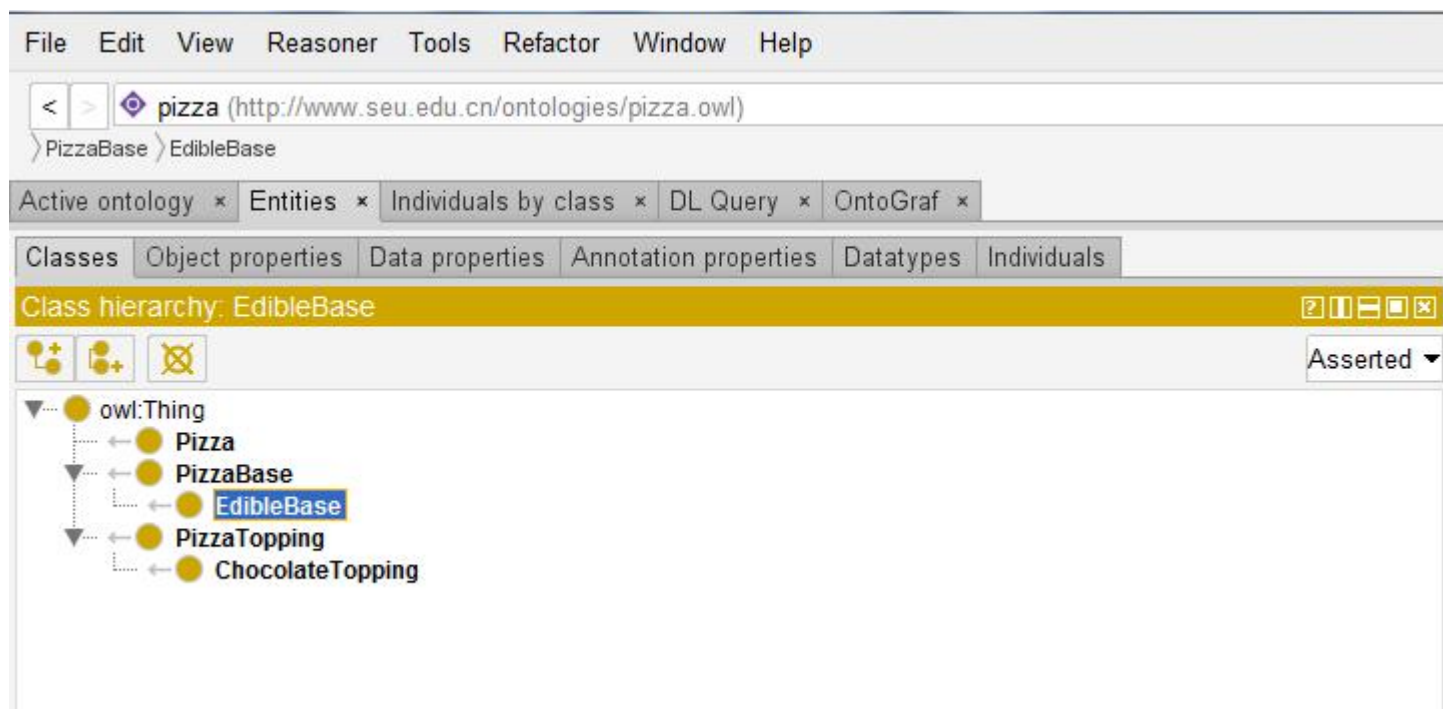


Knowledge Modeling (II) – Prote

一、全称量词、存在量词示例

全称量词、存在量词示例

1. 打开 “pizza_2.owl” 文件;
2. 增加 “PizzaBase” 的subclass “EdibleBase” 与 “PizzaTopping” 的subclass “ChocolateTopping”



存在量词示例

选择“Object properties”中的“hasTopping”；

The screenshot displays the Protege ontology editor interface. The top menu bar includes File, Edit, View, Reasoner, Tools, Refactor, Window, and Help. The main workspace shows the 'pizza' ontology (http://www.seu.edu.cn/ontologies/pizza.owl) with a breadcrumb path of > hasIngredient > hasTopping. The left sidebar contains tabs for Annotation properties, Datatypes, and Individuals, with sub-tabs for Classes, Object properties, and Data properties. The 'Object property hierarchy: hasTopping' is expanded, showing a tree structure: owl:topObjectProperty > hasIngredient > hasBase > hasTopping. The right sidebar is divided into two panes. The top pane, 'Annotations: hasTopping', shows a green plus icon for adding annotations. The bottom pane, 'Description: hasTopping', contains a list of property characteristics (Functional, Inverse functional, Transitive, Symmetric, Asymmetric, Reflexive, Irreflexive) and a list of domain and range restrictions. The 'Ranges (intersection)' section is highlighted with a red box, showing a restriction on the 'PizzaTopping' class.

