The Intangible Nature of Drama Documents: An FRBR View

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ABSTRACT

As a pervasive form of artistic expression through ages and media, drama features a twofold nature of its tangible manifestations (theatrical performances, movies, books, etc.) and its intangible abstraction (the story of Cinderella underlying Disney movie and Perrault's fable). The encoding of the intangible drama abstraction of drama documents is relevant for the preservation of cultural heritage and the didactics and research on drama documents. This paper addresses the task of encoding the notion of intangible story abstraction from the drama documents. The reference model is provided by a computational ontology that formally encodes the elements that characterize a drama, for purposes of semantic linking and inclusion in annotation schemata. By providing a formal expression posited between drama as work and its manifestations, the ontology-based representation is compliant with the model of Functional Requirements for Bibliographic Records (FRBR).

CCS CONCEPTS

• **Applied computing** → **Arts and humanities**; **Annotation**; • **Information systems** → *Ontologies*;

KEYWORDS

drama annotation, FRBR, intangible cultural heritage

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1 INTRODUCTION

Pervasive in human culture through ages, drama has increased in importance throughout the last decades, along with the widespread availability of audiovisual media. A drama is a story conveyed through characters who perform live actions, such as Shakespeare's Hamlet, but also Tom Stoppard's Rosencrantz and Guildenstern Are Dead, David Chase's American crime TV series The Sopranos, and even reality shows, such as Keeping Up with the Kardashians, and, games, such as Ubisoft's Assassin's Creed series (cf. also Esslin's notion of 'dramatic media' [7]).

The massive availability of drama in digital form, issued from both digitalization of old media and new media productions, has transformed the traditional dialectics between text and performance into a more complex relationship between drama as an abstraction and its manifestations in multiple forms and formats. More, such a massive availability challenges the research in digital humanities, where data are typically small, structured, and enriched with metadata (see, e.g., the Text Encoding Initiative [1]). This challenge is attested by the tension between "big" and "smart" data, with the expectation that data tend to be bigger and smarter through crowdsourcing and automation [31]. The aim of building annotated data of drama heritage can be accomplished through the design of an annotation schema and the implementation of tools that can ease the task through partial automation.

Recently, there have been many approaches to the annotation of stories (a larger set than drama, including general narrative, not exclusively conveyed by characters performing actions). Annotations are going to enrich drama documents with appropriate metadata. Most of the approaches, e.g., the Story Workbench tool [9] and the DramaBank project ([6]), build upon the linguistic expression of the story, typically some natural language, and annotate story elements, such as characters and conflicts, over the linguistic layer of part-of-speech tagging and verbal frames. Other approaches are more detached from the linguistic expression: they consider the cultural object of the story and rely on conceptual models encoded in logic frameworks, e.g., the Contextus Project[2], the StorySpace ontology [34], and Drammar [13].

However, most projects work in an isolated fashion: each approach provides its own annotation schema, and do not provide the documents with a clear status. In this paper, we bridge the gap between the annotated drama documents and the widespread FRBR conceptual model. The FRBR model (Functional Requirements for

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[1] http://www.tei-c.org/index.xml, visited on 7 July 2017.
[2] http://www.contextus.net, visited on 7 July 2017.

Bibliographical Entities) [23], designed for capturing the semantics of bibliographic information, addresses the abstract ideation (called Work, e.g., Beethoven's idea of the Ninth Symphony), the encoding in a specific language such as the text (called Expression, e.g., Berliner Philarmoniker's interpretation of the Ninth), the concrete representation (called Manifestation, e.g., some Berliner Philarmoniker's recording of the Ninth), and a single instance (called Item, e.g., some published CD of some Berliner Philarmoniker's recording of the Ninth). We employ the computational ontology Drammar to devise an annotation schema for drama documents: this supports automation through reasoning services and links the annotated documents to the FRBR conceptual model: in particular, we show that an annotated drama document is a particular Expression of the underlying drama abstraction, or Work (a form of intangible cultural heritage), encoded in the ontological format. And the drama document is the actual Manifestation of a novel, ontological linguistic Expression that is perfectly compliant with the FRBR model.

The paper is organized as follows. In the next section, we survey the related work, addressing both the annotation systems mentioned above and the inspirational works. In Section 3 we describe the intangible notion of drama abstraction and the Drammar ontology approach, with the major tenets of its representation. Then, in Section 4, we describe the annotation pipeline that relies on Drammar, the annotation tool devised to ease the task of the annotators, and the construction of the corpus of annotated drama documents. Finally, we show how the Drammar encoding can be accommodated within the framework provided by the FRBR model (Section 5). Conclusion ends the paper.

2 RELATED WORK

In recent times, the annotation of narrative documents has been prompted and influenced by two main lines of research. On the one side, the tradition of knowledge representation in AI has contributed the conceptual tools for describing the content of stories, with languages that span from scripts [30] to frames [20]. The linguistic counterpart of this line of research has resulted in resources situated at the lexico-semantic level (such as FrameNet [1] and at the interface between syntax and semantics (such as PropBank, which offers tools for representing the connection between the expression of the narrative through the text and the narrative content itself). For example, the Story Workbench tool [9] encompasses a layered annotation scheme, which uses these resources for the multi-layer annotation of narratives. On the other side, the annotation of narratives has benefited from the trend, established during the last three decades [4], of representing the content of documents in a machine-readable form. With the advent of markup languages such as Text Encoding Initiative (TEI) for encoding text in digital form and annotating their structure, the use of markup has soon become the standard in text annotation projects. In particular, projects such as Narrative Knowledge Representation Language (NKRL) [36] leveraged the use of markup languages for the representation of the narrative content of text, revamping the use of frames into the emerging scenario of media indexing and retrieval. More recently, as part of the more general effort of constructing resources for the automation of language processing and generation, Elson has proposed a template based language for describing the narrative content of text documents, with the goal of creating a corpus of annotated narrative texts, called DramaBank project [6].

