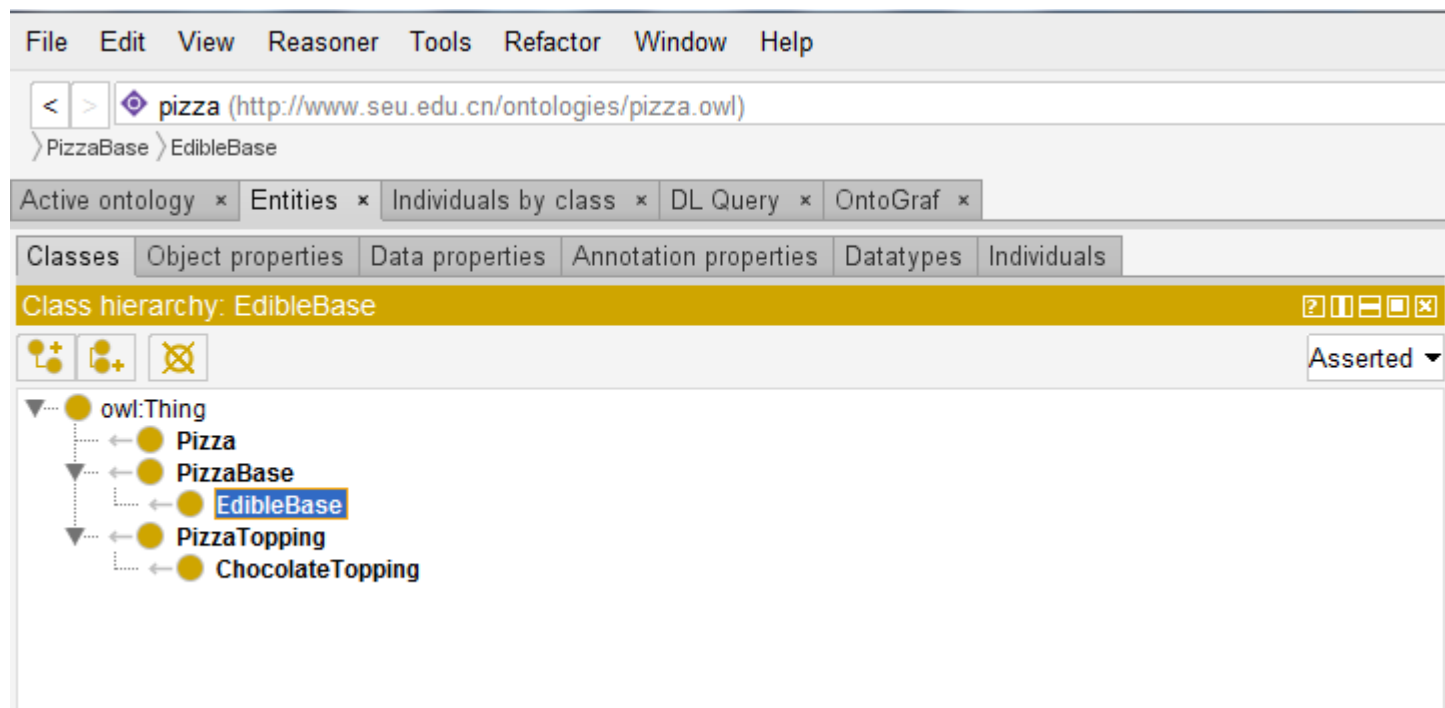


Knowledge Modeling (II) - Protege

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 window is titled 'pizza (http://www.seu.edu.cn/ontologies/pizza.owl)' and shows a breadcrumb path: > hasIngredient > hasTopping. The left sidebar contains tabs for 'Active ontology', 'Entities', 'Individuals by class', 'DL Query', and 'OntoGraf'. Below these are tabs for 'Annotation properties', 'Datatypes', and 'Individuals'. The 'Object properties' tab is selected, showing a hierarchy where 'hasTopping' is a sub-property of 'hasIngredient'. The right sidebar has tabs for 'Annotations' and 'Usage'. The 'Annotations' tab is active, showing a list of annotations for 'hasTopping'. Below this, the 'Description: hasTopping' panel is visible, containing a list of checkboxes for property characteristics: Functional, Inverse functional, Transitive, Symmetric, Asymmetric, Reflexive, and Irreflexive. The 'Domains (intersection)' checkbox is highlighted with a red box, and the domain 'Pizza' is listed below it. Other options like 'Equivalent To', 'SubProperty Of', 'Inverse Of', 'Ranges (intersection)', 'Disjoint With', and 'SuperProperty Of (Chain)' are also visible.

