

Law ? Computation

Michael J. Bommarito II
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April 22, 2011

M.S.E. Financial Engineering, M.S. Political Science, University of Michigan.
Currently a hedge fund quant \Rightarrow This is my own work and in no way represents my employer.
Presentation online: <http://bit.ly/gcBKqA>

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So let's try this again.

Law ? Computation

The past, present, and future relationship

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Outline

Introduction

Law as Computation

Law is not Computation

Computation on Law

Law and Computation

Definitions

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OK, let's continue.

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OK, let's actually get started.

Not a new idea.

Those long chains of reasoning, simple and easy as they are, of which geometricians make use in order to arrive at the most difficult demonstrations, had caused me to imagine that all those things which fall under the cognizance of man might very likely be mutually related in the same fashion.

Descartes. McCrae, *The Unity of the Sciences: Bacon, Descartes, and Leibniz*, 18 *J. Hist. Ideas* 27 (1957)

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Leibniz Center for Law at the University of Amsterdam

In particular, Leibniz viewed the recently rediscovered work of Roman jurists as equal to Greek geometers.

See [Hoeflich, Law & Geometry: Legal Science from Leibniz to Langdell, Amer. J. Legal Hist., 30:2 \(1986\)](#) for more.

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 - ▶ Civil law

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 - ▶ Divine law or law by decree

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 - ▶ Action
- ▶ State an argument, which consists of a set of observed or hypothetical facts.
- ▶ Deduce the consequence of the argument.

These consequences are either rulings or new, “derived” laws.

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- ▶ applications of advanced information technology to support tasks in the legal domain

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We'll get to these last two later.

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But, to be honest, this isn't my cup of tea.

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Artificial intelligence and law, where we think about how to represent and evaluate computation in a legal system.

Philosophy and law, where we use logical computations to create or examine legal systems.

Law as computation *tomorrow*

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While many treat automated reasoning as the holy grail, I think the inverse or optimization problem will provide more benefit to society.

Examples of tomorrow, today - Hammurabi

The screenshot shows the GitHub repository page for 'The Hammurabi Project'. At the top, there are tabs for Source, Commits, Network, Pull Requests (0), Issues (0), Wiki (12), and Graphs. The 'Wiki (12)' tab is selected. Below the tabs, there are links for Home, Pages, Wiki History, and Git Access. The main heading is 'The Hammurabi Project' with a 'Page History' button to its right. The content area starts with a welcome message: 'Welcome to the home of The Hammurabi Project.' This is followed by a paragraph: 'The Hammurabi Project is an experiment in codifying U.S. law - such as the U.S. Code, the Code of Federal Regulations, state laws, etc. - in the C# programming language.' Below this, it states 'It has two basic components:' and lists two items: 1. 'Core library' - functions to support legal knowledge engineering, and 2. 'Parallel legal corpus' - a machine executable version of U.S. legal provisions. Then, it says 'Other things you may be curious about:' and lists several links: Project rationale, Basic concept, What the law looks like when codified in C#, Scope and granularity of the project, Syntax reference, Installing and using Hammurabi, and Buzz. At the bottom, it mentions the project's affiliation with Stanford University's CodeX Center for Computers and Law and provides contact information for Michael Poulshock.

Source Commits Network Pull Requests (0) Issues (0) **Wiki (12)** Graphs Branch: master

Home Pages Wiki History Git Access

The Hammurabi Project

Page History

Welcome to the home of The Hammurabi Project.

The Hammurabi Project is an experiment in codifying U.S. law - such as the U.S. Code, the Code of Federal Regulations, state laws, etc. - in the C# programming language.

It has two basic components:

1. [Core library](#) - functions to support legal knowledge engineering
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- [Buzz](#)

The project is affiliated with Stanford University's [CodeX Center for Computers and Law](#). For more information, contact [Michael Poulshock](#) at michael.poulshock@gmail.com.

Hammurabi ([Michael Poulshock](#))



Examples of tomorrow, today - Hammurabi

Around the world, there are millions of pages of law - constitutions, statutes, regulations, case law, and interpretive decisions - with which societies are expected to comply. This mass of material is logically complicated, referentially byzantine, terminologically inaccessible, difficult to contextualize, and sometimes vague and ambiguous. Aside from the ethical issues caused by this complexity, it is grossly inefficient as an information system. The capital required for an actor to understand a legal right or obligation is a wasted resource that creates drag on individual, corporate, and social progress.

Though not often thought of this way, law is inherently computational. It is a set of algorithms that prescribe how various computations are to be carried out. What is my standard (tax) deduction? Am I eligible for family and medical leave? On what day did I become liable for unemployment taxes? Determinations such as these are like mathematical functions: given various inputs, they produce corresponding outputs.