The latter project focuses on the discourse relations specifically designed for modeling narrative discourse. The annotation schema is called the Story Intention Graph (SIG) and a particular annotation of a narrative is called a SIG encoding. DramaBank is a corpus of SIG encodings, collected through the work of trained annotators. A SIG encoding consists of three interconnected sections called layers: 1) the textual layer represents spans of the original discourse; 2) the timeline layer contains nodes that represent events and statives that occur in the story being narrated; 3) the interpretative layer is the layer where nodes represent goals, plans, beliefs, affectual impacts, and the underlying intentions of characters (agents). The annotation of the DramaBank project can be carried out through Scheherazade, a publicly available annotation tool. The tool provides interfaces for the three layers above. A graph shows the relationships over the nodes at the several layers. Graphic interfaces allows the inspection of nodes and arcs very easily. The SIG elaborated can be rephrased, by generating a natural language re-telling of the story, for checking the validity of the annotation produced. DramaBank consists of 110 encodings, as a methodology and the beginning of a shared corpus from which it is possible to pursue data-driven investigations of narrative structure. DramaBank addresses the narrative/story/drama features that we address in our project. A major difference is that the focus, in this case, is on the linguistic level, for its attention on fixed terminology. This task, though made easy through the graphic interface and the access to linguistic data bases, reveals to be very hard to carry out (we made a number of annotation experiments with the DramaBank tool before moving to the implementation of a novel tool). In fact, the corpus is limited to short stories, such as Aesop's fables. It would be cumbersome to annotated large dramas, where attention should be posed on conflicts on large chunks of the discourse. Our project, in fact, though grounded on a formal theory of drama, leaves a relative freedom on the annotation of terms, providing a strict annotation on intentions and conflicts, as related to the timeline incidents.

In recent years, the annotation of narrative text has evolved towards minimal schemata targeted at grasping the regularities of written and oral narratives at the discourse level [26]. However, these initiatives, rooted in narrative theories, tend to focus on the realization of narratives though a specific medium, e.g., text, neglecting the universal elements of dramatic narration that go behind the expressive characteristics of each medium.

A media-independent model of story is provided by the OntoMedia ontology, exploited across different projects (such as the Contextus Project, see footnote above) to annotate the narrative content of different media objects, ranging from written literature to comics and TV fiction. This project encompasses some concepts, such the notion of character, that are relevant for the description of drama, but, being mainly focused on the representation of events and the order in which they are exposed in media for cross-media comparison, it lacks the capability of representing the core notions of drama. In the field of cultural heritage dissemination, the StorySpace ontology [34], an ontology of story, supports museum curators in linking the content of artworks through stories, with the ultimate

goal of enabling the generation of user tailored content retrieval [21]. Finally, some scholars have created representational tools for specific narrative theories, ranging from literary structuralism [25] to scriptwriting practices [33].

Drammar[3] is an ontology of drama, specifically conceived to annotate dramatic media [15]. Drammar aims at extending the use of ontologies to describe the content metadata of dramatic media in a theory-neutral, media-independent way. The use of the ontology format not only allows specifying the conceptual model of drama in a formal, unambiguous way but also makes the knowledge about drama available as a vocabulary for the interchange of annotations across different projects and readily usable for applications that encompass the manipulation of annotations by automatic reasoners and other software types. For example, [13] employ automatic reasoning techniques to compute the emotions felt by the characters on the basis of the events and the intentions manually annotated.

3 MODELING THE INTANGIBLE NATURE OF DRAMA

Throughout the multiple media, a single drama can assume several forms, fulfilling a number of its core conditions. For example, the abstraction of the oral tale Cinderella appears in, for example, Perrault's and Disney's versions. Abstracting from the media objects that exhibit a drama, we face a form of intangible cultural heritage (ICH). as shown in [17] and surveyed in section 3.1; the drama abstraction can then be encoded through the constructs of the Drammar ontology (section 3.2).

3.1 Drama as intangible cultural heritage

A number of characteristics make drama a form of ICH (cf. [32], pp. 146-148, and [17]):

(1) Drama does not reside within a specific location and can be performed in different locations and by different artists.
(2) Drama is mobile and ephemeral, since the elements of drama may be reinterpreted (Hamlet exists in many versions).
(3) Drama is limited in duration and evolving, since virtually we cannot have two manifestations of a specific drama that are totally identical; but, also, the form and function of what we call drama may change (e.g., consider the functional difference between the Greek tragedy Oedipus and the modernist play Six Characters in Search of an Author).
(4) Drama is transmitted from generation to generation, constantly evolving, skills and techniques learned by means of mimetic techniques by future generations. Young authors study drama through the experience of the manifestations of the intangible heritage that we know as drama, being such experiences as reading a text, attending a performance, watching a movie, listening to a radio drama, and so forth.
(5) Drama is often spread over large areas or dispersed (cf., e.g., the original movie The Seven Samurai and the Hollywood movie The Magnificent Seven).
(6) Drama is not safeguarded as living heritage by means of documentation, though documented in many different ways (text, score, video, audio, and so forth) through its discrete manifestations; however, drama lives and continues to develop, and such a documentation will have historical value, and help research, memory, and transmission. However, such a documentation does not contribute to the safeguarding of the drama as an ICH item; scholars foresee a collaborative environment for the creation/sharing/dissemination of the metadata that express knowledge on the essential elements of drama and theater [3].

The major assumption of our approach is that computational ontologies and semantic web technologies can fulfill the latter requirement. The digital item will be expressed in a machine-readable format, in order to limit, as far as possible, terminological ambiguities and vagueness and support accessibility and preservation. Metadata annotation for dramatic media will be carried out through the introduction of a drama ontology (major sources are [13], [15], and [17]), which encodes the major concepts and relations of the drama domain, the so-called *dramatic qualities*, which have been shared by a majority of scholars in the drama literature, and provides the terminological knowledge for the instantiating the annotation metadata for the dramatic media objects. As we will see, the digital item that preserves drama as a form of intangible cultural heritage is an expression of an abstract dramatic work in the formal language of the computational ontologies.