File Edit View Reasoner Tools Refactor Window Help

< > pizza (http://www.seu.edu.cn/ontologies/pizza.owl)

> hasIngredient > hasTopping

Active ontology x Entities x Individuals by class x DL Query x OntoGraf x

Annotation properties Datatypes Individuals

Classes Object properties Data properties

Object property hierarchy: hasTopping

owl:topObjectProperty

hasIngredient

hasBase

hasTopping

Annotations Usage

Annotations: hasTopping

Annotations +

Characteristics Description: hasTopping

Functional

Inverse functional

Transitive

Symmetric

Asymmetric

Reflexive

Irreflexive

Equivalent To +

SubProperty Of +

hasIngredient

Inverse Of +

Domains (intersection) +

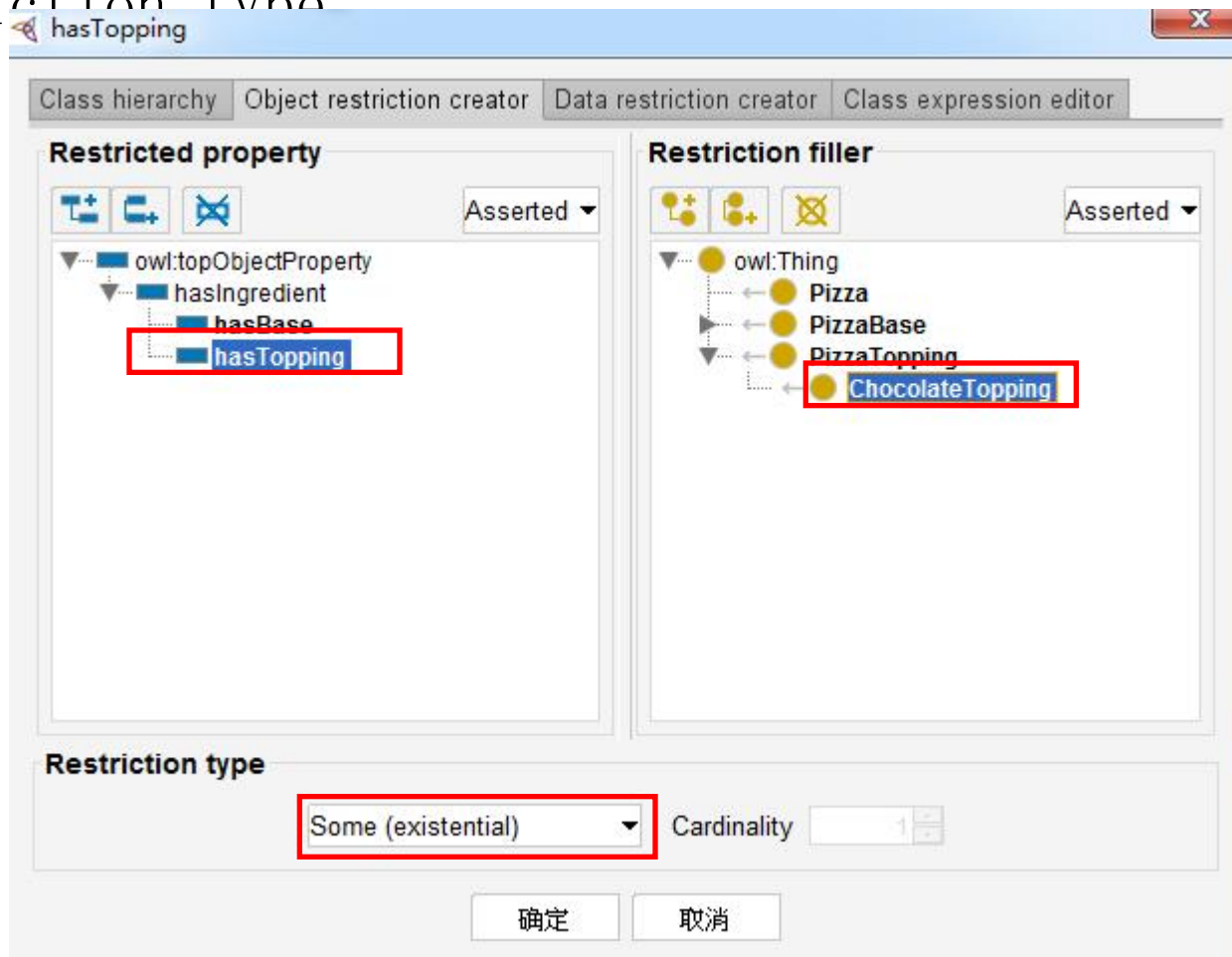
Pizza

Ranges (intersection) +

PizzaTopping

存在量词示例

选择Restricted property、Restriction filler、
Restriction type



存在量词示例

The screenshot displays the Protégé ontology editor interface. The top menu bar includes File, Edit, View, Reasoner, Tools, Refactor, Window, and Help. The address bar shows the ontology URL: `http://www.seu.edu.cn/ontologies/pizza.owl`. The left sidebar shows the ontology structure with `hasTopping` selected under `owl:topObjectProperty`. The main panel is divided into two tabs: `Annotations` and `Usage`. The `Annotations` tab is active, showing a list of annotations for `hasTopping`. The `Usage` tab is also visible, showing the property's domain and range. The domain is `Pizza`, and the range is `hasTopping some ChocolateTopping` (highlighted with a red box) and `PizzaTopping`. The `Character` tab is also visible, showing various property characteristics like Functional, Inverse functional, Transitive, Symmetric, Asymmetric, Reflexive, and Irreflexive.

File Edit View Reasoner Tools Refactor Window Help

< > pizza (http://www.seu.edu.cn/ontologies/pizza.owl) Search.

