Animation Produced in Japan

Luís Mouta

up201808916@fe.up.pt

Faculty of Engineering of University of Porto

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Abstract

Japanese Animated Cartoons or can also be called Animes, are starting to become popular within all circles regardless of age, status and profession. Animes have several genres from action, comedy, drama, romance, adventure, etc., and can be accessed in online media such as websites that offer various types of anime, one of which is myAnimeList on this web having 14,000 anime films shared genre that will be used as the dataset for this Milestone. It will be required to create an Ontology for this dataset because developing an ontology is the most essential part any system of knowledge requires to have, because it represents a definition of the domain implicit. Existing ontologies will be analyzed first in order to retrieve the most important ideas of what is behind an ontology in order to develop a fresh one. It will be used Protégé to develop the new ontology and after analysing the main concepts to be defined and all the relations Animes have to have we can proceed to the part of the actual Class hierarchy definition in Protégé. Class, Object and Data Properties will be defined within the Ontology in order to be able to submit the ontology to querying processes.

1 Introduction

Anime is hand-drawn and computer animation originating from Japan. This term is used to describe all animation, regardless of style or origin. These animations are characterized by the distinct look of its characters, with huge eyes, different hair, and exaggerated emotional faces and expressions[1].

Japan began producing animation in 1917, but anime's only started to become famous after the 60s due to the creation of television, which had a crucial role in making these Japanese characteristic films an increasing trend[2][3].

Nowadays, with the growth of anime popularity and the number of animated films being produced every year, anime fans gather in online platforms where information about anime and its reviews are collected and can be accessed, allowing users to interact with each other, share what animations they are interested in and keep track of what they have watched, are watching and want to watch in the future [4].

These online platforms store all this data and it is intended to get and process all the necessary data from these platforms, to find a suitable way to store and develop methods to answer our queries [5].

Since all of this data isn't in a centralized place to counter this all the chosen information was stored in a single CSV with all the data refined in order to be able to index them and be able to query by information retrieval tools

1.1 CSV Contents

The Dataset mostly used was the one from MyAnimeList which contains information on all the Animes and also user preferences. The CSV in questions contains roughly the information exported from over seventy thousand users and over ten thousands Animes.

Each user is able to add one or more Animes to the Dataset and give it a Rating. Basically this CSV is a compilation of all this information.

Each line of the CSV represents a single Anime with the following contents: **animeID**, **Name**, **title synonyms**, **animeType**, **source**, **producer**, **genre**, **studio**, **episodes**, **status**, **Airing**, **aired**, **duration**, **rating**, **score**, **scored by**,**rank**, **popularity**, **members**, **favorites**, **synopsis**, **background**, **premiere**, **broadcast**, **related**.

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2   Ontology

The goal for this iteration is to explore existing Ontologies regrading the Topic Anime in order to design a brand new ontology. It is also a purpose of this iteration to explore the data domain of Animes by utilizing ontology properties to the max.

2.1   Data Domain

Regarding the previous definitions for Anime, a general overview of the matter is that Anime basically refers to an animation originated from Japan. Anime can either be a TV Show, a Movie, a OVA, a ONA or even special episodes having all kinds of producers, licensors and genres. It also has to be taken into consideration all the rest of classes that come along with a single Anime like the dates from when the Anime started and finished airing, it's current rating(Kitsu Rating and Mal Score), synopsis, episode amount, status and how much time does an episode take.

All this information provided in the Data domain is due to the current growth of anime popularity that takes fans to gather in online platforms to evaluate these animations in order to be possible to obtain feasible information regarding these animations.

All the concepts mentioned earlier above are used to describe an anime and to relate it to other entities. For example entities like: Producers, Licensors, Studios can be defined in the ontology has properties of Animes. Status, Rating, Genre, Source, Type can also be used to relate Anime's as we may want to know all the Animes with the "Fantasy" genre, for example.

All these values are ordered and predefined in order to promote a consistent classification of Anime characterization.

Regarding the Ontology some relations between Objects are going to be defined, most specifically two of them:

- It is going to be possible to relate an Anime with other Animes

- It is going to be possible to relate an Anime with other entities

2.2   Relation between Animes

It was implemented the following functional properties to relate an Anime with other Animes:

- hasAlternativeSetting - relates an Anime to other Anime regarding a alternative Story

- hasParentStory - relates an anime to other Anime telling the origin story of the first Anime

- hasPrequel - relates to a Prequel of an Anime

- hasSequel - relates to a Sequel of an Anime.

- hasSideStory - relates an Anime to another telling a side story that is similar or identical to both.

- hasSpinOff - relates to an Anime to its spin-off

- hasSummary - relates to a resumed version of an Anime.

2.3   Relation between Anime and other Entities

In order to relate Animes to other Entities the following functional properties were implemented:

- hasGenre - relates an Anime to one or more Genres

- hasLicensor - relates an Anime to one or more Licensores

- hasProducer - relates an Anime to one or more Producers

- hasRating - relates an Anime to the Age Rating classification

- hasSource - relates an Anime to one single Source

- hasStatus - relates an Anime to its current status

- hasStudio - relates an Anime to one or more Studios

- hasType - relates an Anime to one or more Types

2.4   Existing Ontologies

After doing some research it was found two different ontologies that represent important information for the development of the Anime ontology using Protégé.

