least one   Article: 14 (2)

[fan=1
,start='INVITATION(S) to make   Was there any invitation to make an   neutral
offers']   offer ?   negRep=yes

                                 Advice:
                                 Please provide details.   incl. in negRep

                                 Date(s):
                                 Invitor(s):
                                 Terms Invited (if any):

% Inter-triad link from 'INVITATIONS to make offers' to below 'ADDRESSED to offeree(s)' fan 3.

[fan=2
,start='INITIAL OFFER']   Was there an initial offer ?   neutral
                                                                        negRep=yes   Hypothetical - possible
                                                                                           cases

                                 Advice:
                                 Please provide details.   incl. in negRep

                                 Date(s):
                                 Invitor(s):

Terms Invited (if any):

[fan=3
,start='COUNTER-OFFER(S)']

Was there any counter-offer ?

neutral
negRep=yes

Advice:
Please provide details.

incl. in negRep

Hypothetical - possible
cases

Date(s):
Invitor(s):
Terms Invited (if any):

[fan=4
,start='ENQUIRY']

Was there any enquiry to clarify the
offer ?

neutral
negRep=yes

Advice:
Please provide details.

incl. in negRep

Hypothetical - possible
cases

Date(s):
Invitor(s):
Terms Invited (if any):

[fan=5
,start='CLARIFICATION']

Was there any clarification of the offer
in response to an enquiry ?

neutral
negRep=yes

Advice:
Please provide details.

incl. in negRep

Hypothetical - possible
cases

Hypothetical - possible cases

Date(s):
Invitor(s):
Terms Invited (if any):

,stop='NEGOTIATONS'].

zlevel_1_doublehelix_3_ 'ADDRESSED to offeree(s)' has
% 3 fans_mutex

[fan=1
,start='SPECIFIC person']

Was the offer addressed to a specific person ?   jpos=yes   Article: 14

[fan=2
,start='SPECIFIC PERSONS']

Was the offer addressed to specific persons ?   jpos=yes   Article: 14

[fan=3
,start='NON-SPECIFIC persons'

Was the offer addressed to non-specific persons ?   jpos=no jpos=yes   Article: 14

% system condition: only if jpos=yes take path

,path=[[INTENDED as an offer]

Was the offer to non-specific persons intended as an offer to them ?   jpos=yes   Article: 14

% report condition: if 'INTENDED as an offer'=jneg: report 'non-specific persons' as jneg.

,stop='ADDRESSED to offeree(s)'].

% invitation to treat=wormhole+

text = 'Advice:

A proposal for concluding a contract which is addressed to non-specific persons is *prima facie* an invitation to make an offer unless it can be shown that the proposer intended that it be an offer: Article 14(2).

WARNING - HYBRIDS: The Convention does not clearly state that a proposal which is made to specific and non-specific persons is *prima facie* an invitation to make an offer. In this hybrid case, all the circumstances should be considered in order to discover the intention of the offeror, which will be one of the following:

There is an offer to all the specfic and non-specific offerees.
There is an invitation to make an offer to all the specific and non-specific invitees.
There is an offer to specific offerees and an invitation to make offers to non-specific invitees.
(rare) There is an invitation to make offers to the specific invitees and an offer to the non-specific offerees.

If your case is a hybrid please select one of the four alternatives - the one which represents your situation.'

% Inter-triad link from 'INVITATIONS to make offers' above to 'ADDRESSED to offeree(s)' fan 3.

% Do Syllogistic Truth Test to match selection of input for 'INVITATIONS to make offers' above and 'ADDRESSED to offeree(s)' fan 3.

zlevel_1_helix_3_'sufficiently DEFINITE' has

[start='INDICATES GOODS'   Does the offer sufficiently indicate the   Article: 14 (1)
                             goods ?   jpos=yes

,path=['QUANTITY of goods',   Does the offer provide for the quantity   Article: 14 (1)
                             of the goods ?   jpos=yes

'PRICE of goods',   Does the offer provide for the price of   Article: 14 (1)
                             the goods ?   jpos=yes

'STATED - quantity',   Empty - points to fan   Article: 11 (1)

