Designing a Controlled Natural Language for the Representation of Legal Norms

Stefan Hoefler and Alexandra Bünzli

University of Zurich
Overview

1 Motivation

2 Design Requirements

3 Design Decisions

4 State of Development

5 Conclusion
Tasks

1. How can legal reasoning be formalised?
2. How can legal knowledge be formalised?

Problem

One of the main obstacles to progress in the field of artificial intelligence and law is the natural language barrier.

Since the raw materials of the law are embodied in natural language – cases, statutes, regulations, etc. – the designer of a knowledge-based legal information system today must translate them, by hand, into a formal language, just to get started. (McCarty 2007:217)
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• familiar with formal representations

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Legal expert (lawyer)

- legal expertise
- not familiar with formal representations
Can controlled natural language bridge the gap?
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Research question

Can we develop a controlled natural language that can serve as an **interlingua** between legal texts and formal representations?
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**Controlled Legal German (CLG)**

Can we design a controlled natural language for the representation of legal norms codified in Swiss statutes and regulations?
Can controlled natural language bridge the gap?

Research question
Can we develop a controlled natural language that can serve as an *interlingua* between legal texts and formal representations?

Controlled Legal German (CLG)
Can we design a controlled natural language for the representation of *legal norms codified in Swiss statutes and regulations*?

Requirements

1. CLG must be formal, i.e. have an unambiguous formal semantics.
2. Swiss legislative texts must be easy to translate into CLG.
3. CLG representations must be easy to verify for legal experts.
**What formal semantics?**

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Considerations

- Formal representations are always simplifications of some sort...
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- Map CLG onto a logical form that is
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  2. “deep” enough to capture the **essential content** of a norm:
  
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• Ignore superstructures (for the moment).
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- Start with **individual sentences, representing individual norms**.
- Ignore superstructures (for the moment).
- Add logical concepts incrementally during development.
## Current semantic underpinning

**Art. 1 Abs. 1 BGG**

Das Bundesgericht ist die oberste rechtsprechende Behörde.

‘The Federal Supreme Court is the supreme judicial authority.’

\[ \exists ! xy : \text{federal\_supreme\_court}(x) \land \text{supreme\_judicial\_authority}(y) \land \bigcirc \exists e : \text{is}(e, x, y) \]
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Logical concepts included so far

• FOL + deontic concepts (obligation, permission, prohibition)
• existential, universal and counting quantifiers
• some constituents (Adj+N, adverbial phrases) are not yet analysed
• reification/quantification of events
• no temporal or intensional concepts yet
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Function words
- controlled semantics

Content words
- user-defined semantics
- mapped onto atomic predicates
  → essential in the context of legal rule systems:
open-texturedness/vagueness of the concepts is maintained
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Designing the controlled natural language

Main task

- Controlling *ambiguous constructions and function words*

Methods

1. prohibit their use
2. assign them a default interpretation

Design decisions

- which constructions shall be allowed/prohibited?
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Design requirements

**Requirements II+III**

CLG must facilitate two operations:

1. **translation**
   of legislative texts into CLG (by knowledge engineers)

2. **verification**
   of the CLG representation (by legal experts)

→ **Design requirements**

1. proximity to **conventional** legislative language
2. maximal **explicitness**

How can this be achieved?
Method I: simulating domain characteristics

CLG construction and interpretation rules must reflect the conventions of legislative language.

Origins of these conventions

1. pragmatics of the text domain
2. historically grown frequency distributions
3. standards defined in official drafting guidelines
4. stylistic means artificially developed to improve readability
Method II: providing syntactic sugar

CLG must provide ample **syntactic sugar**: constructions with default interpretations must have **explicit paraphrases**.
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**Procedure**

```
source text ↓
conventional representation in CLG ↓
explicit representation in CLG
```

- *easier if CLG resembles source lang.*
- *deterministic*
Pragmatics of the text domain I

Norms contain two basic types of modality:

- **obligation**: müssen ('must'), haben zu ('have to'), no modal verb
- **permission**: dürfen ('may'), können ('can')

In CLG semantically equivalent:

- Radfahrer müssen einen Helm tragen.
  ‘Cyclists must wear a helmet.’
- Radfahrer haben einen Helm zu tragen.
  ‘Cyclists have to wear a helmet.’
- Radfahrer tragen einen Helm.
  ‘Cyclists wear a helmet.’

\[ \forall x : \text{cyclist}(x) \rightarrow \exists y : \text{helmet}(y) \land \text{wears}(e, x, y) \]
Pragmatics of the text domain II

Example

Radfahrer müssen mindestens einen Rückstrahler tragen.
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**Example**

Mindestens eine Veranstaltung *muss* allen Personen offen stehen.

‘At least one event *must* be open to all persons.’

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Interpretation rule

Modal verbs have wide scope over the whole sentence.
Pragmatics of the text domain III

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Explicit paraphrase

Es ist obligatorisch, dass Radfahrer mind. einen Rückstrahler tragen. ‘It is obligatory that cyclists wear at least one reflector.’

