From e-business to e-laws and e-judgments: 4,000 years of experience

Luigi Logrippo

Université du Québec en Outaouais

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Computer-Assisted Judgments

- Using computers to help decide litigations and trials is not a new idea
- But can we trust computers to independently decide legal cases? Even simple ones?
- This can be done under some conditions:
  - The law is represented in a precise, logical, computer-processable form
  - The facts are also represented in a precise, computer-accessible form
    - Possibly after having been checked by a human

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Practical importance

- In e-business, contracts can be executed in seconds
- But for litigations we still have the usual 'long' model, no shortcuts …

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Precedents …

- This is being done already (or almost) in some areas:
  - Tax laws
  - Traffic tickets
- Although these are not judgments, they can be easily transformed into judgments

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How can the law be written in computer-processable form?

- This has been known from the very beginning of legislation: Sumerian codes
- The legislator was attempting to closely program the behavior of judges, who were his delegates

Code of Ur-Nammu, 2000 BC
(4000 yrs ago)

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An article from Ur-Nammu Code

- *If a man had let an arable field to a(nother) man for cultivation, but he did not cultivate it, turning it into wasteland, he shall measure out three kur of barley per iku of field*
- *Analysis:*
  - *Subject: a man*
  - *Trigger: did not cultivate, turning it into wasteland*
  - *Object: an arable field*
  - *Pre-condition: which he had let from another man*
  - *Action: he shall measure out three kur of barley per iku of field*
    - *Note the algorithm in the action part*

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The Ur-Nammu laws are in a form that is very well-known in computing

- Event-Condition-Action, which has many applications in computing
- E.g.: Access control policies
  - Subject: a doctor
  - Verb: requests to read   } Event
  - Object: a patient's file
  - Condition: the patient is not one of his
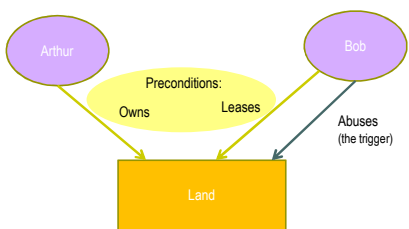 - Action: DENY

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Complexity of legal structures

- Structures of legal norms are of course much more complex than access control policies
- The latter relate to a subject, an object, and an access right
- Legal norms involve often several subjects and objects:
  - The owner of the land
  - The tenant
  - The land

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Graphically

Arthur   *Bob*

Preconditions:
Owns   Leases

Abuses
(the trigger)

Land

*If a man had let an arable field to a(nother) man for cultivation,
but he did not cultivate it, turning it into wasteland,*

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How can we deal with more complex laws?

- They can be (manually) broken down into simple statements as the one we have seen
- Roman magistrates were doing this 2000 yrs ago

Roman formular process

- Before starting arbitration, a magistrate went over the essential element of a civil suit to narrow down the point of law to be decided:
- The formula
  - Subject: Titius
  - Trigger: refuses to give up
  - Object: a golden vase
  - Precondition: which he has received in deposit from Caius
  - Action: Titius must be ordered to pay Caius the value of the vase
- A formula instantiates what can be a complex law into factual elementary conditions
- Reduces the decision to a simple logical deduction after having checked the facts

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How could this idea be applied today

- Application: e-commerce
  - Suppose plaintiff does not receive a product
- Plaintiff could consult a structured database providing the possible components of complaint, and construct a complaint appropriate to her situation, e.g.
  - Subject: Alice
  - Trigger: Did not receive within reasonable time
  - Object: A book
  - Pre-condition: Ordered from BookSeller
  - Action: BookSeller must replace book or return amount paid by Alice
- Note that the components are not independent, some of the possibilities depend on others

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How to check the facts?

- In an initial phase, clerks could be used to check the facts
- In the future, *audit files* will have to be made available by e-merchants in standard formats
  - They will be useful for a variety of purposes
    - Tax purposes, etc.
- It will be possible to check them automatically
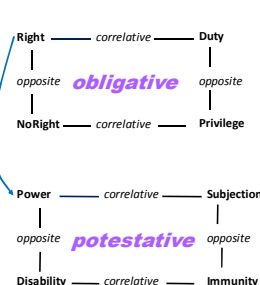 - E.g. airline flight records can already be checked in this way

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The role of ontologies

- Legal ontologies can be used to make the law applicable in different situations
- If a man had let a **thing** to another man, but he **damaged** it, he shall pay the value of the damages
  - Possibilities for **thing**: a field, a house
  - Possibilities for **damaged**: burned, flooded
- Now we have an article of law that covers four possibilities

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Ontologies for legal deductions

Right ——— *correlative* ——— Duty

opposite   **obligative**   *opposite*

NoRight ——— *correlative* ——— Privilege

Power ——— *correlative* ——— Subjection

opposite   **potestative**   *opposite*

Disability ——— *correlative* ——— Immunity

Hohfeld's obligative and potestative squares

- Legal concepts are correlated by complex logical links that can be used to make deductions
- The contract of Alice with Amazon creates her **right** to receive the book and the **duty** of Amazon to deliver it
- It gives Alice the **power** to ask for execution, to which Amazon is **subjected**

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Logical deductions and AI methods

- AI methods are often invoked to construct models of legal thinking
- Unfortunately AI methods can lead to different conclusions according to the method used!
- This must be avoided
  - Judicial conclusions establish legal certainty
  - Our approach is feasible only where laws and facts are organized in a purely deductive manner, where only one solution is possible
- However: can we consider a person guilty if a heuristic leads to the conclusion that he is guilty with probability 90%?
  - Perhaps, but we may prefer human judgment to do this

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Applications

- A country decides to award compensation for late flights
  - User complains to e-authority, which automatically checks for late flights, passenger lists and weather reports
  - The judgment is rendered within seconds
- A cloud service provider commits to a QoS, if it cannot provide it, user must be compensated
  - User complains to an e-authority, automatic checks are carried out, user receives compensation within seconds
- User is denied access to a government database according to privacy law
  - User automatically appeals with privacy commissioner appeal center
  - Latter decides that access should be granted, issues an order that access must be provided
  - The order is automatically executed, all in seconds
- Many other examples …
  - E.g. situations in commerce law for which computerized audit files exist

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Summary

- In many cases, automatic and rapid decision of cases involving simple cyberlaws is desirable and possible
- Some simple laws can be written in a way that automatic derivation from them is possible
- Some complicated laws can be instantiated to simple formulae
- The method can evolve to complex legal arguments, by using ontologies
- Full automation depends on existence of computerized audit trails in standard format
- Role of AI can be questioned, because of the need of indisputable conclusions

Thanks!

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The full paper

http://www.site.uottawa.ca/~luigi/papers/11_Cyberlaws.pdf

More info on this research topic

http://www.site.uottawa.ca/~luigi/papers/LegalLogicBlog.htm

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