'STATED - price',   Empty - points to fan   Article: 14 (1)

'DETERMINED - quantity',   Empty - points to fan   Article: 14 (1)

'DETERMINED - price']   Empty - points to fan   Article: 14 (1)

,stop=sufficiently DEFINITE'].   Article: 14 (1)

```
zlevel_2_doublehelix_4_'STATED - quantity' has
% 2 fans_mutex
  [fan=1
  ,start='EXPRESS - quantity']
```
Does the offer expressly provide for the quantity of the goods ?   jpos=yes   Article: 14 (1)

```
  [fan=2
  ,start='IMPLICIT - quantity']
```
Does the offer implicitly provide for the quantity of the goods ?   jpos=yes   Article: 14 (1)

```
  ,stop='STATED - quantity'].
```
Article: 14 (1)

```
zlevel_2_doublehelix_4_'DETERMINED - quantity' has
% 2 fans_mutex
  [fan=1
  ,start='FIX - quantity']
```
Does the provision for quantity of the goods fix the quantity?   jpos=yes   Article: 14 (1)

```
  [fan=2
```

,start='PROVISION for - quantity']

Is the provision for quantity of the goods a provision for determining quantity?

Article: 14 (1)

,stop='DETERMINED - quantity'].
zlevel_2_doublehelix_4_'STATED - price' has
% 2 fans_mutex

jpos=yes

Article: 14 (1)

[fan=1
,start='EXPRESS - price']

Does the offer expressly provide for the price of the goods?

jpos=yes

Article: 14 (1)

[fan=2
,start='IMPLICIT - price']

Does the offer implicitly provide for the price of the goods?

jpos=yes

Article: 14 (1)

,stop='STATED - price'].
zlevel_2_doublehelix_4_'DETERMINED - price' has
% 2 fans_mutex

Article: 14 (1)

[fan=1
,start='FIX - price']

Does the provision for price of the goods fix the price?

jpos=yes

Article: 14 (1)

[fan=2
,start='PROVISION for - price']

Is the provision for price of the goods a provision for determining price?

jpos=yes

Article: 14 (1)

,stop='DETERMINED - price'].

Article: 14 (1)

