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A Criminal Domain Ontology for Modelling Legal Norms

Mirna El Ghosh[1], **Habib Abdulrab**[1], **Hala Naja**[2] **and Mohamad Khalil**[3]

[1] INSA, ROUEN, France

[2] Lebanese University, Faculty of Sciences, Lebanon

[3] Lebanese University, Faculty of Engineering, Lebanon

Abstract

- An ontological model for legal norms of the criminal domain.
- An ontology-based modelling approach: (1) build a criminal domain ontology; (2)formalize the legal rules based on it.
- A middle-out approach is applied for developing the criminal domain ontology based on ontology modularization and reuse processes.
- Domain application: Lebanese criminal code.

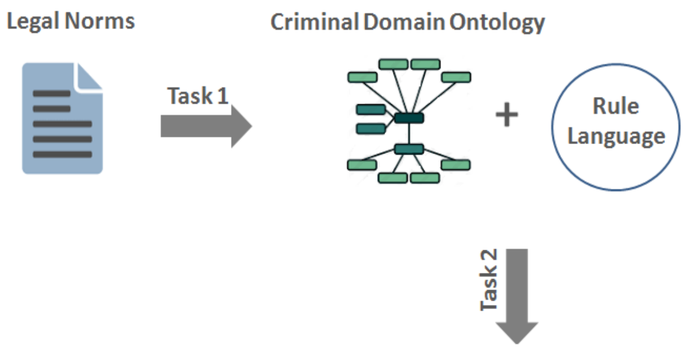
Objectives

- Simplify the difficulty of modeling legal norms by proposing an ontology-based approach.
- Simplify the complexity of ontology building process by reusing foundational and legal core ontologies.
- Obtain a well-founded ontological model for the legal norms of the criminal domain.

Methods

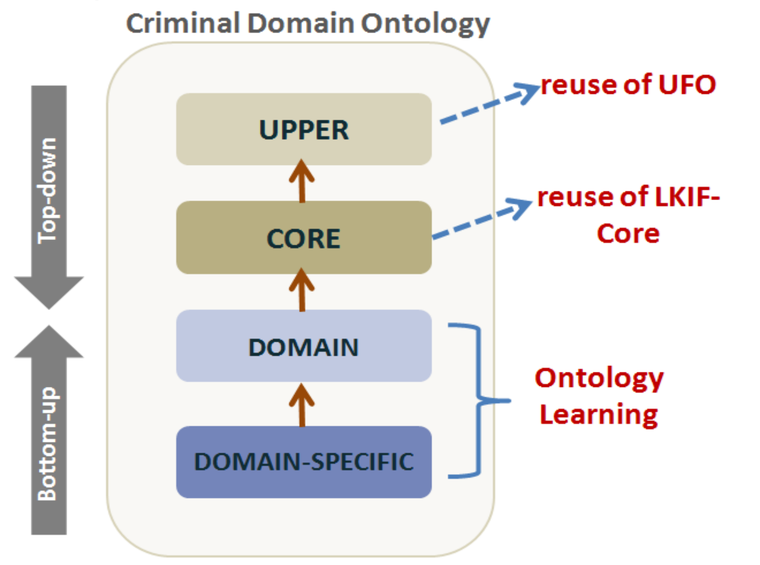
Ontology-based Modelling Approach

- **Modelling the legal norms:**
  1. Modelling the **content** of the legal norms: results in an ontological model (criminal domain ontology).
  2. Modelling the **procedural aspect** of the legal norms using logical formalisms: results in list of formalized rules.



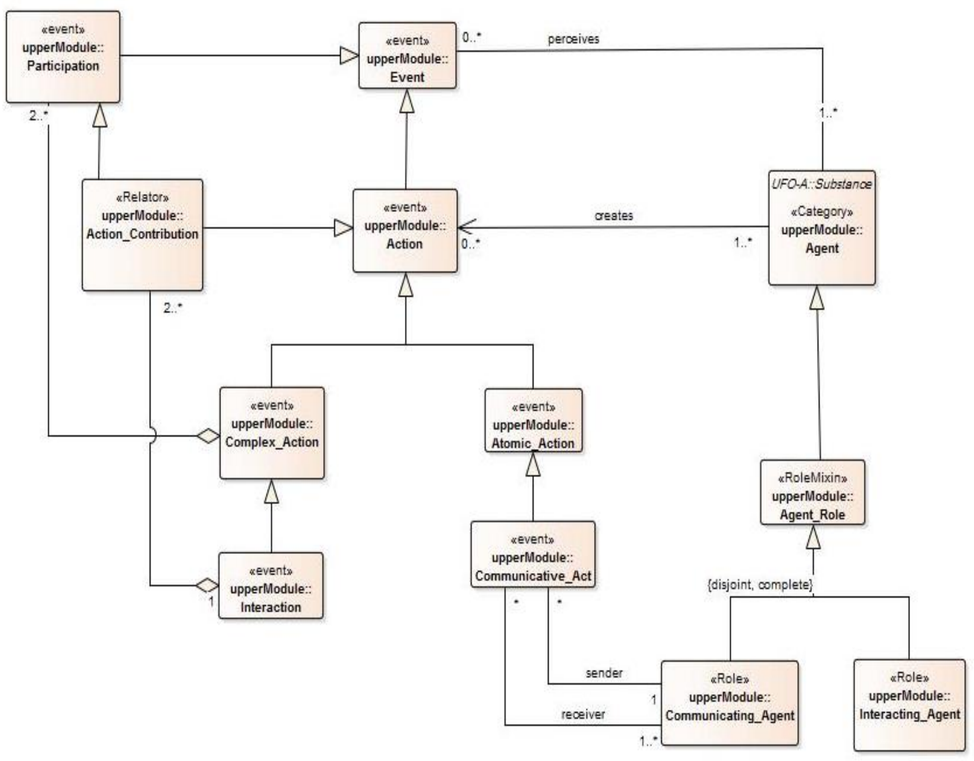
Middle-out Approach

- **Building a criminal domain ontology**: modularize the ontology into four modules: upper, core, domain and domain-specific.
  1. **Top-down:** conceptual modelling process (using OntoUML as ontology modelling language) performed by reuse of existent validated ontologies.
     - ***Upper*** module: reuse of the unified foundational ontology (UFO).
     - ***Core*** module: reuse of the legal core ontology (LKIF-Core).
  2. **Bottom-up**: Ontology learning process from texts + NLP techniques (**domain** and **domain-specific** modules).
  3. Modules **Integration**.

