Law, Metadata and Semantics

Guido Governatori

Metadata Australia, Canberra, 26–27 May 2010
An Interactive Experiment

How many of have taken a plane in the last month?
An Interactive Experiment

How many of you have used your credit card, eftpos, ATM, internet banking?
suppose you are an engineer, and you have a design/build a bridge and you have to compute the following formula

\[ \int_{x=0}^{x=50} \frac{\sqrt{1234e} \cdot \frac{x}{\pi}}{\rho \cdot x} \]

to check the structural soundness of the bridge. How many of you would use a computer to do the computation?
Suppose you are involved in a legal proceeding as one of the party (defendant, plaintiff).
Suppose you are involved in a legal proceeding as one of the party (defendant, plaintiff).

How many of you would like a computer to decide the case?
Artificial Intelligence and Law: Goals

- Contribute to jurisprudence/cognitive science/AI
- Improve the training and skill of lawyers
  - More careful reading of legal materials
  - More precise drafting of legal documents
  - More rational management of risk
  - More efficient management of information
- Provide a fairer and more efficient system of justice
  - Reduce high transaction cost of legal services
  - Make it easier to treat like cases alike
  - Facilitate alternative dispute resolution
  - Advance public understanding of the law and legal system
- Avoid potential for abuse:
  - Computer programs should be tools for legal decision makers; they should not make the decisions.
Representing legislation for both inference and maintenance
Representing and reasoning with open-textured concepts
Representing and reasoning with normative concepts
Simulating the process of expert legal prediction/advising
Reasoning and arguing using examples as well as rules
Understanding and generating legal texts
Artificial Intelligence and Law: Grand Challenges

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- Representing and reasoning with open-textured concepts
- Representing and reasoning with normative concepts
- Simulating the process of expert legal prediction/advising
- Reasoning and arguing using examples as well as rules
- Understanding and generating legal texts

Formalising legislation using logic
Syntactic vs semantic ambiguity

Example

No person shall engage in or institute a local telephone call . . . of an anonymous nature and therein use obscene, profane, vulgar, lewd, lascivious or indecent language, suggestions or proposals of an obscene nature and threats of any kind whatsoever. (from State v. Hill 245 La 119, 1963)

To be in violation, must the call include obscene language AND threats?
Syntactic vs semantic ambiguity

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Sad state of legal draftmanship – syntactic ambiguity is almost always present and unintentional
Solving Syntactic Ambiguity

1. Identify “atomic” substantive propositions and replace with variables (S1, S2 . . .)
2. Use propositional logic to clarify the syntax
3. Restore the text of the substantive propositions
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Technical issue: “scope” of a logical operator

**AND** vs **NOT**

- NOT use obscenity
- NOT use obscenity

**AND**

- use obscenity
- make threats

Normalised version: IF

S1 (anon. phone call) AND S2 (obscene) OR b S3 (threats) THEN S4 Violation

Today – a normalized statute is “runnable”! By asking the user whether each substantive proposition is true or false, the logic of the statute is automated.
Technical issue: “scope” of a logical operator

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Freedom of Information Act
2000

2000 CHAPTER 36

An Act to make provision for the disclosure of information held by public authorities or by persons providing services for them and to amend the Data Protection Act 1984 and the Public Records Act 1958, and for connected purposes. [17 November 2000]

Be it enacted by Her Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

PART I
ACCESS TO INFORMATION RELATING TO PUBLIC AUTHORITIES

Right to information

1. The right of a person making a request for information to a public authority is confirmed as follows:

(a) the authority shall, within reasonable time after the request is made, provide the information in the manner specified in the request, and
(b) if that is not possible, then the information communicated to the requester;

(2) Subsection (1) applies subject to the following provisions of this Act and to the provisions of section 2, 3, 4, 12 and 13.

(3) Where a public authority —

(a) reasonably requires further information in order to identify and locate the information requested, and

(b) has informed the applicant of that requirement,

the authority is not obliged to comply with subsection (1) unless it is satisfied with that further information.
Law

IF X is a subject eligible and is resident in Italy and pay or secures interest and is an individual and is a beneficial owner and is resident in another member states and is operates as debtor THEN X shall communicate information concerning the payment

Semantics

Metadata
Standards for Representing Legislation: Legal XML

- FORMEX data model – EUR-LEX
- MetaLex and SDU BWB – Netherland
- LexDania – Denmark
- eLaw – Austria
- CHLexML – Swiss
- Crown XML Schema for Legislation – United Kingdom
- NormeinRete – Italy
- AKOMA NTOSO – United Nations for Pan-African Parliaments
- EnAct – Tasmania, Australia, New Zealand and Canada
- European Parliament XML4EP
- StratML.xsd – for strategic plan and enabling agencies to comply with the provisions of subsections 202(b)(4), (5) and 207(d) of the eGov Act http://www.xml.gov/stratml/index.htm
- House of Representative http://xml.house.gov/ bills, amendments, final voting roll call, resolutions
- LegalXML for Courts, e-Contract, e-Notariat
- Argentina – Chamber of Deputies for bill and debates
- Brazil – LegalXML Brazil
- Chile – XML for e-document legislative management Decree No 81, 2005
- Columbia – GEL-XML eGov standard
- Mexico – Chamber of Deputies for the debates
- Uruguay – XML-isation project in Parliament
- others... (Palmirani 2009)
Legal XML Generations