A SIMPLE TREE

Root Node

Leaf Nodes
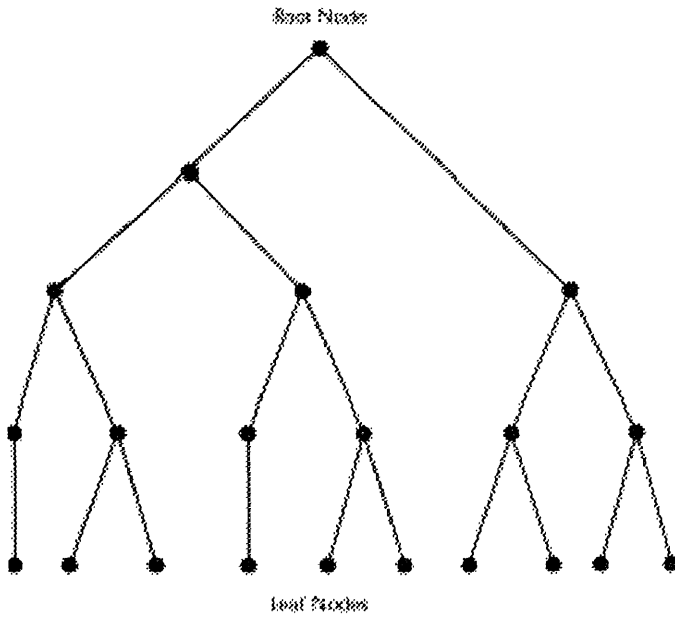
THE WORLD OF RIVERS PARADIGM
