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Grounding the development of an ontology for narrative and fiction

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Abstract

This paper investigates the methodological foundations and theoretical assumptions behind the construction of computational ontologies for modeling narrative and fiction, with a focus on literary characters. We survey and critically assess a set of existing domain-specific ontologies for fictional narrative, evaluating their modeling strategies, taking into consideration their philosophical and knowledge representation criteria. Drawing from ontology engineering principles and foundational frameworks such as DOLCE, BFO, and CIDOC-CRM, we propose a two-class ontology mapping methodology (harmonisation and alignment) to evaluate and foster semantic interoperability across the considered models. An experimental ontology pattern for fictional characters is then introduced and aligned with both DOLCE and BFO via CIDOC-CRM, revealing the ontological commitments and modeling trade-offs required to formalise the nuanced nature of fictional entities. This study offers a preliminary attempt to explore how foundational ontologies might support conceptual clarity, while also highlighting the epistemological challenges involved in representing complex, non-referential cultural artifacts. Ultimately, this work aims to highlight the relevance of ontologies as a shared infrastructure for computational literary studies, supporting interdisciplinary collaboration, fostering Open Science and encouraging more structured, transparent, and conceptually grounded approaches to the representation and analysis of cultural phenomena.

Keywords

Ontology, Fiction, Narrative, Semantic Web, Knowledge Organisation

1 Introduction

1.1 Knowledge Organisation and Computational Humanities

In the age of Open Science, data production and management is being exposed to a radical paradigm shift. Given the historically established interplay between hard sciences and computational methods, the adoption of the FAIR methodological guidelines for data stewardship first emerged in the fields of life, natural, and technological sciences Harrower et al. (2020). In the Humanities, the role of domain-specific repository networks is still marginal. However, if one considers that knowledge production in the Humanities is characterised by interpretative processes and judgments of (moral, historical, aesthetic, etc.) value, resources for a systematic comparison between statements about social and cultural artefacts are undoubtedly useful in order to advance a shared knowledge of them. The epistemological and practical benefits of organising data in a way that fosters its Findability, Accessibility, Interoperability and Reusability, need to be fully acknowledged and harnessed by the Humanities as well Ruediger and MacDougall (2023). In order to achieve such a goal, the Digital Humanities (DH) along with Semantic Web technologies play a key role. Effective data management is not to be conceived as an end in itself; rather, it serves as the crucial pathway to facilitate knowledge discovery and scientific innovation. Furthermore, it enables the subsequent integration and reuse of both data and knowledge by the community following the data publication process Wilkinson et al. (2016). In this context, FAIR guidelines play a pivotal part in promoting and leveraging interdisciplinary approaches, marking a fundamental stride towards a scenario where a systematic and socially sustainable management of complexity becomes genuinely achievable.

Science *modus operandi* does not solely rely on Cartesian reduction of complex formations like artworks and communication to their elementary constituents, but also considers the latter as non-derivative elements themselves. Complex phenomena possess properties and behaviors that cannot be fully understood or predicted by examining their individual parts alone. Semantic Web technologies enable scientific community to implement holistic perspective by facilitating seamless integration and interoperability of diverse data sources [1]. Computational ontologies are the backbone of the Semantic Web and serve as a foundation for tackling interoperability and reusability challenges. Poveda-Villalón et al. (2020). When it comes to the field of literary and narrative studies, several scholars have attempted more or less rigorous formalisations of the knowledge produced

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by literary critics Pianzola (2024). From Russian formalism at the beginning of last century, to the 1970s and 1980s semiotic and structuralist theories of literary text, narratology endeavored to establish a path akin to what cognitive functionalism sought to achieve regarding mental notions: a coherent and comprehensive formalisation of concepts that is able to account for the complexity of literary texts. More recently, computational literary studies have directly addressed the problem of turning literary theories into models that can be operationalised by computer-assisted analysis Pichler and Reiter (2022); Jacke (2025). However, only in a few cases the attention had been given to the creation of computational ontologies to model literary data Bartalesi et al. (2016); Schöch et al. (2022); Bruno et al. (2024), despite the fact that ontology engineering has the capability to provide theoretical as well as technical tools to specifically address the formal operationalisation of conceptual frameworks. In this article, we reflect on the ontological and epistemological assumptions that can guide the creation of computational ontologies for literary studies.

In the literary studies' domain, as well as in any scientific field, data do not exist before and aside the action of modeling: rather, they always emerge as a product of a modeling operation. They only exists as the outcome of an hermeneutical process Barrowman (2018); Flanders and Jannidis (2018). Designing formal models based on an "explicit specification of a shared conceptualisation" Gruber (1993), namely ontologies, requires scholars to precisely and unambiguously define their conceptual categories and to reflect on the philosophical implications underpinning their choices. According to Guarino (1998), the result of this endeavor is an ontology which is a "logical theory accounting for the intended meaning of a formal vocabulary, i.e. its ontological commitment to a particular conceptualisation of the world. The intended models of a logical language using such a vocabulary are constrained by its ontological commitment. An ontology indirectly reflects this commitment (and the underlying conceptualisation) by approximating these intended models" (Guarino 1998, 5). Moreover this engineering artifact – the computational ontology – enables the emergence of new knowledge, since it compels us to elucidate the implicit assumptions that form a substantial component of literary criticism and literary theory.

Ontological formalisms offer techniques for collaboratively sharing, combining, and ultimately mapping diverse ontologies, capitalising on the pertinent modeling and formalisation endeavors undertaken in neighboring research domains. Finally, since ontologies are based on Description Logic (DL) [2], they enable computational inferences, allowing scholars to uncover unforeseen and subtle connections among concepts and entities within the model. Considered in this light, the convergence between literary theory and ontology engineering provides a substantial opportunity for the future of Computational Literary Studies Ciotti (2016).

The aim of this paper is to take the initial steps in researching viable and generalisable solutions for the ontological modeling of narrative and fiction. For illustrative purpose, the emphasis will be placed on a specific type of fictional entity: characters. Accordingly, the idea is not to craft a new ontology from scratch, but rather to leverage and integrate already existing W3C-compliant models in order to rely on ontologies reuse and interoperability. The article's content is structured as follows. Section 2 provides and overview and selection of existing models designed for narrative and fiction. Section 3 delineates the heuristics and methodology employed in constructing the overarching argumentation on which our final proposal is based. Section 4 conducts an evaluation of the domain-level models outlined in section 2, analysing them in conjunction with well-established foundational ontologies. This assessment is carried out in consideration of both philosophical and knowledge representation issues pertaining to the endeavor of modeling fictional entities. Building upon the theoretical foundation established in section 4, section 5 explores feasible solutions for achieving a mapping between ontologies. Lastly, a concluding section addresses existing gaps and forthcoming challenges to be tackled.

2 State of the Art

Over the past years, several ontology-driven models for narrative and fiction have been proposed. A review conducted by Varadarajan and Dutta Varadarajan and Dutta (2021) about ontologies for narrative information analyses and compares eleven models. Among these, the following nine are of interest for modelling the content and style of fictional narrative: i) an ontology Nakasone and Ishizuka (2006) for generic aspects of storytelling aimed at ensuring coherence among the events within a story and implementing the relations set proposed by the Rhetorical Structure Theory (RST) Mann et al. (1989); ii) a narratology-based model Bartalesi et al. (2016); iii) the Archetype Ontology Damiano and Lieto (2013), tailored to the identification of potential relationships between a set of archetypes and the implicit narrative elements present in every form of artwork; iv) the Story Fountain's ontology Mulholland et al. (2004), specifically designed to assess relations between stories and themes; v) a character-based model for emergent narrative devoted to represent event sequencing Swartjes and Theune (2006); vi) the Ody Ontology Khan et al. (2016), a perdurantist-oriented model designed to support the semantic analysis of literary texts' narrative content, implemented on Homer's Telemachy; vii) the Transmedia Ontology Branch et al. (2017), designed to model the narrative content of trans-media cultural objects with a particular emphasis on trans-media relationships between characters, their attributes, events, places, elements of power and objects; viii) the Drammar Ontology Damiano et al. (2019), which deals with formalising the semantic annotation of dramatic qualities in narrative content regardless of the medium used, emphasising the conflict dynamics involving characters in a story and specifically the relationship between characters' intentions and the effects of their actions. ix) the ProppOnto Peinado and Díaz-Agudo (2004), an OWL based framework designed for automating story generation by leveraging Propp's *Morphology of the Folk Tale*. An improved version is the ProppOntology Pannach et al. (2021), which focuses on the role of fictional characters and their narrative functions.

In addition to the models mentioned by Varadarajan and Dutta Varadarajan and Dutta (2021), the following four ontologies, thought specific to sub-domains of narrative and fiction, present models that could be potentially generalised to the whole domain: ix) the Japanese Visual Media Graph Pfeffer and Roth (2019), which aims to establish a research database covering various types of Japanese visual media, such as anime, manga, computer games, and visual novels. Databases are mapped to an ontology designed to model expressions, themes, topics, characters, and reception; x) the MiMoText knowledge graph Schöch et al. (2022), an information system combining linked open data (LOD) principles with a Wikibase infrastructure and text mining techniques to delve into data-driven literary history; xi) the DraCor project Fischer et al. (2019), an ecosystem promoting diverse approaches for browsing and accessing European drama corpora in a programmable way; xii) an ontology for representing literary characters along with their attributes Hastings and Schulz (2019);

Additionally, there are some ontologies developed specifically for individual literary works, e.g. ODI, BACODI, which focuses on Italo Calvino's masterpiece *Il castello dei destini incrociati* Bruno et al. (2024).