3.2 The Drammar ontology

In order to build a formal encoding of the dramatic elements, Drammar (see [13] and [17] for thorough descriptions) resorts to a set of theories and models that are well established in Artificial Intelligence and Computer Science . The ratio of this design strategy is twofold: on the one side, it relies on widespread, sound models, with formal properties that have been investigated in depth; on the other side, it augments the interoperability of the representation with other encodings, which can be contributed by several disciplines, such as, e.g., interactive storytelling and procedural animation.

The design of Drammar ontology relies on three representation layers (see Figure 1 for a synoptic overview). The first, the closest to the drama document to be annotated, is the observable *timeline* (middle of Figure 1), appraised through a literary text or an audiovisual medium, a succession of the incidents (or *actions*) that happen in the drama. Incidents are assembled into discrete structures, called *units*. Each succession of incidents forms a sub-timeline of the whole timeline of the drama. This level is formalized through the Situation Calculus paradigm ([19]): with sub-timelines that function as operators advancing the story world from one state to another (states aggregated in consistent state sets, ellipses in the figure), that work as preconditions and effects of some sub-timeline of incidents. The actions result from the deliberation process of the characters, named *agents* here.

The deliberation process is represented by the motivational layer (bottom of Figure 1), which centers upon the notion of the character's intention in achieving (or trying to achieve) a *goal*. The intention, or the commitment of the character, is represented by a

[3]https://www.di.unito.it/wikidrammar, visited on 7 July 2017.

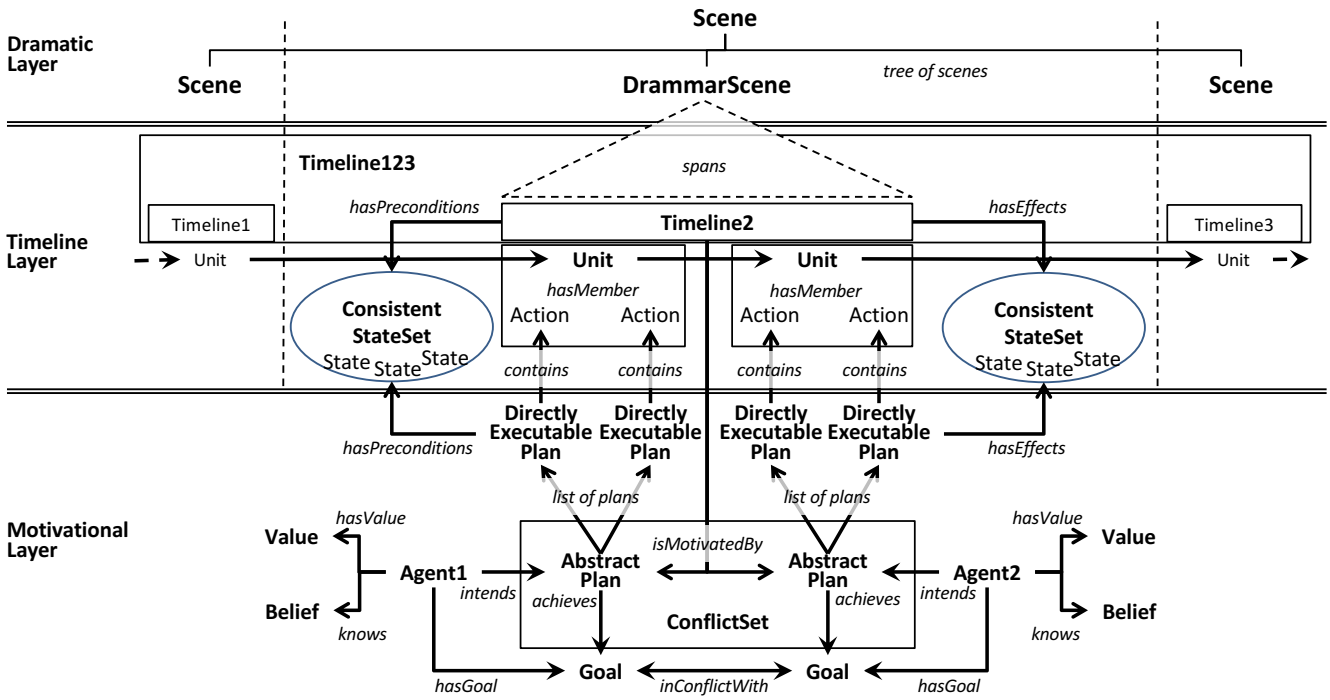

Figure 1: Layers of ontology Drammar

plan, which consists of the actions that are to be carried out in order to achieve some goal; plans are organized hierarchically, with high-level behaviors (abstract plans) formulated as lists of lower-level plans, or *subplans*, until the directly executable plans, which directly contain actions. Goals originate from the *values* of the characters that are put at stake and need to be restored, given the *beliefs* (i.e. the knowledge) of the agents. This level is formalized through the rational agent paradigm, or BDI (Belief, Desire, Intention) paradigm ([2]) (which is also applied in the computational storytelling community ([22]; [24]). This is why characters are encoded as *agents* in Drammar (bottom of Figure 1). The agent is characterized by goals, beliefs, values engaged, and plans; values can be at stake or in balance; plans can be in conflict with other plans, possibly of other agents; a conflict set aggregates all the plans, agents and goals that determine a dramatic scene (DrammarScene), through the game of alternate accomplishments. The plan is the major structure of the Motivational Layer, where all the other entities participate ([8]); plan hierarchies are trees of plans, with abstract plans that recursively dominate children subplans, until directly executable plans with actions that are actually performed by the agents in the drama; each plan hierarchy pertains to a single agent; several hierarchies (pertaining to several agents) project onto the same portion of the timeline, often with goals in conflict (actually, conflicts motivate a dramatic scene). The success/failure in achieving goals as well as in supporting own values is responsible for agents' appraisal of the drama incidents. Plans have preconditions and effects, which are consistent sets of states (where consistent means that there no two states in contradiction within the set); when some plan motivates a timeline, its preconditions and effects (the consistent state sets mentioned above) are included in the preconditions and effect of a timeline.