First generation – 1998

- long list of tags
- typographical or database approach - SGML
- no division between content and metadata

Second generation – 2000

- separation between content and metadata
- no abstract categorization of tags into classes

Third generation – 2005

- Pattern oriented
- Strong separation between content, metadata, presentation

Fourth generation – 2010

- Pattern based schema with local limitations (co-constraints) to help national customizations
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Document and presentation centric with no provision to “logical structure” (semantics)
3.1 A “Premium Customer” is a customer who has spent more than $10000 in goods.

3.2 Services marked as “special order” are subject to a 5% surcharge. Premium customers are exempt from special order surcharge.

5.2 The (Supplier) shall on receipt of a purchase order for (Services) make them available within one day.

5.3 If for any reason the conditions stated in 4.1 or 4.2 are not met the (Purchaser) is entitled to charge the (Supplier) the rate of $100 for each hour the (Service) is not delivered.
Ambiguity and Open Texture

Vehicles are not permitted in this park (H.L.A. Hart 1958)
Ambiguity and Open Texture

Vehicles are not permitted in this park (H.L.A. Hart 1958)

- Are baby carriages prohibited?
- Are tricycles prohibited?
- Are 10 speed bikes prohibited?
- Are 1000 cc Harley Davidson motorcycles prohibited?
- Is a functioning tank prohibited for ANZAC Day Parade?
Requirements for Representation of Norms (1)

- **Isomorphism.** One-to-one correspondence between rules in the formal model and the units of natural language text.

- **Reification.** Rules are objects with properties (jurisdiction, authority, temporal properties).

- **Rule semantics.** Need for a rigorous semantics for correctly computing the legal effects.

- **Defeasibility.**
  - **Conflicts:** exceptions, rules with different ranking status, rules enacted at different times.
  - **Exclusionary rules:** rules explicitly providing conditions to make other rules inapplicable.
  - **Contraposition:** Rules do not counterpose.

- **Contributory reasons or factors.** “The educational value of a work needs to be taken into consideration when evaluating whether the work is covered by the copyright doctrine of fair use.”
Requirements for Representation of Norms (2)

- **Rule validity.** Rules can be invalid or become invalid
- **Legal procedures.** Burden of proof; detecting violations of the law; legal compliance

- **Normative effects.** Many normative effects:
  - **Evaluative:** “Human dignity is valuable”
  - **Qualificatory:** “x is a citizen”
  - **Definitional:** “adult means a 18 year old person or older”
  - **Deontic:** “x has the obligation to do A”
  - **Potestative:** “A worker has the power to terminate his work contract”
  - **Evidentiary:** “It is presumed that dismissal was discriminatory”
  - **Existential:** “The company ceases to exist”
  - **Norm-concerning effects:** abrogation, repeal, substitution

- **Persistence of normative effects**
  - “If one causes a damage, one has to provide compensation”
  - “If one is in a public office, one is forbidden to smoke”

- **Values and goals**
The Basic Structure of Norms

If

\[ A_1, \ldots, A_n \]

then

\[ B \]

where

\[ A_1, \ldots, A_n \]

are the applicability conditions of the norm, and

\[ B \]

is the legal effect.

Refinements

- Rules Types
  - Constitutive rules
  - Technical rules
  - Prescriptions

Prescriptions: content
- the norm-subjects
- the action-theme
- the conditions of application
- the nature of guidance

We have developed and implemented a logical framework to handle such requirements (FCL).
The Basic Structure of Norms

if $A_1, \ldots, A_n$ then $B$

where

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1. constitutive rules
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Part II

From Theory to Practice: Applications
Rules:

- If a condition is met, then a customer is entitled to charge the supplier the rate of $100 for each hour the service is not delivered.

Facts:
- "Premium Customer" is a customer who has spent more than $10,000 in goods.
- Services marked as "special order" are subject to a surcharge.
- Premium customers are exempt from the 5% surcharge.
Superiority relation:

Rules:

Facts:

DRAFT:

Example

Facts: a : t0, b : t2, b : t2, d : t3

Rules: r1 : a : t ⇒ p e : t
r2 : b : t ⇒ p ¬e : t
r3 : c : t ￿ p e : ... e using r1 (e is persistent)

Conclusions at time t1

e

Conclusions at time t2

b, c, e

Conclusions at time t3

d, ¬e

3.1 ``Premium Customer'' is a customer who has spent more that $10000 in goods.

3.2 Services marked as ``special order'' are subject to a more that $10000 in goods.

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5.2 The (Supplier) shall on receipt of a purchase order for (Services) make them available within one day.

