An explicit representation of judicial reasoning to enhance transparency and consistency without sacrificing discretion

Dr Andrew Stranieri

Graduate School of Information Technology and Mathematical Sciences
Centre for Informatics and Applied Optimisation
University of Ballarat
Ballarat, Australia
a.stranieri@ballarat.edu.au

Abstract

A judicial reasoning model is an explicit representation of reasoning that encapsulates all relevant claims, evidence, statutes and principles pertinent to a field of law so that any judgment can be instantiated in the model. Schemas that have been used to provide explicit representations of reasoning include the Issue Based Information System (IBIS) map, variants of the Toulmin argument structure (TAS) and other knowledge representation schemes used for intelligent computational systems. This paper advances the notion that a Court that makes its current judicial reasoning explicit in an abstract model, can provide greater transparency and clarity about its reasoning than is currently the case, where current judicial reasoning is expressed implicitly, within the narrative of judgments. The clarity and transparency comes without the need to reduce complex reasoning to rigid guidelines devoid of discretion. Further, as the abstract model represents a coalescing of sometimes divergent judicial views, its elicitation and maintenance requires deliberation amongst judges toward explicit agreement regarding the importance of factors, their inter-relationships and the scope of discretion. The case for an explicit representation of judicial reasoning within the jurisdiction of a Court, is made with examples of reasoning models in family law and refugee law over a fifteen year period. Benefits of this approach for the integration of information technology into the legal process in ways that enhance justice are described.

1. Introduction

Although individuals have been engaged in reasoning for many hundreds of thousands of years, endeavors to represent any aspect of the reasoning permanently, outside the mind of the reasoner, is a relatively recent phenomena. Schmandt-Besserat (1996) suggests that writing was invented in Mesopotamia in the fourth millennium BCE in order to create records that enabled taxation officers to deal with arguments that were too complex for verbal recollections. Writing was a significant advance over verbal processing because it brought reliable memory and permitted greater examination and rigor to be applied to the reasoning. The marks and strokes of the tax collectors eventually evolved into alphabets and grammars so that reasoning was depicted by syntactically valid sentences in a natural language.

Many centuries after the advent of natural language, Aristotle (2006) advanced the classical syllogism to represent reasoning in a more systematic manner than language permitted by combining a major premise (e.g All men are mortal) and a minor premise (e.g Socrates is a

man) with an inference rule (e.g modus ponens) to represent the inference of new knowledge (e.g Socrates is mortal). In the ensuing two and half thousand years many systems of formal logic have advanced on the classical syllogism however, only in recent decades, with the emergence of computational intelligence could schemes for representing reasoning be implemented and their utility practically assessed. The computer language Prolog, for instance, is an implementation of first order predicate logic. (Sergot et al 1986) were the first to use Prolog for legal reasoning with their representation of reasoning involved in the determination of British nationality.

The representation of law using logic promised much. Allen and Saxon(1995) represented statutes using a logic based formalism to illustrate that many statutes were logically inconsistent and that the formalism suggested ways to restructure the statute to remove ambiguities. In Australia, government reports including the Administrative Review Council's report on automated decision making tools (Commonwealth of Australia 2004) advocated greater use of automated tools based on logic or a related formalism, production rules, to increase the number of decisions made, to increase transparency of process and to increase consistency of decisions reached.

Zeleznikow and Hunter (1994) present many limitations of first order predicate logic for representing legal reasoning in practice. It is too rigid, insists on universally true premises, does not handle discretion or teleological reasoning and is jurisprudentially questionable. These limitations present significant obstacles for the application of automated decision support systems for any decision maker in the legal context. Other obstacles to the adoption of automated systems including the development expense, cultural change necessary within the legal profession and difficulties inherent in maintaining the systems further limit their applicability.

All automated decision support systems ultimately aim to model reasoning so that, like Aristotle's syllogism, new conclusions can be inferred from old by computer. While, the search for a computationally feasible representation of reasoning that avoids the limitations of first order logic continues in earnest, legal reasoning in practice continues to be expressed by decision makers as it has been for many thousands of years; with the use of natural language. The key contention advanced here is that a representation of legal reasoning that is not necessarily intended nor sufficient for automated inference, can be adopted to represent legal reasoning and lead to greater transparency and clarity. Factors considered relevant and their interrelationships can be articulated in a manner that is readily grasped by others, litigation that turns on contrasting interpretations of precedents can conceivably be reduced and the exercise of discretion more clearly demarcated.

Further, the reasoning sanctioned in a practice area such as family law property proceedings can be expressed in a sufficiently generic and structured manner so as to act as a template of reasoning for all lawyers, registrars and first instance decision makers to guide their reasoning. The representation needs to be sufficiently abstract to allow all and contrasting arguments, yet clearly identify relevant factors and their interrelationships. In this article, a representation called an Argument tree that is sufficiently general for the representation of legal reasoning, is described. An explicit representation of reasoning to a decision in a practice area can conceivably be sanctioned by an appropriate Court for use by practitioners.

Ultimately, such a representation could enable computational systems to better automated support systems but this is not the primary goal. The primary aim is to increase transparency and consistency without sacrificing discretion. However, concepts of consistency and discretion are complex and a discussion regarding their definition is presented in the next section to contextualise the primary aim. Following that, the argument tree representation is described mainly with examples from family law.