The Hammurabi Project provides a vehicle for representing portions of the law in an executable format, so that the process of logical inference can be offloaded from human to machine. Once executable, it can be embedded into our computing infrastructure where it can drive other applications.

From the **Hammurabi rationale**.

Examples of tomorrow, today - Estrella

ESTRELLA

Home Deliverables & Publications Contact LKIF Language LKIF Core MetaLex Carneades Harness

Welcome to the Estrella project website

Information Society Technologies

The European project for Standardized Transparent Representations in order to Extend Legal Accessibility (Estrella, IST-2004-027655) aims to develop and validate an open, standards-based platform allowing public administrations to develop and deploy comprehensive legal knowledge management solutions, without becoming dependent on proprietary products of particular vendors. Estrella will support, in an integrated way, both legal document management and legal knowledge-based systems, to provide a complete solution for improving the quality and efficiency of the determinative processes of public administration requiring the application of complex legislation and other legal sources. Estrella will facilitate a market of interoperable components for legal knowledge-based systems, allowing public administrations and other users to freely choose among competing development environments, inference engines, and other tools.

The main technical objectives of the Estrella project are to develop a Legal Knowledge Interchange Format (LKIF), building upon emerging XML-based standards of the Semantic Web, including RDE and OWL, and Application Programmer Interfaces (APIs) for interacting with legal knowledge-based systems. To achieve and demonstrate vendor neutrality and independence, translators between the LKIF format and the existing proprietary formats of LKBS vendors participating in the project will be developed.

To demonstrate and validate the Estrella platform, European tax related legislation and national tax legislation of two European countries will be modelled and used in the pilot applications. The finance ministries or tax administrations of several other European countries will take part in an Observatory Board to ensure generality of the approach.

More information available in the 2006, 2007 and 2008 periodic activity reports.

Pages
Contact
Deliverables & Publications
Periodic Activity Report (2006)
Periodic Activity Report (2007)
Periodic Activity Report (2008)
Welcome to the Estrella project website

Coordinator
Leibniz Center for Law (UvA)

Estrella Consortium
Adó-és Pénzügyi Ellenőrzési Hivatal
Budapesti Corvinus Egyetem
Centro Nazionale per l'Informatica nella Pubblica Amministrazione
Consorzio Pisa Ricerche SCARL
Fraunhofer FOKUS
Haley Limited
Interaction Design

Estrella

Examples of tomorrow, today - MetaLex

CEN MetaLex

Website of the Workshop on an Open XML Interchange Format for Legal and Legislative Resources

[About](#)
[News](#)
[Specification](#)
[Workshop](#)


About






Sunday, 11. 11. 2007

The *CEN Workshop on an Open XML Interchange Format for Legal and Legislative Resources (MetaLex)*, declares, by way of its title, an interest in legal and legislative resources. CEN MetaLex aims to standardize the way in which sources of law and references to sources of law are to be represented in XML.

The standard will enable public administrations to link legal information from various levels of authority and different countries and languages. Moreover, the standard will enable companies that are active in the field of legal knowledge systems to connect to and use legal content in their applications, which allows them to support a much larger market. An open interchange format will also protect customers of such companies from vendor lock in. Finally, the standard will help to improve transparency and accessibility of legal content for citizens and businesses.

CEN MetaLex is an **interchange format**, a lowest common denominator for other standards, intended not to replace jurisdiction-specific standards and vendor-specific formats in the publications process but to impose a standardized view on legal documents for the purposes of **information exchange** and **interoperability** in the context of software development.



 European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung
    

RECENT NEWS

- CEN MetaLex metadata and UK linked open data.
- Proposal is final: 2010 agreement published

DOWNLOAD

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- Latest Proposal
- OWL Schema
- SVN Repository
- XML Schema

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- News
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- Akoma Ntoso
- Legacy MetaLex
- Nome In Rete
- Official CEN Workshop

CEN MetaLex

Summary

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Code is law (is code).
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While computation may be involved in these processes, computation alone cannot explain observed outcomes.

The “Law and ...” movements

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- ▶ Given a desired behavior, how can we effect this through law?

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These are questions about the design of economic rules and institutions.

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For the seminal work and a good review, see Priest & Klein, [The Selection of Disputes for Litigation](#) and Daughety & Reinganum, [Economic Theories of Settlement Bargaining](#).

Empirical Legal Studies

Often referred to pejoratively as “law and regression.”

