Brief Documentation for Onto-OrthoCCL Ontology of Topics

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1. Overview

Title: Onto-OrthoCCL Ontology of Topics

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Ontology IRI: https://orthocclproject.sde.uom.gr/onto-orthoccl-ontologies/onto-orthoccl-topics

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Description:

The Onto-OrthoCCL Ontology of Topics is a domain-specific computational ontology designed to capture the topics of the *Orthodox Christian Canon Law* (OrthoCCL) corpus by modeling specialized, lower-level concepts. Four linked modular sub-ontologies make up this ontology:

(1) OrthoCCL-based Canons Ontology
(2) OrthoCCL-based Contexts Ontology
(3) OrthoCCL-based Keywords Ontology
(4) OrthoCCL-based Subject Headings Ontology

Comment: The term 'Onto-OrthoCCL Ontology' is an umbrella term utilized to denote ontologies that describe aspects of Orthodox Christian Canon Law (OrthoCCL), that is, ontologies containing knowledge pieces based on texts of Canons enacted by the Eastern Orthodox Christian Church.

2. Introduction

The ontology addresses the lack of machine-readable and semantically structured canonical data. It supports the transformation of canonical texts into a formal knowledge base suitable for computational processing, thematic exploration, and scholarly research.

The ontology is developed as part of the broader OrthoCCL Project, which focuses on the digital modernization of Orthodox Canon Law through ontology engineering and semantic technologies.

3. Scope

The ontology models the thematic domain knowledge of OrthoCCL, focusing on the thematic representation of Canons through:

- Semantic organization of subject headings (hierarchical taxonomy)
- Controlled vocabulary of keywords (non-hierarchical indexing)

- Textual content of Canons (multilingual)

The ontology is applied to the canonical collection “The Rudder (Pedalion)”, which serves as the primary case study.

4. Purpose

The ontology aims to:

- Provide a formal and machine-processable knowledge model
- Support thematic search and retrieval
- Enable comparative analysis of canonical texts
- Facilitate semantic organization of canonical material
- Serve as a knowledge base for researchers, theologians, and Church authorities

5. Competency Questions

The basic competency questions that the ontology can answer are the following:

(i) Hierarchical navigation of subject headings

– CQ1. What are the narrower subject headings of a given subject heading?

– CQ2. What are the broader subject headings of a given subject heading?

(ii) Retrieval of subject headings and Canons

– CQ3. Which subject headings are associated with a given Canon?

– CQ4. Which Canons are associated with a specific subject heading?

(iii) Keyword-based thematic access

– CQ5. Which keywords are associated with a given Canon?

– CQ6. Which Canons are indexed by keywords?

– CQ7. Which skos:related exists for a keyword (if any)?

– CQ8. Which skos:altLabel exists for a keyword (if any)?

– CQ9. Which given keyword refers to another keywords (see relationship)?

(iv) Content-level search

– CQ10. In which Canons is a particular word found?

– CQ11. What textual implementations exist for a given Canon?

6. Ontology Architecture

The ontology follows a four-module architecture (see Figure 1) comprising the Canons, Contents, Keywords, and Subject Headings sub-ontologies, each addressing a distinct yet complementary aspect of the OrthoCCL domain. This modularization enables the separation of concerns between normative entities (Canons), their textual realizations (Contents), lexical access mechanisms (Keywords), and conceptual thematic organization (Subject Headings).

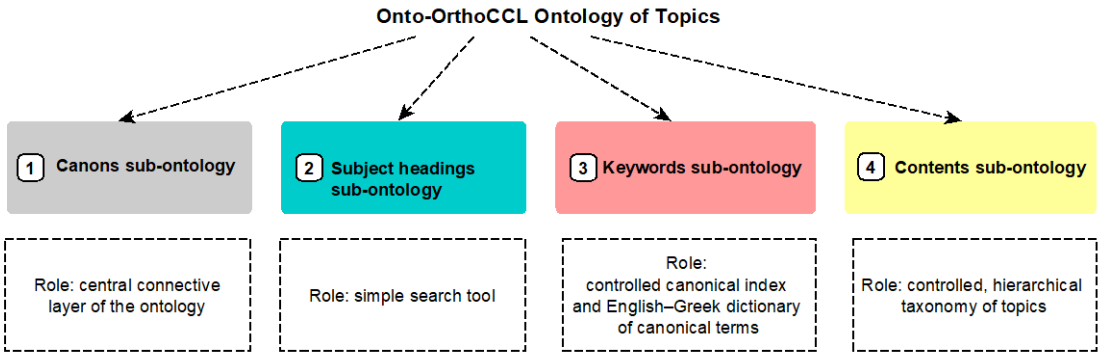

Figure 1. Modular architecture of the Onto-OrthoCCL Ontology of Topics

7. Conceptual Model

The conceptual model of the Onto-OrthoCCL Ontology of Topics (Figure 2) captures the core entities and their semantic relationships across the four sub-ontologies, providing a unified representation of the OrthoCCL domain.

