

TWO (UN)FAIR SCENARIOS:  
ADMINISTRATIVE AUTOMATED DECISION-MAKING IN  
FORMAL VERSUS NATURAL LANGUAGE

Administrative Automated Decision-Making (AADM)

Promises:

- efficiency
- effectiveness
- fairness

Drawbacks:

- only applicable to computational laws
- only applicable to domains describable by ontologies
- interaction with basic legal principles
- prone to errors

**Computational law:** the legal instrument – or its provisions – designed to be applied exclusively by machines.

Methodology

A computational law example was chosen in natural language. A formal language specification was proposed to evaluate both specifications against selected legal principles to avoid

unfair

AADM errors.

AADM and LEGAL PRINCIPLES

Legal Principles considered for our AADM example:

- Legality
- Legal Certainty
- Arbitrariness
- Motivation
- Clarity

Running example: Art 6.1. EU Regulation 561/2006 on certain social legislation relating to road transport

AADM and ERRORS

Traditional categories of administrative law errors:

- error of Law
- factual error
- material error

Every erroneous outcome with legal relevance can be deemed unfair.

Not all AADM errors do fit traditional administrative law categories of errors.

- Avoiding AADM errors requires deployment of formal verification methods.
- To formally prove the correctness of the AADM formal language specifications are necessary.
- Natural and formal language specifications present different benefits and challenges for AADM.

NATURAL LANGUAGE SPECIFICATION (Art. 6.1. EU Regulation 561/2006)

Article 6.1: The daily driving time shall not exceed nine hours. However, the daily driving time may be extended to at most 10 hours not more than twice during the week.

The natural language specification is highly problematic and underspecified.  
Choices needed to be made to arrive at a formalization (Gallina formal language)

Errors and breach of the chosen legal principles amount to systematic unfairness in the implementation of EU Regulation 561/2006



Proposed FORMAL LANGUAGE SPECIFICATION using the Gallina Formal Language

Definition article6\_1 (w : list time) : bool := is\_weeklyDP w ==> all is\_leq\_10 w && count is\_gt\_9 w <= 2.

CONCLUSIONS

Tension Table for AADM and Legal Principles

Legend: – drawbacks + benefits	Legal instrument written in Natural Language	Legal instrument written in Formal Language
Legality	– Requires prior legal authorization. – Potential externalization of administrative AADM. – Errors susceptibility. + Aligned with traditional legal practice.	– Incompatibility with traditional legal practice. + Software according to specification. + Formal methods software correctness certification.
Legal Certainty	– Difference between everyday-life and legal definition of terms. – Terms underspecification and need for interpretation of such terms. + Embedded in citizens' reference frame.	– Incomprehensibility of formal language to non-experts. – Explainability of the software does not entail the predictability of its behavior. + Elimination of underspecifications and ambiguities.
Arbitrariness	– No justification of the interpretation option chosen for ambiguities and contradictions.	+ Fully deterministic.
Motivation	– Motivation of the decision does not necessarily correspond to the functioning of the automated implemented reasoning. + Natural Language specification helps to provide motivation of the AADM decision.	– Execution of the software does not provide an explanation. Explanation does not equate motivation. + Formal methods proof of correctness can substitute motivation with due diligence.
Clarity	– Software may constitute a <i>black box</i> . + Easily understandable.	– Unintelligibility of the provision for non-experts. – Difficult retrieval of data leading to the outcome.

1. Avoiding erroneous, unfair AADM outcomes is facilitated by the deployment of formal specifications.
2. Both natural language and formal language specifications of computational laws present benefits as well as challenges for the current legal framework. The Tension Table organise those benefits and challenges by legal principles.
3. The decision on the deployment of natural or formal language for a fair AADM is ultimately societal. This paper aims at guiding such a decision.