The dramatic layer (top of Figure 1), which is directly inspired by the literature on drama theory, accounts for the hierachical structure of the scenes: scenes are recursively composed of daughter scenes. Scenes span timelines, that is sequences of units. Some scenes are called DrammarScenes, meaning that they are motivated by some conflict over the characters' intentions, which is the characterization of scenes according to the Drammar ontology.

The abstract ontology, expressed as a set of logical specifications of classes and properties, is expressed through a formal language to become a digital, textual artifact that can be fed to a software program (for manipulation, querying, comparison, etc.). In particular, Drammar is expressed through the ontology language, which has been designed as part of the Semantic Web project and allows conceptual models to be described in an unambiguous way, open to understanding and manipulation by both human users and software programs. The concepts and relations introduced above are encoded in the ontology Drammar, written in the Semantic Web language known as OWL (Ontology Web Language). In particular, Drammar is written in a specific sub-language, OWL2 RL (Rule Language), a syntactic and semantic restriction of OWL 2 ([13]), which provides the adequate tradeoff between expressivity and complexity with respect to the requirements of the drama domain (see ([11]) for an introduction to computational ontologies). Also, Drammar includes classes that are intended as an interface between the drama domain concepts and the linguistic and common sense types of knowledge that express the content of the drama when instantiated in media, according to the paradigm of linked data ([12]).

4 THE ANNOTATION OF DRAMA

The ontology Drammar is embedded in an annotation schema for the dramatic documents, employed with the help of specific software tools that assist the annotation process from the encoding of the metadata to their enrichment with semi-automatic tools.

4.1 Drama Annotation Workflow

The workflow of annotation in Drammar is incremental, and the consistency of the metadata can be tested at any moment through the application of reasoning techniques ([13]) and visualization tool ([18]). As the construction proceeds, more and more sophisticate structures augment the timeline of incidents extracted from the original text or video. The item can be revised subsequently, as more knowledge on the drama instance is available.

In order to clarify the description, we make reference to a running example taken from Shakespeare's *Hamlet*: the so called "nunnery" scene. In this scene, situated in the Third Act, Ophelia is sent to Hamlet by Polonius (her father) and Claudius (Hamlet's uncle, the king) to confirm the assumption that Hamlet's madness is caused by his rejected love. According to the two conspirators, Ophelia should induce him to talk about his inner feelings. At the same time, Hamlet tries to convince Ophelia that the court is corrupted and that she should go to a nunnery. In the middle of the scene, Hamlet puts Ophelia to a test to verify her honesty: guessing (correctly) that the two conspirators are hidden behind the curtain, he asks the girl to reveal where her father Polonius is. She decides to lie, by replying that he is at home. Hamlet realizes from the answer that also Ophelia is corrupted and consequently becomes very angry, realizing that there is no hope to redeem the court. The representation of the scene provided to exemplify the use of Drammar describes the excerpt in which Hamlet is testing Ophelia's honesty by asking rhetorically a question he knows the answer of, namely the current location of her father Polonius (the same room where they are, behind a curtain), and Ophelia lies by giving a false location, namely Polonius' home.

Creating Timeline and Units, Agents and Objects

The construction starts from the encoding of the total timeline of incidents (actions) as a sequence of `Unit` instances. Here, we identify the unit boundaries[4] and the major actions that occur in them, described through an informal sentence (e.g., "Hamlet tests Ophelia for honesty and she lies"). In this phase, we also identify the major objects and agents that participate to the incidents.

Describing Scenes and Agents

Once the sequence of units is defined, we refine the description of the agents involved by explicitly marking the conflicts that emerge from the interplay of the agents. This also leads to identifying the scenes that cluster several units together. Therefore, at this step of the workflow, the units begin to be augmented with these informal conflicts (e.g., "Hamlet wants to test Ophelia honesty") and values engaged (e.g., "Honesty at Stake" for Hamlet). Such values engaged, put at stake, underlie the formation of goals as well as the devise of plans to achieve them.

Defining the intentions

Then, we take into account the deliberative processes underlying the units and scenes. We first identify the simplest plans that motivate the incidents occurring in the units. For each agent, we build directly executable plans (e.g., the plan "Hamlet intends to ask Ophelia about Polonius' location"). This plan includes the action ("Hamlet asks Ophelia about Polonius location"), and has precondition and effect states. This plan is a subplan of the abstract plan "Hamlet intends to test Ophelia for honesty". In principle this subplan is followed by another subplan that is not deployed because Ophelia's answer is not what Hamlet was expecting (she lies about Polonius' location). Thus, the annotator can insert an underspecified plan, which is not deployed. Also, more abstract plans can be devised as annotation proceeds, intended to achieve wider spanning goals ("Hamlet intends to send Ophelia to a nunnery").

Appraising emotions with condition-action rules

Values put at stake as a result of some plan accomplishment and goals in conflict are the input to condition-action rules for the emotion appraisal ([13]). These rules compute the emotions felt by some agent given two main elements, namely the values of the same agent put at stake (or re-balanced) and the achievement of her/his own goals with respect to other agents' conflicting goals. In particular, Hamlet feels Distress about his value honesty put at stake by the achievement of Ophelia's plan that is to save Polonius' authority through lying. Hamlet also feels Reproach for Ophelia because his goals of proving Ophelia's honesty fails while Ophelia's goal to save Polonius' authority is achieved and the two goals are in conflict. Finally, the combination of Distress and Reproach, according, causes Hamlet to feel anger toward Ophelia.

4.2 The Drammar Annotated corpus

Here we illustrate the task of the annotation process and propose a pipeline for building a system that can contribute to the construction of an annotated corpus. The enterprise is called Pop-ODE (POPulating Ontology Drammar Encodes); it consists of a pipeline and a number of tools (see Figure 2).