> hasIngredient > hasTopping

Active ontology x Entities x Individuals by class x DL Query x OntoGraf x

Annotation properties Datatypes Individuals

Classes Object properties Data properties

Object property hierarchy: hasTopping

Annotations Usage

Annotations: hasTopping

Annotations +

Character Description: hasTopping

☐ Functional

☐ Inverse functional

☐ Transitive

☐ Symmetric

☐ Asymmetric

☐ Reflexive

☐ Irreflexive

Equivalent To +

SubProperty Of +

hasIngredient

Inverse Of +

Domains (intersection) +

Pizza

Ranges (intersection) +

hasTopping some ChocolateTopping

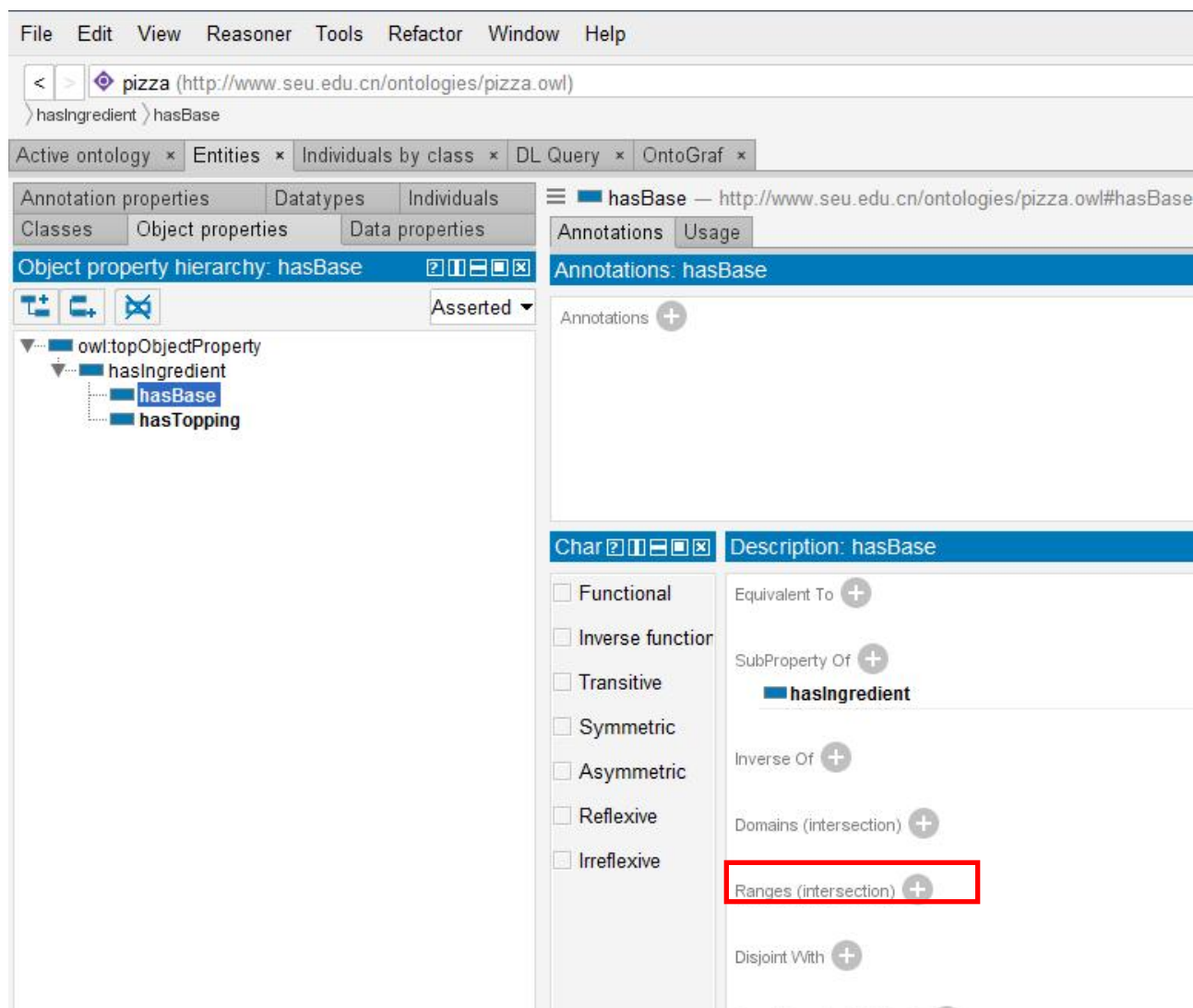
PizzaTopping

Disjoint With +

SuperProperty Of (Chain) +

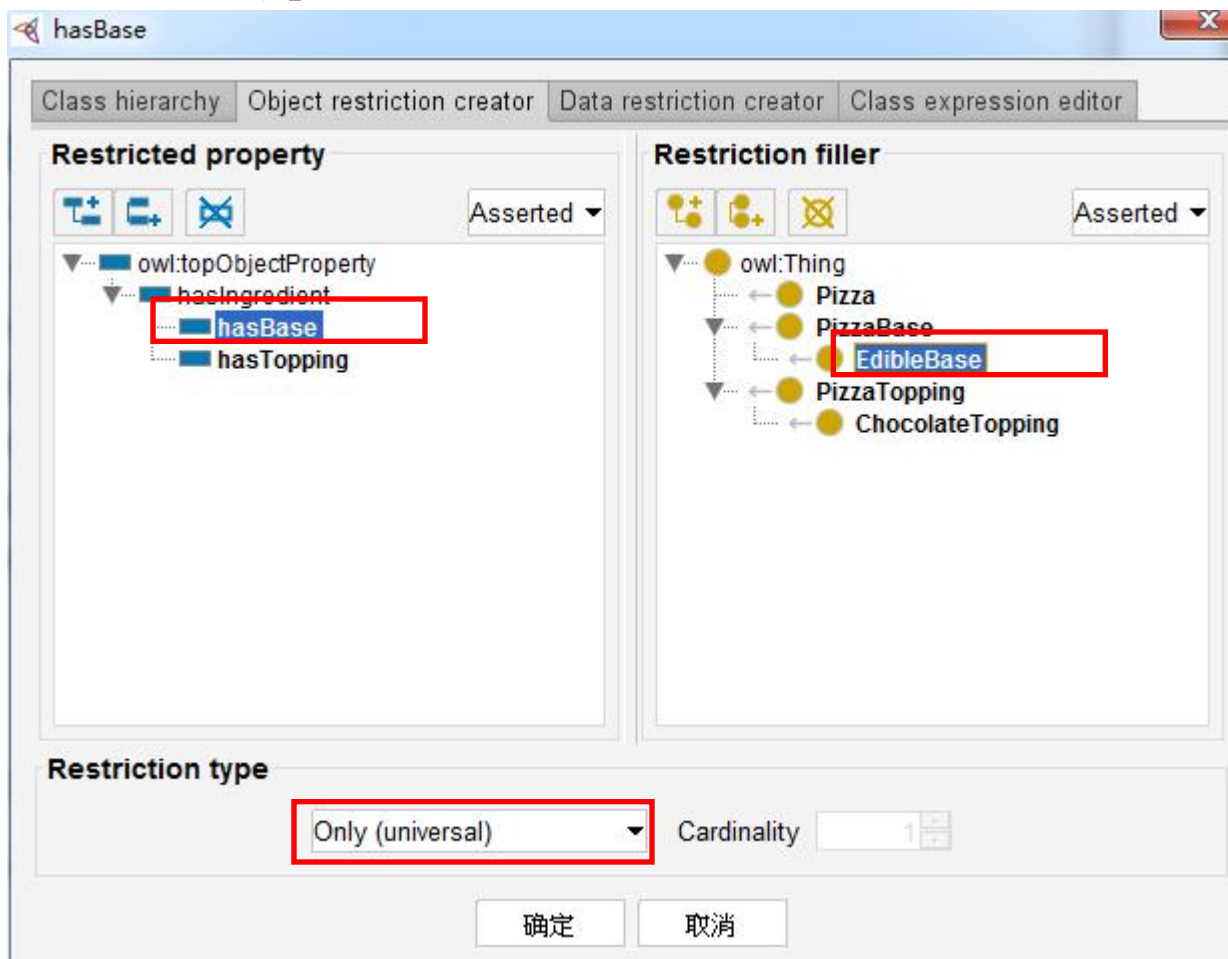
全称量词示例

选择“Object properties”中的“hasBase”；



全称量词示例

选择Restricted property、Restriction filler、Restriction type



全称量词示例