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: hasTopping

Annotations +

Charac: Description: hasTopping

☐ Functional

☐ Inverse functional

☐ Transitive

☐ Symmetric

☐ Asymmetric

☐ Reflexive

☐ Irreflexive

Equivalent To +

SubProperty Of +

hasIngredient ? @ X O

Inverse Of +

Domains (intersection) +

Pizza ? @ X O

Ranges (intersection) +

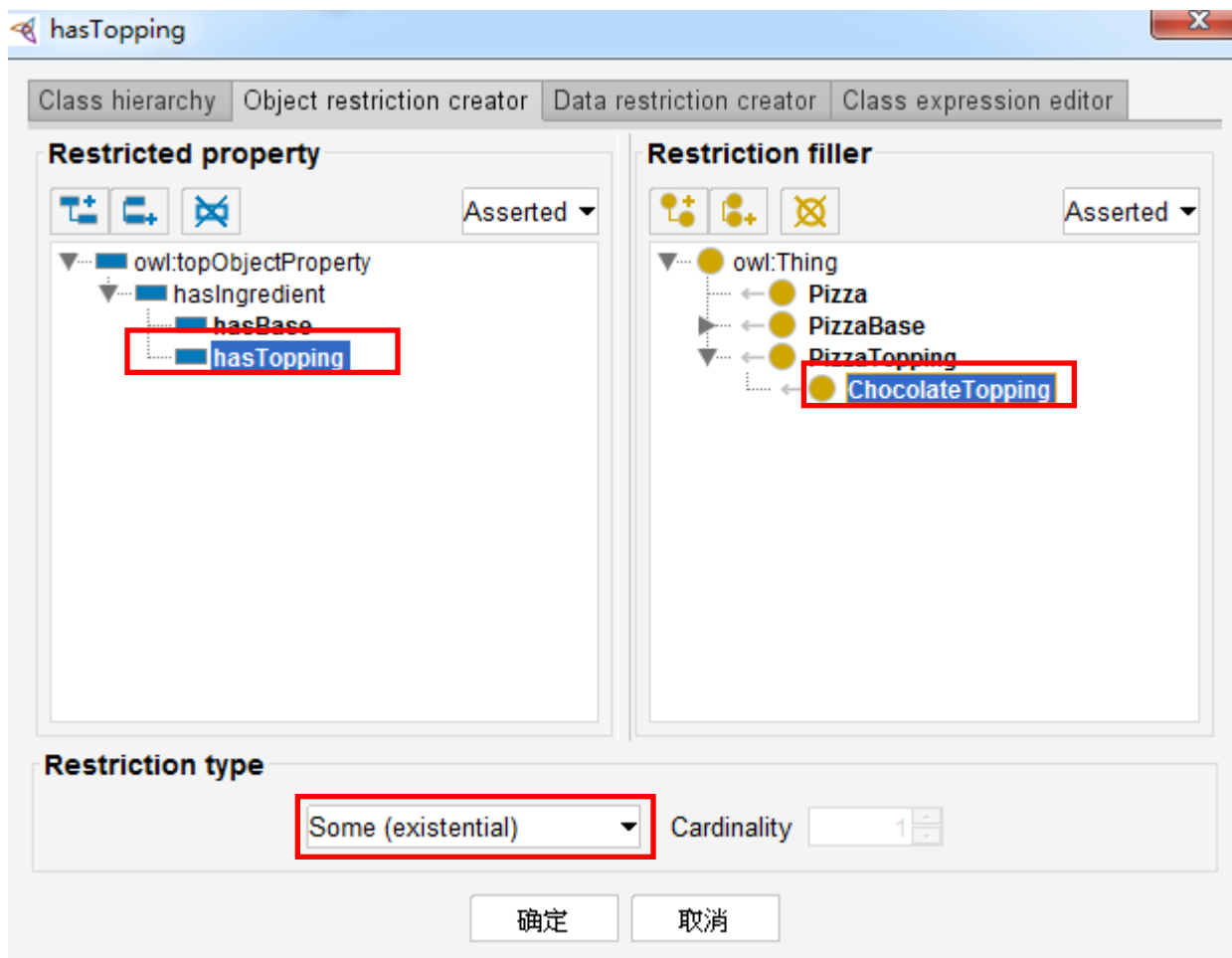
PizzaTopping ? @ X O

Disjoint With +

SuperProperty Of (Chain) +

存在量词示例

选择Restricted property、Restriction filler、Restriction type



存在量词示例

The screenshot displays the Protege ontology editor interface. The main window shows the configuration for the `hasTopping` property, which is a subproperty of `hasIngredient`. The property is configured with the following settings:

- Functional:** ☐
- Inverse functional:** ☐
- Transitive:** ☐
- Symmetric:** ☐
- Asymmetric:** ☐
- Reflexive:** ☐
- Irreflexive:** ☐

The **Domains (intersection)** section shows the following domains:

- `Pizza`
- `hasTopping some ChocolateTopping` (highlighted with a red box)

The **Ranges (intersection)** section shows the following ranges:

- `PizzaTopping`

The **Object property hierarchy: hasTopping** section shows the following hierarchy:

- `owl:topObjectProperty`
 - `hasIngredient`
 - `hasBase`
 - `hasTopping`

全称量词示例

选择“Object properties”中的“hasBase”；

The screenshot displays the OntoGraf application interface for editing an ontology. The main window shows the 'hasBase' property configuration. On the left, a tree view under 'Object property hierarchy: hasBase' shows the property 'hasBase' selected. The main panel is divided into two sections: 'Annotations: hasBase' and 'Description: hasBase'. The 'Description: hasBase' section contains a list of checkboxes for property characteristics: Functional, Inverse functional, Transitive, Symmetric, Asymmetric, Reflexive, and Irreflexive. The 'Domains (intersection)' checkbox is highlighted with a red rectangle. To the right of these checkboxes, there are buttons for adding various logical constraints: Equivalent To, SubProperty Of, Inverse Of, Domains (intersection), Ranges (intersection), Disjoint With, and SuperProperty Of (Chain). The 'SubProperty Of' button is currently selected, and the 'hasIngredient' property is listed as the subproperty.