2. Consistency

The need to ensure that decisions are made consistently is inherent in stare decisis, a fundamental principle in common law legal systems. The principle dictates that the reasoning used in new cases must follow the reasoning used by decision-makers in courts at the same or higher level in the hierarchy. Wassestrom (1961) and Lawler (1964) identified three types of stare decisis; traditional, local and personal:

- *Traditional stare decisis.* Under this type of stare decisis, the same, equivalent or more favorable fact pattern presented to the same or higher court will result in the same outcome;

- *Local stare decisis.* This represents the tendency of a group of judges that make up a current court to follow its own decisions. Under local stare decisis, the same, equivalent or more favorable fact pattern presented to the same court will result in the same outcome and;

- *Personal stare decisis.* This is used to describe the observation that most judges attempt to be consistent with their previous decisions. Under personal stare decisis, the same fact pattern presented to the same judge will result in the same outcome.

The objective of consistent judicial decision making can be seen to manifest as the performance of adequate traditional, local and personal stare decisis. However, an assessment of the extent to which each category of stare decisis is evident is difficult to realise when the reasoning is expressed solely with the use of natural language in a judgement. First of all, although judgements are stored digitally, the retrieval of a case that has a similar fact pattern to a current case is difficult. Search engines are designed to perform keyword matches on words in judgements so cannot readily be deployed to retrieve similar fact patterns because natural language permits such a wide variation in their expression. More sophisticated engines such as those based on case based reasoning exemplified by Hypo Ashley (1991) have proven difficult to implement in real world Courts.

Lawler (1964) points out that predicting the outcome of a case cannot be possible without the concept of stare decisis. Furthermore, the ability to predict an outcome with some accuracy is important if the law is to be respected within the community. Though Kovacs (1992) claimed that stare decisis in family law in Australia had broken down, by and large, practitioners experienced with the way in which the Court and individual judges exercise discretion can predict outcomes in property proceedings with a reasonable degree of accuracy. This apparent contradiction is resolved if we assume Kovacs (1992) reference to stare decisis be to traditional stare decisis. That commonplace case outcomes can be

predicted relatively easily by experienced practitioners suggests that local and personal stare decisis operates with some vigour in the Family Court.

Community perceptions of inconsistency in judicial decision making in sentencing have triggered calls for the introduction of guidelines that aim to diminish discretion and, according to Freiberg (1995) dominated sentencing discourse. Sentencing regimes in a number of jurisdictions in the United States and Australia are met with resistance from judges who often feel compelled to arrive at a less than optimal, if not unjust outcomes by rigidly following guidelines.

The assertion raised here is that the perception of inconsistency can be seen to be partially due to the sole use of natural language, in oral form for lower courts, or written form in higher courts, to represent judicial reasoning. However, the identification of a representation of reasoning more adept than natural language at enabling the reasoning toward a case outcome to be more transparent and the loci of discretion explicit, is far from straight forward. Logic formalisms typically deployed for representing reasoning are too rigid. Sets of rules are conceptually equivalent to logic clauses and are equally rigid. Matrix formulas are arithmetic approximations of reasoning that are equally rigid. Diagrammatic schemes for representing knowledge such as semantic networks, concept maps, topic maps are too unstructured.

In the next section, a representation called an Argument Tree is presented that derives from the Generic Actual Argument Model (GAAM) advanced by (Yearwood and Stranieri 2006). An Argument Tree has been deployed to model judicial reasoning in a number of practice areas for the development decision support systems in law including; Split Up, predicting the percentage split of assets a Family Court judge awards divorcees (Stranieri *et al* 1999), Embrace, integrating an information retrieval engine for claims for refugee status (Yearwood and Stranieri 1999), GetAid, determining eligibility for legal aid in Victoria (Stranieri et al 2001), witness selection in Scotland (Bromby and Hall, 2002), sentencing (Hall et al 2005) the generation of a first draft judgement by (Yearwood et al 1999).

In the subsequent section, the way that discretion is conceptualised within the context of an Argument Tree representation is described before contrasting the approach with two other representations; the Toulmin Argument Structure introduced by Toulmin (1958) and Rittel and Webber's (1973) Issue Based Information System.

3. An argument tree as a representation of legal reasoning

An Argument Tree represents the relevant factors in all possible cases in one diagram. The top of the tree, or ultimate factor represents possible case outcomes as illustrated in Figure 1 where the factor labelled percentage split in Figure 1 has a range of values that represent plausible case outcomes regarding the percentage split of assets between husband and wife following divorce. The 13 point Likert scale values were drawn from the natural language description in case judgements in consultation with practitioners. A Likert scale with more than 13 values was considered unnecessary and less than 13, too coarse-grained.