The screenshot displays the Protégé ontology editor interface for the 'pizza' ontology. The main window shows the 'Object property hierarchy: hasBase' on the left and the 'Annotations: hasBase' on the right. The 'hasBase' property is highlighted in the hierarchy, and its configuration is shown in the 'Description: hasBase' panel.

Object property hierarchy: hasBase

- owl:topObjectProperty
 - hasIngredient
 - hasBase**
 - hasTopping

Annotations: hasBase

Annotations +

Description: hasBase

Functional ☐

Inverse function ☐

Transitive ☐

Symmetric ☐

Asymmetric ☐

Reflexive ☐

Irreflexive ☐

Equivalent To +

SubProperty Of +

hasIngredient

Inverse Of +

Domains (intersection) +

Ranges (intersection) +

hasBase only EdibleBase

Disjoint With +

作业一：

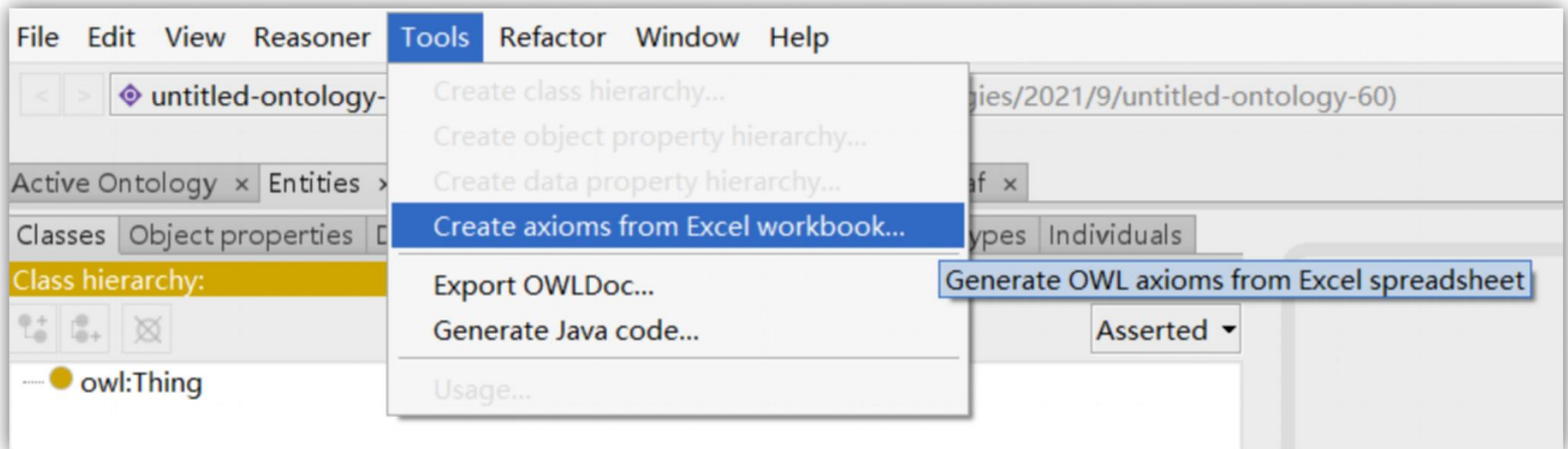
创建一个包含axioms和assertions的consistent ontology（任选感兴趣的领域），要求：