Although the aforementioned ontologies provide valuable insights into specific types and features of fictional narratives, their narrow focus on specialised areas constrains their usefulness as standardised frameworks for the ontological modeling of narrative and fiction. In section 4, we provide a more in-depth analysis of some of these ontologies, based on the methodology outlined in section 3.

3 Methodology

Ontology mapping is the technique used to deal with the issue of ontology-based knowledge integration, especially in relation to data interoperability and reusability in the context of SW Ehrig and Staab (2004). Several alternative definitions of integration, along with practical implementations of the concept of 'mapping' are available, with no clear consensus on a standard approach Kalfoglou and Schorlemmer (2003). In simple terms, mapping two ontologies $O1$ and $O2$ means that for each entity in $O1$ there is a corresponding entity in $O2$ which has the same intended meaning Ehrig and Staab (2004). To ensure clarity regarding our methodology, we summarise here the theory of mapping in a more formal way.

First, we have to clarify what an ontology consists of. An ontology can be represented as a pair $O = (S, A)$, where S is the signature describing the vocabulary (the set of concepts denoting some entities) and A is a set of axioms specifying the intended interpretation of the vocabulary related to a domain of discourse. An ontological signature (S) can be described as a hierarchy of concepts structured as a partially ordered set (poset), together with a set of relations whose arguments are defined over the concepts' hierarchy. Based on these specifications, ontology mapping can be characterised as the process of relating the vocabulary of two ontologies that share the same domain of discourse. This is done in such a way that the logical structure of ontological signatures, coupled with interpretations established by the ontological axioms, are consistently respected Kalfoglou and Schorlemmer (2003). A mapping that preserves logical consistency between two ontological structures can be viewed as a *semiotic morphism*. In brief, semiotic morphisms act as principles used to articulate the mapping, translation, interpretation, and representation of concepts in one ontology to corresponding concepts in another ontology Sampson and Zervas (2005). It is also possible to describe ontology mapping as semiotic morphisms of ontological signatures leveraging an algebraic semiotic notation. Two primary types of mapping structures are identified: total and partial mapping. In the first case $O_1 = (S_1, A_1)$ maps to $O_2 = (S_2, A_2)$ *iff* there exists a morphism $f : S_1 \to S_2$ of ontological signatures, such that $A_2 \models f(A_1)$. In the second case $O_1 = (S_1, A_1)$ partially maps to $O_2 = (S_2, A_2)$ *iff* there exists an ontology subset $O'_1 = (S'_1, A'_1)(S'_1 \subseteq S_1 \wedge A'_1 \subseteq A_1)$ such that there is a total mapping $O'_1 \to O_2$ Kalfoglou and Schorlemmer (2003). The present discussion focuses on this weaker notion of mapping, and specifically on two types of partial mappings—*harmonisation* and *alignment*—as defined by D'Andrea and Niccolucci D'Andrea and Niccolucci (2008). While their framework identifies three types of mapping (including *extension*), the current analysis concentrates on the first two types, as the third, related to task ontologies, is not of interest in the following. Harmonisation concerns mappings where the relevant ontology fragments are semantically equivalent; alignment, by contrast, involves a generalisation relation between concepts, typically where a more specific ontology is mapped to a more abstract one. More formally:

A subset $O'_1 = (S'_1, A'_1)$ of the source ontology O_1 **harmonises** with a subset $O'_2 = (S'_2, A'_2)$ of the target ontology O_2 *iff* there exists a semantic equivalence relation $r : S'_1 \equiv S'_2$ such that:

$$\text{for all models } \mathcal{M}, \quad \mathcal{M} \models A'_2 \iff \mathcal{M} \models f(A'_1)$$

where f is a structure-preserving mapping (morphism) translating the axioms from O'_1 to O'_2.

A subset $O'_1 = (S'_1, A'_1)$ of the source ontology O_1 **aligns** with a subset $O'_2 = (S'_2, A'_2)$ of the target ontology O_2 *iff* there exists a generalisation relation $r : S'_1 \subseteq S'_2$ such that:

$$\text{For all models } \mathcal{M}, \quad \mathcal{M} \models A'_2 \Rightarrow \mathcal{M} \models f(A'_1)$$

The methodological perspective adopted in this paper, focused on reusing models and making them interoperable, rather than in designing a new ontology from scratch, encompasses different mapping techniques, aiming at identifying potential solutions for models integration in the field of narrative and fiction. Borrowing Magee's (2011) expression, the task is viewed as a 'bottom-up' problem that entails conceiving mapping as a process to be carried out at the level of individual concepts Magee (2011). In other words, it means individually evaluating whether, and to what extent, a concept $C1$ from ontology $O1$ is related to a concept $C2$ from ontology $O2$ in terms of equivalence, generalisation, or disjointness. It is worth noting that in the realm of ontology engineering the term *bottom-up* is primarily used to refer to a widely employed approach for building ontologies.[3]

The heuristic strategy adopted in this article is implemented through the articulation of two mapping steps. In the first step, the mapping between domain ontologies is referred to as *harmonisation*, while the generalisation process that will be performed in the second step, connecting to foundational ontologies, is called *alignment*. Mapping to foundational ontologies is not only a means to ensure semantic interoperability, it also stands as a method to enhance concept-modeling tasks by drawing upon contributions from disciplines like philosophical logic, metaphysics, linguistics, and cognitive science. Furthermore, engaging in representing (modal) meta-properties of a set of concepts provides a precise account of their ontological commitments Schmidt (2020); Guizzardi (2006). Different philosophical assumptions embedded in foundational ontologies give rise to a range of alternative theoretical conceptualisations. The aim of this paper is to propose and evaluate, whenever feasible, multiple mapping solutions. In order to achieve such a goal, on one hand we evaluate modelling solutions based on literary theory; on the other hand, we provide an examination of the philosophical implications and knowledge representation strategy that underpin the adoption of foundational ontologies.

4 Critical review of ontologies

4.1 Domain-specific models

Following the overview of ontologies provided in section 2, some of those models are here analysed in a more detailed way. For illustrative purposes, we focus our reflection on one kind of narrative content and explore possible mappings. We decided to model fictional characters since they play a central role in the cognitive and affective relations that readers have with narrative and fiction Willis (2018). The criteria employed for this subsequent selection can be considered as necessary requirements for the ontologies' mapping proposed in Section 5. These essential conditions include i) a sufficient level of detail about the formal structure of a model[4], and ii) an explicit and clearly defined modeling strategy for representing fictional characters. For each selected ontology, we offer a brief general description followed by a focused examination of two specific dimensions: firstly, we explore the theoretical foundation guiding the modeling of characters (if applicable); secondly, we delve into how this theoretical framework is implemented in terms of KR design techniques.

4.1.1 Ody ontology In order to depict narrative elements within a literary text, Khan et al. Khan et al. (2016) designed a model which is part of an information system devised for querying literary text on a semantic basis. The *Telemachy* from Homer's *Odyssey* was chosen as a case study. The ontological model has been conceived in accordance with a perdurantist approach Welty and Fikes (2006), also called 4D (four-dimensional) approach, which maintains that all entities are perdurants, i.e. all entities have parts that exist in time. The central axis of the model is therefore constituted by temporal events, interconnected with characters, objects, and places. This strategy does not focus directly on relations of participation between characters and events. Instead, it connects temporal parts (time-slices) pertaining to a character to an event the character participates in. In this perspective, a time-slice is regarded as a set of unchanging properties throughout a defined time span. This approach allows for the representation of characters by assigning specific qualities to them during certain intervals of time, while excluding those qualities at other times. The management of temporal components in the narrative is achieved through the controlled vocabularies OWL-TIME [5] and TIME-PLUS Cox (2016). Top-level classes of the model are aligned to PROTON Terziev et al. (2005), a lightweight and highly versatile upper-level ontology commonly used for semantic annotation. Characters are modeled through the class *Fantastic Character*, which is declared as sub-class of the *Agent* class from PROTON. The latter is connected to a class for time-slices, called *Temporal Part*, via the property *hasTemporalPart*. *Temporal Part* is in turn connected to the *Ody Event* class by means of the *participant* property. Both the *Temporal Part* and *Ody Event* classes are declared as subclasses of the PROTON *Event* class.

4.1.2 Transmedia Ontology The Transmedia Ontology Branch et al. (2017) represents an initial endeavor to build a computational ontology for narrative information contained in trans-media fictional worlds (TMFW). This model is crafted to infer connections among trans-media elements such as characters, character-associated attributes, items, places, and events. Notably, it incorporates a set of 72 classes and 239 properties.

The research interests inspiring the construction of this model are twofold: i) to explore how knowledge is inherently structured within the domain of trans-media narratives, and ii) to understand how end-users navigate, organise, and comprehend the information contained in such narratives. Applying a *bottom-up* methodology, four TMFWs were selected for the ontology learning process: *Star Wars*, *The Wizarding World of Harry Potter*, *The Marvel Universe*, and *The Lord of the Rings*.

Classes designed to encapsulate narrative structures within a TMFW include *Transmedia Property*, which encompasses a *Story World* composed of interconnected stories across various media. A *Story World*, in turn, describes a series of stories forming a cohesive narrative within a *Transmedia Property*. The *Storyline* refers to a single story unfolding across multiple creative works, while the *Transmedia Creative Work* represents the smallest unit encapsulating a Creative Work belonging to a *Transmedia Property*, *Story World*, or *Storyline*.

Semantic interoperability is achieved through mappings with four external ontologies: the Comic Book Ontology (CBO)[6], the Ontology of Astronomical Object Types[7], Schema.org[8], and SKOS[9]. To minimise compilation issues, detailed links to these ontologies are also listed in the Appendix.

