

Finding inconsistencies and redundancies in Pizza ontology

Akash Raj Komarlu Narendra Gupta

I. RESOLVING INCONSISTENCIES

In the given pizza.owl ontology, there are two inconsistencies.

- 1) IceCream class - The domain of hasTopping relation has been extended to Food. IceCream will be the subclass of 'hasTopping only FruitTopping'. This restricts IceCream from having any other toppings (say, TomatoTopping).
- 2) CheesyVegetableTopping - CheeseTopping is modified to remove disjointness with VegetableTopping. CheesyVegetableTopping is any topping that has a CheeseTopping and VegetableTopping. The justification is that we can have a Pizza with vegetable and cheese toppings.

II. REMOVING REDUNDANCIES

- 1) Caprina (Named Pizza) - There are two redundancies associated with this. It is given that *all* of the toppings are either GoatsCheese or Mozzarella or SundriedTomato or Tomato. In this statement, whenever Caprina has a SundriedTomatoTopping, the statement that Caprina has a TomatoTopping is also true. Since all toppings can be TomatoTopping, some of the toppings here could include SlicedTomato. Therefore, the inclusion of SundriedTomatoTopping offers no additional information.
It is stated that *at least one* of the toppings is a TomatoTopping and that *at least one* of the toppings is a SundriedTomatoTopping. The former statement offers no additional information as SundriedTomatoTopping is a sub-class of TomatoTopping.
- 2) SlicedTomatoTopping and SundriedTomatoTopping - Removed the property: hasSpiciness some Mild. It is stated in TomatoTopping class that it is a subclass of **hasSpiciness some Mild**. SlicedTomatoTopping and TomatoTopping also have this statement. Since they are sub-classes of TomatoTopping, they have this property implicitly. Therefore the statement, **hasSpiciness some Mild** defined in SundriedTomatoTopping and SlicedTomatoTopping classes is redundant.
- 3) VegetarianTopping - Removed PizzaTopping from the conjunction. VegetarianTopping is a subclass of PizzaTopping and specifying it again in the definition of VegetarianTopping is redundant.
- 4) Giardiniera (Named Pizza) - There are two redundancies associated with this. It is given that *all* of the toppings are either SlicedTomato or Tomato (or one of the others stated). In this statement, whenever

Giardiniera has a SlicedTomatoTopping, the statement that Giardiniera has a TomatoTopping is also true. Since all toppings can be TomatoTopping, some of the toppings here could include SlicedTomato. Therefore, the inclusion of SlicedTomatoTopping offers no additional information.

It is stated that *at least one* of the toppings is a TomatoTopping and that *at least one* of the toppings is a SlicedTomatoTopping. The former statement offers no additional information as SlicedTomatoTopping is a sub-class of TomatoTopping.

- 5) NonVegetarianPizza - Removed the disjoint statement. It is defined as equivalent to **Pizza and (not VegetarianPizza)**. This means that it is disjoint with VegetarianPizza. Hence the specification of 'disjointness with VegetarianPizza' is redundant.
- 6) InterestingPizza - now defined as **Pizza and (hasTopping min 3 PizzaTopping)**. The range of hasTopping is only PizzaTopping. Therefore specifying **hasTopping min 3 owl:Thing** is redundant (Also, IceCream is disjoint with Pizza, and hence it cannot be a topping).

(Many more redundancies were found. Everything has been uploaded to my github repo - <https://github.com/akashrajkn/so-many-pizzas>)

III. ADDING REDUNDANCIES

- 1) Capricciosa (NamedPizza) - Added the statement, **hasSpiciness some Mild**. This is redundant because Capricciosa has at least one TomatoTopping. TomatoTopping has Mild spiciness.
- 2) InterestingPizza - Change the definition to hasTopping min 3 Food. This is redundant because hasTopping has a range that includes only PizzaTopping. Also, other subclasses of Food - IceCream, Pizza, and PizzaBase are disjoint with PizzaTopping.
- 3) AmericanHot (NamedPizza) - Add the statement **hasTopping some PepperTopping**. This statement offers no extra information since AmericanHot Pizza will have at least one JalapenoPepperTopping, which is a subclass of PepperTopping.
- 4) DeepPanBase - Add the statement that it is disjoint with PizzaTopping. This is redundant because, DeepPanBase's superclass is PizzaBase which is disjoint with IceCream, Pizza and PizzaTopping.