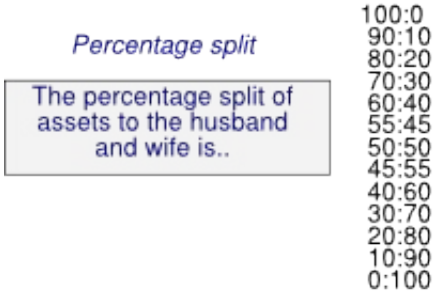

Figure 1 Top of the Split Up argument tree

Figure 2 illustrates that past contributions, the wealth of the marriage and future needs of both parties were considered to be the most immediate factors in judicial reasoning toward a percentage split inference. This was ascertained in consultation with experienced family law practitioners, by reviewing statutes, text books, many unreported cases and leading judgements. Each factor is relevant because a statute such as the Family Law Act 1975 (FLA) has explicitly deemed it relevant, a precedent case has introduced the factor or the factor is relevant due to commonly accepted practice. The statute reference or case citation is included in the diagram.

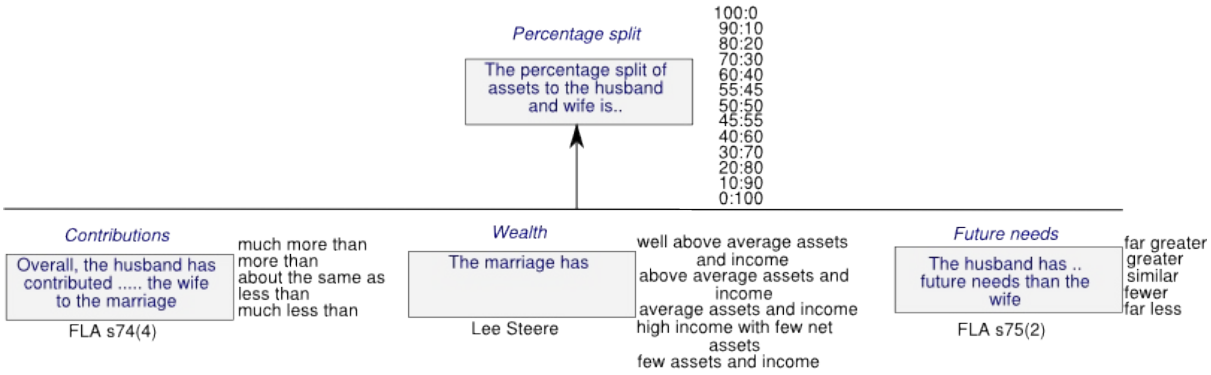

Figure 2 First level of the Split Up argument tree

Each factor represents a linguistic variable; a variable that has values expressed in natural language such as *much more, more, less than.* The values for each relevant factor derive from judgements and consultation with experienced practitioners. For example, Hannon J. in The Marriage of B [1]states: *"I assess their respective contributions as to 60 per cent to the husband and 40 per cent to the wife"*. Natural language phrases such as : *"I assess the contributions to favour the husband to some extent",* or *"I find the wife to have made the greater contribution by far"* exemplify judicial expressions of the contribution factor.

The tree does not represent the inference of a parent node from child nodes. For instance, there is no way of telling the percentage split value for a case where the contributions and needs are equal between the parties and the marriage has typical assets. Attempting to do represent the inference would entail making a commitment to a correct inference and this would act to diminish the discretion judges have, as described in more detail below. Rather, the tree represents the structure of reasoning or the way in which factors inter-relate.

[1] (1995) ML4336

A careful interpretation of a judgement is required when an argument tree is first constructed. For example, an unreported judgement in the Family Court of Australia by Hannon J. in The Marriage of B ML4336 1995 illustrates the way reasoning is expressed with natural language :

".. Both parties are in good health and that is not a relevant consideration. . .."

Clearly, the health of each party is a factor made relevant by the statute and leading cases though Hannon J's natural language statement reflects the notion that good health does not add to a party's future needs. This is accommodated in the argument tree by including health as a relevant factor and assigning it values that include *good health*. In any case where the parties display good health, the inference procedure for inferring an assertion at a higher level in the tree from the lower level is not represented.

Figure 3 illustrates the factors in a second level of the Split Up tree. An overall assessment of contributions is made following an assessment of direct contributions, negative contributions such as gambling or domestic violence, and homemaker contributions. The length of the marriage is also relevant here as there are a precedents toward an equalising of contributions for longer marriages.

Extensive consultation with experienced practitioners is required to appropriately locate a factor in the tree because this is rarely made explicit in a judgement or statute. For example, Section 75(2) presents a list of factors to be taken into account though the list is not explicitly referred to as needs in the future. Further, each party's age and health are listed in Section 75(2) but their relative importance is not mentioned. Perhaps more importantly than their relative importance is whether age impacts on needs by diminishing employment prospects and health, or whether age impacts directly on future needs.

The location of a factor in the tree is often difficult to extract from the text or subtext of a judgement expressed in natural language. For instance, when the initial Split Up argument tree was derived, domestic violence was not considered relevant in property proceedings. Since then the Full Bench of the Family Court has clearly indicated its relevance though there was a great deal of debate and discussion played out in ensuing years through a number of appellate Court cases regarding whether domestic violence was a negative contribution on the part of the perpetrator or increased the future needs of the victim. This corresponds to a debate regarding whether the newly introduced factor was properly located on the contributions branch of the tree or the needs branch.