File Edit View Reasoner Tools Refactor Window Help

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

hasIngredient hasBase

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: hasBase

Annotations: hasBase

Annotations +

Charac Description: hasBase

☐ Functional

☐ Inverse functional

☐ Transitive

☐ Symmetric

☐ Asymmetric

☐ Reflexive

☐ Irreflexive

Equivalent To +

SubProperty Of +

hasIngredient

Inverse Of +

Domains (intersection) +

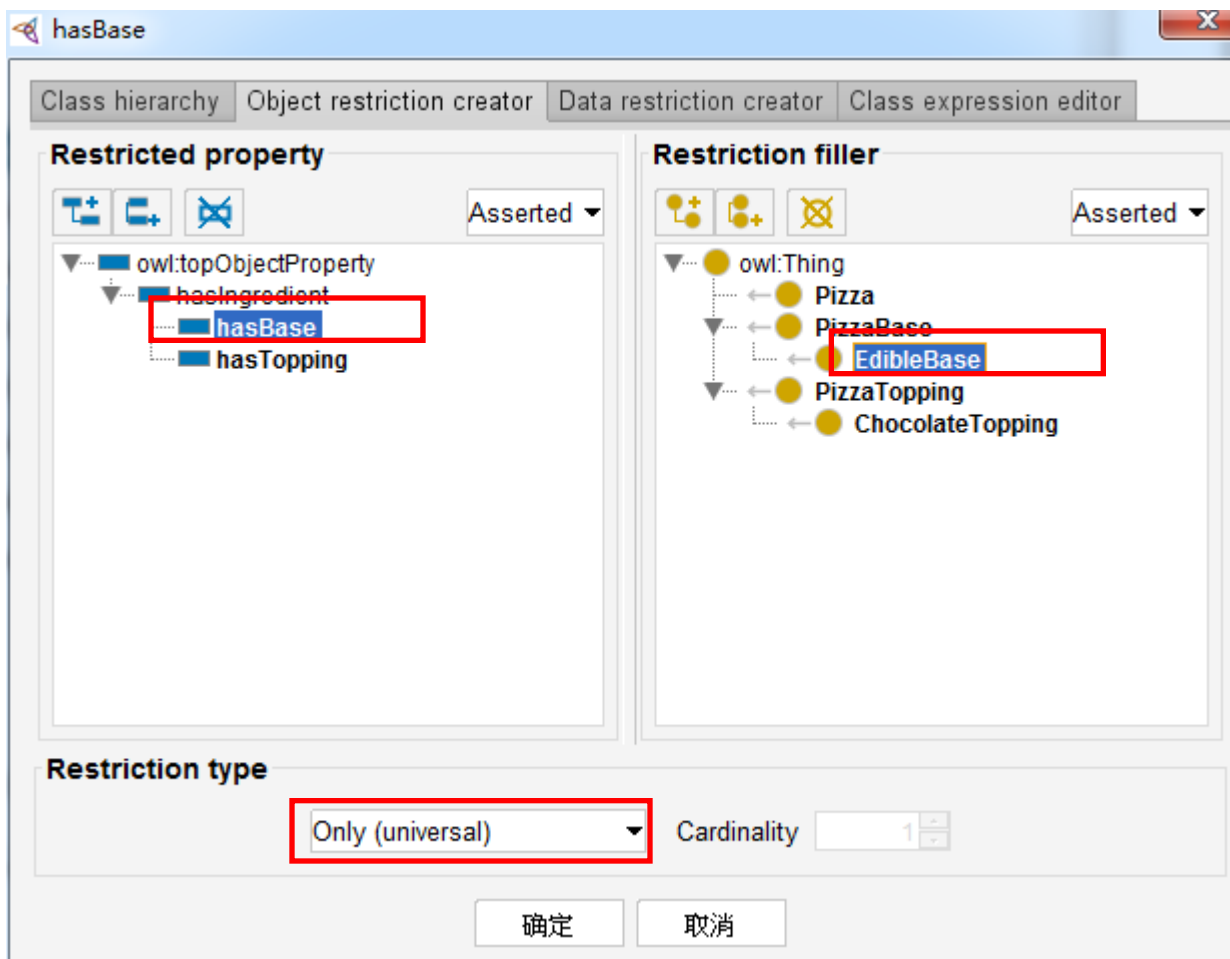
Ranges (intersection) +

Disjoint With +

SuperProperty Of (Chain) +

全称量词示例

选择Restricted property、Restriction filler、Restriction type



全称量词示例

The screenshot displays the OntoGraf web interface for the ontology `http://www.seu.edu.cn/ontologies/pizza.owl`. The left sidebar shows the hierarchy: `owl:topObjectProperty` > `hasIngredient` > `hasBase`. The main panel is titled `Annotations: hasBase` and shows the property's configuration. The `Domains (intersection)` section is highlighted with a red box, showing the domain `hasBase only EdibleBase`. The `Functional` checkbox is unchecked, and the `SubProperty Of` list includes `hasIngredient`.