A drama encoding annotator (on the left) works through a web-based interface to fill the tables of a data base built according to the tenets of ontology Drammar, encoded and accessible through the well-known Protégé editor [5], on behalf of the drama scholar, possibly supported by an ontology engineer. The mapper module DB2OWL, which incorporates the same tenets as the Drammar ontology, converts the data base tables into the OWL format, thus producing a Drammar instantiated ontology file (DIO file). A further software module, OWL2CHART, extracts the individuals and properties, XML Drammmar Chart file, which are then visualized by the interactive chart module ([18]). The figure does not show the emotion annotation module, separately implemented through the semantic infrastructure hosting the generated ontology (see [13] for details).

The system relies on a client server schema. The annotation is stored in a relational data base on the server; the server exposes a set of APIs, for accessing the data base tables and for validating the generated OWL file. The client is the web interface, which guides the user through the annotation of the drama, scene by scene, The web-based annotation tool allows a user to annotate drama without

[4] An experiment has shown the feasibility of such an approach, see ([14]), without much discrepancy over different annotators.

[5] http://protege.stanford.edu

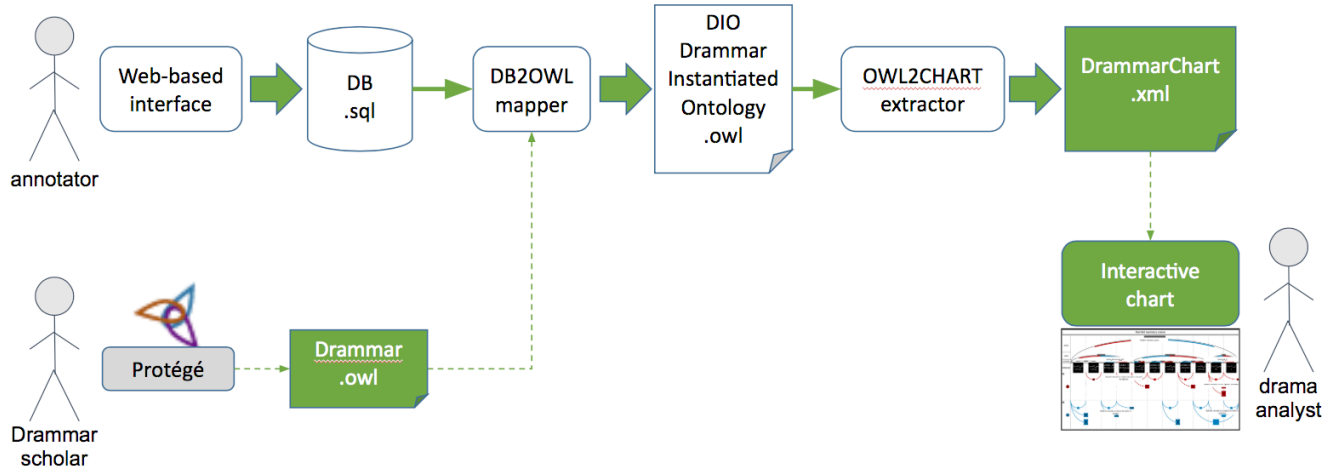

Figure 2: The Pop-ODE annotation pipeline.

knowing the details of the ontology language. The user is only required to informally know the tenets of model underlying the annotation, which are reflected in the annotation interface. Through the annotation interface, the user can create and describe a set of elements that represent the content of the drama (such as agents, plans and units) and relate them to each other (for example by binding plans to units, which equates to annotating motivations for timelines): the tags and comments inserted by the user in the annotation interface will be bound to the annotation schema automatically by the system. The tool has been designed with two main objectives in mind: the alignment of agents' intentions with respect to the incidents, and the computation of agents' emotions through the annotation of conflicts and values engaged: this choice was motivated by some earlier preliminary investigations on the visualization tool for those sections of the ontology Drammar ([16, 18]) and on the rule-based computation of emotions ([13]). In order to enable a crowdsourcing-based schema in the management of the annotation projects, the annotation tool has been developed and deployed as an online system.

The annotation tool interface implements a vertical alignment (Figure 3) between the Timeline layer and the Motivational layer, with the creation and selection of the *units* at the upper level, and the annotation of agents' *plans* – with their goals and relationships to other agents' traits – in the lower part. In yellow, the interface reports panels that pivot the two parts, respectively units (above) and plans (below). Timelines and scenes are inferred automatically by the interface. So, the user is invited (other functions are forbidden otherwise) to initially select some unit or create a new one; each unit is annotated through a formal name (identifier of the instance of the ontology class `Unit`) and a free textual description. By selecting the adjacent units for newly created units, the user can perceive the context of the unit along the *timeline* of incidents (these relations correspond, intuitively, to property *precedes*). The occurrence of some unit can also modify the values engaged for some agent, by putting them at stake or in balance, respectively; so, the user can annotate on the left and the right of the current unit, respectively, the engagement of values before and after the occurrence of the unit; the annotation distinguishes between the values that are put at stake and the ones that are brought to balance.

In the lower part of the interface, the user can create the plans that motivate the actions in the unit (instance of the class `DirectlyExecutablePlan` or `AbstractPlan`, respectively); each plan is described through a name, a free textual description, and possibly the description of the action (instance of the class `Action`) that actually implements the plan and contributes to the unit. Once a plan is selected, the user can annotate the agent that intends the plan, the goal of the plan, and the relations the plan holds with other story components. The agent that intends the plan is referenced through a formal name and a free textual description (panel of the far left of the lower part), with an annotation of pleasantness, i.e. an annotation whether the agent is perceived as pleasant or unpleasant, an annotation of whom/what the agent likes/dislikes, and finally, and most importantly, the list of values engaged for the agent. The goal of the plan (near left panel) is annotated through a formal name and a free description. The relations/attributes of the plan (panel on the right) concern its accomplishment (yes/no), the possible conflicts/supports with respect to other plans, values that are put at stake or at balance by the plan as effects of its execution or that are preconditions for its execution. Finally, this structure of the interface reflects the visualization tool that has been associated with Drammar ontology ([18]), with units and scenes on upper part of the layout, and plans and agents reported as tracks on the lower part of the layout.