DRAFT: e

Conclusions at time t0, e

Conclusions at time t2, b, c, e

Conclusions at time t3, d, ¬e

compare
Example
Facts: a : t0, b : t2, b : t2, d : t3
Rules: r1 : a : t ⇒p e : t
r2 : b : t ⇒p ¬e : t
r3 : c : t ¬p e : t
Conclusions at time t1
 e
Conclusions at time t2
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Conclusions at time t3
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Conclusions at time t1
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DRAFT
3.1 ``Premium Customer'' is a customer who has spent more that $10000 in goods.

3.2 Services marked as ``special order'' are not delivered. The (Supplier) the rate of $100 for each hour the (Service) is not delivered. Premium customers are exempt from 5% surcharge. The (Supplier) shall on receipt of a purchase order for (Services) make them available within one day, or charge the special order surcharge.

5.3 If for any reason the conditions stated in 4.1 or 4.2 are not met the (Purchaser) is entitled to charge the (Supplier) the rate of $100 for each hour the (Service) is not delivered.

Conclusions at time $t_0$: $e$.

Conclusions at time $t_2$: $b, c, e$.

Conclusions at time $t_3$: $d, \neg e$.
Example

Facts: a : t0, b : t2, b : t2, d : t3

Rules: r1 : a : t ⇒ p e : t
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Conclusions at time t1
e

Conclusions at time t2
b, c, e

Conclusions at time t3
d, ¬e
Superiority relation:

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b, c, e

Conclusions at time t3

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DRAFT:

CONTRACT

Revise

merge

compare

conflict
**Superiority relation:**

**Rules:**

- r1 : a : t \(\Rightarrow\) p e : t
- r2 : b : t \(\Rightarrow\) p \(\neg\) e : t
- r3 : c : t \(\neg\) p e : ... e using r1 (e is persistent)

**Conclusions at time t1:**

- e

**Conclusions at time t2:**

- b, c, e

**Conclusions at time t3:**

- d, \(\neg\) e

---

**Example**

**Facts:**

- a : t0, b : t2,
- b : t2, d : t3

**Rules:**

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- r2 : b : t \(\Rightarrow\) p \(\neg\) e : t
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- e

**Conclusions at time t2:**

- b, c, e

**Conclusions at time t3:**

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**eContracts Negotiations**
What’s compliance?

Ensuring that business operations, processes, and practices are in accordance with a given prescriptive (often legal) document.
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Ensuring that business operations, processes, and practices are in accordance with a given prescriptive (often legal) document

<table>
<thead>
<tr>
<th>Regulatory</th>
<th>Standards</th>
<th>Contracts</th>
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<tbody>
<tr>
<td>Basel II</td>
<td>Best practice models</td>
<td>Service Agreement</td>
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<td>Sarbanes-Oxley</td>
<td>SAP solution maps</td>
<td>Customer Contract</td>
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**Regulatory**
- Basel II
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- OFAC (USA Patriot Act)
- OSFI “blocked entity” lists
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**Standards**
- Best practice models
- SAP solution maps
- ISO 9000
- Medical guidelines

**Contracts**
- Service Agreement
- Customer Contract
- Warranty
- Insurance Policy
- Business Partnership

Compliance spending for Sarbanese-Oxley US$ 27b in 2009 (Gartner 2008)
How to ensure compliance?

Compliance is a relationship between two sets of specifications:

Alignment of formal specifications for business processes and formal specifications for prescriptive (legal) documents.
Compliance is a relationship between two sets of specifications.
How to ensure compliance?

Compliance is a relationship between two sets of specifications

Alignment of formal specifications for business processes and formal specifications for prescriptive (legal) documents.
Compliance Ecosystem

Legal Space
- Regulatory/Contractual Document
- Domain Experts
- Analysis
- (Formal) Specification:
  - obligations
  - prohibitions
  - permissions

Connection Points
- Contract vs process rules
- Resource-related issues
- Complianc e Checking
- Translation
- New or Existing
- Existing

Process Space
- Process Modellers
- BP Models
- New or Existing
- BP Execution
- Process Data
- Violation Detection
- Violation Response
- Monitoring
- New or Existing

Design time
- Existing
Run time
- Existing

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A BPM describes the tasks to be executed (and the order in which they are executed) to fulfill some objectives.
The Journey to Compliance

1. Take or design a business process
2. Annotate the process
   - effects of the tasks (each task is annotated with the effects it produces)
   - rules encoding the norms relevant to the process
Business Process Compliance

Compliance checker

Compliance rule base & checker
- Rule1
- Rule2
- Rule3
- Rule4
- Rule5
- Rule6
- Rule7
- Rule8
- Rule9
...

Logical state representation
- I*(e1)
- I*(e2)
- I*(e3)
- I*(e4)
  ...

Annotated process model

Recommendation sub-system

Legalese

Formalisation

Recommendations

What-if analysis

Status report

Obligations

Input

Post1

Post2

Post3

Post4

Post5

Post6

Post7

T1

T2

T3

T4

T5

T6

T7

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    organisation="NICTA"
    email: firstname.lastname@nicta.com.au
    phone="+61 (0)7 3300 8523" />
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