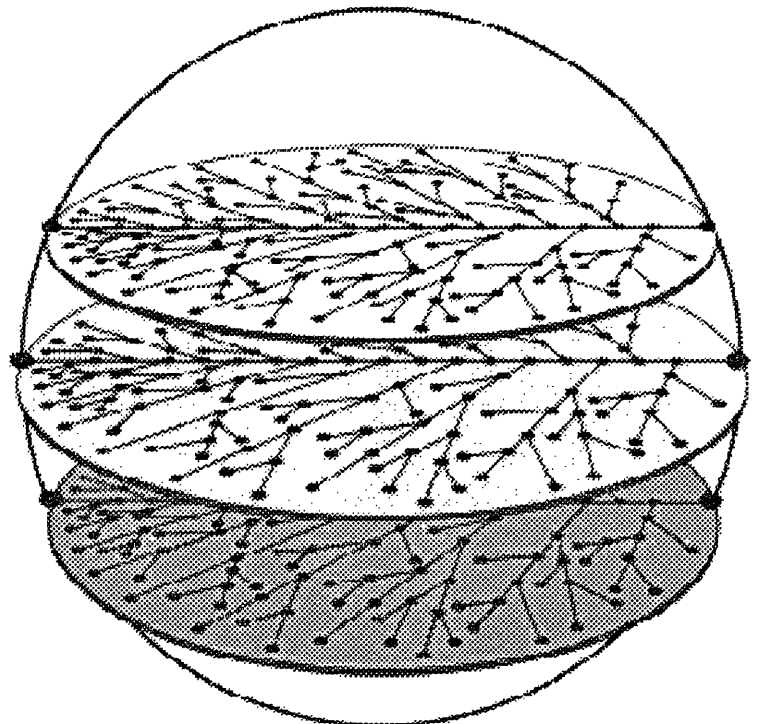
A FAN OF RIVERS
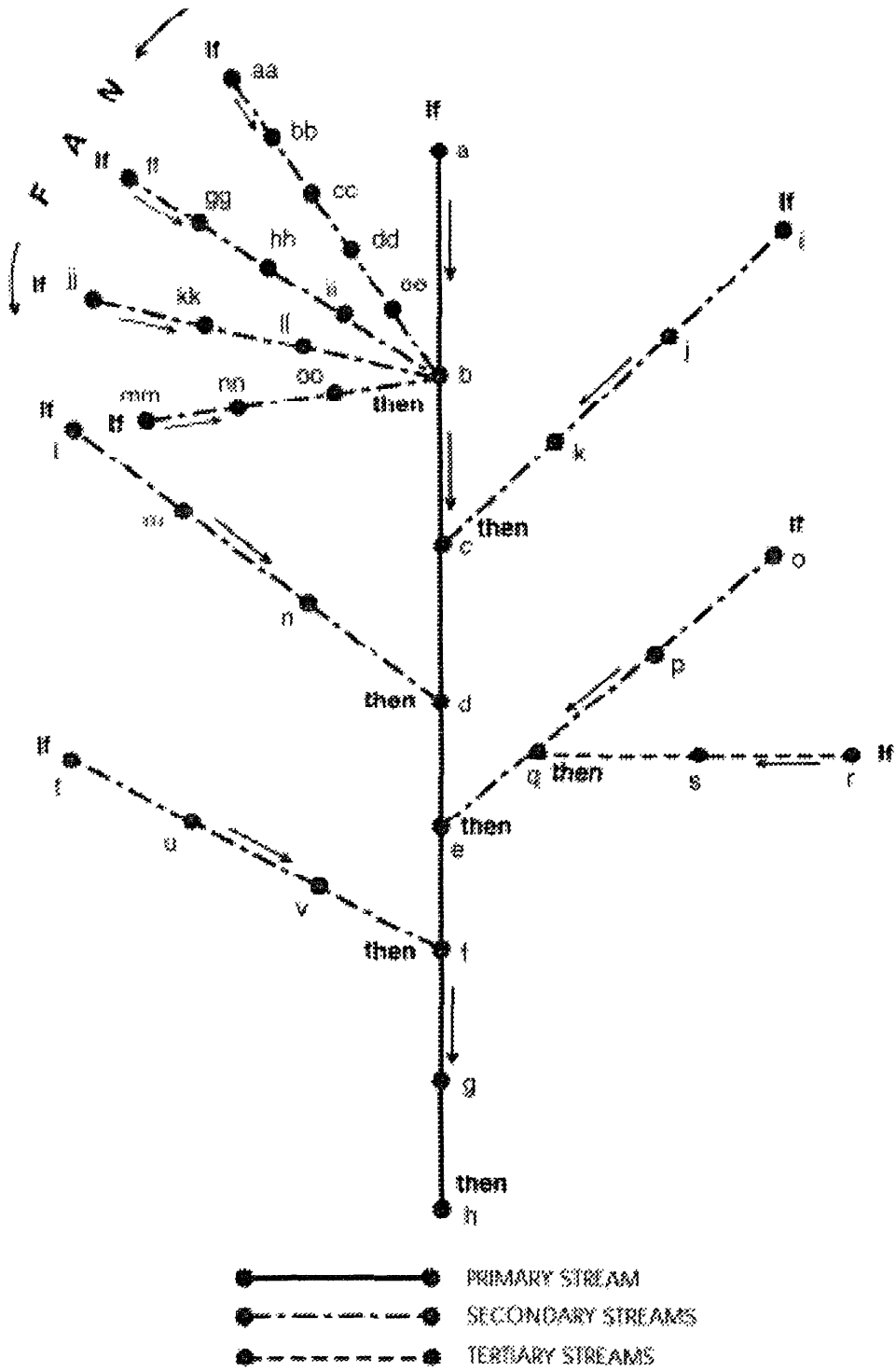
A COMPLEX RIVER SYSTEM OF RULES