- 1) 包含Class、Individual、Object Property、Data Property
- 2) 定义Property Domain、Range、Individual Type
- 3) 最终以Turtle形式导出，三元组数量不低于25条
- 4) 体现全称量词与存在量词

二、从Excel表导入本体

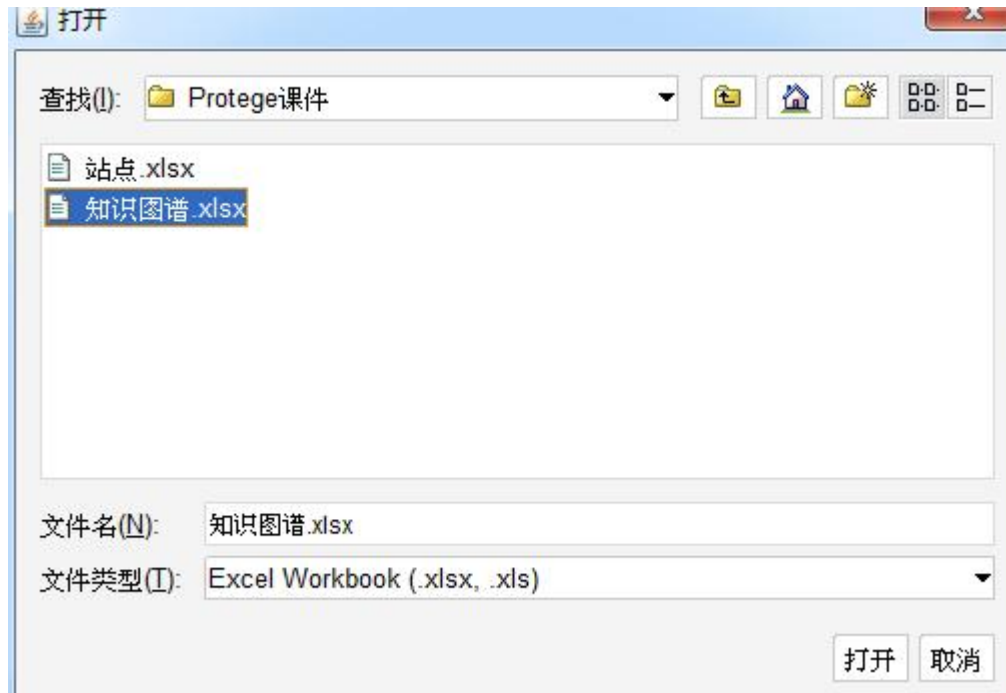
从Excel表导入本体

选择 “Tools” → “Create axioms from Excel workbook”



从Excel表导入本体

打开Excel文件“知识图谱.xlsx”



从Excel表导入本体

Target Ontology: untitled-ontology-20 (<http://www.semanticweb.org/administrator/ontologies/2021/10/untitled-ontology-20>)

Workbook (D:\上课\东南大学\知识工程\2021\实验课\Knowledge Modeling\Protege\Protege课件\Protege课件\知识图谱.xlsx)