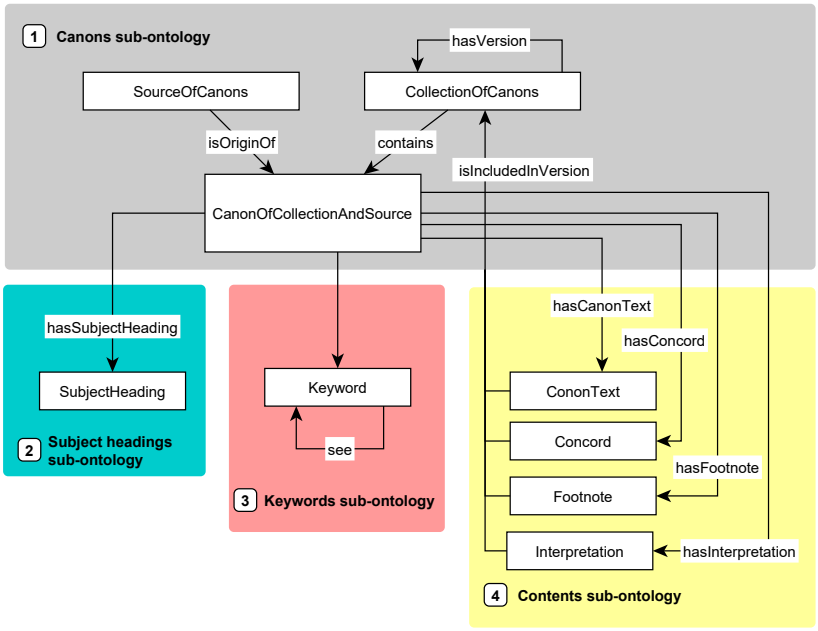

Figure 2. Core ontological model of the Onto-OrthoCCL Ontology of Topics.

Table 1 presents the core concepts of the Onto-OrthoCCL Ontology of Topics, organized according to the four sub-ontologies that constitute its modular architecture. Each concept is defined in terms of its role within the semantic model and its contribution to the representation of the OrthoCCL domain.

Table 1. Description of the core concepts of each sub-ontology.

Concept	Definition
(a) Canon sub-ontology	
CanonOfCollectionAndSource	It represents a Canon as it appears in a specific canonical collection and source.
CollectionOfCanons	It represents a resource in which the Canons of the Orthodox Christian Catholic Church are collected
SourceOfCanons	It represents a resource from which the Canons of the Orthodox Christian Catholic Church originate
(b) Contents sub-ontology	
Content	It represents the textual realizations (textual content) associated with a Canon in a specific canonical collection, including its main text and related explanatory or supplementary textual elements (e.g., concords, footnotes, and interpretations) published by a specific editor and in a specific language.
CanonText	It represents the textual expression of a Canon as it appears in a particular canonical collection, published by a specific editor and expressed in a specific language.
Concord	It represents a concordance note that establishes mainly thematic correspondences between a Canon and other related canonical texts.
Footnote	It represents an editorial annotation providing supplementary information, clarification, or references related to a Canon.
Interpretation	It represents an interpretative commentary that explains or elaborates on the meaning, application, or context of a Canon.
(c) Keywords sub-ontology	
Keywords	It represents a controlled lexical indexing term used for thematic access to the canonical material of OrthoCCL.
(d) Subject Headings sub-ontology	
SubjectHeadings	It represents a controlled conceptual term used to describe and organize the thematic content of the canonical material of OrthoCCL within a hierarchical taxonomy of topics.

8. Knowledge Representation Model

8.1 Multi-Level Structure

The ontology adopts a multi-level modeling approach, distinguishing between:

- Abstract Canon (conceptual level)
- Textual realizations (content level)
- Collections (publication level)
- Versions (edition level)

This enables:

- Representation of multiple textual versions
- Comparative analysis across collections
- Clear separation between abstract and textual entities

8.2 Canon Modeling

A Canon is modeled as:

- An abstract entity
- Linked to multiple textual realizations
- Associated with:
    - Source
    - Collection
    - Subject headings
    - Keywords

9. Description

This section provides a detailed description of the Onto-OrthoCCL Ontology of Topics in terms of its quantitative characteristics and its formal semantic structure, as derived from its implementation in OWL 2.

