CS Honours: Ontology Engineering Assignment
TV Show Ontology

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Abstract

This paper is a brief description of the TV Show ontology created for classifying and reasoning over television shows. The ontology stores and classifies television shows and metadata attached to them such as people associated with the show and genres, which can be used for providing additional information and for recommender systems.

1 Introduction

Television programming has always been an integral part of human life since the introduction of the television in the 20th Centuary. With the introduction of online streaming services such as Netflix people are finding it easier than ever to watch shows, however while services have built their own recommendation systems [1], and categorisation and informational systems[2], these services are either proprietory or do not provide a large range of metadata and are not based on a foundational ontology such as DOLCE [2].

The ontology produced for this paper tackles the knowledge domain of television shows, providing a common language for describing the shows and their metadata that can be used for anything from reasoning and recommendation systems to integrating multiple data sources into a common queriable framework.

The Protégé software was used to build the ontology and OWL 2 DL was used for the ontology to stay current with the current standards, as well as to take advantage of new features.

2 Current Ontologies

The BBC in collaboration with Freie Universität Berlin and Rattle Research has developed a set of Ontologies for integrating legacy data on their web properties. The focus is currently on music and television programming[2]. Their television programming ontology, while highly detailed, is largely focused on the metadata related to distribution[2], while our ontology focuses on the metadata that would be able to connect television shows by a number of factors such as director, concept creator and characters. The BBCs ontology is also not based on a Foundational Ontology, while the ontology produced for this paper is based on DOLCE in order to provide greater interoperability with other services[3].

3 Goals of Ontology

The TV Show Ontology has applications in the classification of television shows as well as in recommendation systems. The ontology provides an interface for integrating multiple different television data sources and providing reasoning services over them. This could be used to provide users with additional information about a television show as well as connections to other television shows. Furthermore the connected web of television shows that this ontology would represent could be used in conjunction with machine learning algorithms to recommend similar shows to users.

4 Outline of Ontology

Figure 1 shows a subset of classes used in the ontology. The classes are built on top of the DOLCE-Lite foundational ontology to provide a common vocabulary for interoperability[3].

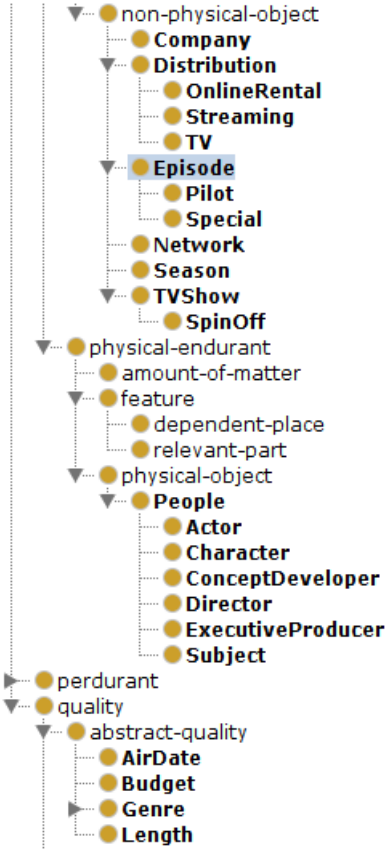

Figure 1: A subsection of the classes used in this ontology

Figure 2 shows a subset of the Object Properties used in the ontology. The properties are also based on the DOLCE-Lite foundational ontology's framework.

The following gives a basic description of the ontology and its **Classes** and *Object Properties*. To view the complete structure of the ontology refer to the OWL File.

A **TVShow** *hasSeason* **Season** and a **Season** *hasEpisode* **Episode**, a **TVShow** also has *tVShowEpisode* **Episode** via a *hasSeason* $\circ$ *hasEpisode* chain. These are *part* relations. A **TVShow** *isProducedBy* a **Network** which *isOwnedBy* a **Company**. A **TVShow** or **Season** or **Episode** *airsOn* **Distribution** which *isOwnedBy* a **Company** or **Network**.

Additional metatdata is used to show show connections with qualities: **People** *involvedIn* the **TVShow** or **Episode**; that a **TVShow** *hasAirDate* **AirDate**, *hasBudget* **Budget**, *hasGenre* **Genre**, and *hasLength* **Length**

Person, **Length**, **AirDate**, **Genre**, **Budget** are some of the disjoint classes in the ontology.