The interface is implemented in Ajax, using the JQuery library, so that the annotation interface is never re-loaded during the interaction and all elements can be manipulated asynchronously by the user. An advantage of this approach is the annotation is not pipelined through a sequence of pages; rather, the user can follow the logical order she/he prefers when annotating a unit, provided

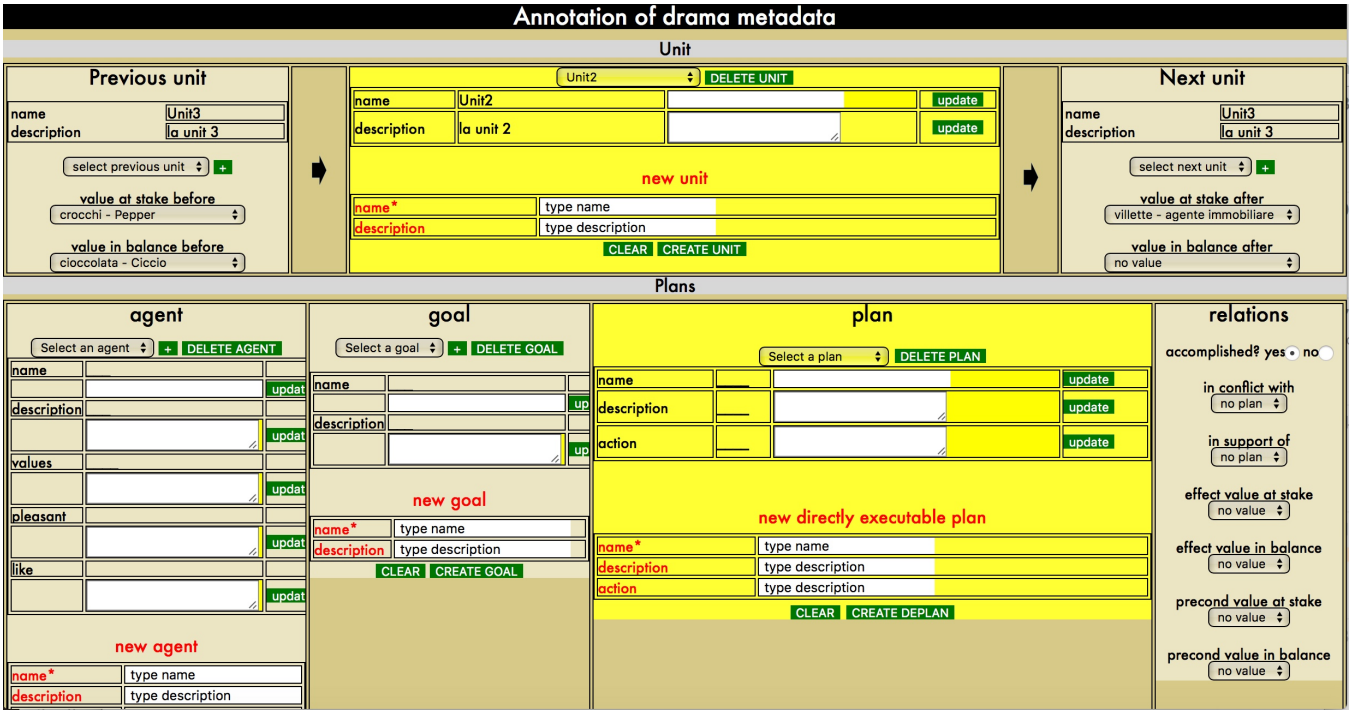

Figure 3: The annotation interface.

that the two constraints that regulate the interaction are met (first, selecting a unit, then, selecting a plan).

Any time the user creates, describes or deletes an element of the schema described above, the interface executes a call of the corresponding API, which manipulates the database via SQL queries by inserting, updating or deleting the data stored in the data base, and retrieving the updated data from it after each operation. For example, when the user creates a unit, a new row is added to the corresponding table; if the user adds a plan to it, a row is added also to the table representing the plan, with a field referencing the corresponding unit.

The data base is implemented as a mySql database. The web services are written in PHP; following a well established practice, the services return data in Json format so as to guarantee the independence of the server side implementation from the technologies employed client side. The system design allows the APIs to be called by different client side applications to update or retrieve the data. The API that support the annotation tool may be exploited, for example, by a client side application that visualizes the annotation. Or, the API it may produce the data for the translation into other formats than the relational model, such as the OWL format. For example, the Json data in Figure 4 are sent by *get_VAS_unit.php*, which retrieves from the database the values put at stake (VAS_before) and balanced (VAB_before) before and after (VAS_after and VAB_after) a given unit.

The corpus of annotated drama documents consists in two sets of drama documents, video and textual documents, respectively. The video documents are ten cult dramatic scenes from Hollywoodian movies (as selected in a course of media studies), namely


```
{
"VAS_before":
 [
  {
   "id_state":"8363",
   "id_agent":"118",
   "id_value":"65",
   "name_value":"loyalty"
  }
 ],
"VAB_before":
 [
  {
   "id_state":"8363",
   "id_agent":"118",
   "id_value":"64",
   "name_value":"honesty"
  }
 ],
"VAS_after":
 [
 ],
"VAB_after":
 [
 ]
}
```


Figure 4: Example of data extracted from the annotation database (characters' values in the preconditions and effects of a timeline).