PRIMARY STREAM
SECONDARY STREAMS
TERTIARY STREAMS
QUATERNARY STREAMS
QUINARY STREAMS
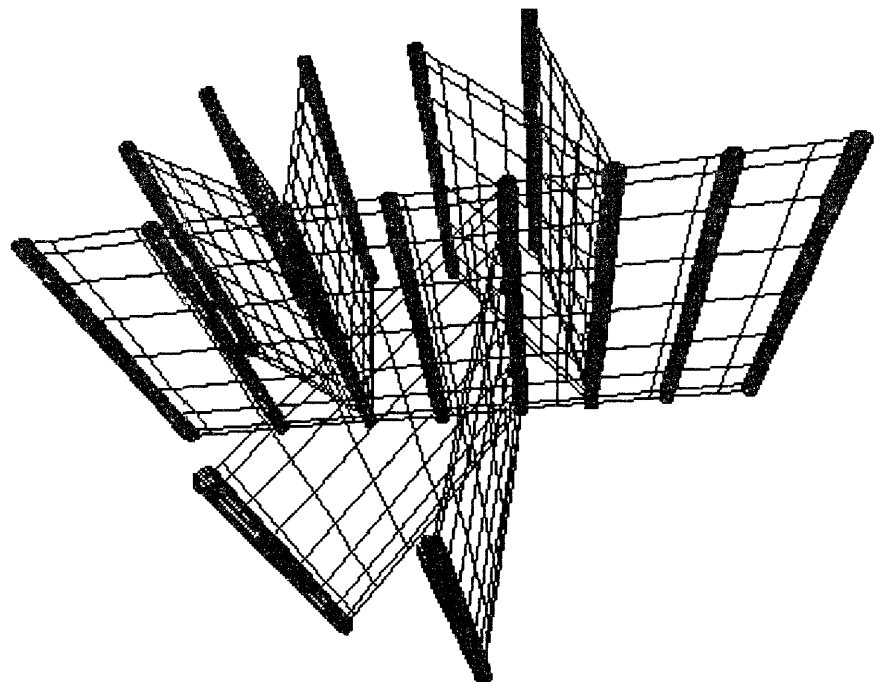