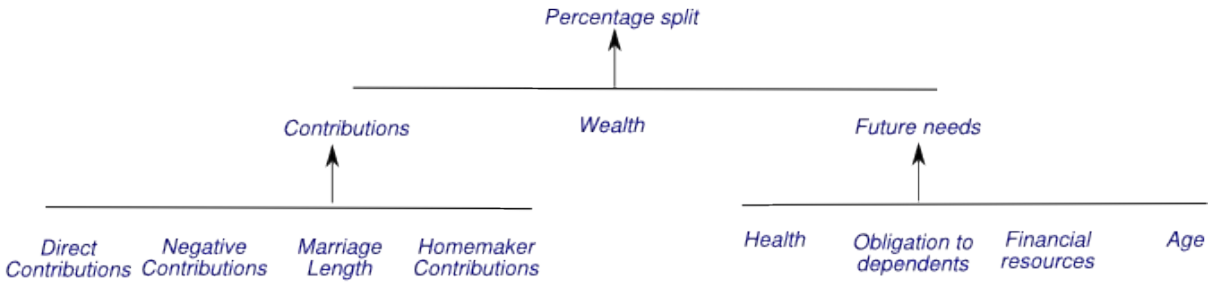

Figure 3 Partial Split Up argument tree

The initial Split Up tree developed comprised 35 factors leading to the percentage split decision. Factors at leaf nodes represent findings of fact and included the husband's age, the wife's age, the value of assets brought into the marriage, the health needs of each dependent and the number of dependants. The tree, as a model of reasoning cannot be the reasoning but must be abstract at some point. Whether a factor is considered to be a leaf node or not is ultimately a modelling decision. For instance, the length of the marriage would seem at first sight to be sufficiently fine grained to be a leaf node requiring a relatively simple finding of fact. However, this is not actually the case. Factors that go to an inference of marriage length that arise so frequently that their inclusion was warranted include the length of prior cohabitation, the duration of the marriage, and periods of separation or absence during the marriage.

Once elicited, an Argument Tree can be used by a judicial decision maker to complement the full judgement expressed in natural language. For instance, a judge may use the tree to indicate that the finding in a case was that the husband contributed *less* than the wife, the marriage was of *average* assets and the wife had *greater* future needs. These assertions led the judge to a judgement of *40:60%* in favour of the wife. Another judge may have a split of *35:65%* on the same findings. An appeal court may consider the difference to be within acceptable bounds of discretion. A third judge on the same case may make a different finding on future needs yet arrive at *40:60%* in favour of the wife.

To sum up, the features of the argument tree that make it an appropriate representation for legal reasoning include the capacity it displays for representing the inter-relationship of key factors in all cases. The representation is sufficiently abstract to represent the loci of discretion without constraining the exercise of discretion yet far more concise a representation of reasoning than a natural language expression in a judgement. The nature of discretion and its relationship to argument tree representation is discussed next.

4. Discretion

Dworkin (1977) identified three basic types of discretion that exemplified different conclusions inferred in different ways: two types of weak discretion and a type he characterized as strong. Strong discretion describes that reasoning that involves the liberty, on the part of the reasoner to incorporate standards of his or her own choosing. Dworkin proposes that this is the nature of the position of the judge in a situation where usual standards or rules do not apply. Weak discretion of type one exists when one’s decision is bound by standards that may inherently have variable interpretations, but nevertheless, those rules apply. The second type of weak discretion exists when a decision is made according to applicable rules and standards but the decision maker's decision stands as final, as in an umpire’s call.

Although McCormack (1981) suggested discretion is more a continuum rather than distinct categories as proposed by Dworkin, the basic tenent still maintained was that discretion involved the liberty to infer conclusions in various ways. Christie (1986) claimed that the exercise of discretion involves power relationships within a political system but shares the view with Bayles (1990) that discretion involves the ability to reason toward one of a number of possible conclusions.

In Stranieri, Yearwood and Meikl (2002), the claim is made that the conceptualisation of discretion is dependent on the form of representation of reasoning. Discretion arises in different ways in a natural language expression of reasoning than it does if an argument tree or logic is deployed. Discretion manifests in the following ways, described in more detail below, if an argument tree representation is used;

- Discretion to add (or remove) data item factors
- The decision maker has discretion to use an inference procedure of his/her own choosing to infer a claim value from data item values
- The decision maker has the discretion to leave data items, reasons for relevance, inference procedure, and reasons for the appropriateness of inference procedures implicit when drafting a judgement in natural language.

Discretion to add (or remove) data item factors.

A trial judge first presented with a new factor must decide whether the factor is irrelevant and if it is relevant, where in the tree it belongs. The liberty a decision maker has to add or remove data items in an argument is not a blanket freedom but is subject to constraints of varying degrees. At one extreme, a decision maker entirely free to add data items of his/her own choosing need not articulate reasons for why the items may be relevant. This equates with Dworkin's strong discretion that describes situations where a decision maker is free to select his own standards. Weaker discretion involves the requirement to associate reasons with the introduction of new factors and to apply principles that act as referents for the discretionary choices.