(1) the helicopter attack scene in “Apocalypse now” (with the ride of valkyries),
(2) the “Are you talkin’ me?” scene in “Taxi driver”,
(3) the bullet time scene in “Matrix”,
(4) the Trevi fountain scene in “La Dolce Vita”,
(5) the Flat Block Marina scene in “The Clockwork Orange”,
(6) the “I’ve seen thinks ...” scene in “Blade Runner”,
(7) the Russian roulette scene in “The deer hunter”,
(8) the Sollozzo omicide scene in “The Godfather”,
(9) the dog VS. rabbit scene in “The Snatch”,
(10) the “losing the other eye” scene in “Kill Bill - Vol. 2”

plus some drama music video clip (Taylor Swift’s “You belong with me”), a dramatic advertisement clip (“Zippo” lighter), and an animated short movie (“Oktapodi”).

The textual documents, which have been segmented and annotated by three classes of media studies, are well known theatre dramas, namely Shakespeare’s “Hamlet”, Brecht’s “Mother Courage”, and Testori’s Italian neorealist “L’Arialda”.

Though we have not carried a thorough evaluation of the annotation with users from the humanities community, we have employed the yielded ontological format in two applications: the first is the application of automatic reasoning techniques to compute the emotions felt by the characters on the basis of the events and the intentions manually annotated [13]; the second is the realization of printed charts of the characters’ intentions aligned with the timeline of incidents (described in [18]), currently employed in the didactics of drama writing at the University of Torino. We are going to evaluate the appropriateness of Drammar on the adequacy of description from the point of view of research on the humanities.

5 AN FRBR VIEW OF DRAMA ANNOTATION

Since its appearance, the model known as Functional Requirements for Bibliographical Entities, or FRBR [23], has attracted the attentions of theorists in the cultural heritage domain, given its capability of dealing with the distinction between the abstract notion of work and its derived entities in a way that lends itself to generalizations to other domains than the bibliographic one. Designed with the goal of capturing “the underlying semantics of bibliographic information", FRBR acknowledges four main entities: Work, i.e., abstract ideation, Expression, i.e., the encoding of the Work in a specific language (such as text or music), Manifestation, i.e., the embodiment of the Expression in a concrete representation, and Item, a single instance of the Manifestation.

FRBR has seen several attempts at applying it to specific domains of cultural heritage, ranging from music [28] and performance [5], to intangible cultural heritage [35]. In particular, [5] resorts to FRBR to account for the problem of variation in performance, an acknowledged area of ICH: “the problem of variation is the problem of how, if a Work is defined by all the examples of it, we can determine that two examples that are not identical are nonetheless part of the same Work. This problem is especially pronounced in live performance, which, by its very nature, has the potential for each of its examples to be unique" [5] [10]. According to Doty, an ontology of drama performance should include the notion of production in order to guarantee the recognizability of a performance with respect the production it belongs to. Although Doty’s claim on production is well motivated, here we do not take any position about how the notion of performance can be accommodated into the FRBR model, since the annotation provided by Drammar addresses only, in FRBR terms, the Expression of the play. In our view, FRBR offers a valid conceptual framework for accommodating the status of the annotated drama documents, by representing at the same time the dialectics between the intangible nature of drama and its tangible manifestations across media.

Recently, the FRBR model has been challenged by [27], who pointed out the inadequacy of the notion of ‘type’ to describe the transition from Expression to Manifestation and Item in FRBR, and proposed to replace it with the more flexible notion of role. Renear’s main argument is that the entities in the Expression-Manifestation-Item triad are not related to the each other by an immutable necessity, but only as the result of a social process of meaning assignment of which linguistic rules are a mere enabling condition. Renear’s revision of FRBR, however, does not affect the practical orientation of FRBR, as the author admittedly notices: for practical purposes, in fact, including the preservation of drama as intangible cultural heritage assumed by Drammar, the properties of FRBR entities can be considered fixed and their relationships taken for granted. Encoding the meaning of drama through formal ontologies, then, is in line with Renear’s most recent work on preservation: [29] propose a model of digital preservation that relies on the distinction between propositional content and symbol structure, and on the mapping between the two. The use of ontologies to represent drama documents is in line with this model, since they provide a powerful and formalized language for transmitting unambiguously a given propositional content across different encoding formats and supports.

The description of the drama abstraction provided by Drammar is itself conceptually situated at the level of Expression in FRBR, i.e. an abstract linguistic entity encoded in a Semantic Web language, the Ontology Web Language (OWL), that can be subsequently turned into a specific format among those encompassed by the specifications the version of OWL employed for Drammar (OWL2, see previous section) and finally transferred into a digital resource. So, a play and a specific production of the play can both be separately encoded in Drammar, but the representation provided by Drammar does not provide any means to describe the relation between the two, and relies on external models (such as FRBR and its derivatives, including Doty’s) to account for this relationship.

In order to illustrate our claim, we resort to Fig. 5, which represents the relations of a drama, intended as intangible, abstract entity, and its realizations into tangible media, represented here by performing media. The abstract work called Hamlet (namely, Shakespeare’s Hamlet, at the top of the figure) is actualized through the encoding into different expressions, each characterized by a different language: jambic English for Shakespeare’s original expression of his Hamlet, filmic language for the derivative expressions devised by filmmakers (such as Lawrence Olivier and Kenneth Branagh) who adapted Shakespeare’s work in the form of a movie. Each expression can be further encoded in a Drammar instantiated object (or DIO, see bottom of the figure): the obtained expressions, encoded in the ontology format, can be compared with each other, and studied in relation with the Drammar encoding of the original