The *Character* class is declared as a subclass of both *schema:Person* and *cbo:Character*, and has two subclasses: *Hero* and *Villain*. This connection allows characters to be associated with both real-world individuals and fictional characters. Several object properties connect *Character* to other classes, enabling the specification of the *Transmedia Creative Work* in which characters appear, kinship relationships, places of residence, assigned titles, roles, races, and more. Except for moral tropes, no solution is currently provided for modeling characters' physical or psychological attributes.

Another crucial component of character modeling is the *Metamorphosis* class, which represents processes of transformation involving characters. *Metamorphosis* establishes a temporal connection between an entity before and after a transformation. Object properties associated with *Metamorphosis* enable the specification of factors leading to the transformation, its location, catalysts involved, and other related elements.

4.1.3 Drammar ontology The Drammar ontology Damiano et al. (2019) focuses on formalising the semantic annotation of dramatic qualities in narrative content, regardless of the employed medium. Dramatic qualities are those elements that are considered necessary for the existence of a drama. The emphasis is on the structure of conflict dynamics involving characters in a story, particularly on the relationship between characters' intentions and the effects of their actions on the narrative's progression. There are four top-level classes. *DramaEntity* is the class for entities that are peculiar to drama. *DataStructure* organises elements of the ontology into common data structures (lists, sets, and trees). *DescriptionTemplate* contains patterns for representing instantiated drama based on role-specific templates. Lastly, *ExternalReference* connects the description of drama to commonsense and linguistic concepts found in external resources. Characters are modeled through the *Agent* class, defined as an indirect subclass of *DramaEntity*. In fact, the latter branches into *DramaPerdurant* and *DramaEndurant*, which are aligned, respectively, with *Perdurant* and *Endurant* of DOLCE-Lite[10], a foundational ontology. *DramaPerdurant* is further divided into *Process* and *State*, aligned with the homonymous classes of DOLCE-Lite. *DramaEndurant* splits into *Agent* and *Object*, distinguished by the presence of intentionality in the actions involving their instances. Here a theoretical apparatus is employed to formally represent the aforementioned dramatic qualities. In particular, theories from semiotic and structuralist narratology are leveraged, relying on key notions such as action, agent, conflict, and segmentation Elam (1980); Ciotti (2016). An action denotes a purposeful, intentional, conscious, and subjectively meaningful activity. Characters are conceptualised using the term *agent* for two specific reasons. Firstly, the emphasis is not on the psychological, moral, social, or political dimensions that arise as a cognitive dramatic product created for an audience. Rather, the focus is on the structural elements of dramatic action. Secondly, the notion of *agent* captures someone who is fundamentally responsible for the action, thereby mediating all other consequences of their activity. Conflict is identified as the driving force behind the character's transformations. It is portrayed as an obstacle and elicits an emotional response in the agent. Segmentation emphasises the hierarchical organisation of dramas, where each part at every level mirrors the structure of the entire drama through fractal recursion. In this context, parts are referred to as units, acting as containers for the agents' actions. With respect to the modeling of characters, the *State* class is of fundamental value. It branches into subclasses based on the entity to which the state is attributed – either agent or story world – resulting in the *MentalState* and *StateOfAffairs* subclasses. Within the *MentalState* class, the rational vs. irrational distinction is acknowledged. Mental states, crucial for describing the intentional behavior, of agents fall into classes such as *Belief* (agent's subjective view), *Emotion* (felt emotions), *ValueEngaged* (values affected by the plot), and *Goal* (objectives motivating actions). However, no solution is provided for physical attributes and appearance-in relation to characters within a fictional work.

4.1.4 ProppOntology and ProppOnto A narrative theory that allows modelling of (folklore) narratives in a structural way is Vladimir Propp's *Morphology of the Folk Tale* Propp (1968). The morphological method he developed revolves around the organisation of "functions," providing a systematic way to characterise folk tales based on their constituent parts, the relationships between these components, and the connections among the elements and the overall narrative. Propp defined 31 invariant functions that describe key plot components in the Russian Magic Tale collection of A. Afanasyev. Each of these functions describes a certain type of event or action related to a subset of seven archetypal characters (Dramatis Personae). Functions can be represented by a literal or abbreviation, with storylines encoded as sequences of those literals. Not all 31 Proppian functions have to appear in a tale, but if they do, they follow a strict ordering. For instance, the function β *Absentation* applies if a family member of the Hero leaves at the beginning of a tale. Similarly, the function *W Wedding* is a function of reward to the Hero and applies only at the end of the tale. If a wedding takes place in a tale at the beginning of the tale, it could be a variant of absentation, e.g. if one of the Hero's family members gets married and leaves the home. In this case, it would be a case of *Absentation* and not *Wedding*. All functions are tied to respective Dramatis Personae: Hero, Villain, False Hero, Donor, Helper, Dispatcher, the Princess and her father, where the latter two are grouped together, because they usually appear together when the reward function is applied (e.g. in marriage or when a hero receives a kingdom).

There are two approaches that model Proppian morphology. Pannach et al. (2021) define both Dramatis Personae and Proppian functions as classes. Additionally, Proppian functions and related subfunctions (special cases or narrower functions) are defined as object properties, with domain and range values based on the participating Dramatis Personae, e.g. *interrogates(Donor, Hero)* which relates to the function *D2 Donor greets and interrogates the hero* and applies to a story in which the supplier of a magical agent (Donor) tests the Hero by means of interrogation. If the Hero is worthy, the magical agent is transferred. In this case, the interrogation of the Hero is performed by the Donor character. This means, if the function is applied, it can be logically inferred that the two characters who participate in the function have to be assigned the classes of *Hero* and *Donor*. ProppOntology was developed to serve as a framework to annotate Proppian structure in folktales of diverse origin and has been applied to a set of Southern African and Southern Indian tales. It was also extended with additional character classes from previous work Koleva et al. (2012). Verbalisations of Proppian functions that appear in a tale are modelled as data properties.

Peinado et al. Peinado and Díaz-Agudo (2004) worked on the construction of an ontology oriented towards automatic story-plot generation. The primary aim of this model is to allow the assessment of semantic distance between narrative functions. Some key top-level classes in the model include: i) *ProppFunction*, which represents the basic recurrent units of a plot corresponding to Propp's character functions; ii) *Move*, which represents a type of development proceeding from villainy or a lack through intermediary functions to marriage or other functions employed as a denouement (ending); iii) *Confilct*, which express a specific type of move that involves conflicts in the story, such as a *Competition* or a *Test of the hero*; iv) *Role*, which includes various roles that characters can play in the story, such as *Hero*, *Villain*, *Helper*, *Donor*, *FalseHero*, etc.; v) *Place*, which reflects different locations or settings in the story, such as *City*, *Country*, *Dwelling*, etc.; vi) *Character*, which shows different characters in the story, such as *Human*, *Animal*, *AnimatedObject*, etc. vii) *Description*, which encapsulates descriptions associated with characters, places, or objects, capturing their external qualities or attributes; vii) *SymbolicObject*, which models objects in the story that hold symbolic significance. Regarding characters' modeling, what one may infer from the article describing the ontology [11] is that they are represented in strong relation with the narrative function they embodies, therefore manifesting somehow their intentionality as agents. The *Description* class is meant to model characters attributes, including their external appearance. However, it is not clear which object property is used to connect characters with their attributes. No solution has been provided for modeling the appearance-related properties of characters in relation to the work in which they appear.

4.1.5 Character ontology Hastings and Schulz offer a strategy – a pattern – for modelling fictional characters and their attributes within an ontology Hastings and Schulz (2019). Their approach follows a top-down methodology informed by the Basic Formal Ontology (BFO), a foundational model designed to support information integration, retrieval, and analysis across the natural sciences. Notably, BFO adopts a realist standpoint, presuming a real-world existence for the entities within its scope of application. Unlike entities considered by the natural sciences, fictional characters do not exist as real-world entities Rouillé (2023). Therefore, it is quite problematic to model fictional characters using the same methodological practices typically employed in the development of ontologies within the natural sciences. The main issue is the relation of 'aboutness', which allows an information entity to denote the referred entity. To deal with this obstacle, an ontology for modeling information entities has been developed as an extension of BFO, the Information Artifact Ontology (IAO)[12]. The IAO is an attempt to give a realist account of information entities. The root class of this model is *Information Content Entity* (ICE), a subclass of *Generically Dependent Continuant* from BFO. That is, entities that maintain self-identity over an extended period of time (continuant) and depend on the existence of at least one instance of the bearer type (generically dependent). For example, the text pattern contained in a PDF document can exist and be replicated across multiple PDF files. The relation that allows an *Information Content Entity* to denote something is defined in IAO as *is-about*[13], but Smith and Ceusters Smith and Ceusters (2015) suggest incorporating into IAO the capacity for an *Information Content Entity* to handle non-referring representational units and non actualised 'portions of realities'[14].