According to Kovacs (1992), family law in Australia is so discretionary the concept of stare decisis is brought into question. The Family Law Act lists factors which must be considered in resolving property disputes following divorce and, in addition to this, section 79(4)(o) of that Act grants that a judge may take into account:

" any fact or circumstance which, in the opinion of the court, the justice of the case requires to be taken into account"

Dickey (1990) describes an invocation of section 79(4)(o) in The Marriage of Issom 30 F.L.R. 502. In that case the judge considered that the conduct of the wife in leaving her husband and children for a lover in Finland, only to return to Australia to seek orders for spousal maintenance was a relevant factor. The reason stated for the relevance of this conduct was that although misconduct is not normally a relevant consideration, "obvious and gross" examples of misconduct were relevant. Subsequent decisions limited the discretion available to judges under section 79(4)(o) by mandating that only circumstances of a financial nature ought to be considered.

The freedom to add data items varies according to constraints placed on the decision maker. At one extreme, a decision maker is not required to articulate a reason for why a factor used to infer a claim was relevant. At the other extreme, we can imagine a decision maker tightly constrained by statute, precedent cases, prevailing community views or a myriad of other issues.

The decision maker has discretion to use an inference procedure of his/her own choosing to infer a claim value from data item values.

Different Family Court judges may agree that a marriage has few assets, the husband contributed much more to the marriage than the wife and both have the same future needs, yet some judge infer a 50:50% split while the other infers a 45:55% split. No additional factors have been involved in the inference so the difference is understandable by supposing that the judges have deployed different inference procedures.

In this application of discretion, a decision maker can infer a claim value from data values using inference methods of his/her own choosing. Schild (1998) points out a number of sentencing rationales have been identified by judges and legal scholars. For example a judge's primary motivation in sentencing an offender may be to protect the community, to rehabilitate the offender or to dissuade others from committing the same crime. Two offenders may receive different sentences despite identical fact situations because a judge applies a different rationale.

The sentencing rationales described by Schild (1998) correspond to different inference procedures in our knowledge representation framework. Two arguments can have identical data items and values but result in different claims because the inference method is different. An inference procedure for a knowledge based system is any method that can be executed by a machine to infer a claim value given data items and values. A sample of methods commonly used include first order logic implementations of modus ponens, heuristic production rules, neural networks, mathematical programming or case based reasoning.

Although human decision makers rarely articulate an inference procedure in an algorithmic manner it is clear from Schild (1998) that different methods are used in sentencing to infer different sentences when offenders crimes and other factors are identical. As was the case for the reasons for relevance of data items, the extent to which discretion manifests in this way depends on the liberty a decision maker has to choose an inference procedure. At one extreme, a decision maker not bound to supply a reason for the appropriateness of the selected inference method is exercising strong discretion. The sentencing judge is constrained to select one of the accepted rationales for sentencing and cannot, to invent a ludicrous example, use the inference procedure random selection and justify it on the grounds that a coin knows no human biases.

The decision maker has the discretion to leave data items, reasons for relevance, inference procedure, and reasons for the appropriateness of inference procedures implicit when drafting a judgement in natural language.

According to Ingleby(1993), the Full Court of the Family Court of Australia has attempted to control the exercise of discretion by indicating that the failure of a trial judge to set out reasons for their decision is sufficient cause to justify the interference of an appellate court. In In the Marriage of AM and JA Bonnici, the Full Court held that the duty of a trial judge to give reasons for a decision was not met, and provided the following trial judge's explanation to illustrate this issue.

"Overall, therefore, I believe that the factors to which I have referred under s 79(4) are such that the parties have contributed in their ways to an equal degree and that it is appropriate

that the parties share the total property on an equal basis. There are no s 75(2) factors that need to vary such provision."

Two claims are made in the paragraph above; that contributions (s 79(4)) to the marriage are equal and that future needs (s 75(2)) are also equal. However, there is little additional explanation. How the judge inferred that future needs are equal between husband and wife is left implicit. In terms of our knowledge representation relevant data items are not made explicit.

Yearwood, Stranieri and Anjaria(1999) carefully mapped text fragments in 20 refugee determinations onto sequences of arguments that conform to the Argument tree elicited for that domain and found that approximately 50% were left implicit. Reasons for this is speculative but there is no doubt that crafting a document that makes every component of every argument explicit is difficult and leads to long winded and cumbersome determinations.

In the Split Up project, the Argument tree was generated for family law property disputes as a knowledge engineering exercise for the development of an expert system. In that context, the tree was drawn by a knowledge engineer in consultation with experienced practitioners in family law. The claim made in this paper is that a representation of reasoning such as the argument tree, made for the purposes of facilitating transparency and consistency without losing discretion is best made by the Court with the most immediate jurisdiction in the practice area and, perhaps sanctioned by the High Court of Australia. Once derived, the tree can be maintained by the first instance Court and used to determine cases to be reported, to ensure the bounds of discretion are upheld by trial judges and to clearly depict the positioning of new factors deemed relevant by appeal Courts.

The identification of all relevant factors for every case prior to judgement is clearly not theoretically possible because each case is unique and legal concepts are inherently open textured. Waismann (1955) coined the term open texture to refer to concepts that cannot be completely defined prior to their use. However, the identification of factors known and accepted to be relevant for decisions in general is plausible while accepting that each new case may not use all relevant factors and may even introduce new ones or new interpretations.

