BulgAIrianCuisine: Онтология за Български ястия

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Цел

Онтологията BulgAIrianCuisine има за цел да представи различните концепции и обекти в областта на българската кухня – традиционни ястия, съставки, начини на приготвяне, регионален произход и други. Онтологията може да бъде използвана за уеб и мобилни приложения, свързани с препоръчване и популяризиране на българската кухня, както и за създаване на интерактивни готварски книги.

Йерархията на класовете се опитва да спазва известен design pattern за проектиране на онтологии и е организирана в два аспекта - такива, представляващи реални обекти (наследници на **DomainThing**) и такива, имащи по-абстрактно значение (наследници на **ValuePartition**).

Елементи на онтологията

Концепти

DomainThing ⊑ Thing

ValuePartition ⊑ Thing

CookingMethod ≐ [AND DomainThing [ONE-OF Baking, Boiling, Frying, Grilling, NoCooking]]

Region ≐ [AND DomainThing [ONE-OF BalkanRegion, BlackSeaCoastRegion, DobridjaRegion, PirinRegion, RhodopeRegion, ThracianRegion]]

Food ⊑ DomainThing

Dish ⊑ [AND Food [EXISTS 1 :hasCookingMethod] [EXISTS 1 :hasIngredient] [ALL :hasIngredient DishIngredient]]

DishIngredient ⊑ Food

ChocolateIngredient ⊑ [AND DishIngredient [ALL :hasSweetness VerySweet]]

DairyIngredient ⊑ DishIngredient

EggIngredient ⊑ DishIngredient

FiloDoughIngredient ⊑ DishIngredient

LeanIngrediant ⊑ DishIngredient

MeatIngredient ⊑ DishIngredient

ButterIngredient ⊑ DairyIngredient

CheeseIngredient ⊑ DairyIngredient

YogurtIngredient ⊑ DairyIngredient

WhiteCheeseIngredient ⊑ CheeseIngredient

YellowCheeseIngredient ⊑ CheeseIngredient

BeanIngredient ⊑ LeanIngrediant

RiceIngredient ⊑ LeanIngrediant

FruitIngredient ⊑ LeanIngrediant

VegetableIngredient ⊑ LeanIngrediant

PumpkinIngredient ⊑ [AND FruitIngredient [ALL :hasSweetness VerySweet]]

CucumberIngredient ⊑ VegetableIngredient

GarlicIngredient ⊑ [AND VegetableIngredient [ALL :hasSpiciness VerySpicy]]

OnionIngredient ⊑ [AND VegetableIngredient [ALL :hasSpiciness MildSpicy]]

PepperIngredient ⊑ VegetableIngredient

TomatoIngredient ⊑ VegetableIngredient

PotatoIngredient ⊑ VegetableIngredient

SauerkrautIngredient ⊑ VegetableIngredient

EggplantIngredient ⊑ VegetableIngredient

CarrotIngredient ⊑ VegetableIngredient

BeefIngredient ⊑ MeatIngredient

ChickenIngredient ⊑ MeatIngredient

FishIngredient ⊑ MeatIngredient

LambIngredient ⊑ MeatIngredient

PorkIngredient ⊑ MeatIngredient

NamedDish ⊑ Dish

HighCalorieDish ≐ [AND Dish [ALL :hasCalorieContentValue >= 300]]

LeanDish ≐ [AND Dish [ALL :hasIngredient LeanIngredient]]

NoCookableDish ≐ [AND Dish [FILLS :hasCookingMethod NoCooking]]

RegionalDish ≐ [AND Dish [EXISTS 1 :hasRegion]]

SpicyDish ≐ [AND Dish [EXISTS 1 :hasIngredient [ALL :hasSpiciness VerySpicy]]]

SweetDish ≐ [AND Dish [EXISTS 1 :hasIngredient [ALL :hasSweetness VerySweet]]]

Banitsa ⊑ [AND NamedDish [FILLS :hasCookingMethod Baking] [ALL :hasIngredient ButterIngredient] [ALL :hasIngredient EggIngredient] [ALL :hasIngredient FiloDoughIngredient] [ALL :hasIngredient WhiteCheeseIngredient] [ALL :hasIngredient YoghurtIngredient] [ALL :hasTexture Crunchy]]