To model fictional characters in a way compliant with BFO without affirming their actual existence, Hastings and Schulz's strategy tackles indeed the gap concerning the issue of aboutness when applied to a specific type of non-referring representational units. The authors expand the theoretical framework established by Smith and Ceusters, combining it with two metaphysical theories: the theory of *quasi-judgments*, derived from Ingarden's phenomenological realism, and Meinong's theory of objects. Ingarden's theory asserts that statements involving non-existent entities, such as fictional ones, do not strictly denote something, but are rather quasi-denoting and therefore do not claim any truth value Seifert and Smith (1994). The Meinongian perspective posits that fictional entities are a subset of what are known as Meinongian objects, i.e. objects that, unlike both concrete and abstract entities, do not actually possess any kind of existence, lacking whatsoever ontological determination. Nevertheless, Meinong allows for the attribution of properties to these objects, only to the extent that these properties are designated as pure intensional objects Casati and Priest (2017). Indeed, fictional characters are considered to effectively correspond to the intensional meaning of the logical conjunction of properties that are attributed to them. Hence, these objects would be nothing more than bundles of properties. Expanding on this theoretical framework, the authors propose the adoption of the construct *as-if-about only*, which refers to a specific type of aboutness relation inspired by Ingarden's concept of quasi-denoting. This links information entities that denote fictional characters to the attributes that they appear to possess. Utilising the OWL constructor *only* in the connection between the information entities and the intersection of attributes identifying fictional characters, any existential claim is avoided. The OWL logical connective *only* can be equivalently expressed as 'not-some-not', signifying that an information entity whose meaning identifies a fictional character does not denote (is not about), and therefore is not ontologically committed to anything beyond the intensional limits expressed by the intersection of the attributes associated with them Hastings and Schulz (2019). As this ontological pattern is explicitly designed to model fictional characters and their attributes in the broadest sense, representing qualities such as physical or psychological traits, as well as the relation of appearing in a work of fiction, though not explicitly addressed, would simply consist of a specific implementation of the overall representational strategy for modeling attributes in general.

4.1.6 DraCor ontology DraCor, acronym of 'drama corpora', is a growing collection of TEI-encoded plays. It is accessible as programmable corpora Fischer et al. (2019); Börner and Trilcke (2023) or research-oriented corpora providing an API that enables the automatic extraction of data. As part of the LOD cloud, DraCor is an infrastructure in which the reusability and interoperability of data is central. Its data model uses Wikidata identifiers for authors and plays, and provides several metrics related to the network of characters within a play. The DraCor knowledge base is organised through an ontology comprising seven classes: *Author, Character, Corpus, Genre, Play, Relation of Characters* and *Segment*. However, the source code does not provide any type of annotation, description, or axiom for any of the included classes. For what concern our research interests, *Character* connects to *Play* via the *contains play character data* property. Additionally, the ontology provides a limited set of options for representing character attributes, all modeled as data properties: name, gender, and roles in the play, along with other metrics related to the characters' network.

4.2 Top-level models

The analysis of the domain models considered in the previous subsection brought to light three foundational ontologies to which some of those models are aligned, namely DOLCE (Descriptive Ontology for Linguistic and Cognitive Engineering), PROTON (PROTo ONtology) and BFO (Basic Formal Ontology). Generally speaking, foundational ontologies – also defined as 'top' or 'upper-level' ontologies – are characterised as domain-independent frameworks that articulate what are considered fundamental concepts. The aim is to provide a common and shared understanding of the broadest ontological categories, facilitating interoperability and fostering a standardised ground for knowledge representation across different domains. In fact, these artifacts are rapidly emerging as a pivotal technology for integrating heterogeneous knowledge originating from various sources. Additionally, they facilitate more precise descriptions of the concepts and relationships within a specific discursive domain Guizzardi (2019). The three models mentioned can be considered among the most widely adopted and well-established standards within the research community Mascardi et al. (2007). However, notable differences characterises their inspiration and structure.

4.2.1 DOLCE DOLCE's initial development traces back to research conducted at ISTC-CNR (Trento and Rome) for the European project *WonderWeb*[15]in the early 2000s, as documented in Masolo et al. Masolo et al. (2003). This version was axiomatised in First-Order Logic (FOL) along with some modalities. Subsequent to this foundational work, DOLCE has found applications in various domains and several application-oriented versions have been published, axiomatised in lightweight versions of the Web Ontology Language (OWL) Porello et al. (2024), such as DOLCE-lite, DOLCE-ultralite, and DOLCE-zero. DOLCE is an ontology of particulars[16]. This implies that its domain of discourse consists solely of particular entities, with universals functioning as organisational principles used to characterise them. However, since universals are not themselves included within the domain—despite being referred to—they are not subject to formal characterisation within the ontology itself, but are instead handled at the level of the meta-language[17] Gangemi et al. (2002). DOLCE approach is explicitly descriptive, incorporating a cognitive perspective. Consequently, it makes no commitment to a strictly referentialist metaphysics regarding the intrinsic nature of the world. On the contrary, the categories introduced are considered cognitive artifacts that ultimately rely on human perception, cultural influences, and social conventions — a form of 'cognitive' metaphysics. The model is structured around a fundamental distinction between: i) *endurant entities*, representing objects or substances; ii) *perdurant entities*, corresponding to events, processes, and situations; iii) *qualities*, which are properties or attributes that can be perceived or measured and inhere to entities; iv) *abstract*, i.e. entities that have neither temporal nor spatial determinations. One of the foundational assumptions of DOLCE is grounded in Searle's concept of 'deep background': humans possess a shared set of skills, tendencies and habits resulting from their specific biological makeup and evolved capacity to interact with their environment. This perspective enables the explicit articulation of pre-existing conceptualisations, emphasising a clear reflection of cognitive and linguistic structures Gangemi et al. (2002). Searle's standpoint within DOLCE characterises this upper-level ontology as constructivist. Additionally, it encompasses *possibilia*[18], indicating its nature as a possibilist ontology. Considering the philosophical assumptions that underpin the structure of this foundational ontology, one viable solution for representing fictional entities is through creationism. The latter is a well-established metaphysical theory about fictional entities mainly inspired by the works of Searle, Thomasson and Van Inwagen. This theory conceives fictional entities as non-concrete artifacts that fall within a specific category of abstract objects, namely *contingent abstracta*. This means that, being closely tied to the mind of a creator or author, these entities are temporally indexable. The focus here is on human creative activity. Specifically, on the cognitive process that renders these entities dependent on a creator for their beginning to exist and on a narrative context that 'hosts' them, enabling their persistence over time Goodman (2004); Livingstone et al. (2011); Friend (2007). In accordance with this theoretical grounding, fictional characters may be conceptualised as a particular type of *Non-Physical Object*, namely a *Social Object*. The constraints specified for this class establish a generically dependence relation with both an *Agentive-Physical Object* and a *Communication-Event*. Fictional character attributes may instead be subsumed by the *Abstract Quality* class, specifically designed to model attributes inherent to *Non-Physical Endurant*. It is worth noting that, in DOLCE, qualities are not treated as abstract properties, but as concrete particulars—i.e., *qualia*[19]. Consequently, multiple objects cannot inhere the same quality; rather, each object inheres an individual quality, which is in turn associated with a shared quality-space value, or *quale*. Conversely, when an object has a quality that changes over time, it is not a matter of multiple universal qualities being replaced, but rather a change in the quale associated with a single, persistent quality.

As stated by Masolo et al. (Masolo et al. 2003, 18), this approach is explicitly inspired by the metaphysical stance known as *trope theory*. The latter holds that what we call attributes are in fact individualised, non-repeatable entities—tropes—which exist only insofar as they inhere in specific objects. Unlike universals, tropes do not exist across multiple instances; each trope is tied to its bearer, yet similarity between objects is accounted for by resemblance between tropes, not identity. [20] While DOLCE introduces the term quale to denote the value a quality assumes within a quality space—reflecting its cognitive orientation—its treatment of qualities as object-dependent particulars aligns with the trope-theoretic commitment to an ontology grounded in particulars.

4.2.2 BFO BFO, which stands for 'Basic Formal Ontology', is a framework designed to facilitate information integration, retrieval, and analysis across scientific domains. Its development dates back to the beginning of BFO project around 2002 Grenon et al. (2004). Serving as the top-level ontology for both the Open Biomedical and Bioinformatic Ontology (OBO) Foundry and the Industrial Ontology Foundry (IOF), BFO is a key component of the standard ISO 21838 (part 2). It is axiomatised in Common Logic (CLIF) and OWL. From a philosophical viewpoint, BFO adopts Aristotelian realism, or a metaphysical approach based on the belief that there is a real world existing independently of us, a world constituted of objective facts Dumontier and Hoehndorf (2010). This kind of approach considers the existence in time of entities populating the world. Therefore, it focuses exclusively on entities whose existence is substantiated by empirical evidence derived from the natural sciences.

BFO organises entities along three orthogonal dimensions. Firstly, it distinguishes between *occurrents* and *continuants*—categories that correspond to *perdurants* and *endurants* in DOLCE, respectively. However, while DOLCE conceives these as particulars, BFO treats them as universals. Hence, occurrents involve processes unfolding over time, encompassing events, actions, and procedures, along with their beginnings, endings, and the time spans they occupy. Continuants are the participants in such processes, or entities that endure during the period of their existence and the spatial boundaries of such entities, as well as the spatial regions in which they are located. Secondly BFO distinguishes between *independent* and *dependent* entities. Cells and organs represent independent continuants, while qualities of entities, like the mass or volume of a cell, are considered dependent continuants. Thirdly, since BFO is grounded in metaphysical realism, it fully acknowledges the ontological distinction between particulars and universals, and treats the latter as factually existing entities. Unlike DOLCE, it permits the direct (i.e., non-meta-linguistic) definition of classes of universals, along with reasoning about their properties, subsumption, and quantification over them. Furthermore, BFO provides formal specifications for high-level universals—called *categories*—which are defined by the aforementioned dichotomies Smith and Ceusters (2012). Universals extend beyond scientific realms to include general entities referred to in domains such as engineering, commerce, administration, and intelligence analysis. Although BFO was initially designed for entities within the natural sciences, particularly biology, its scope expanded in such a way to encompass social and psychological entities. Even though BFO operates as a realist ontology, it can be viewed as a descriptive model without any inclination towards a prescriptive metaphysics. However, contrary to DOLCE, it does not admit neither abstract entities nor possibilia. When dealing with the challenge of modeling fictional characters, one approach to consistently employ BFO without undermining its realist standpoint, is to follow the strategy proposed by Hastings and Schulz, as detailed in subsection 5.1.5 Hastings and Schulz (2019) and shown in (Figure 1).