5. Other schemes for the representation of reasoning

Schemes for the representation of reasoning have broadly emerged from three fields of endeavour; philosophy, artificial intelligence and argumentation. First order predicate logic is not suitable as the template of reasoning advanced here because contradictory clauses are not permitted and the inference rule is tightly bound within each clause. The following application for refugee status made to the Refugee Review Tribunal of Australia serves to illustrate the issues involved: an application for refugee status was made on the grounds that the authorities in country C, denied the applicant a health care card. Some decision makers of the Refugee Review Tribunal in Australia accepted the that the denial constituted persecution.

In this case the default rule could be expressed in predicate logic that is read: " for all applicants X, if X was a citizen and did need a health care card and was denied one, then X is said to be persecuted. For all applicants X, if X is persecuted then X will be granted refugee status.

1. $\forall$x citizen(x) & neededHealthcard(x) & deniedHealthcard(x) → persecution(x)

2. $\forall$x persecution(x) → refugee_status(x)

However, other decision makers of the Tribunal concluded that the denial of required documentation is not sufficient for a claim of persecution because the documents can, in practice, be readily obtained by offering a gratuity to appropriate administrative officers. This may be represented using a clause such as:

$\forall$x citizen(x) & neededHealthcard(x) & deniedHealthcard(x) → ¬persecution(x)

The inclusion of this clause alongside the contradictory clause No. 1, violates predicate logic. Further, the reason that a denial of health care card does not amount to persecution, that one can easily be obtained by bribery, is not represented.

First order predicate logic has been applied for the automation of legal reasoning. As such, it is intended for logicians and programmers and was not developed for the lay reader. The perusal of hundreds of clauses does little to facilitate a clearer understanding of the reasoning typically deployed in a field of law. Non-monotonic logics such as the default reasoning advanced by Nute(1988) permit contradictory clauses and include a mechanism for preferring one clause over its contradiction. Non-monotonic logics go one step further than first order logic in automating legal reasoning, but their clauses are even more difficult for the lay reader to absorb. Consequently, the representation of legal reasoning with the use of a logic formalism cannot readily facilitate more consistent and transparent decisions without sacrificing discretion.

Schemes for the representation of contradictory claims advanced during argumentative exchanges have been advanced by a number of theorists including Toulmin (1958) and Rittel and Webber (1973). A brief overview of each scheme follows.

The Toulmin layout was initially advanced to illustrate that scientific reasoning was more like legal argument than formal logic and although it was only specified informally, it remains one of the most influential schemes and has been widely applied to structure knowledge. Toulmin concluded that most arguments, regardless of the domain, have a structure that consists of six basic invariants: claim, data, modality, rebuttal, warrant and backing. Every argument makes a claim based on some data. The argument in Figure 4 is drawn from reasoning with respect to an Australian government policy regarding asylum seekers who arrive on Australian shores by boat, so called 'Boat people'. The claim of the argument in Figure 4 reflects a solution often labelled the 'Turn them away' option. This claim is made on the basis of three data items which act as premises for the claim. A justification for why the claim follows from data is known as the warrant and represents a reason that connects the two.

The backing provides authority for the warrant and in a legal argument is typically a reference to a statute or a precedent case. The rebuttal provides an exception that obviates the claim and the modality indicates the force or certainty that the claim follows from the data item. Marshall (1989) first illustrated the use of the Toulmin structure to represent judicial reasoning. Branting (1994) based his computational model of ratio decidendi on the Toulmin structure.

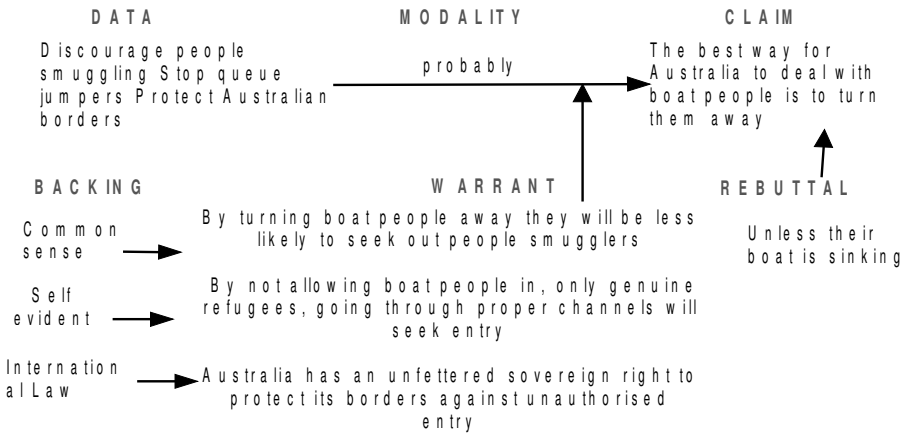

Figure 4 Toulmin argument structure

The Issues Based Information System (IBIS) model advanced by Rittel and Webber (1973) as a simple diagrammatic device to capture all views on an issue. It can be viewed as a grammar for making an explicit representation of important elements in capturing and representing individual and group views and reasons on an issue. There are just three basic elements: questions or issues, positions, and arguments (very simply represented as pros and cons). The positions correspond to the possible solutions stakeholders advance; the arguments argue for and against each position. Figure 5 shows an IBIS representation of an issue concerned with how the Australian government should deal with unauthorised entry by 'boat people'. The nodes of the graphs can contain arbitrary natural language expressions and other forms of media. Such systems can be quite useful for structuring and organizing information, despite their lack of formal semantics. Almost any creative conversation - brainstorming, design, planning, analysis, problem solving - can be captured in terms of IBIS questions, ideas, and arguments.