The first Ontology found is from DBpedia[6] where an anime is categorized as a subclass of "Cartoon". The second ontology is from Wikidata[7] where an Anime is categorized as a "Animated Film of Japan" and it also comprehensible to the following keywords " Anime and Manga".

This two studied Ontologies also relate to each other in the equivalent class section

3   Building an Ontology

In order to build an a research was made beforehand in order to know more about the existing ontology editors that were available, such as, Protégé, NeOn Toolkit, SWOOP, TopBraid Composer and a bunch of them.

The choice was obvious and for the creation of the ontology , the ontology editor Protégé was used, this open-source framework provides a graphic user interface (GUI) that helps the user to define ontologies, by supporting a lot of plug-ins that ease the difficulty of complex ontologies.

The ontology was created following a set of rules and ideas defined before starting. The first step was the creation of the classes "*Anime, Genre, Licensor, Producer, Rating, Source, Status, Studio* and *type* as well as the Anime subclasses, "*AiringAnime, FinishedAnime, HighScoreRatedAnime, LowScoreRatedAnime, MediumScoreRatedAnime, MusicAnime, MovieAnime, ONAAnime, OVAAnime, SpecialAnime, TVAnime*". This Anime subclasses will identify and classify the different Anime individuals included in the ontology.

Fig. 1 - *Class Hierarchy for Anime ontology"*

The next step had to be the definition of object properties, which represent the relation between classes in order to be able to add some restrictions onto classes. In OWL properties most of the tools available are to assert relationships between individuals. Each characteristic has it's own properties, attributes were given for the ones found most suitable taking into consideration domains and ranges for each property.
Characteristics can be defined as:

- *Functional* that means that for any given individual, the property can have at most one value

- *Inverse Functional* which means the inverse property of the select property funcional

- *Transitive*, that if a individual "*x*" is related to individual "*y*", and individual "*y*" is related to individual "*z*", then the individual "*x*" will be related to individual "z"

- *Symmetric*, meaning that this property has itself as a inverse

- *Asymmetric* meaning that if an individual "*x*" is related to an individual "*y*" then the individual "*y*" is not related to individual "*x*"

- *Reflexive*, asserting that a property is reflexive causes every single individual to be related to itself via that property

- *Irreflexive* which is the opposite of *Reflexive*, meaning that an individual cannot be related to itself.

Taking into consideration all this characteristics the domains and range for each property were defined in the Anime ontology as it can be seen on the Figure below.

Fig. 2 - Object Property Hierarchy for Anime Ontology"

Fig. 3 - Data Property Hierarchy for Anime Ontology"

By last before we can start adding individuals to improve the quality of the ontology is it also required to describe the relations between the individuals and their data values, known as data properties.

Regarding Data property it displays a tree where all the tree nodes correspond to data properties and is considered one of the primary navigation devices in Protégé and is responsible for returning the value of the data attribute of an object element.

The Data property Hierarchy was defined as expressed in the image below

3.1 Populating Ontology

The dataset used has information of over 12900 Animes, and since Protégé doesn't work well with big amounts of data it was decided that it wasn't feasible to populate the ontology with all the examples provided in the dataset. It was only imported a subset of the dataset, approximately 50 Animes were imported as individuals with all the characteristics implemented to the ontology. The feature used to import this data was very intuitive and simple, it was used the plugin Cellfie which offers a GUI in Protégé that eases the use of it and allows to import data from .xlsx files to the Ontology.

4 Queries

Since the ontology is all ready we are able now to query it using the SNAP SPARQL Query plugins on Protégé. Six different queries were made.

Query Number 1

Retrieves the anime which name is "Regalia: The Three Sacred Stars" and shows its name , synopsis, studio, rating and status.

```
SELECT
        ? name ? synopsis ? studio ? rating ? status
WHERE
        { ? anime a ontology:anime;
ontology:name ? name;
ontology:synopsis ? synopsis;
ontology:hasrating ? rating;
ontology:hasstudio ? studio;
ontology:hasstatus ? status FILTER( ? name = "regalia: the three sacred stars"). }
```

***Fig. 4** - Query 1*

***Fig. 5** - Query 1 Result*

Query Number 2

Retrieves all Animes with Mal Scores between 3 and 9 ordering from the lower to the higher displaying the name, rating and synopsis of the current Animes

```
SELECT
        ? name ? rating ? synopsis
WHERE
        { ? anime a ontology:anime ;
ontology:name ? name ;
ontology:mal_score ? rating;
ontology:synopsis ? synopsis FILTER(( ? rating >= 3) && ( ? rating < 9)). }
ORDER BY
        ASC( ? rating)
```