ChocolateBanitsa ⊑ [AND NamedDish [FILLS :hasCookingMethod Baking] [ALL :hasIngredient ButterIngredient] [ALL :hasIngredient FiloDoughIngredient] [ALL :hasIngredient ChocolateIngredient] [ALL :hasTexture Crunchy]]

Kavarma ⊑ [AND NamedDish [FILLS :hasCookingMethod Boiling] [ALL :hasIngredient OnionIngredient] [ALL :hasIngredient PepperIngredient] [ALL :hasIngredient TomatoIngredient] [ALL :hasIngredient YellowCheeseIngredient] [ALL :hasTexture Soft] [FILLS :hasRegion ThracianRegion]]

ShopskaSalad ⊑ [AND NamedDish [FILLS :hasCookingMethod NoCooking] [ALL :hasIngredient CucumberIngredient] [ALL :hasIngredient OnionIngredient] [ALL :hasIngredient PepperIngredient] [ALL :hasIngredient TomatoIngredient] [ALL :hasIngredient WhiteCheeseIngredient] [ALL :hasTexture Crunchy] [FILLS :hasRegion PirinRegion]]

StuffedPeppersWithBeans ⊑ [AND NamedDish [FILLS :hasCookingMethod Baking] [ALL :hasIngredient BeanIngredient] [ALL :hasIngredient PepperIngredient] [ALL :hasTexture Soft] [FILLS :hasRegion RhodopeRegion]]

Tarator ⊑ [AND NamedDish [FILLS :hasCookingMethod NoCooking] [ALL :hasIngredient CucumberIngredient] [ALL :hasIngredient GarlicIngredient] [ALL :hasIngredient YoghurtIngredient] [ALL :hasTexture Liquid]]

Tikvenik ⊑ [AND NamedDish [FILLS :hasCookingMethod Baking] [ALL :hasIngredient ButterIngredient] [ALL :hasIngredient FiloDoughIngredient] [ALL :hasIngredient PumpkinIngredient] [ALL :hasTexture Crunchy] [FILLS :hasRegion RhodopeRegion]]

Patatnik ⊑ [AND NamedDish [FILLS :hasCookingMethod Baking] [ALL :hasIngredient PotatoIngredient] [ALL :hasIngredient OnionIngredient] [ALL :hasIngredient ButterIngredient] [ALL :hasTexture Soft] [FILLS :hasRegion RhodopeRegion]]

Kapama ⊑ [AND NamedDish [FILLS :hasCookingMethod Boiling] [ALL :hasIngredient PorkIngredient] [ALL :hasIngredient ChickenIngredient] [ALL :hasIngredient RiceIngredient] [ALL :hasIngredient SauerkrautIngredient] [ALL :hasTexture Soft] [FILLS :hasRegion PirinRegion]]

Lyutenitsa ⊑ [AND NamedDish [FILLS :hasCookingMethod Boiling] [ALL :hasIngredient TomatoIngredient] [ALL :hasIngredient PepperIngredient] [ALL :hasIngredient EggplantIngredient] [ALL :hasTexture Soft]]

BobChorba ⊑ [AND NamedDish [FILLS :hasCookingMethod Boiling] [ALL :hasIngredient BeanIngredient] [ALL :hasIngredient OnionIngredient] [ALL :hasIngredient TomatoIngredient] [ALL :hasIngredient CarrotIngredient] [ALL :hasTexture Liquid] [FILLS :hasRegion DobrudjaRegion]]

FishSoup ⊑ [AND NamedDish [FILLS :hasCookingMethod Boiling] [ALL :hasIngredient FishIngredient] [ALL :hasIngredient OnionIngredient] [ALL :hasIngredient CarrotIngredient] [ALL :hasTexture Liquid] [FILLS :hasRegion BlackSeaCoastRegion]]

Gyuvech ⊑ [AND NamedDish [FILLS :hasCookingMethod Baking] [ALL :hasIngredient PorkIngredient] [ALL :hasIngredient TomatoIngredient] [ALL :hasIngredient PepperIngredient] [ALL :hasIngredient EggplantIngredient] [ALL :hasIngredient OnionIngredient] [ALL :hasTexture Soft] [FILLS :hasRegion ThracianRegion]]