Object Properties were also defined with inverses, cardinalities, property chaining, and characteristics such as transitivity and functionality. Temporal qualities were also added to extend the DOLCE-Lite foundational ontology, in order to have relations between preceding and following **Episode**s and **Season**s.

In addition to Object Properties, Data Properties and custom Annotation Properties were used.

Certain decisions had to be made with regards to cardinalities, transitivity and chaining as OWL 2 DL does not allow a relationship to have both features. In some cases transitivity and chaining was more useful in the ontology so cardinality was not used. Furthermore constraints such as a *nextEpisode* must have the same *episodeOfTVShow* value as its *prevEpisode* could not be added.

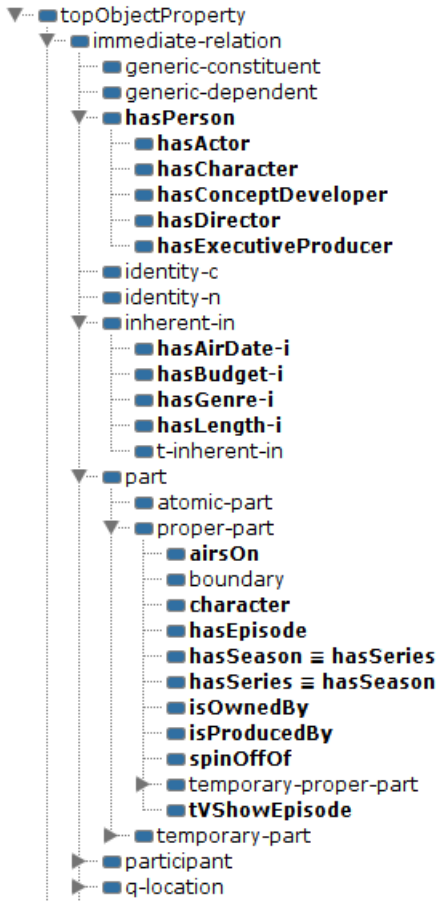

Figure 2: A subsection of the Object Properties used in this ontology

5 Motivation for Owl Species

OWL 2 DL is being used to represent our ontology in order to satisfy for the need for maximum expressiveness, while maintaining tractability and full reasoning. OWL 2 is in use so that cardinality could be used, as well as to keep the ontology in line with the most modern standards[4]. The specific Description Logic used was: $\mathcal{SROIQ}(\mathcal{D})$

6 Resources and Foundational Ontologies Used

The foundational ontology DOLCE-Lite was used in order to make the TV Show Ontology interoperable with other ontologies, as well as providing a common and well defined vocabulary and structure[5].

7 Method/Methodologies Used

The methodology followed in the development of the TV show ontology was an adapted version of the Methontology as described by Fernandez et al.,[1999]. Firstly, the domain of television shows was chosen. After this the Specification phase was performed where an informal specification document was produced. This document included the purpose, the possible users and the scope of the ontology. The use of the middle-out approach was decided apon, where during the development of the scope of the ontology a rough intermediate representation of the ontology was created based on the general knowledge of the group members[6]. This intermediate representation included a list of terms and concepts that should be included in the ontology. The Knowledge gathering phase was then completed where the first rough intermediate representation was improved apon by finding information relevant to the knowledge domain. In the Conceptualization phase a conceptual model was developed using the improved intermediate representation that showed possible relationships and classes needed to develop the ontology[6]. This was used as a blueprint in the final Implementation phase where the ontology was developed using Protégé.

8 Discussion

The Hermit reasoner was used in order to reason over the ontology and perform some tests. 2 Individuals were created to test the ontology under failure scenarios (these were removed before the submission in order to have a working ontology submission).

The first individual tested disjoint classes by making an entity both a **Company** and a **Genre** which resulted in a logical inconsistency as expected.

The second individual tested one of the Domain and Range of the *actsIn* relation by setting the individual to have the Object Property Assertion: **Pilot** *actsIn* **Director**, this caused an inconsistency as expected.

A variety of success Individuals were included in the Ontology to show how it would be used to infer information from a particular dataset (While every care was made to ensure that the data is correct, it should not be considered a complete and correct dataset of television shows).

9 Who Did What

Both Roscoe and Mitch worked equally on the report and ontology, switching roles throughout the project.

References

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