4.2.3 PROTON The PROTo ONtology has been developed in the SEKT project[21] and is designed as a lightweight upper-level ontology for implementation in Knowledge Management and Semantic Web applications. In particular, it has been used for tasks like semantic annotation, indexing, and retrieval of documents Mascardi et al. (2007). The model is relatively unrestrictive. It delineates a simple hierarchy of classes and establishes domain and range for its defined properties, without imposing any additional constraints on the interpretation of those constructs. As a result, it emerges as a top-level model with a low ontological commitment degree Partridge et al. (2020). PROTON exhibits a lack of precision in certain aspects, particularly in its treatment of the conceptualisation of space and time. This is partly due to the fact that creating accurate models for these aspects would involve employing a logical apparatus that exceeds the acceptable limits for many tasks where PROTON is intended to be applied, such as queries and the management of extensive datasets and knowledge bases. Moreover, creating rigorous and precise conceptualisations that are suitable across various domains and applications presents substantial challenges Terziev et al. (2005).

PROTON is encoded in a fragment of OWL-Lite and in organised in four modules. The principal layer is occupied by the *System* module, followed by *Top, Extent*, and *Knowledge Management* ontology modules. The *System* module functions as an application ontology, delineating essential notions and concepts crucial for the functionality of ontology-based software. The top module establishes fundamental philosophically-driven distinction among types of entities, following the rationale behind the modeling design of DOLCE higher classes. This includes delineating entities as *Objects* (*dolce:Endurant*), *Happenings* (*dolce:Perdurant*), and *Abstracts* (*dolce:Abstract*). The *Extent* module works as an extension of the latter, comprising about 450 classes and 90 object properties. Lastly, the *Knowledge Management* module contains the former SKULO ontology Terziev et al. (2005), further developed and integrated into PROTON. It consists of 38 classes of slightly specialised entities that are specific for typical Knowledge Management tasks and applications. Considering both the minimal ontological assumptions implied by the design principle of this model and the inherent 'naïve metaphysics' stemming from its focus on natural language as the scope of its quantification Partridge et al. (2020), this ontology does not require nor allow for a sharp philosophical analysis in the modeling process of the domain of interest.

For what concerns the representation of fictional character, a viable solution is provided by the Ody ontology, as reported in Subsection 4.1.5. In that case, the class *Fantastic Character* is aligned to *proton:Agent*. However, unlike in DOLCE, where agents are entities to which we can attribute intentions, beliefs, and desires, PROTON employs a more relaxed definition, allowing for an agent to manifest an independent action, whether consciously or not. In this sense, in PROTON one can use the *Agent* class to denote even

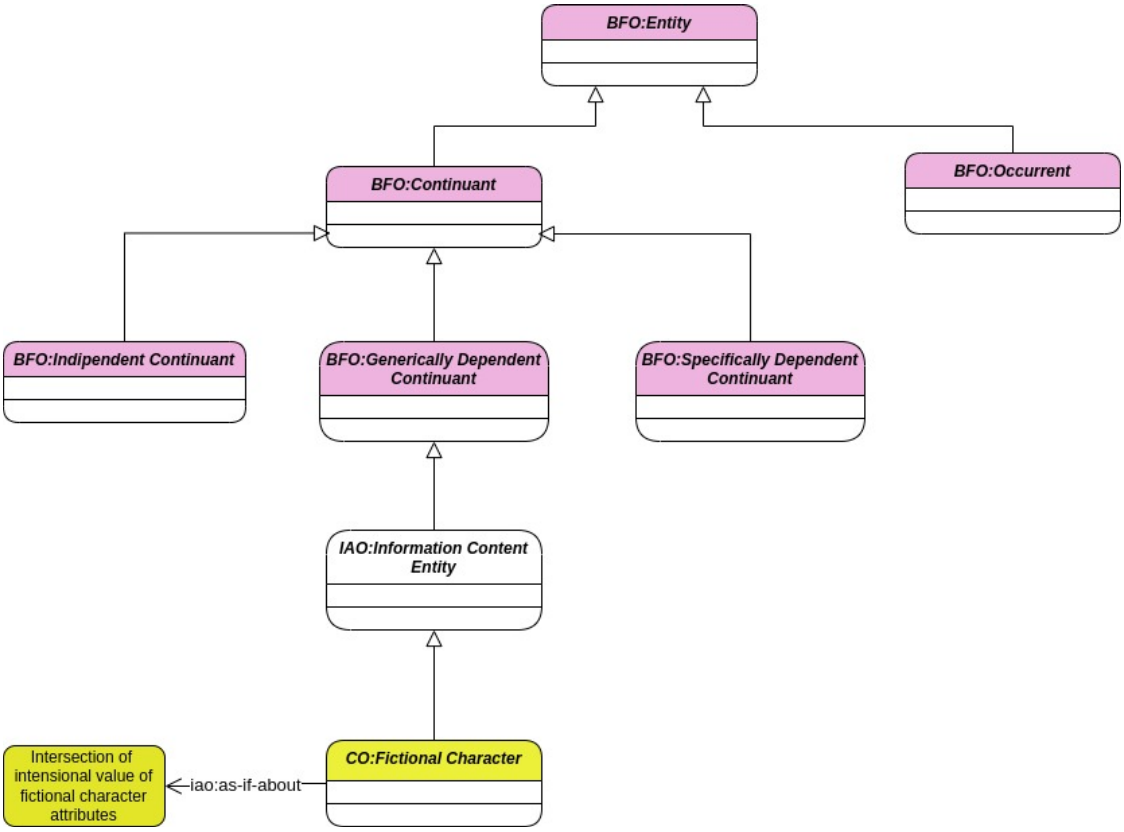


Figure 1. BFO-compliant pattern for fictional characters and their attributes

animals or automatic services, including web services and servers Terziev et al. (2005).

5 Analysis

5.1 Harmonisation

The first step of the mapping process here proposed is that of harmonisation between domain-specific ontologies. In particular, we focus on classes modeling characters, their attributes (if any) and the relation that connects them to the narrative works in which they appear (if any). As explained in the methodology section, harmonising two or more classes (as well as two or more object properties) means establishing a relation of semantic equivalence among them. In the context of OWL, this is to be understood in a model-theoretic sense, specifically through the notion of extensional equivalence (i.e., having the same extension in every model). As indicated in the W3C Recommendation[22], the OWL construct to implement the harmonisation relation between classes is *owl:equivalentClass* and the axiom schema to be respected is the following: *class1_description owl:equivalentClass class2_description* (the same logic is followed for object properties and the OWL construct in that case would be *owl:equivalentProperty*). The meaning of such a class axiom is that the two class descriptions involved have the same class extension (i.e., both class descriptions denote the same set of individuals in every model) (Table 1).

With regard to object properties equivalence, the formal axiomatisation presented above implies that if P_1 and P_2 are considered equivalent, and the domain and range of P1 are denoted as D_1 and R_1 respectively, and the domain and range of P_2 are denoted as D_2 and R_2 respectively, then it follows that D_1 is equivalent to D_2 and R_1 is equivalent to R_2. To formally express this entailment, we must move to a Second-Order Logic (SOL)[23] framework:

$$\begin{aligned}&\forall P_1\, \forall P_2\, \forall D_1\, \forall D_2\, \forall R_1\, \forall R_2\\&(\mathrm{Equivalent}(P_1, P_2) \wedge \mathrm{Domain}(P_1, D_1) \wedge \mathrm{Range}(P_1, R_1) \wedge\\&\quad \mathrm{Domain}(P_2, D_2) \wedge \mathrm{Range}(P_2, R_2) \rightarrow\\&\qquad D_1 \equiv D_2 \wedge R_1 \equiv R_2)\end{aligned}$$

In other words, if two object properties are considered equivalent, it is inherently impossible for them to be harmonised without their respective domain and range classes also being harmonisable. To proceed systematically, it is thus essential to compare each ontology based on: i) description of the classes modelling fictional characters, ii) definition of object properties modelling their attributes, and iii) definition of object properties modelling the characters' appearance-in-a-work relation. Table 2 summarises the relevant classes and properties for the ontologies that we are considering.

5.1.1 Character classes comparison

Let's start by examining the possible combinations of character classes. In the Ody ontology, explicit information regarding the *Fantastic Character* class is not provided. However, some details can be inferred from the *proton:Agent* class (with which it is aligned), as well as from various pieces of information scattered throughout the paper that introduces the ontology. A character is then defined as a fictional entity that can be either human or non-human, and its actions are carried out independently of the intentionality of the agent. As a

OWL Vocabulary Term	OWL Class Axiom for C_1/P_1	DL Syntax	FOL Semantics
`Class`	`equivalentClass(C2)`	$C_1 \equiv C_2$	$\forall x\,(C_1(x) \leftrightarrow C_2(x))$
`Property`	`equivalentProperty(P2)`	$P_1 \equiv P_2$	$\forall x\,\forall y\,(P_1(x,y) \leftrightarrow P2(x,y))$

Table 1. First-order logic representation of model-theoretic semantics for OWL equivalence constructs

Ontology	Fictional Character Class Description	Fictional Character Attribute	Appearance-in-Work-of-Fiction Relation
Ody	Derived from `proton:Agent`	Not specified	Not specified
Transmedia	Derived from `cbo:Character` and `schema:Person`	`:morality` domain:`Thing`; range:`Moral Trope`	`:appearsIn` domain:`Thing` range:`Transmedia Creative Work`
Drammar	A rational entity who forms intentions, or plans, to achieve goals	`:hasValueEngaged`; domain:`Agent` range:`Value`	Not specified
Propp	Any fictional person (human or non-human) appearing in a fairy tale	Not specified	`:appearsIn`; domain:`Fictional Character`; range:`Tale`
Character	Defined through the attributes assigned to them	(inferred) `:as-if-about only(have-physical-attribute)`; domain:`Fictional Character`; range:`Physical Attribute`	(inferred) `:as-if-about only(appears-in)`; domain:`Fictional Character`; range:`Work of Fiction`
Dracor	Based on structured character data	Several specific properties	`:containsPlay-Character Data`; domain:`Play`; range:`Character`

