Pizza Ontology using Protégé

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I. INTRODUCTION

Ontologies, provide a way to organize and categorize the data, enabling us to reason about it in a structured way. In this report, we present a pizza ontology, which represents the knowledge about pizza restaurants and the pizzas they sell using the Protégé ontology editing tool. This ontology can be used as a foundation for developing more complex ontology in the domain of food and beverage industry.The data set for this coursework is sourced from a Kaggle data set on Pizza Restaurants and their offerings.This ontology includes classes, properties, and property restrictions that capture the concepts and relationships within the domain.

II. METHODOLOGY

A. Changing the namespace for the ontology:

Changing the namespace of the ontology requires modifying the namespace declaration. This will be in the form of an OWL annotation that specifies the namespace URI. we changed this to : "ohhp://www.city.ac.uk/inm713-in3067/2023/RatnaAarti"

B. Creating a prefix 'ra:' for the above namespace:

We created 'ra' as our prefix to define this as to provide a shorter, more convenient way to refer to URIs (Uniform Resource Identifiers) that are used in the ontology.The prefix declaration associates a prefix name with a namespace URI, which is then used throughout the ontology to refer to entities in that namespace. Using prefixes can make ontologies more readable and easier to maintain. They also allow ontologies to use existing URIs from well-known namespaces, such as those defined by W3C, without having to write out the full URI each time.

C. Reusing the annotation property dc:creator to indicate the ontology has been created by us:

The annotation, visible in the "Ontology Annotations" tab of Protégé indicate that this ontology is created by Ratna and Aarti, as shown in the fig. 1 Although it is not a mandatory, and there are other properties that can be used to provide additional information for the ontology, but it is considered as good practice to denote extra metadata.

Fig. 1. Annotation Property

D. Creating classes and organizing them into a hierarchy

One of the strengths of this report is its class organization and structure. The report is divided into distinct sections, each of which addresses a different aspect of the pizza ontology. This structure makes it easy for readers to follow the logical flow of the analysis and understand the key points being made.Creating classes and organizing them into a hierarchy is a fundamental aspect of ontology development that can support semantic interoperability, consistency, reasoning, inference, and extensibility of the model. The hierarchy created for this ontology is shown is fig 2.

E. Creating properties and property restrictions

In ontology modeling, creating properties and property restrictions is important for defining the relationships between classes, and for specifying how instances of different classes are related to each other. Properties are used to describe the attributes or characteristics of a class, the size of a pizza, or the city of a restaurants. In ontology modeling, properties are defined using object properties or datatype properties, depending on whether they describe relationships between classes or simple attributes of a class.

Property restrictions, on the other hand, are used to define the constraints or rules that apply to properties. These restrictions can be used to specify the range of values that a property can take, the minimum or maximum number of values allowed for a property, or the cardinality of a property.

In ontology modeling, local scope refers to the context-specific restrictions that are applied to individual properties. These restrictions can be either existential or universal.Existential restrictions are used to specify that a certain property must exist for an instance of a class to be considered valid. Global scope refers to the broader constraints that are applied to classes and properties across the entire ontology.
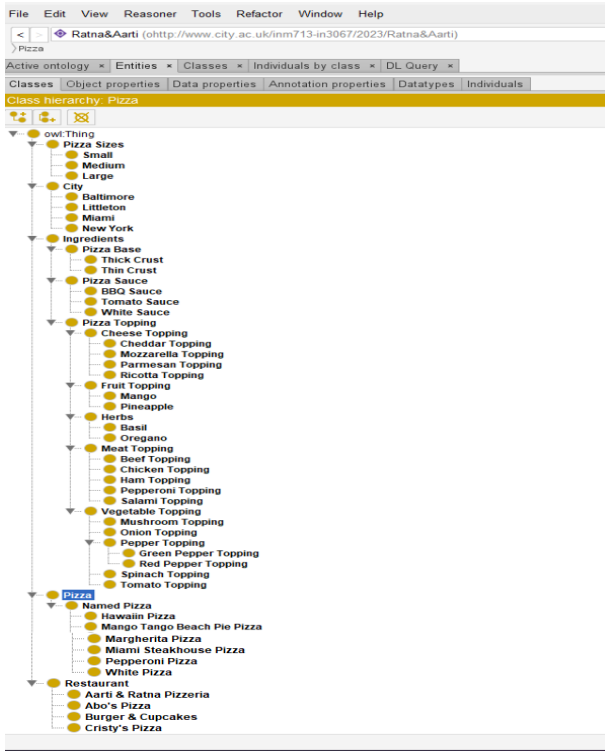
Fig. 2. Class Hierarchy

These constraints can be related to the domain and range of properties.The domain of a property specifies the class to which the property applies, while the range of a property specifies the class of the object that the property points to.

F. Creating appropriate property characteristics:

Creating appropriate property characteristics is important for ensuring that the properties defined in the ontology accurately captures the attributes and relationships of the domain.Two important characteristics that can be used to define properties in the pizza ontology are functional and transitive. Functional properties are those which can only have one value for a given individual. If a pizza has a particular size, the "hasSize" property could be defined as functional, indicating that each pizza can have only one size. This would help to ensure that the ontology is more accurate and consistent.

Transitive properties are properties that are inherited through a chain of related individuals.In the pizza ontology, If a pizza "hasTopping", and that topping is itself a pizza that has a topping, then the original pizza is said to have the second topping as well, even if it is not explicitly stated.This example demonstrates how transitive properties in the pizza ontology can be used to propagate properties through a hierarchy of related entities, enabling more advanced reasoning and data integration capabilities.

G. Creating a label and a comment for several entities:

Creating labels and comments for entities in ontology modeling is important for improving readability, facilitating data entry, supporting multilingual applications, enabling search and retrieval, and supporting integration with external systems. Labels and comments provide descriptive names and explanations for entities, making the ontology more understandable and accessible for human users. They can also help to facilitate data exchange and sharing between different systems, enabling more effective knowledge representation and reasoning capabilities. We have created appropriate annotation : label and comment for every entity.

H. Creating a new type of Restaurant and a new type of Pizza with its ingredients

In this ontology we have created : "Aarti Ratna Pizzeria" which is only situated in the city of Miami, and we have created two special type of pizza "Mango Tango Beach Pie Pizza" and "Miami Steakhouse Pizza" which is only served in our restaurant. Mango tango Beach Pie Pizza is having restriction that at least one topping will be of Mango."Miami Steakhouse Pizza" has restrictions as it should have BBQ Sauce, Beef Topping and Parmesan Topping. Shown in Fig 4 and Fig 5.

Fig. 3. Example of a new type of Pizza.

III. RESULT AND CONCLUSION

We utilized Protégé software to develop an ontology dedicated to pizzas, which proved to be a valuable tool in comprehending the principles of ontology modeling and reasoning.Through the creation of classes, properties, and individuals, as well as the inclusion of annotations, comments, and the utilization of reasoners to deduce relationships, a comprehensive and functional model of pizzas was constructed, which can be applied to a range of endeavors, such as food ordering platforms and nutritional analysis tools.The ontology's establishment of a standard vocabulary and concept set allows for simplified communication and sharing of information.This gave us an idea of how ontologies can be utilized to represent intricate concepts in a formal and structured manner.

REFERENCES

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