SvinskoKufte ⊑ [AND NamedDish [FILLS :hasCookingMethod Grilling] [ALL :hasIngredient PorkIngredient] [ALL :hasIngredient OnionIngredient] [ALL :hasTexture Crunchy]]

TeleshkoKebapche ⊑ [AND NamedDish [FILLS :hasCookingMethod Grilling] [ALL :hasIngredient BeefIngredient] [ALL :hasIngredient OnionIngredient] [ALL :hasTexture Crunchy]]

Spiciness ≐ [AND ValuePartition [SOME-FROM MildSpicy VerySpicy]]

MildSpicy ⊑ Spiciness

VerySpicy ⊑ Spiciness

Sweetness ≐ [AND ValuePartition [SOME-FROM MildSweet VerySweet]]

MildSweet ⊑ Sweetness

VerySweet ⊑ Sweetness

Texture ≐ [AND ValuePartition [SOME-FROM Crunchy Liquid Soft]]

Crunchy ⊑ Texture

Liquid ⊑ Texture

Soft ⊑ Texture

Свойства

Свойства на обектите

Свойство	Domain	Range	Характеристика
hasCookingMethod	Dish	CookingMethod	functional
hasIngredient	Food	Food	transitive inverse
hasRegion	Food	Region	functional
hasSpiciness	DishIngredient	Spiciness	functional
hasSweetness	DishIngredient	Sweetness	functional
hasTexture	Dish	Texture	functional
isIngredientOf	Food	Food	transitive inverse

Свойства на данните

Свойство	Domain	Range	Характеристика
hasCaloricContentValue	Dish	xsd:integer	functional
hasPreparationTime	Dish	xsd:integer	functional
isTraditional	Dish	xsd:boolean	functional

Индивиди

Baking → CookingMethod

Boiling → CookingMethod

Frying → CookingMethod

Grilling → CookingMethod

NoCooking → CookingMethod

BalkanRegion → Region

BlackSeaCoastRegion → Region

DobridjaRegion → Region

PirinRegion → Region

RhodopeRegion → Region

ThracianRegion → Region

Example-Banitsa → [AND Banitsa [FILLS :hasCalorieContentValue 350] [FILLS :hasPreparationTime 45] [FILLS :isTraditional true]]

Example-ChocolateBanitsa → [AND ChocolateBanitsa [FILLS :hasCalorieContentValue 500] [FILLS :hasPreparationTime 60] [FILLS :isTraditional false]]

Example-Kavarma → [AND Banitsa [FILLS :hasCalorieContentValue 250] [FILLS :hasPreparationTime 90] [FILLS :isTraditional true]]

Example-ShopskaSalad → [AND Banitsa [FILLS :hasCalorieContentValue 120] [FILLS :hasPreparationTime 15] [FILLS :isTraditional true]]

Example-StuffedPeppersWithBeans → [AND Banitsa [FILLS :hasCalorieContentValue 200] [FILLS :hasPreparationTime 60] [FILLS :isTraditional true]]

Example-Tarator → [AND Banitsa [FILLS :hasCalorieContentValue 80] [FILLS :hasPreparationTime 10] [FILLS :isTraditional true]]

Example-Tikvenik → [AND Banitsa [FILLS :hasCalorieContentValue 300] [FILLS :hasPreparationTime 60] [FILLS :isTraditional true]]

Example-Patatnik → [AND Patatnik [FILLS :hasCalorieContentValue 250] [FILLS :hasPreparationTime 50] [FILLS :isTraditional true]]

Example-Kapama → [AND Kapama [FILLS :hasCalorieContentValue 400] [FILLS :hasPreparationTime 180] [FILLS :isTraditional true]]

Example-Lyutenitsa → [AND Lyutenitsa [FILLS :hasCalorieContentValue 150] [FILLS :hasPreparationTime 120] [FILLS :isTraditional true]]

Example-BobChorba → [AND BobChorba [FILLS :hasCalorieContentValue 200] [FILLS :hasPreparationTime 90] [FILLS :isTraditional true]]