Table 2. Comparison of fictional character modeling across ontologies.

result, harmonising it with either Transmedia or Drammar is not feasible, as both of these ontologies center their character definitions around the concept of intentionality. The ProppOntology does not explicitly address intentionality and allows for the inclusion of non-human characters. However, there is an axiom mandating that every character must appear in a fairy tale, while in Ody the relation of appearance-in is not addressed at all, preventing the possibility of harmonisation. As an extension of BFO, the Character Ontology defines fictional characters in a way that avoids commitment to entities that, as described in Subsection 4.1.5, would not be considered to exist from a realist perspective. Consequently, it stands as a unique case in our sample and cannot be harmonised with any of the domain ontologies we have considered. Lastly, the DraCor ontology does not explicitly delineate the scope of its character class. However it can be inferred from the *contains play character data* property that it exclusively encompasses those characters manifesting themselves in a specific category of narrative artifacts: theater plays. Therefore, there cannot be any overlap between the two class extensions of the Ody and DraCor ontologies. The Transmedia ontology defines characters as persons who are featured in a *Transmedia Property*. Additional details can be drawn from the classes to which it is aligned. These are *schema:Person*, from which we can draw that characters must be human beings, and *cbo:Character*, declared as a subclass of *cbo:Agent*, affirming the emphasis both on fictionality and intentionality. Acknowledging this premise, and considering that the Drammar ontology defines characters based on their intentions in stories, it appears logically consistent to harmonise them (i.e., *transmedia:Character owl:equivalentClass drammar:Agent*). With respect to the Propp, Character, and Dracor ontologies, no viable solution seems applicable, since the first admits non-human characters, the second defines them in terms of their inherent attributes, and the third restricts them to characters in plays. Given that the Transmedia and Drammar character classes share the same extension, comparing *drammar:Agent* with *propp:Character*, *character:Fictional Character*, and *dracor:Character* respectively leads to identical outcomes. That is, the Drammar class cannot be harmonised with the other three. As a final comparison, *propp:Fictional Character* needs to be mapped to *dracor:Character*. The former is designed for characters appearing in tales, while the latter is geared towards characters appearing in plays. Therefore no matching is achievable due to the distinct scopes of the two classes.

5.1.2 Character attributes comparison The article presenting the Ody ontology does not provide specifications concerning the modeling of character attributes. Let's then start with the Transmedia model. When comparing it to Drammar, there is only one viable match: the one between *transmedia:morality* and *drammar:hasValueEngaged*. Domain and range for the Transmedia property are *Thing* and *Moral Trope* respectively, while in Drammar, *Agent* is set as domain and *Value* as range. The *drammar:Value* class explicitly denotes "the moral values acknowledged by an agent, which are engaged by the unfolding of the plot" Damiano et al. (2019). The problem arises when comparing the respective domains. In Transmedia every entity may potentially inhere moral tropes, since *Thing* is all-encompassing. In Drammar, instead, only agents can. Therefore, considering that the extension of *transmedia:Thing* encompasses a broader scope than that of *drammar:Agent*, there could be other entities beyond characters that may inhere moral tropes. Hence, it is not possible to establish an equivalence relation between these two object properties. The comparison of Drammar and Transmedia with the Character ontology is achievable quite straightforwardly for two reasons. On the one hand, the Character ontology defines Fictional characters in a fundamentally different way than the other models considered here. Fictional characters are seen as sets of properties without a substance to which they inhere, that is without actual bearers. On the other hand, the BFO-compliant representational strategy offers a particularly refined and sophisticated OWL-based approach to modeling characters' attributes in the broadest sense. It supports the representation of both properties — attributes that apply to entities individually — and relations, which apply to pairs of entities.[24]. However, while the method can be readily implemented for the specific case of character's psychological attributes such as moral attitudes, it only considers the intensional meaning of the classes connected with these attributes, not their extension as individuals. The extension of these classes, i.e. their instantiation as individually existing first-order objects, cannot be endorsed within a realist perspective. Therefore, fundamental incompatibilities exist and achieving harmonisation remains unattainable for two ontologies grounded in such distinct metaphysical perspectives.

5.1.3 Appearance-in-work relations comparison Concerning the appearance-in property, which establishes a connection between a character and the work it appears in, there are three ontologies available for comparison: Transmedia, Propp, and Dracor. Regarding Transmedia and Propp, discrepancies exist at both domain and range levels. This is due to the fact that (i) *transmedia:Thing*, the specified domain class for Transmedia appearance-in relation, is way more extensive than *propp:Fictional Character*, and (ii) the extensions of *transmedia:Transmedia Creative Work* and *propp:Tale* are evidently disjoint. An analogous scenario emerges when comparing Transmedia with Dracor. In fact *transmedia:Thing* encompasses a broader scope than *dracor:Character* and there is no intersection between *transmedia:Transmedia Creative Work* and *dracor:Play*. Lastly, despite Propp and Dracor appearance-in properties share equivalent domains, their ranges, i.e. *propp:Tale* and *dracor:Play* respectively, remain disjoint. This implies that the two properties involve two different typologies of characters, hindering any possibility of establishing harmonisation.

5.2 Alignment

In what follows, two distinct scenarios are outlined. The first scenario considers the harmonisation outcome from the previous section and shows a strategy based on existing alignment solutions with upper-level ontologies. In the second scenario, the aim is to put forth alternative strategies by aligning a proposed ontology pattern that models fictional characters, their attributes and the relation governing their appearances in works of fiction. This alignment process occurs in two phases: firstly, the ontology pattern aligns with the CIDOC-CRM framework, then the latter is aligned with DOLCE and with BFO foundational models.

5.2.1 Ready-made solutions The harmonisation process described above resulted in establishing a relation of semantic equivalence in only one case. The classes for fictional characters from the Drammar and Transmedia ontologies meet the specified conditions. Considering that *drammar:Agent* is declared as a subclass of *drammar:DramaEndurant* and that the latter is aligned with the *dl:Endurant* high-level class from DOLCE-Lite, this upper ontology can be used in a similar manner to align *transmedia:Character* class. The rationale for this operation is quite straightforward: if class A and class B are equivalent, and class B is a subclass of class C, then it follows that A is also a subclass of C. This logical propagation of subclass relationships is visually illustrated in Figure 2, which shows the alignment path between *Transmedia:Character* and *DOLCE:Endurant* via *Drammar:Agent*. In FOL, this can be formalised as:

$$\forall x \left[(A(x) \leftrightarrow B(x)) \land (B(x) \rightarrow C(x)) \right] \\ \rightarrow (A(x) \rightarrow C(x))$$

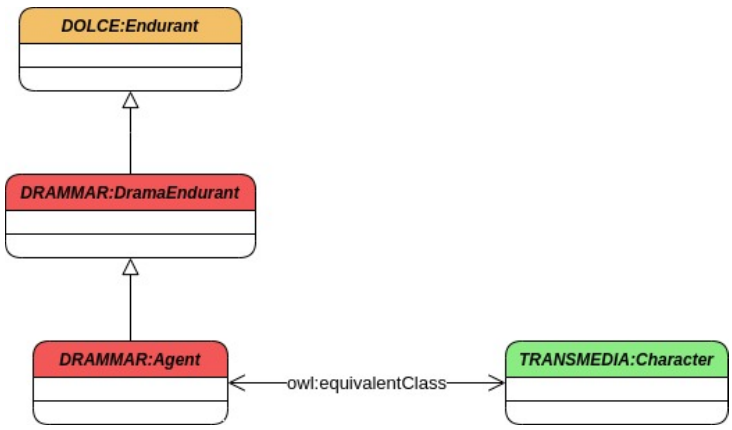


Figure 2. *Transmedia:Character* aligned with DOLCE

The alignment suggested by the authors of Drammar is unquestionably robust and effective. The decision to utilise DOLCE is meaningful and is substantiated by the model's dedication to a cognitive and linguistic viewpoint on foundational ontology issues. DOLCE provides a conceptual framework explicitly tailored for the representation of human activities and the creation of applications intended for human users. The *Endurant* class from DOLCE serves as a stable and well-established common ground for both Drammar's *Agent* and *Object* classes. This enables the application of *differentia specifica* criteria,[25] utilising the category of intentionality as a discriminant. Such an approach is reminiscent of the distinction between agentive and non-agentive objects made by DOLCE.

5.2.2 Alternative solutions To lay out our alignment strategy, an hypothetical ontology pattern modeling our object of interest is first designed. This pattern revolves around three core classes: *Fictional Character*, *Character Attribute*, and *Work of Fiction*. Additionally, it incorporates two relations that link fictional characters with the other two classes: *has-attribute*, which connects *Fictional Character* with *Fictional Character Attribute*, and *appears-in*, which connects it with *Work of Fiction* (Figure 3).