The ontology constitutes a rich and expressive knowledge model, as reflected in its metrics (Table 2), which include a large number of axioms, classes, properties, and individuals. These metrics indicate the extent to which the ontology captures the complexity of the OrthoCCL domain and supports detailed semantic representation.

Table 2. Onto-OrthoCCL Ontology of Topics Metrics.

Metric	Value
Axiom	38.390
Logical axiom count	24.249
Declaration axioms count	4.184
Class count	440
Object property count	26
Data property count	12
Individual count	3.693
Annotation Property count	14
Subclass Of	450
Class Assertion	3.659
Object Property Assertion	11.125
Data Property Assertion	8.970
Annotation Assertion	9.957

Table 3 presents the object properties, data properties, and annotation properties of the Onto-OrthoCCL Ontology of Topics, which collectively define its formal semantic structure.

Table 3. Object properties, data properties, and annotation properties of Onto-OrthoCCL Ontology of Topics.

Object properties	*belongsTo, comesFrom, contains, hasCanonText, hasConcord, hasContent, hasFootnote, hasInterpretation, hasKeyword, hasScheme, hasSubjectHeading, hasVersion, isCanonTextOf, isConcordOf, isContentOf, isFootnoteOf, isIncludedInVersion, isInterpretationOf, isKeywordOf, isOriginOf, isReferencedTermFor, isSchemeOf, isSubjectHeadingOf, isVersionOf, see*
Data properties	*canonFormat, canonNumber, canonText, canonType, chronologicalOrder, includedInCorpusCanonum, issued, language, place, presentationOrderInRudder, publisher, validity*
Annotation properties	*dc:contributor, dc:creator, dc:definition, dc:license, dcterms:isseud, dcterms:license, dcterms:location, dcterms:title, owl:versionInfo, rdfs:comment, skos:altLabel, skos:inScheme, skos:prefLabel, skos:related*

Table 4 presents the core object properties of the Onto-OrthoCCL Ontology of Topics, along with their corresponding domains, ranges, and inverse relations, providing a formal specification of the semantic relationships that structure the ontology

Table 4. Core object properties with their domains, ranges, and inverse relations of Onto-OrthoCCL Ontology of Topics.

Domain	Object Properties	Range	Inverse of
CollectionOfCanons	contains	CanonOfCollectionAndSource	belongsTo
SourceOfCanons	isOriginOf	CanonOfCollectionAndSource	comesFrom
CollectionOfCanons	hasVersion	CollectionOfCanons	IsVersionOf-
CanonOfCollectionAndSource	hasSubjectHeading	SubjectHeading	isSubjectHeadingOf
CanonOfCollectionAndSource	hasKeyword	Keyword	isKeywordOf
CanonOfCollectionAndSource	hasCanonText	CanonText	isCanonTextOf
CanonOfCollectionAndSource	hasInterpretation	Interpretation	isInterpretationOf
CanonOfCollectionAndSource	hasConcord	Concord	isConcordOf
CanonOfCollectionAndSource	hasFootnote	Footnote	isFootnoteOf
CanonText	isIncludedInVersion	CollectionOfCanons	includesContent
Interpretation	isIncludedInVersion	CollectionOfCanons	includesContent
Concord	isIncludedInVersion	CollectionOfCanons	includesContent
Footnote	isIncludedInVersion	CollectionOfCanons	includesContent
Keyword	see	Keyword	isReferencedTermFor
Keyword	hasScheme	ConceptScheme	isSchemeOf

10. Alignment and Standards

- Based on OrthoCCL Metadata Standard v1.0
- Extends Dublin Core
- Keywords aligned with SKOS

11. Data Sources

The ontology is based on:

- The Rudder (1957) as primary corpus
- Subject classification by Patsavos (2003)
- Canonical index by Mihai (2014)
- Canon numbering alignment via Menevissoglou (2013)

Bibliography of data sources:

- Agapius the Monk, & Nicodemus the Hagiorite. (1957). *The Rudder (Pedalion): Of the metaphorical ship of the one holy Catholic and Apostolic Church of the Orthodox Christians or all the sacred and divine canons of the holy and renowned Apostles, of the holy Councils, ecumenical as well as regional, and of individual fathers* (1st edn; D. Cummings, Trans.). Chicago: Orthodox Christian Educational Society.

- Menevissoglou, P. (2013). *Lexicon of the Sacred Canons, in Greek*. Katerini.
- Mihai, V. (2014). *Orthodox Canon Law Reference Book*. Brookline, Massachusetts: Holy Cross Orthodox Press.
- Patsavos, L. J. (2003). *Spiritual dimensions of the holy canons*. Brookline, Massachusetts: Holy Cross Orthodox Press.