***Fig. 6** - Query 2*

***Fig. 7** - Query 2 Result*

Query Number 3

Retrieves all Animes that are sequels of other Animes

```
SELECT DISTINCT
        ? name
WHERE
        { ? y a ontology:anime. ? x a ontology:anime;
ontology:name ? name ;
ontology:hasgenre ? z . ? y ontology:hassequel ? x }
```

***Fig. 8** - Query 3*

"Sword Art Online Movie: Ordinal Scale"

"Steins;Gate: Oukoubakko no Poriomania"

"Tokyo Ghoul:re"

"Tokyo Ghoul √A"

"Shingeki no Kyojin Season 2"

"Sword Art Online II"

"Steins;Gate"

***Fig. 9** - Query 3 Result*

Query Number 4

Retrieves a list of Animes that have an awesome rank <125 ordered by ascending order displaying the Anime's name, rank, members, favorites and popularity.

```
SELECT
        ? name ? RANK ? members ? favorites ? popularity
WHERE
        { ? x rdf:type ontology:anime ;
ontology:name ? name ;
ontology:mal_rank ? RANK ;
ontology:mal_members ? members;
ontology:mal_favorites ? favorites;
ontology:mal_popularity ? popularity;
FILTER ( ? RANK < 125) }
ORDER BY
        ASC( ? RANK )
```

***Fig. 10** - Query 4*

***Fig. 11** - Query 4 Result*

Query Number 5

Retrieves the total amount of Animes for each genre registered in the ontology, ordered from the highest to the lowest.

```
SELECT
        ? genre (COUNT(DISTINCT ? anime) AS ? animes)
WHERE
        { ? anime rdf:type ontology:anime ;
ontology:hasgenre ? genre . }
GROUP BY
        ? genre
ORDER BY
        DESC( ? animes)
```

Fig. 12 - *Query5*

Fig. 13 - *Query 5 Result*

Query Number 6

Retrieves all the Animes that contain the word "Sword art online" on the Synopsis and that contain the word "game" on the Genre displaying the Anime's name,genre and synopsis.

```
SELECT
        ? name (group_concat ( ? genrename;
separator = ", ") AS ? genres) ? synopsis
WHERE
        { ? x ontology:name ? name ;
ontology:hasgenre ? genre ;
ontology:synopsis ? synopsis. ? genre ontology:genre ? genrename FILTER(regex( ? synopsis, "sword art online") && regex( ? genrename, "game") ) }
GROUP BY
        ? name ? synopsis
```

Fig. 14 - *Query6*

Fig. 15 - *Query 6 Result*

5   Conclusion

For this milestone it was required to learn how the knowledge was represented so that a user could search for certain data, and retrieve the information required

The main objective of this milestone was completed, the ontology about Animes was created and all the queries that were planned to be done were achieved.

It was also possible to understand the importance of representing knowledge and information correctly in an ontology, so everyone can analyse it on Web. Protégé proved to be a good tool to use regarding ontologies although when leading with big amounts of data it is not the most suitable.

References

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[6] *WikiData Ontology* http://mappings.dbpedia.org/index.php/OntologyClass:Anime.[Online, accessed at 4-January 2020]

[7] *DBPedia Ontology,* http://dbpedia.org/ontology/Anime. [Online, accessed at 4-January 2020]

6 Appendix
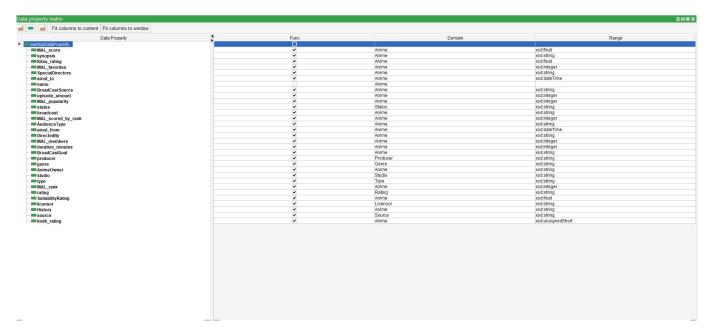
6.1 Data Properties Matrix
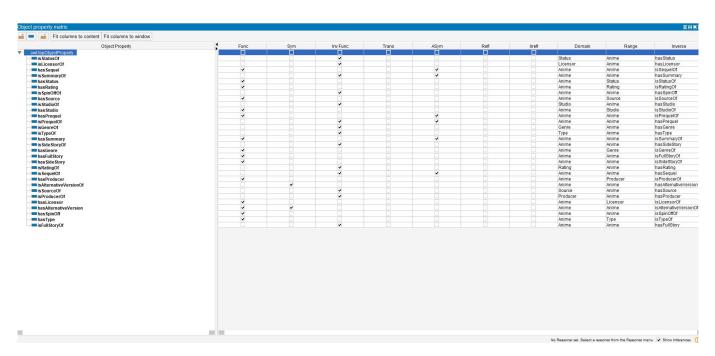

Fig. 16 - *Data Properties Matrix*

6.2 Object Properties Matrix

Fig. 17 - *Object Properties Matrix*