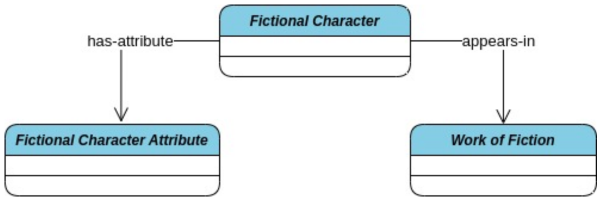


Figure 3. Fictional Character Pattern

As anticipated above, the mapping between the pattern and foundational models is mediated by means of a middle-layer ontological framework: CIDOC-CRM[26]. Within the cultural heritage domain, numerous well-recognised ontologies are available. Among them, CIDOC-CRM stands out as the one with the broadest and official acceptance Bruseker et al. (2017). The CIDOC Conceptual Reference Model (CIDOC-CRM) is an ISO standard upper-level ontology (ISO 21127:2014) designed to facilitate the exchange of information and promote meaningful and sustainable interoperability between GLAM (Galleries, Libraries, Archives, and Museums) and other cultural institutions. Developed by the International Committee for Documentation (CIDOC) under the International Council of Museums (ICOM), it serves as a common and extensible semantic framework for researchers engaged in cultural heritage-related fields Liu et al. (2023). For the reasons just discussed and in line with the semantic interoperability issues addressed throughout this paper, CIDOC-CRM standard is employed as an intermediate modeling level, bridging the domain of interest with foundational ontologies. Thus, as a first step it is essential to determine which classes of our pattern align with the CIDOC-CRM framework.

FRBRoo is an extension of CIDOC-CRM and has been designed to encapsulate and depict the fundamental semantics of bibliographic data. In its version 2.4, FRBRoo offered its own built-in solution for character modeling, specifically through *F38 Character*, which extends CIDOC-CRM's *E28 Conceptual Object*. In accordance with the strategy proposed by CIDOC-CRM, we could then align our *Fictional Character* class to *E28 Conceptual Object*. For what concerns the *Work of Fiction* class, FRBRoo provides a solution through its three layers of specification of CIDOC-CRM's *E89 Propositional Object*. In the latest version of FRBRoo, referred to as LRMoo, the three levels of specification for *E89 Propositional Objects* are organised as a central module comprising three classes: *F1 Work, F2 Expression* and *F3 Manifestation*.

F1 Work directly specifies *E89 Propositional Object* and consists of a distinct conceptual entity representing the abstract intellectual or artistic content of a resource, regardless of its linguistic articulation and its physical or digital concretisation. *F2 Expression* and *F3 Manifestation* extend *E73 Information Object*, which is in turn a CIDOC-CRM subclass of *E89 Propositional Object*. An Expression represents the intellectual or artistic realisation of a work in a particular shape. It encompasses variations in language, style, medium, etc., but maintains the same content and the original intellectual property. A Manifestation represents the outcome of the publication process of one or more expressions. It includes specific features such as format, edition, publisher, and publication date. Given that we solely focus on the discrete intellectual content of a work of fiction without needing to consider its degrees of concretisation, *E89 Propositional Object* would be suitable for our needs. With respect to the *Fictional Character Attribute* class, we are clearly beyond the modeling scope of CIDOC-CRM and FRBRoo, so we can directly map it to foundational ontologies. Below an UML representation of the resulting mapping so far (Figure 4).

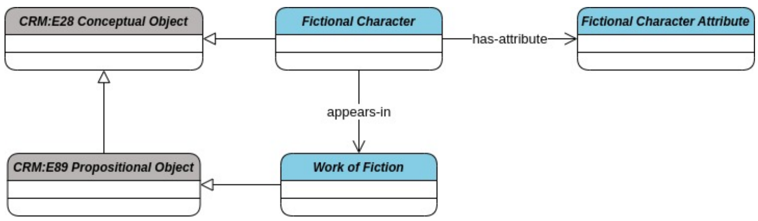


Figure 4. Fictional Character Pattern aligned to CIDOC-CRM

The next step involves aligning *E28 Conceptual Object*, E89 *Propositional Object*, and our class for fictional character attributes with the two foundational ontologies we are working with.

Aligning to DOLCE Given their significance as well-established standards in the domain of knowledge representation, it is notable that no explicit mapping solution between CIDOC-CRM and DOLCE was identified in our research. This apparent gap may hinder interoperability and integration efforts within the Semantic Web community. Below, we present an effort to integrate the CIDOC-CRM classes utilised in our modeling of fictional characters to the DOLCE framework. The rationale behind the proposed solution is guided by two primary factors. On the one hand, we examined the scope annotations of classes from the official documentation of the two ontologies. On the other hand, we aimed to maintain consistency with a metaphysical approach to fictional entities that fits with DOLCE philosophical underpinnings. Given that *E28 Conceptual Object* subsumes *E89 Propositional Objects*, we only need to consider the former class for the alignment.

The scope of *E28 Conceptual Object* specifies that "this class comprises non-material products of our minds and other human produced data that have become objects of a discourse about their identity, circumstances of creation, or historical implication". Additionally, it is noted that "characteristically, instances of this class are created, invented or thought by someone, and then may be documented or communicated between persons"[27]. When considering DOLCE[28], it is not by chance that the class chosen for modeling fictional characters in Subsection 4.2.1, *social-object*, is the one designed to model conceptual objects as well. In fact, DOLCE-Lite-Plus (DLP) documentation specifies that a social object is "a catch-all class for entities from the social world. It includes agentive and non-agentive socially-constructed objects: descriptions, concepts, figures, collections, information objects". Aligning *crm:E28 Conceptual Object* to *dlp:social-object* allows as well to model fictional characters in accordance with the creationist theory about fictional entities. As already mentioned in Subsection 4.2.1, according to creationism, fictional objects are literally created by authors and dependent on texts and readers for their continuous existence. The constraints specified for *dlp:social-object* allow us to be consistent with the two fundamental thesis of creationist theory, since they state that instances of that class need to generically depend both on instances of *dlp:Communication-Event* (as it is the case for a work of fiction) and instances of *dlp:Agentive-Physical Object* (which would be the author of the fictional work). Regarding fictional characters attributes, it is straightforward to align the corresponding class from our pattern with *dlp:Abstract-Quality*, as it is the only viable option for classes subsumed under *dlp:Non-Physical-Endurant*, which is the case of *dlp:Social-Object* (Figure 5).

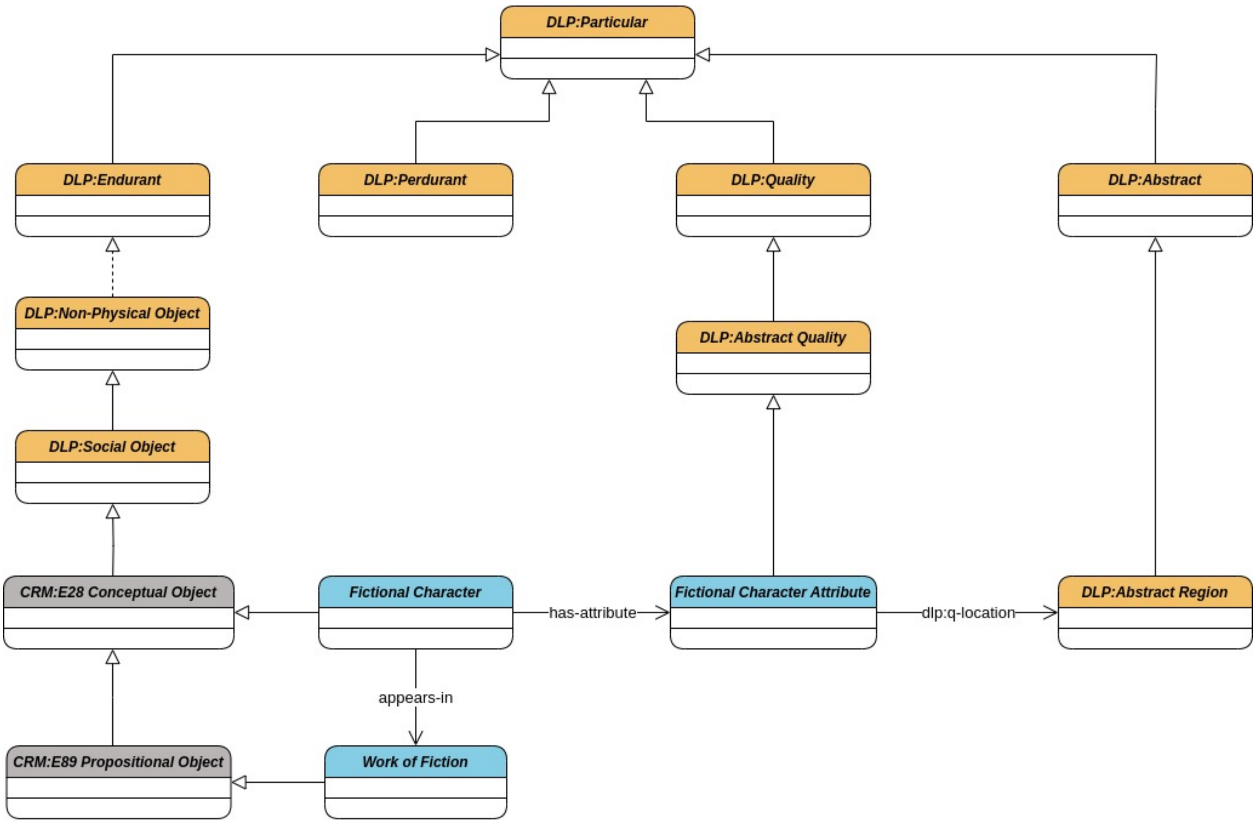
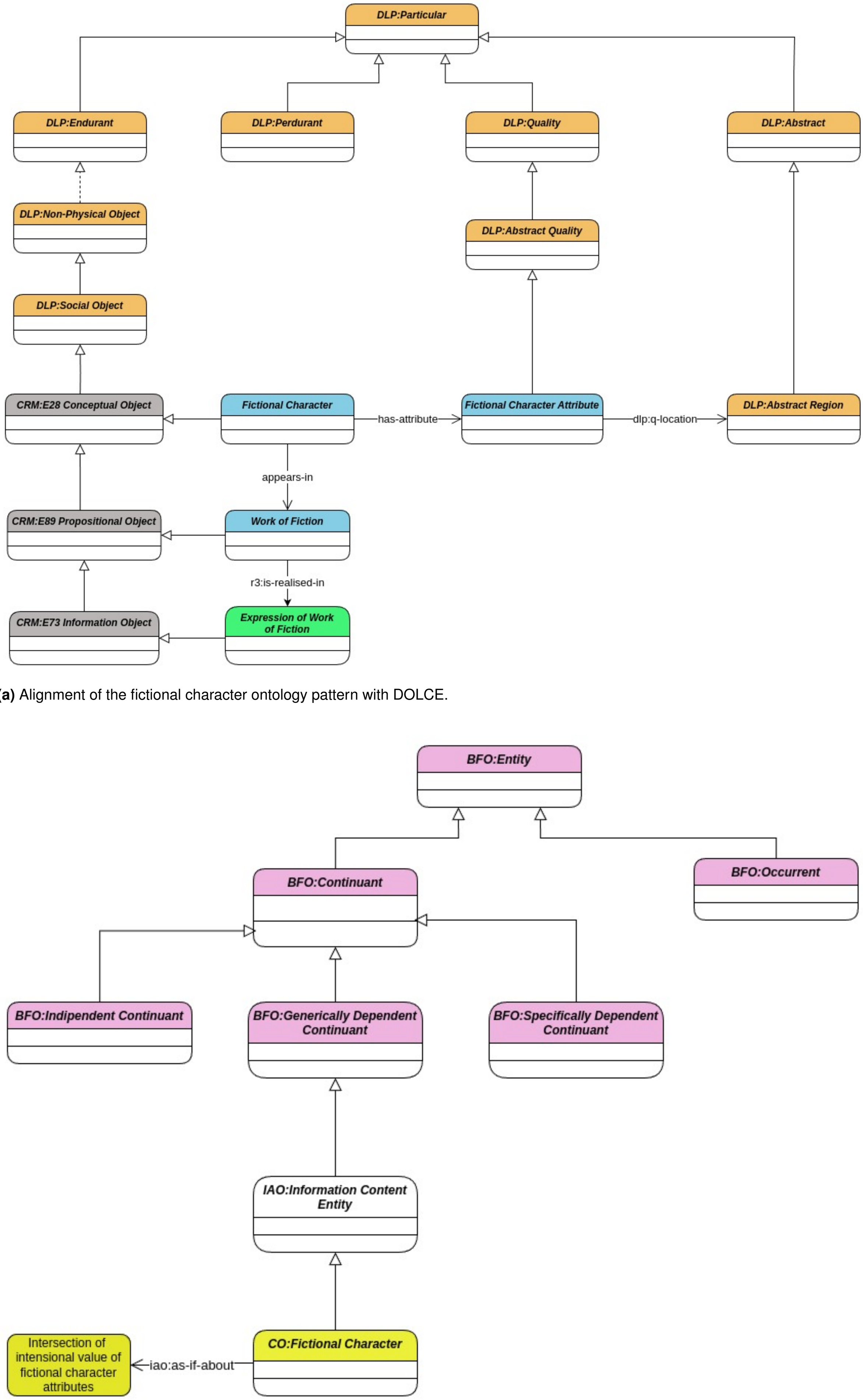