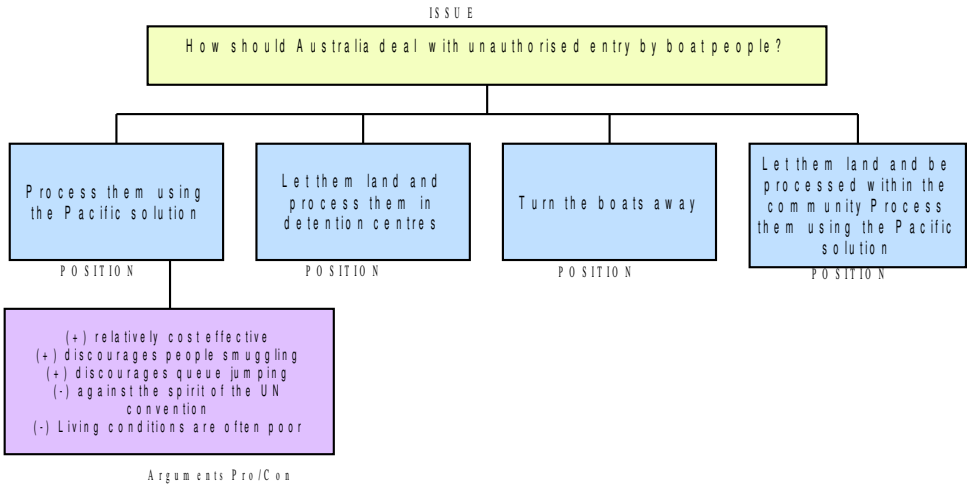

Figure 5. Partial IBIS map for the refugee issue

Dialogue Mapping is a problem-structuring method developed by Conklin based on the IBIS model of Conklin and Begeman (1988). It uses IBIS as a grammar to provide an explicit, on-screen representation of the contributions of a reasoning (problem-solving) group. Contributions to the explicit, on-screen representation are usually facilitated by an external facilitator. The Zeno argumentation framework uses a formal variant of the IBIS grammar to build (dialectical) argumentation graphs (Gordon and Karacapilidis 1997).

6. Conclusion

The manner in which judicial reasoning is represented explicitly, outside of the mind of the decision maker is central to a discussion on consistency and discretion. Traditionally, judicial reasoning is represented using natural language, either verbally in the case of lower court decisions, or in written form as case judgements in higher courts. The representation of reasoning using natural language is limited. Factors that have a bearing on the outcome can easily be left implicit. Others that are not inter-related may appear so by their proximity in sentences or paragraphs. Judgements written in many styles may make the abstraction of commonalities difficult. Further, the retrieval of past cases is restricted to keyword searches notoriously limited.

Systematic representations of reasoning since Aristotle's syllogism have revolved around the use of various logic formalisms aimed at drawing new assertions from existing knowledge in valid and sound ways. In the modern era, with the advance of artificially intelligent implementations, these formalisms have found to be quite limited in representing legal reasoning in practice. This is primarily because they do not handle uncertainty or model discretion well.

The main contention advanced in this paper is that a representation of reasoning that is sufficiently abstract to capture the reasoning deployed in the majority of cases in a practice area can readily be elicited from statutes, cases and practitioner heuristics. Such a representation makes factors that have been relevant in the past explicit and also makes their inter-relationship clear but does not prescribe in any mechanistic way, how a decision should be reached. Examples of the representation, known as an Argument tree drawn from property split decisions in the Family Court and refugee status determinations in asylum decisions illustrates the point.

The use of a representation that is more structured than natural language, but not so constrained as to permit automated reasoning can conceivably contribute to the consistency desired in many jurisdictions without resorting to rigid guidelines that sacrifice discretion.

References

Allen, L., and Saxon, C. Better Language, Better Thought, Better Communication: The A-Hohfeld Language for Legal Analysis. Proceedings of the Fifth International Conference on Artificial Intelligence and Law, ICAIL '95, May 21-24, 1995, College Park, Maryland, USA. ACM, 1995. pp 219-228

Aristotle, 2006, Prior and Posterior Analytics, translated by A. J. Jenkinson and R. G. Mure, Digireads, Lawrence, KS.

Ashley, K. 1991, *Modelling legal argument: Reasoning with cases and hypotheticals.* MIT Press. Cambridge, MA

"Bayles, M. D. 1990. *Procedural Justice. Allocating to Individuals*. Kluwer. Dordrecht.

Branting, K., 1994. A Computational Model of Ratio Decidendi. Artificial Intelligence and Law Vol 2 pl-31.