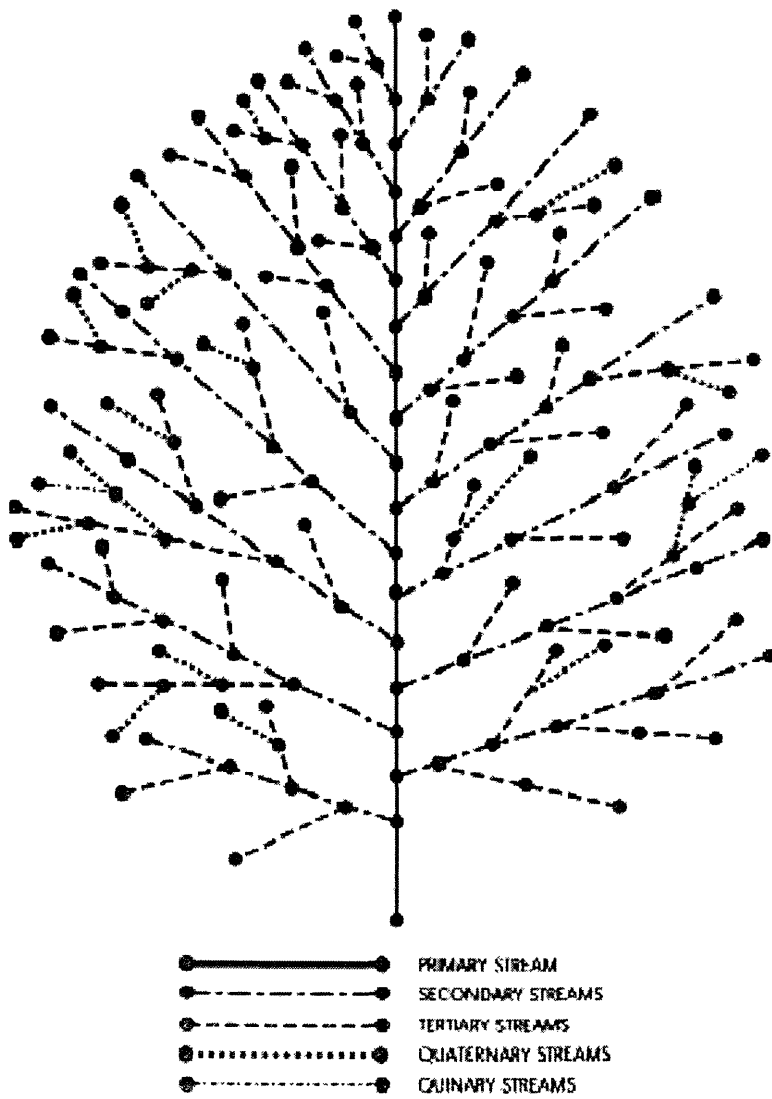
A JURISPRUDENTIAL FISHBONE
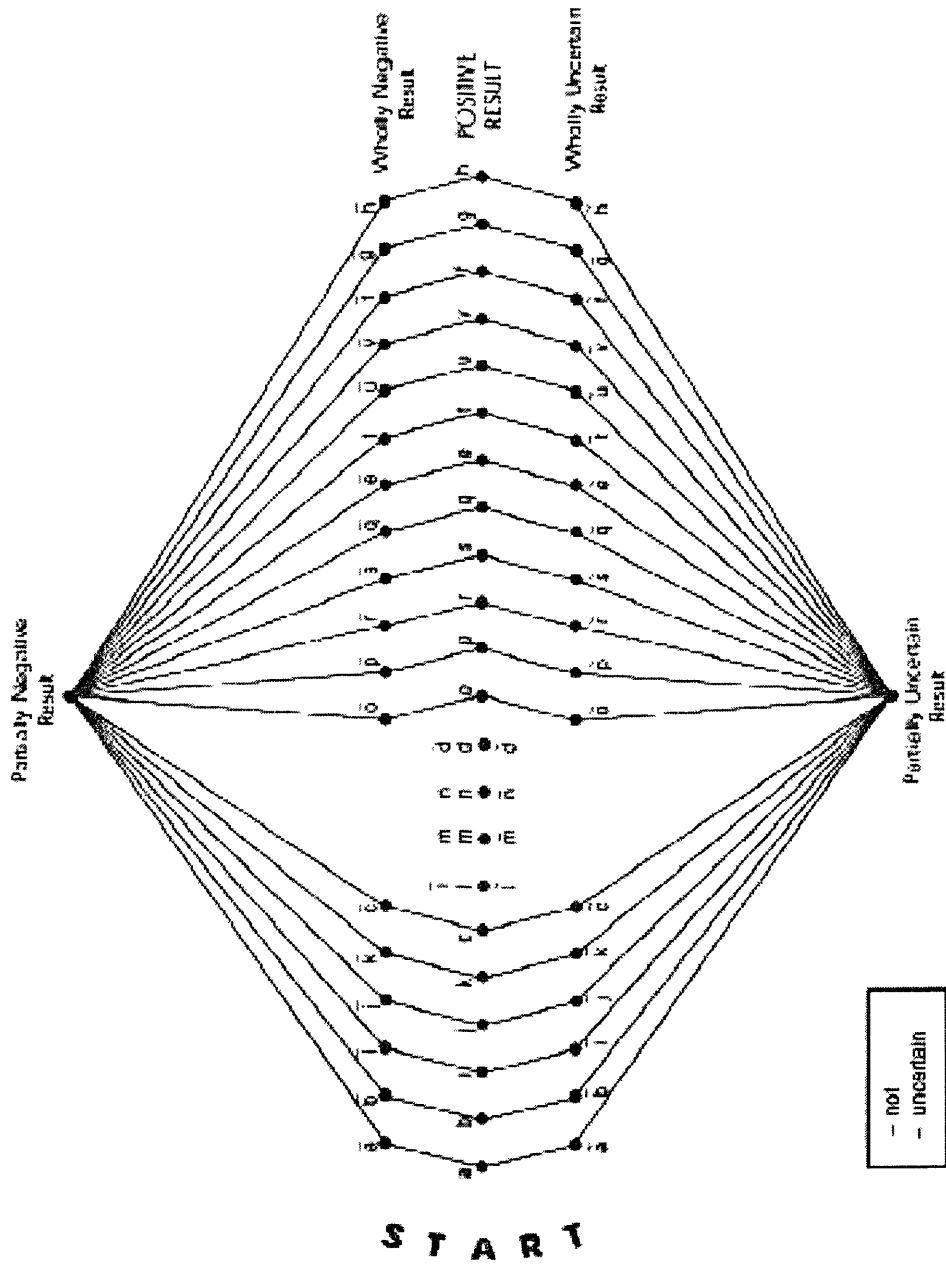
TRIAD STREAMS
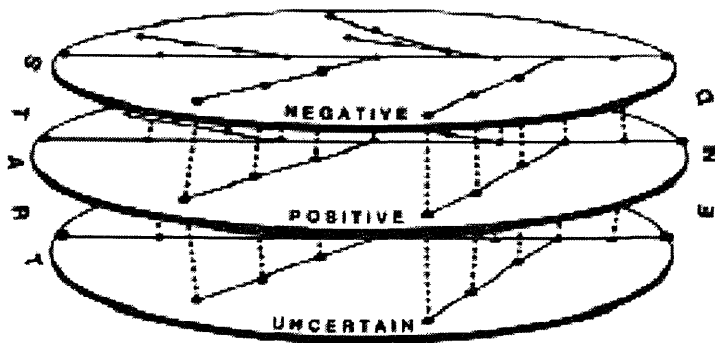