Figure 5. CIDOC-CRM aligned to DOLCE.

Aligning to BFO We have extensively discussed the strategy adopted for modeling fictional characters and their attributes within the BFO framework. In that context, fictional characters are metaphysically resolved into the attributes they inhere. However, this approach does not fit well with the representational goals of our ontological pattern because it postulates a clear ontological difference between characters and their attributes. Inasmuch as a Character is defined as the intersection of all its attributes, this distinction completely blurs within the BFO realist perspective concerning fictional characters. More specifically, characters and their attributes are conceptualised as a particular kind of Meinongian objects, and thus, their existence is purely intensional, located solely at the level of meaning. The philosophical obstacle here is that for BFO it is not possible to model entities with no spatio-temporal extension, as it is the case for CRM's Conceptual and Propositional objects. This limitation of BFO and IAO has been acknowledged and the solution proposed by Hastings (as explained above) is in accordance with the BFO's inability to model entities lacking spatio-temporal extension. As a result, it is not possible to align conceptual and propositional objects to the BFO framework. The only possible alignment with CIDOC-CRM is via the *E73 Information Object* class. Anyway this does not fit our goal of modelling the content of a work of fiction. The UML below (Figures 6a and 6b) clearly shows how two disjoint and different conceptions of fictional character are needed for the alignment to the two foundational ontologies here considered.



(a) Alignment of the fictional character ontology pattern with DOLCE.

(b) Alignment of the fictional character ontology pattern with BFO.

Figure 6. Overview of the alignment of the fictional character ontology pattern with DOLCE and BFO.

6 Conclusions

In conclusion, the development of computational ontologies for narrative and fiction, particularly in the context of literary studies, offers exciting potential for enhancing both scholarly understanding and computational analysis of literary texts. By grounding these ontologies in established frameworks like BFO, DOLCE, and CIDOC-CRM, we can achieve greater interoperability, reusability, and discoverability of literary data. However, as this article demonstrates, the path forward is not without challenges, especially in terms of mapping existing models and refining the philosophical and knowledge representation issues involved. Future efforts should focus on further integration of domain-specific models, fostering collaboration across disciplines, and addressing gaps in the formalisation of literary concepts. Ultimately, the intersection of literary theory and ontology engineering presents a valuable opportunity for advancing computational literary studies and fostering a more systematic approach to the study of narrative and fiction.

Notes

1. However, it's important to recognise that one cannot expect to escape reductionism solely through a mechanical tool like an ontology.
2. Description logics (DLs) are a subset of first-order logic (FOL) formalisms, tailored for knowledge representation. They enable decidability through constrained expressiveness, ensuring computational tractability. This allows for automatic reasoning, a capability not found in the broader FOL, due to its undecidable nature.
3. It involves starting from specific instances or data points and gradually abstracting them into more general concepts, or classes, forming a hierarchy of related terms. This method emphasises empirical observation and data-driven analysis to construct ontologies, contrasting with the *top-down* approach, which begins with predefined conceptual frameworks or theories Uschold and Grüninger (1996); Vet and Mars (1998)
4. The ideal scenario would involve having access to a source code expressed in an RDF-based language
5. https://www.w3.org/TR/owl-time/
6. https://comicmeta.org/cbo/
7. https://www.ivoa.net/documents/cover/AstrObjectOntology-20080716.html
8. https://schema.org/
9. SKOS-XL Specification
10. https://github.com/iddi/sofia/blob/master/eu.sofia.adk.common/ontologies/foundational/DOLCE-Lite.owl
11. Despite being explicitly modeled in OWL, no source code nor official documentation is available so far.
12. https://obofoundry.org/ontology/iao.html
13. https://ontobee.org/ontology/IAO?iri=http://purl.obolibrary.org/obo/IAO_0000136
14. This expression refers to an ontic configuration where units are compositionally related to each other. Its significance is akin to what Wittgenstein, in his Tractatus, referred to as an *obtaining state of affair* Wittgenstein (1961).
15. http://wonderweb.man.ac.uk/index.shtml
16. Assuming *instantiation* as a primitive relation, the term *particular* refers to entities that cannot themselves be instantiated, in contrast to universals, which are defined by their capacity to have instances.
17. For a more detailed overview of the unary predicates constituting this meta-level taxonomy, see *A Formal Ontology of Properties* by Guarino and Welty Guarino and Welty (2001).
18. All possible entities, regardless of whether they actually exist.
19. Within the context of DOLCE, a *quale* is the value that a particular quality takes within a conceptual or quality space (e.g., a specific location in a color space) at a given time. Multiple individual qualities—each inhering in a different object—can share the same quale, which accounts for perceptual similarity without implying shared properties in the form of universals.
20. Trope theory is often referenced as a third position between *universalism* (also known as *metaphysical realism*) and *nominalism*. Universalism holds that attributes are abstract entities—universals—that can be instantiated by multiple objects simultaneously, and it posits a fundamental ontological distinction between universals and particulars. Nominalism, by contrast, denies the real existence of attributes altogether, treating them as mere linguistic constructs used to describe or classify objects, without implying the existence of any underlying entities. Trope theory takes a middle ground: it acknowledges the existence of universals, but only as aggregates or resemblance classes of abstract particulars—that is, tropes. It thereby rejects any fundamental ontological divide between universals and particulars, grounding all attributes in individual, object-dependent instances.
21. see https://www.sekt-project.com/
22. see. https://www.w3.org/TR/owl-ref/
23. This is necessary because the entailment involves quantification over predicates and reasoning about the properties of properties—specifically, that equivalence between relations implies equivalence between their respective domain and range classes. Such statements are not expressible in First-Order Logic, which cannot quantify over predicates or express meta-level axioms.
24. It is worth noting that n-ary relations, i.e., relations with arity greater than two, are not directly representable in OWL. See: https://www.w3.org/TR/swbp-n-aryRelations/
25. In classical metaphysics, a species is defined based on its next highest type, known as the *genus proximum*, along with the specific traits that constitute the species, referred to as the *differentia specifica*.
26. see https://www.cidoc-crm.org/
27. We consider here the last official ISO from February 2024, i.e. Version 7.1.3. See cidoc-crm.org
28. Reference is made to DOLCE-Lite-Plus version 3.9.3. See DOLCE-Lite-Plus v3.9.3

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