Alternatives

- Es ist vorgeschrieben, dass (‘it is prescribed that’)
- Es ist zwingend, dass (‘it is coercive that’)
- ...
Frequency distributions I

§ 67 Abs. 2 Regulation of the University of Zurich

**Ein Mitglied** der Universitätsleitung führt den Vorsitz.
‘**A member** of the university board takes the chair.’

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**Ein Titel** [...] kann [...] entzogen werden, wenn die Inhaberin oder der Inhaber die Interessen der Universität ernsthaft verletzt.
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**Interpretation rule**

Indefinite noun phrases are interpreted as universally quantified in vorfeld position and as existentially quantified elsewhere.
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§ 2 Abs. 4 Regulation of the University of Zurich

*Besondere Veranstaltungen* können auch für eine breite Öffentlichkeit angeboten werden.

‘*Specific events* can also be offered to a broader public.’

∃x : event(x) ∧ ...
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Der Vorsitz wird von einem Mitglied der Universitätsleitung geführt.

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Additional advantage:
The subject now correctly designates what the norm is about.
Drafting guidelines

Example from the drafting guidelines of the canton of Zurich

1 Die Kantone können Fachhochschulen einrichten.
2 Sie werden selbständig geleitet.

‘1 The cantons may establish technical universities.
2 They are governed autonomously.’
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Art. 20 Abs. 3 BGG

In Fünferbesetzung entscheiden sie ferner über Beschwerden gegen referendumspflichtige kantonale Erlasse und gegen kantonale Entscheide über die Zulässigkeit einer Initiative oder das Erfordernis eines Referendums.

‘In a composition of five, they further decide on appeals against cantonal decrees that are subject to referendum and against cantonal decisions on the admissability of an initiative or the necessity of a referendum.’
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**Explicit paraphrase?**

→ exploit structures provided by conventional legislative language
Stylistic conventions II

Rephrase as an explicit enumeration

In Fünferbesetzung entscheiden sie ferner über Beschwerden gegen:

a. referendumspflichtige kantonale Erlasse;
b. kantonale Entscheide über die Zulässigkeit einer Initiative;
c. kantonale Entscheide über das Erfordernis eines Referendums.

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- attachment ambiguities (prepositional phrases, relative clauses)
- plural ambiguities (distributive/collective/cumulative readings)
- scope ambiguities (modal verb, subject, objects, adverbials)
- lexical ambiguities (articles, domain-specific function and content words)
- referential ambiguities (pronouns, relational nouns)
- functional ambiguities (arising from the relatively free German word order)
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- **plural ambiguities**  
  (distributive/collective/cumulative readings)

- **scope ambiguities**  
  (modal verb, subject, objects, adverbials)

- **lexical ambiguities**  
  (articles, domain-specific function and content words)

- **referential ambiguities**  
  (pronouns, relational nouns)

- **functional ambiguities**  
  (arising from the relatively free German word order)
State of development II

Syntax

- sentence patterns for simple norms and for legal definitions
- only present tense
- only canonical word order
- active and passive voice
- prepositional phrases only attach to verbs
- subordinate clauses restricted to conditional and relative clauses
- no genitive attributes (exception: the agent of nominalised verbs)
- no particles (dennoch, also, auch, nur, ...)
- negation only permitted at specific positions
Challenges ahead: e.g. bridging references

Art. 55 Abs. 1 Employee Regulation ETH

Bei der Geburt eines Kindes hat der Angestellte Anspruch auf eine einmalige Zulage von 530 Franken.

‘Upon the birth of a child, the employee is entitled to a one-time allowance of 530 francs.’
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- Approximately 216,000 children are born every year.
- The employee is entitled to an allowance of 530 francs per child being born.
- Therefore, the employee is entitled to an annual allowance of 114,480,000 francs.
Key points

- We are exploring the potential of the employment of controlled natural language as an *interlingua* between legal texts and formal representations.

- To facilitate the translation of the source texts into the controlled language, the controlled language has to *resemble conventional legal language*.

- To facilitate its verification, *explicit paraphrases* for language constructs with default interpretations must be available.

- To fulfil these two requirements, we
  
  1. ensure that our construction and interpretation *rules reflect conventions and frequency distributions* of legal language, and
  2. endow our controlled natural language with ample *syntactic sugar*.
Lessons to be learnt

On the one hand, the requirement that our controlled language must resemble the language of legislative texts substantially increases the amount of work to be put into its design.

On the other hand, the conventions of legal language often provide the very means needed to control certain ambiguous constructions.

However, our work would become a lot easier if the linguistic peculiarities of legal language had been studied more thoroughly.

It is not always possible to provide explicit paraphrases without resorting to extra-linguistic means such as brackets etc.

Translating a legislative text into a controlled natural language helps understanding its meaning properly. → Even if we cannot perform automated legal reasoning (yet), a controlled legal language can serve as a tool for clarification in legislative drafting and/or legal training.
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5. Translating a legislative text into a controlled natural language helps understanding its meaning properly.

→ Even if we cannot perform automated legal reasoning (yet), a **controlled legal language can serve as a tool for clarification in legislative drafting and/or legal training**.