Sheet1 Sheet2 Sheet3

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

选中Transformation Rule的输入内容

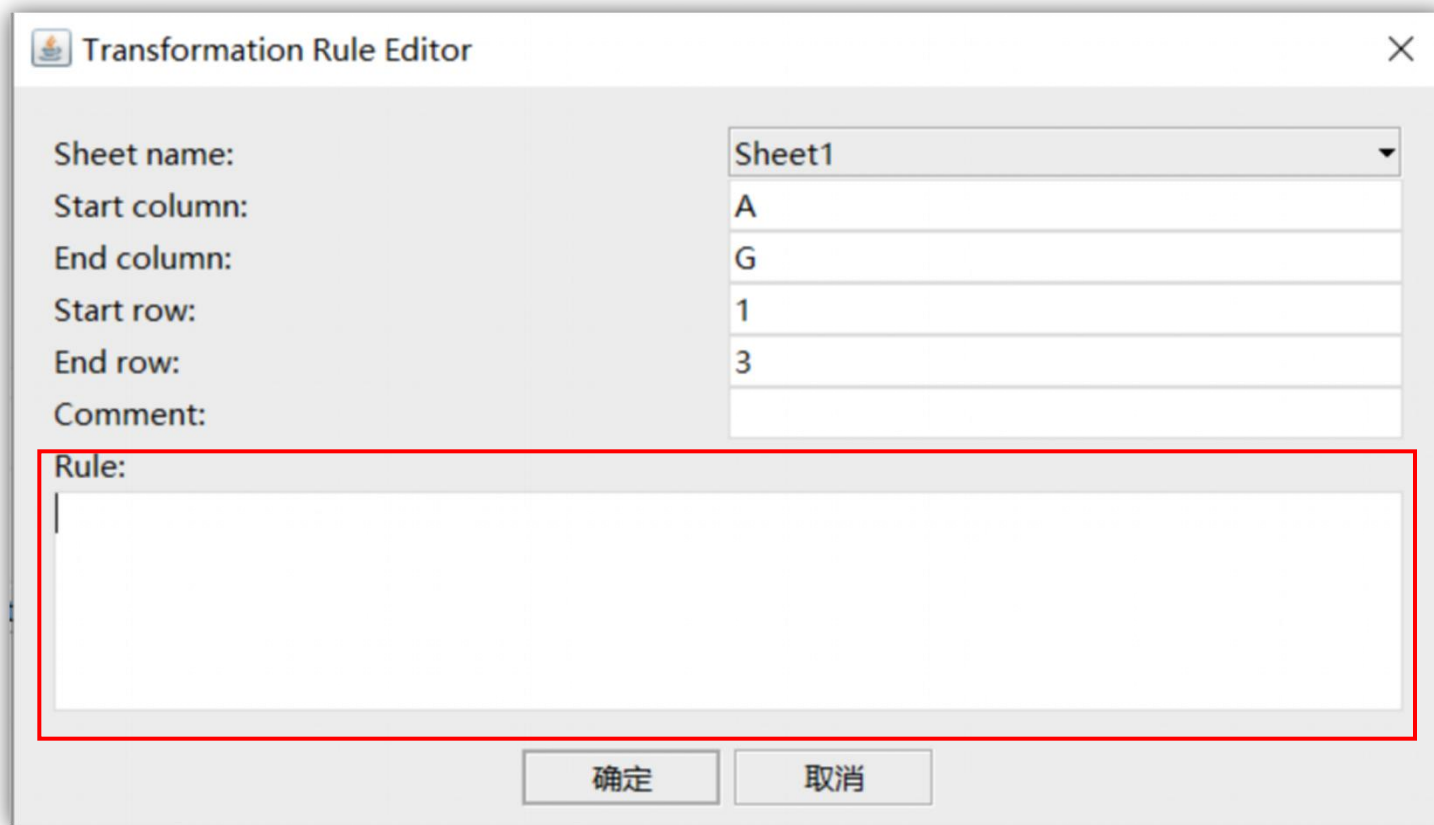
Transformation Rules

Add Edit Delete Load Rules Save F

| <input type="checkbox"/> | Sheet Name | Start Column | End Column | Start Row | End Row | Rule |
|--------------------------|------------|--------------|------------|-----------|---------|------|
|--------------------------|------------|--------------|------------|-----------|---------|------|

从Excel表导入本体

使用MappingMaster DSL的语法规则编辑Transformation Rule



The image shows a 'Transformation Rule Editor' dialog box. It contains several input fields for defining a transformation rule. The 'Sheet name' is set to 'Sheet1'. The 'Start column' is 'A', 'End column' is 'G', 'Start row' is '1', and 'End row' is '3'. The 'Comment' field is empty. The 'Rule' field is a large text area, currently empty, and is highlighted with a red border. At the bottom, there are two buttons: '确定' (OK) and '取消' (Cancel).

| | |
|---------------|--------|
| Sheet name: | Sheet1 |
| Start column: | A |
| End column: | G |
| Start row: | 1 |
| End row: | 3 |
| Comment: | |
| Rule: | |

确定 取消

完整的语法规则:

<https://github.com/protegeproject/mapping-master/wiki/MappingMasterDSL>

从Excel表导入本体

Rule示例:

- 作为类名导入

Class:@A1 /*指定A1单元格作为类名*/

Class:@A* /*指定A列所有内容作为类名*/

Class:@*1 /*指定第1行所有内容作为类名*/

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

- 导入类的同时, 创建类之间的公理

Class:@A1

SubClassOf:@A3 /*A1是A3的子类*/

从Excel表导入本体

Rule示例:

- 作为类名导入

Class:@A1 /*指定A1单元格作为类名*/

Class:@A* /*指定A列所有内容作为类名*/


Class:@*1 /*指定第1行所有内容作为类名*/

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

- 导入类的同时，创建类之间的公理

Class:@A1

SubClassOf:@A3 /*A1是A3的子类*/

 Transformation Rule Editor ✕

Sheet name:

Sheet1

Start column:

A

End column:

G

Start row:

1

End row:

3

Comment:

Rule:

Class:@A1
SubClassOf:@A3

确定

取消

从Excel表导入本体

Cellie

Target Ontology: untitled-ontology-20 (<http://www.semanticweb.org/administrator/ontologies/2021/10/untitled-ontology-20>)

Workbook (D:\上课\东南大学\知识工程\2021\实验课\Knowledge Modeling\Protege\Protege课件\Protege课件\知识图谱.xlsx)

Sheet1 Sheet2 Sheet3

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

Transformation Rules

Add Edit Delete Load Rules

| <input checked="" type="checkbox"/> | Sheet Name | Start Column | End Column | Start Row | End Row | Rule |
|-------------------------------------|------------|--------------|------------|-----------|---------|-----------------------------|
| <input checked="" type="checkbox"/> | Sheet1 | A | G | 1 | 3 | Class:@A1 SubClassOf:@A3 |

Generate Axioms

从Excel表导入本体

Rule示例:

- 作为类名导入

Class:@A1 /*指定A1单元格作为类名*/

Class:@A* /*指定A列所有内容作为类名*/

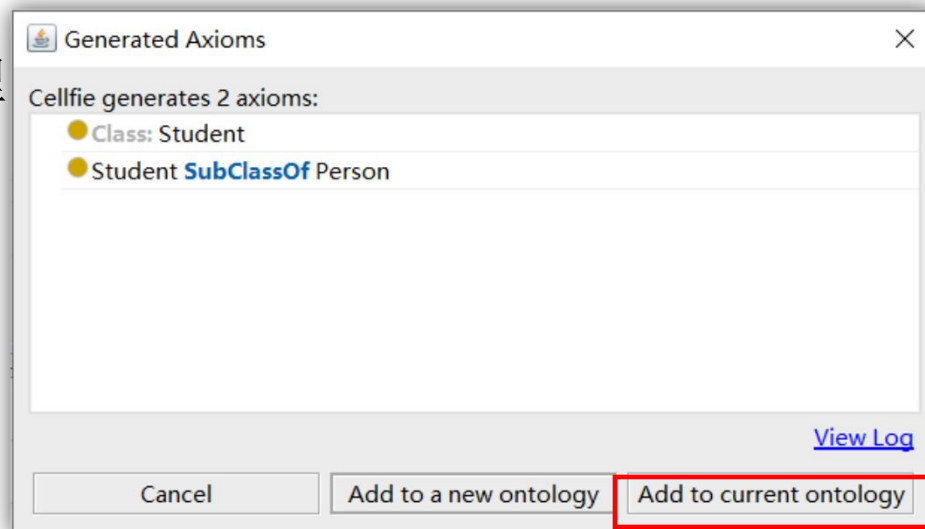
Class:@*1 /*指定第1行所有内容作为类名*/

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

- 导入类的同时, 创建类之间的公理

Class:@A1

SubClassOf:@A3 /*A1是A3的子类*/



从Excel表导入本体

Rule示例:

- 作为实例导入

Individual:@C* Types:@A1

/*指定C列所有内容作为实例，类型为Student*/

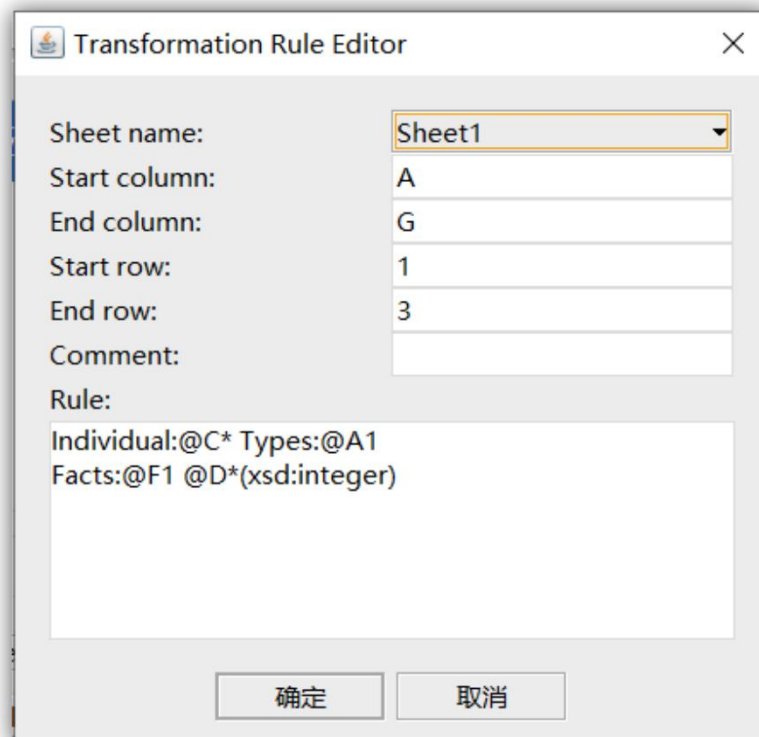
| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

- 导入实例的同时，创建实例属性

Individual:@C* Types:@A1

Facts:@F1 @D* (xsd:integer)

/*创建数据属性age，值为对应的D列的值，类型为Int（默认为String）*/



The image shows a 'Transformation Rule Editor' dialog box. It contains several input fields for configuring a transformation rule. The 'Sheet name' is set to 'Sheet1'. The 'Start column' is 'A', 'End column' is 'G', 'Start row' is '1', and 'End row' is '3'. The 'Rule' section contains the text: 'Individual:@C* Types:@A1' and 'Facts:@F1 @D*(xsd:integer)'. At the bottom, there are '确定' (OK) and '取消' (Cancel) buttons.

| | |
|---------------|--|
| Sheet name: | Sheet1 |
| Start column: | A |
| End column: | G |
| Start row: | 1 |
| End row: | 3 |
| Comment: | |
| Rule: | Individual:@C* Types:@A1 Facts:@F1 @D*(xsd:integer) |

从Excel表导入本体

Cellfie

Target Ontology: untitled-ontology-20 (<http://www.semanticweb.org/administrator/ontologies/2021/10/untitled-ontology-20>)

Workbook (D:\上课\东南大学\知识工程\2021\实验课\Knowledge Modeling\Protege\Protege课件\Protege课件\知识图谱.xlsx)

Sheet1 Sheet2 Sheet3

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

Transformation Rules

Add Edit Delete Load Rules

| <input checked="" type="checkbox"/> | Sheet Name | Start Column | End Column | Start Row | End Row | Rule |
|-------------------------------------|------------|--------------|------------|-----------|---------|--|
| <input checked="" type="checkbox"/> | Sheet1 | A | G | 1 | 3 | Class:@A1 SubClassOf:@A3 |
| <input checked="" type="checkbox"/> | Sheet1 | A | G | 1 | 3 | Individual:@C* Type:@A1 Facts:@F1 @D* (xsd:integer) |

Generate Axioms

从Excel表导入本体

Rule示例:

- 作为实例导入

Individual:@C* Types:@A1

/*指定C列所有内容作为实例，类型为Student*/

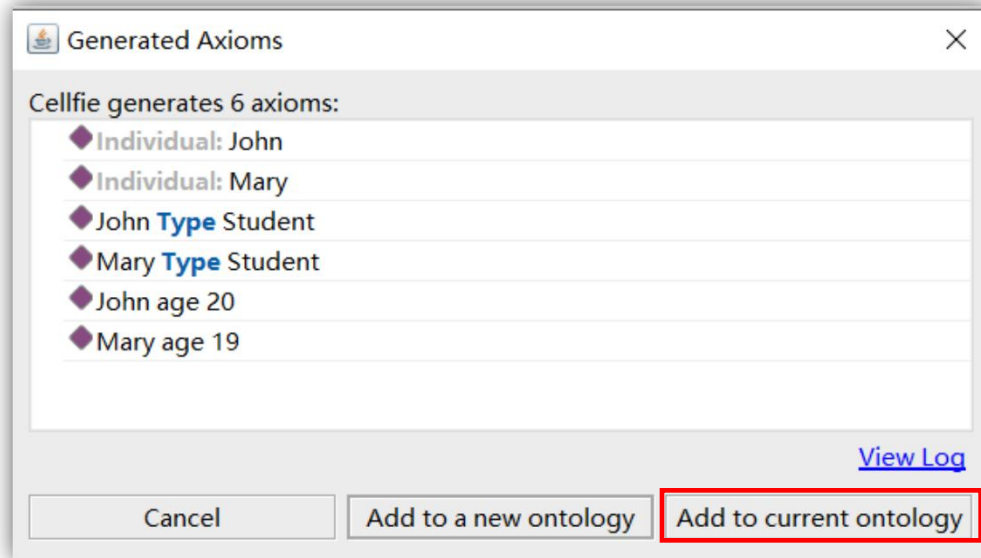
| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

- 导入实例的同时，创建实例属性

Individual:@C* Types:@A1

Facts:@F1 @D* (xsd:integer)

/*创建数据属性age，值为对应的D列的值，类型为Int（默认为String）*/



从Excel表导入本体

Rule示例:


- 导入实例的同时，创建实例属性

Individual:@C1

Facts:@G1(ObjectProperty) @C2

*/*创建对象属性hasFriend，值为Mary*/*

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

 Transformation Rule Editor ×

Sheet name:

Sheet1

Start column:

A

End column:

G

Start row:

1

End row:

3

Comment:

Rule:

Individual:@C1
Facts:@G1(ObjectProperty) @C2

确定

取消

从Excel表导入本体

Cellfie

Target Ontology: untitled-ontology-20 (<http://www.semanticweb.org/administrator/ontologies/2021/10/untitled-ontology-20>)

Workbook (D:\上课\东南大学\知识工程\2021\实验课\Knowledge Modeling\Protege\Protege课件\Protege课件\知识图谱.xlsx)

Sheet1 Sheet2 Sheet3

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |

Transformation Rules

Add Edit Delete Load Rules

| <input checked="" type="checkbox"/> | Sheet Name | Start Column | End Column | Start Row | End Row | Rule |
|-------------------------------------|------------|--------------|------------|-----------|---------|--|
| <input checked="" type="checkbox"/> | Sheet1 | A | G | 1 | 3 | Class:@A1 SubClassOf:@A3 |
| <input checked="" type="checkbox"/> | Sheet1 | A | G | 1 | 3 | Individual:@C* Type:@A1 Facts:@F1 @D* (xsd:integer) |
| <input checked="" type="checkbox"/> | Sheet1 | A | G | 1 | 3 | Individual:@C1 Facts:@G1(ObjectProperty) @C2 |

Generate Axioms

从Excel表导入本体

Rule示例:

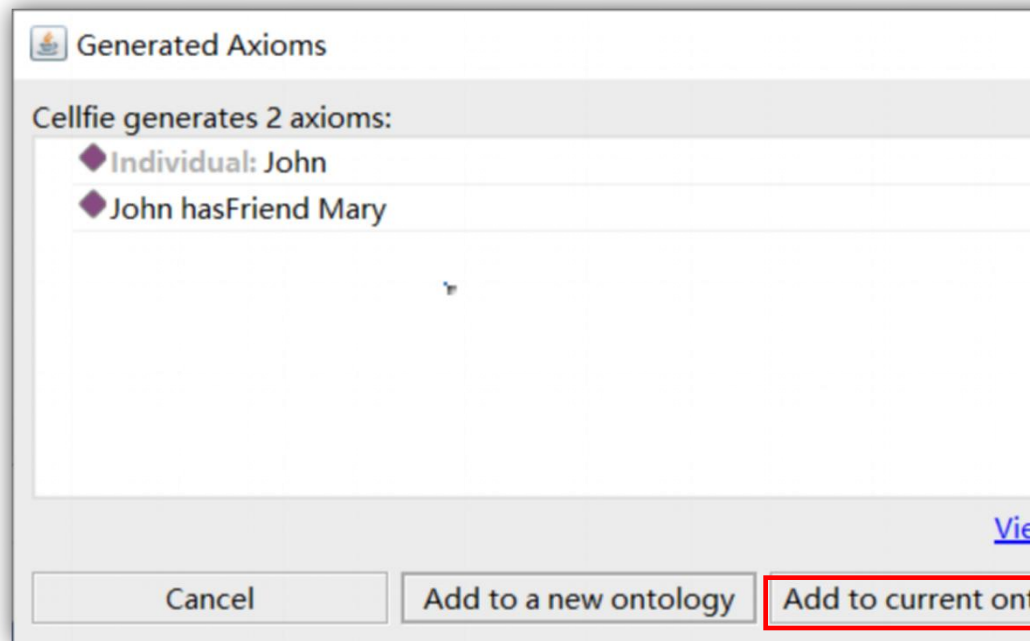
- 导入实例的同时，创建实例属性

Individual:@C1

Facts:@G1(ObjectProperty) @C2

*/*创建对象属性hasFriend，值为Mary*/*

| | A | B | C | D | E | F | G |
|---|----------|---|------|----|---|-----|-----------|
| 1 | Student | | John | 20 | | age | hasFriend |
| 2 | Employee | | Mary | 19 | | | |
| 3 | Person | | | | | | |



三、课堂作业

给定Excel表格“站点.xlsx”，编写相应规则将其导入Protege。

要求：

- 1) 尽可能多地生成三元组；
- 2) 将生成结果可视化。