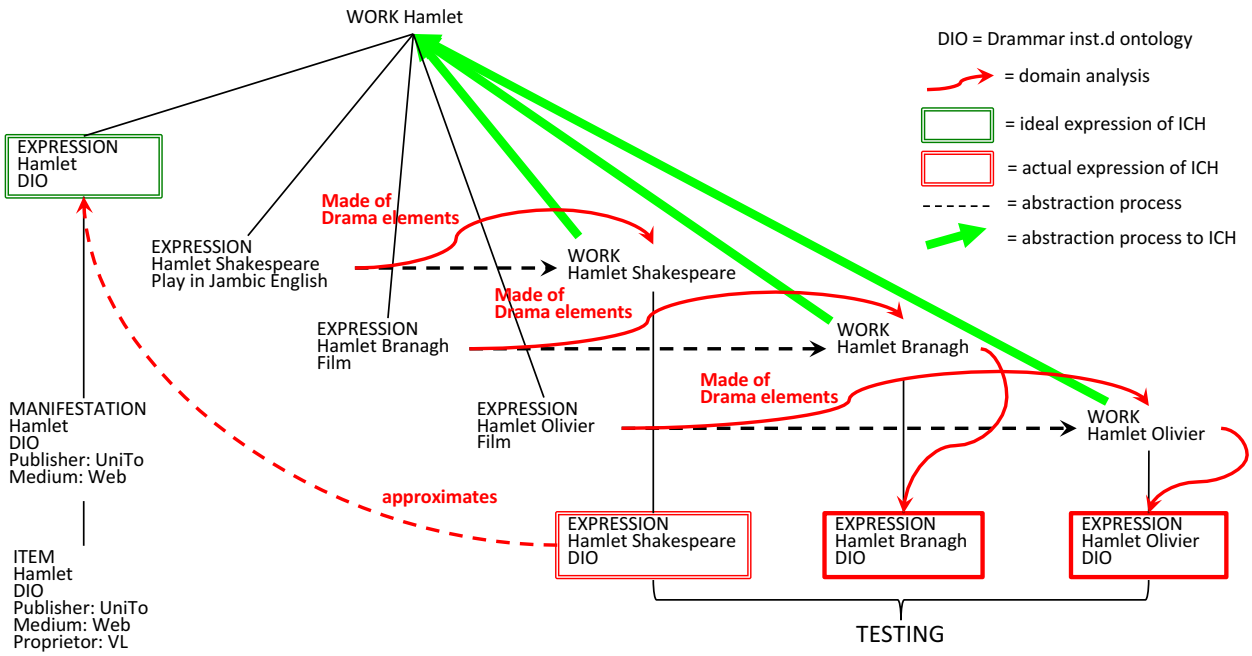

Figure 5: The expressions of drama and their annotation in FRBR, adapted from the slides presented by Barbara B. Tillett and Judith A. Kuhagen (Policy and Standards Division, Library of Congress) at Library of Congress RDA Workshop for Georgia Cataloging Summit, on 9-10 August 2011.

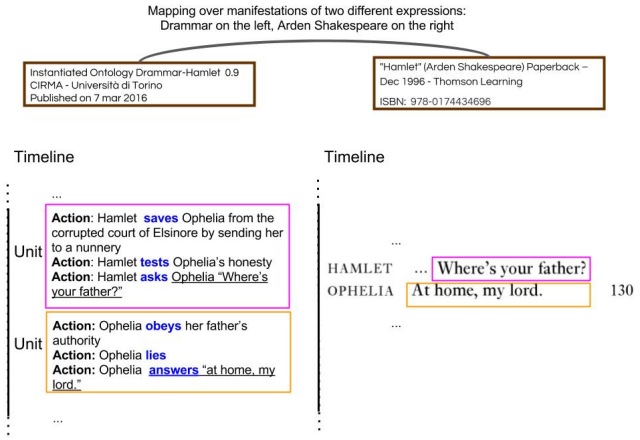

Figure 6: Detail of a Drammar Instatiated Object (DIO)

work, the expression of Intangible Cultural Heritage item named Hamlet. Each DIO concretely becomes a manifestation of its corresponding expression when encoded in a digital format that can be reproduced in several items. In particular, Figure 6 shows the parallel between the specific Drammar Instantiated Object obtained by encoding Shakespeare's expression in jambic English into the ontology language illustrated in Section 3.2 (which has been produced by using the annotation tool described in Section 4). The use of the ontology allows mediating between the ideation of the work, which can be encoded in Drammar – being the latter independent from a specific encoding and manifestation –, and its tangible manifestations across media, in a way that can be stored, referred to, and manipulated with semantic oriented tools online and offline.

6 CONCLUSION

In this paper, we have described how the use of the Drammar ontology in drama annotation reconciles the dialectics between drama as an abstract entity, characterized by the features of intangible cultural heritage, and its multiple, diverse manifestations in media. The formal nature of the computational ontology provides both an interlinked representation, which refers to external linguistic and commonsense terminological bases for its vocabulary, and a neat status for the annotated document, namely the one of an expression for the abstract work in the OWL language. The key feature of our approach for reconciling the twofold nature of drama is given by its capability of encoding the primary elements of the drama as an intangible work in FRBR terms (namely, agent, action, conflict, unit, etc.) and delivering a tangible expression in the form of an instantiated ontology. The latter instantiated ontology can be compared with the expressions in different languages, actualized into different manifestations in old and new media.

The Drammar-based approach described here addresses the issue of interoperability of the annotation, given the formal reference to a computational ontology vocabulary and the reference to external resources for terminology. Also, it addresses the status of the annotated drama documents with respect to other cultural forms, taking the FRBR model as a reference. Being theory-neutral and

language independent, the approach can be employed to annotate video and textual documents, respectively, differently from text-oriented, linguistics-based annotation schema that specifically address written drama forms.

In order to alleviate the production of the ontology annotations of dramatic media, we have also described the annotation workflow for drama documents and a web-based annotation tool. The tool implements a visual interface for the representation of the intentional motivations of the characters (agents) to act within the drama. The tool has proven to be very effective in inferring a number of classes and relations of the ontology that are syntactically important for the coherence of the representation but are cumbersome and error-prone for the task of a manual (or semi-manual) annotator. So, for example, when an annotator states that some scene is spanning from this to to that unit, the tool automatically create a timeline. We are going to make a vast and effective test of the annotation tool over several student classes, together with questionnaires and etnographic observations, to evaluate the functioning of the tool and to create a vast corpus for studies in the digital humanities.

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