●··············● TRIAD STREAMS
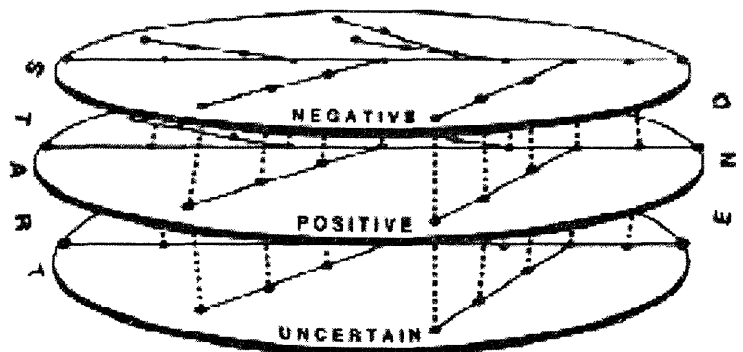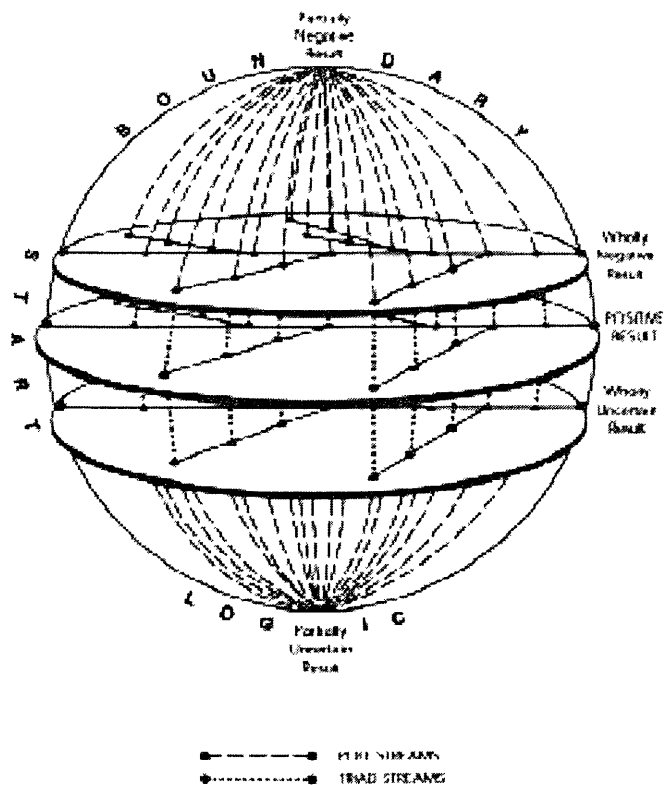
TRIAD STREAMS