WILEY-BLACKWELL

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Journal of Empirical Legal Studies

Published on behalf of The Society for Empirical Legal Studies and Cornell Law School

Edited by:
Theodore Eisenberg, Michael Heise, Jeffrey J. Rachlinski, Stewart J. Schwab, and Martin T. Wells

Journal of Empirical Legal Studies (JELS) fills a gap in the legal and social science literature that has often left scholars, lawyers, and policymakers without basic knowledge of legal systems. Always timely and provocative, studies published in JELS have been covered in leading news outlets such as the New York Times, the Wall Street Journal, the Economist, Forbes Magazine, the Financial Times, and USA Today.

News and Announcements Top

According to an independent, third-party ranking hosted by a law librarian at Washington & Lee Law School, *Journal of Empirical Legal Studies* ranked among the law journals with the most impact in 2008!

Social Sciences and the Law: 1 out of 24 (combined impact and citations)
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 Refereed Law Journals: 2 out of 504 (combined impact and citations)
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Journal of Empirical Legal Studies

Empirical Legal Studies

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- ▶ Researchers have a common language and knowledge of research design and methodology.

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- ▶ Held to some accountability w.r.t. data!
- ▶ Higher likelihood of relevance and policy implication.
- ▶ Researchers have a common language and knowledge of research design and methodology.

It is easy to lie with statistics, but it is easier to lie without them.

Fred Mosteller

Criticism of “Law and ...” research

Balkinization

Wednesday, January 16, 2008

Why the Interdisciplinary Movement in Legal Academia Might be a Bad Idea (For Most Law Schools)

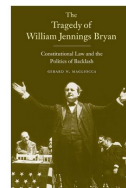
Brian Tamanaha

Interdisciplinary studies are currently the rage in legal academia. An increasing number of law schools are touting their interdisciplinary programs, which include offering courses from other academic disciplines (economics, statistics, anthropology, etc.) in the law school curriculum, creating law and social science institutes of various sorts within the law school, offering joint JD/PhD programs, and hiring JD/ PhD faculty.

It seems like an irresistible movement with the potential to transform legal academia. But based upon the historical evidence and the nature of legal practice, I'm skeptical.

First the historical evidence: this idea has been tried before with no evident success.

Books by Balkinization Bloggers



Balkinization, Jan 16, 2008

Computation on Law *tomorrow*

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Summary

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The results of these inquiries may or may not be useful to lawyers or legal professionals.

Law and computation

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- ▶ the study of legal reasoning and argumentation, using computational methods
- ▶ the formal representation of norms, normative actions, normative systems and norm-governed societies and multi-agent systems
- ▶ the investigation of techniques from advanced information technology, using law as the illustrative domain

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- ▶ Useful
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```
$ wc -l src/main/java/org/mjb/*Code*
425 src/main/java/org/mjb/buildCodeIndex.java
86  src/main/java/org/mjb/searchCodeIndex.java
511 total
```


Building a better legal search engine

```
// Create document.
Document doc = new Document();
doc.add(new Field("documentid", documentID, Field.Store.YES,
    Field.Index.NOT_ANALYZED));
doc.add(new Field("usckey", uscKey, Field.Store.YES,
    Field.Index.NOT_ANALYZED));
doc.add(new Field("currentthrough", currentThrough, Field.Store.YES,
    Field.Index.NOT_ANALYZED));
doc.add(new Field("itempath", itemPath, Field.Store.YES,
    Field.Index.ANALYZED));
doc.add(new Field("head", head, Field.Store.YES, Field.Index.ANALYZED,
    Field.TermVector.YES));
doc.add(new Field("text", text, Field.Store.NO, Field.Index.ANALYZED,
    Field.TermVector.YES));

// Write into index.
indexWriter.addDocument(doc);
```

Results

```
$ mvn -q exec:java -Dexec.mainClass="org.mjb.searchCodeIndex" \
-Dexec.args="text swap"

documentid:7 U.S.C. 6s
currentthrough:20110107
score:2.2053032
itempath:
Title 7
CHAPTER 1
> 6s . Registration and regulation of swap dealers and major swap participants

documentid:7 U.S.C. 6r
currentthrough:20110107
score:2.0396917
itempath:
Title 7
CHAPTER 1
> 6r . Reporting and recordkeeping for uncleared swaps

documentid:7 U.S.C. 7b-3
currentthrough:20110107
score:1.7781076
itempath:
Title 7
CHAPTER 1
> 7b 3 . Swap execution facilities
...
```



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<http://localhost:8080/solrdev/browse?q=swap>

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Conclusion

Thanks for listening!

...and an even bigger thanks to Seth for organizing this.



<http://michaelbommarito.com>