Bromby, M and Hall, M, J. 2002. The Development and Rapid Evaluation of the Knowledge Model of ADVOKATE: an Advisory System to Assess the Credibility of Eyewitness Testimony' in T.J.M. Bench-Capon, A. Daskalopulu and R.G.F. Winkels (eds.), Legal Knowledge and Information Systems. Jurix 2002: The Fifteenth Annual Conference. Amsterdam: IOS Press, 2002, pp. 143-152.

Christie, G. C., 1986. An Essay on Discretion *Duke Law Journal.* pp747-78.

Commonwealth of Australia, 2004. *Automated Assistance in Administrative Decision Making. A Report to the Attorney-General.* Administrative Review Council Report no. 46. Available from http://catalogue.nla.gov.au/Record/3354043

Conklin, J. and Begeman, M.L. 1988. g{IBIS}: A Hypertext Tool for Exploratory Policy Discussion, *ACM Transactions on Office Information Systems*, Vol. 6, No. 4, pp 303-331

Dickey, A., *Family Law.* 1990. 2nd Ed. The Law Book Company Ltd. Sydney.

Dworkin, R. 1977. *Taking rights seriously.* Harvard University Press. Cambridge.

Freiberg, A. (1995). 'Sentencing Reform in Victoria: A Case Study', in Clarkson, C. & Morgan, R. The Politics of Sentencing Reform. Oxford: Clarendon.

Gordon, T. and Karacapilidis, N., 1997. The Zeno Argumentation Framework. *Proceedings of the Sixth International Conference on Artificial Intelligence and Law.* ACM Press. *pp*10-18

Hall, M. J, Calabro, D., Sourdin, T., Stranieri, A., and Zeleznikow, J. 2005. Supporting discretionary decision making with information technology: a case study in the criminal sentencing jurisdiction. *University of Ottawa Law & Technology Journal*, Vol 2, No. 1, p1-36

Ingleby, R., 1993. *Family Law and Society.* Butterworths. Sydney.

Kovacs, D., 1992. *Family Property Proceedings in Australia*. Butterworths. Sydney.

MacCormick, D. N. 1981. *H. L. A Hart*. Edward Arnold.

Marshall, C. C., 1989. Representing the structure legal argument. Proceedings of Second International Conference on Artificial Intelligence and Law. ACM Press, USA. P121-127.

Nute, D. 1988. Defeasible Reasoning, in Fetzer, J. H., *Aspects of Artificial Intelligence* Kluwer Academic Publishers, Norwall, MA, 251-288

Prakken, H., 1997. *Logical Tools for Modeling Legal Argument. A Study in Defeasible Reasoning in Law.* Kluwer Academic. Dordrecht.

Rittel, H. J. and Webber, M. M., 1984. Planning Problems are Wicked Problems, in Cross, N. *Developments in Design Methodology.* John Wiley and Sons. 135-144

Sergot, M., Sadri, F., Kowalski, R., Kriwaczek, A., Hammond, P and Cory, H., 1986. The British Nationality Act as a logic program. Communications of the ACM. Vol 29. pp370-386

Schild, U. 1998. Criminal Sentencing and Intelligent Decision Support. *Artificial Intelligence and Law.* Vol. 6. pp151-202

Schmandt-Besserat, D., 1996. *When writing came about*, University of Texas Press, Austin, Texas

Stranieri, A., Yearwood, J., and Meikl, T., 2000. The dependency of discretion and consistency on knowledge representation. *International Review of Law and Information Technology*

Stranieri, A., Zeleznikow, J. and Yearwood, J. L., 2001, Argumentation structures that integrate dialectical and non-dialectical reasoning, Knowledge Engineering Review, 16(4), 331-358.

Stranieri, A., Zeleznikow, J., Gawler, M. and Lewis, B. 1999. A hybrid—neural approach to the automation of legal reasoning in the discretionary domain of family law in Australia. *Artificial Intelligence and Law* 7(2-3):153-183.

Toulmin, S. 1958, The Uses of Argument, Cambridge University Press, Cambridge, UK.

Rittel, H. J. and Webber, M. M., 1973, Dilemmas in a General Theory of Planning, Policy Sciences, 4, 155-169.

Waismann, F. 1951. Verifiability in Flew, A., *Logic and Language.* Blackwell

Wigmore, J. H., 1937, The science of judicial proof as given by logic, psychology and general experience, Little, Brown and Company, Boston, MA.

Yearwood, J.L. & Stranieri, A. 2006, The generic/actual argument model of practical reasoning, *Decision Support Systems* 41, 358-379.

Yearwood, J., Stranieri, A., and Anjaria, C. 1999. The use of argumentation to assist in the generation of legal documents. *ADCS'99 Fourth Australasian Document Computing Symposium* Southern Cross University Press, NSW, Australia

Yearwood, J., and Stranieri, A., 1999. The integration of retrieval, reasoning and drafting for refugee law: a third generation legal knowledge based system *Seventh International Conference on Artificial Intelligence and Law. ICAIL'99* ACM Press. Pp 117-137.

Zeleznikow, J. and Hunter, J. 1994. *Building Intelligent Legal Information Systems: Representation and Reasoning in Law*. Deventer: *Kluwer*