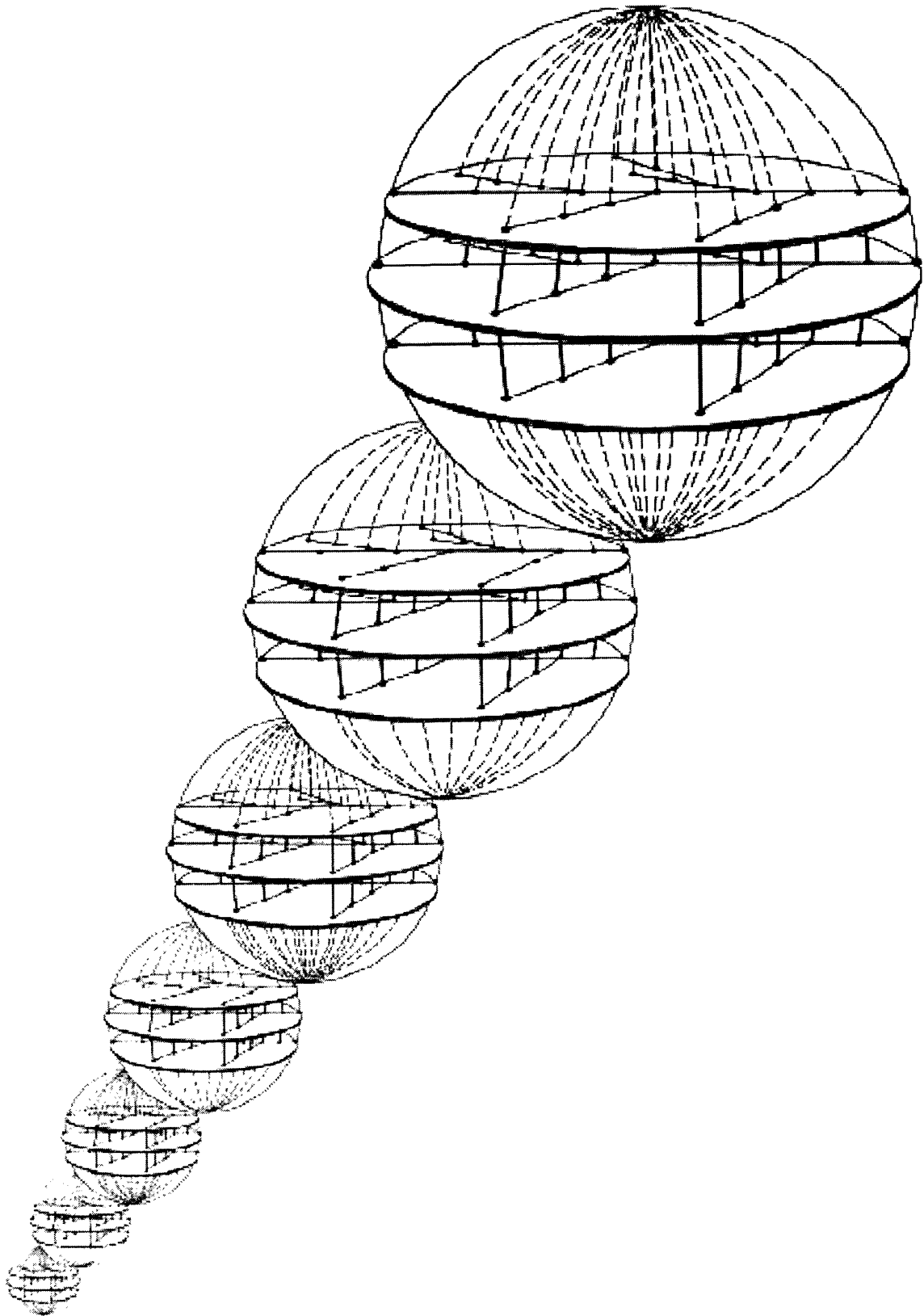**●···········● TRIAD STREAMS**

A STAR OF LEGAL KNOWLEDGE
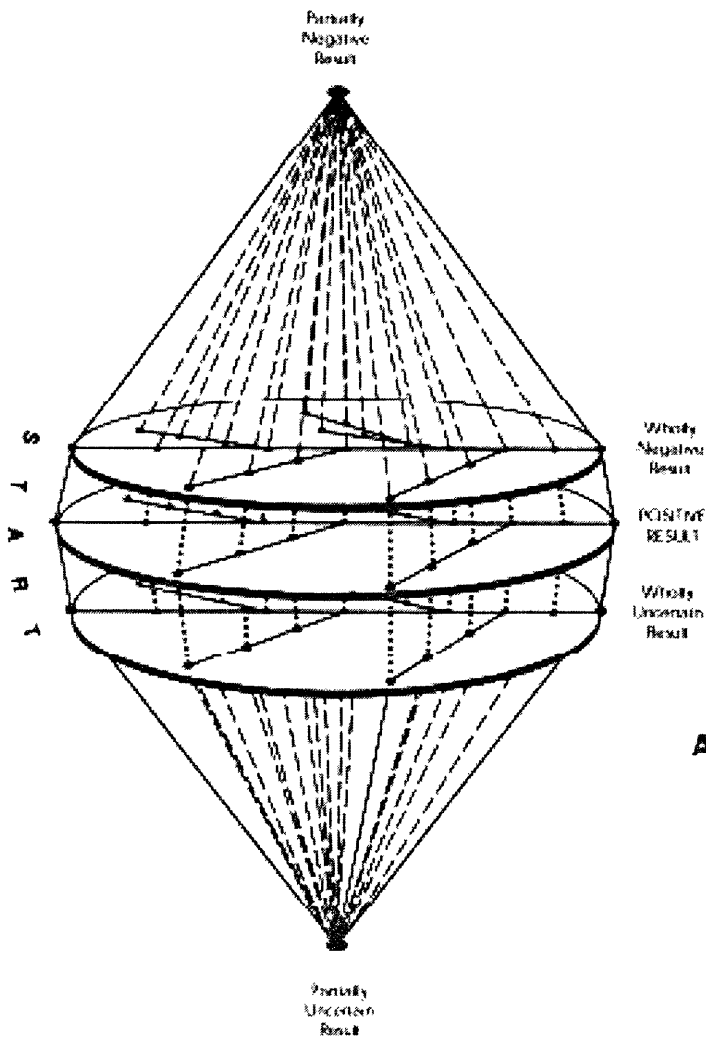
A SPHERE OF LEGAL KNOWLEDGE

LEGAL UNIVERSE

RIVER LOGIC: A SYSTEM OF RULES

PRIMARY STREAM
SECONDARY STREAMS
TERTIARY STREAMS