Example-FishSoup → [AND FishSoup [FILLS :hasCalorieContentValue 100] [FILLS :hasPreparationTime 60] [FILLS :isTraditional true]]

Example-Gyuvech → [AND Gyuvech [FILLS :hasCalorieContentValue 300] [FILLS :hasPreparationTime 120] [FILLS :isTraditional true]]

Example-SvinskoKufte → [AND SvinskoKufte [FILLS :hasCalorieContentValue 350] [FILLS :hasPreparationTime 30] [FILLS :isTraditional true]]

Example-TeleshkoKebapche → [AND TeleshkoKebapche [FILLS :hasCalorieContentValue 320] [FILLS :hasPreparationTime 30] [FILLS :isTraditional true]]

Примери за извършване на логически извод

Пример 1

KB ⊨ (Example-ChocolateBanitsa → HighCalorieDish)

Example-ChocolateBanitsa *Type* **ChocolateBanitsa**
ChocolateBanitsa ⊑ **NamedDish**
NamedDish ⊑ **Dish**

Example-ChocolateBanitsa *hasCalorieContentValue* 500
Dish and (*hasCalorieContentValue* >= 300) ⊑ **HighCalorieDish**

Пример 2

KB ⊨ (StuffedPeppersWithBeans ⊑ LeanDish)

LeanDish ≐ [AND Dish [ALL :hasIngredient LeanIngredient]]
StuffedPeppersWithBeans ⊑ [AND NamedDish [FILLS :hasCookingMethod Baking] [ALL :hasIngredient BeanIngredient] [ALL :hasIngredient PepperIngredient] [ALL :hasTexture Soft] [FILLS :hasRegion RhodopeRegion]]

NamedDish ⊑ Dish
BeanIngredient ⊑ LeanIngrediant
PepperIngredient ⊑ VegetableIngredient
VegetableIngredient ⊑ LeanIngrediant
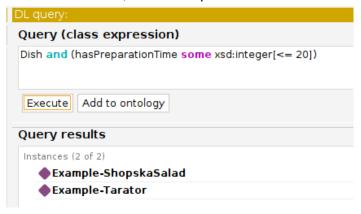
Пример за извършване на класификация

FastPreparableDish ≐ [AND Dish [ALL :hasPreparationTime <= 30]]

Заявки към базите от знания

Пример 1

Заявка, която извлича всички ястия, които се приготвят за по-малко от 20 минути

Пример 2

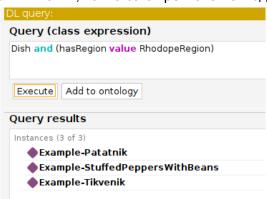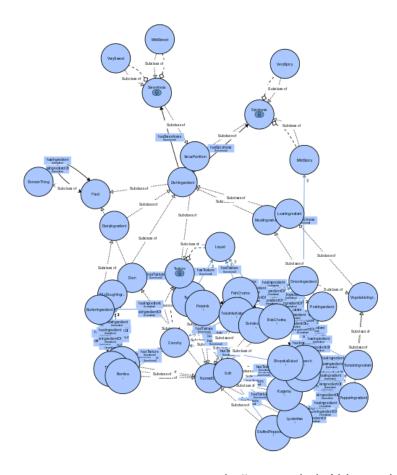Заявка, която извлича всички ястия, които са от региона на Родопите

Схема на онтологията

По-подробно схемата може да се разгледа във файловете bulgAIrian_cuisine.json и bulgAIrian_cuisine.csv

Бъдещо развитие

1. Добавяне на още индивиди
2. Обогатяване на йерархията с нови класове като Soup, Salad, MainDish, Dessert
3. Добавяне на концепцията за подправки като вид съставки, което ще ослужни както йерархията от класове, така и йерархията от свойства
4. Развиване на потенциала на подйерархията ValuePartition

Източници на информация

1. https://en.wikipedia.org/wiki/Bulgarian_cuisine
2. https://bg.wikipedia.org/wiki/Българска_кухня
3. Традиционни български рецепти от готварски книги и уебсайтове
4. Matthew Horridge. A Practical Guide To Building OWL Ontologies Using Protégé 4 and CO-ODE Tools Edition 1.3