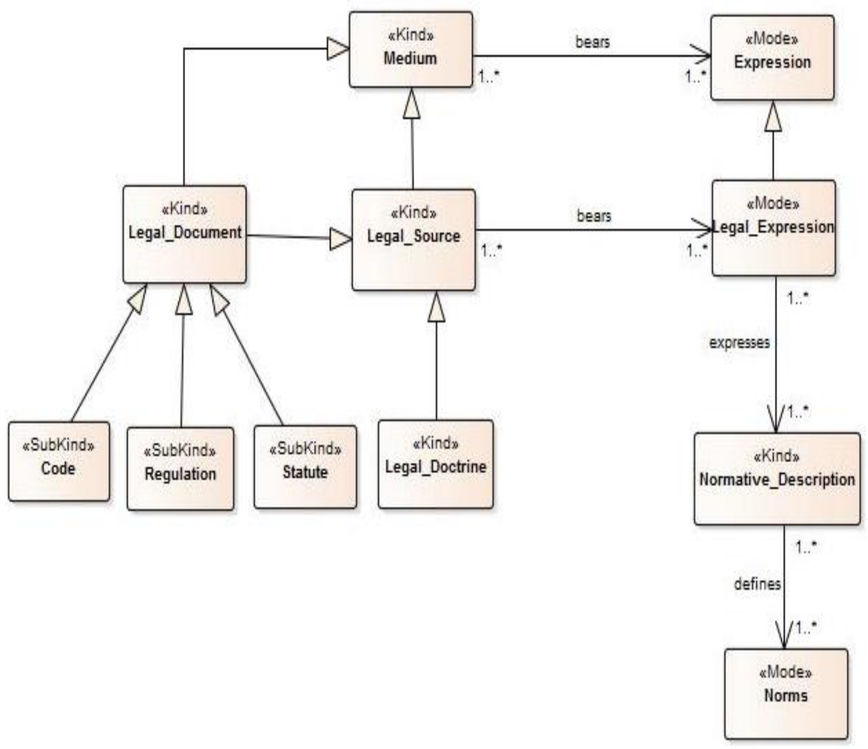


Results

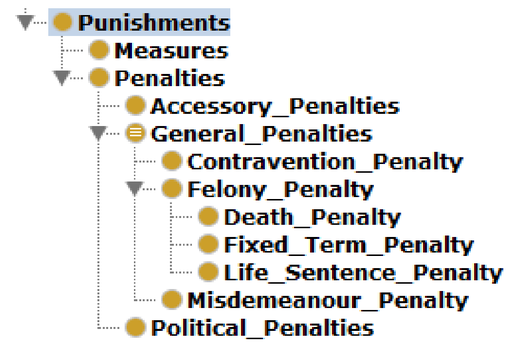
Upper module in ONTOUML
(Concepts reused from UFO)



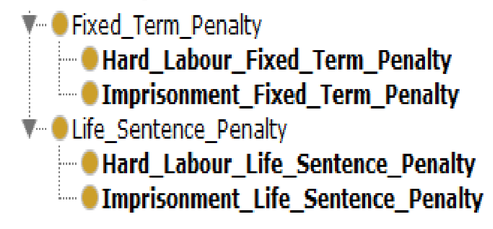
Core Module in ONTOUML
(Concepts reused from LKIF-Core)



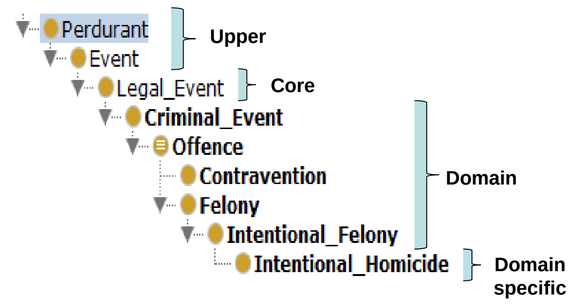
Domain Module in Protégé



Domain-specific Module in Protégé



Modules Integration



Logic rules using SWRL based on the Criminal domain ontology

Excerpt of the Lebanese criminal norms expressed in SWRL logic rules.

Legal Norms	Logic rules expressed in SWRL
Article 547: "Anyone who intentionally kills another person shall be punishable by hard labour for a term of between 15 and 20 years".	Intentional_Homicide(killing), committed_towards(killing, ?y), committed_by(killing, ?x) -> is_punished_by(?x, hard_labour), imposed_for_maximum(hard_labour, max_d_2), imposed_for_minimum(hard_labour, min_d_2), term_value(max_d_2, 20), term_value(min_d_2, 15), term_type(max_d_2, "years"), term_type(min_d_2, "years")

Conclusion

- Criminal domain ontology filled the gap between texts and norms modelling.
- Reusing UFO in conceptual modelling for building well-founded and consistent legal domain ontology.
- Reusing UFO and LKIF-Core facilitate and speed up the ontology building process.