File Edit View Reasoner Tools Refactor Window Help

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

hasIngredient hasBase

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: hasBase

Annotations: hasBase

Annotations +

Charac Description: hasBase

☐ Functional

☐ Inverse functional

☐ Transitive

☐ Symmetric

☐ Asymmetric

☐ Reflexive

☐ Irreflexive

Equivalent To +

SubProperty Of +

hasIngredient

Inverse Of +

Domains (intersection) +

hasBase only EdibleBase

Ranges (intersection) +

Disjoint With +

SuperProperty Of (Chain) +

作业一：

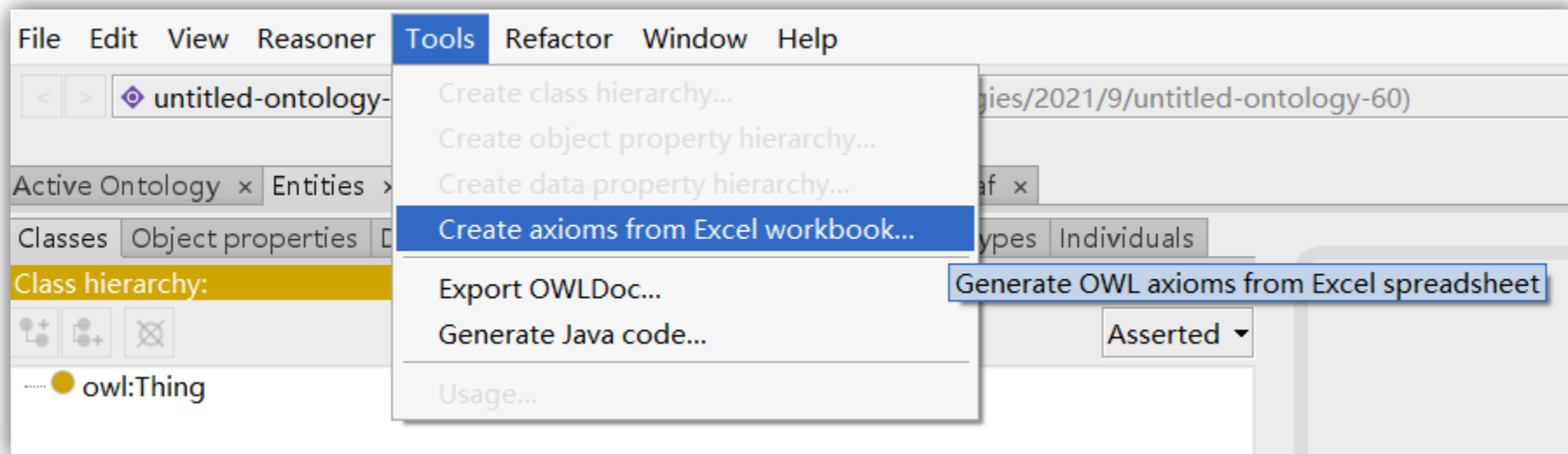
创建一个包含axioms和assertions的
consistent ontology（任选感兴趣的领域），
要求：

- 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

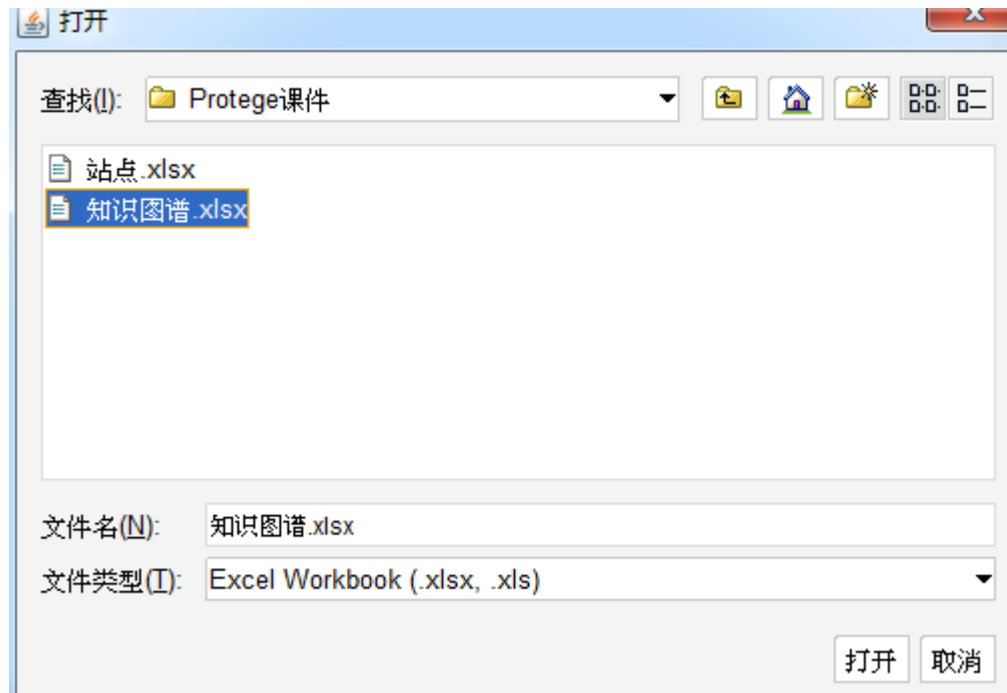
从Excel表导入本体

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

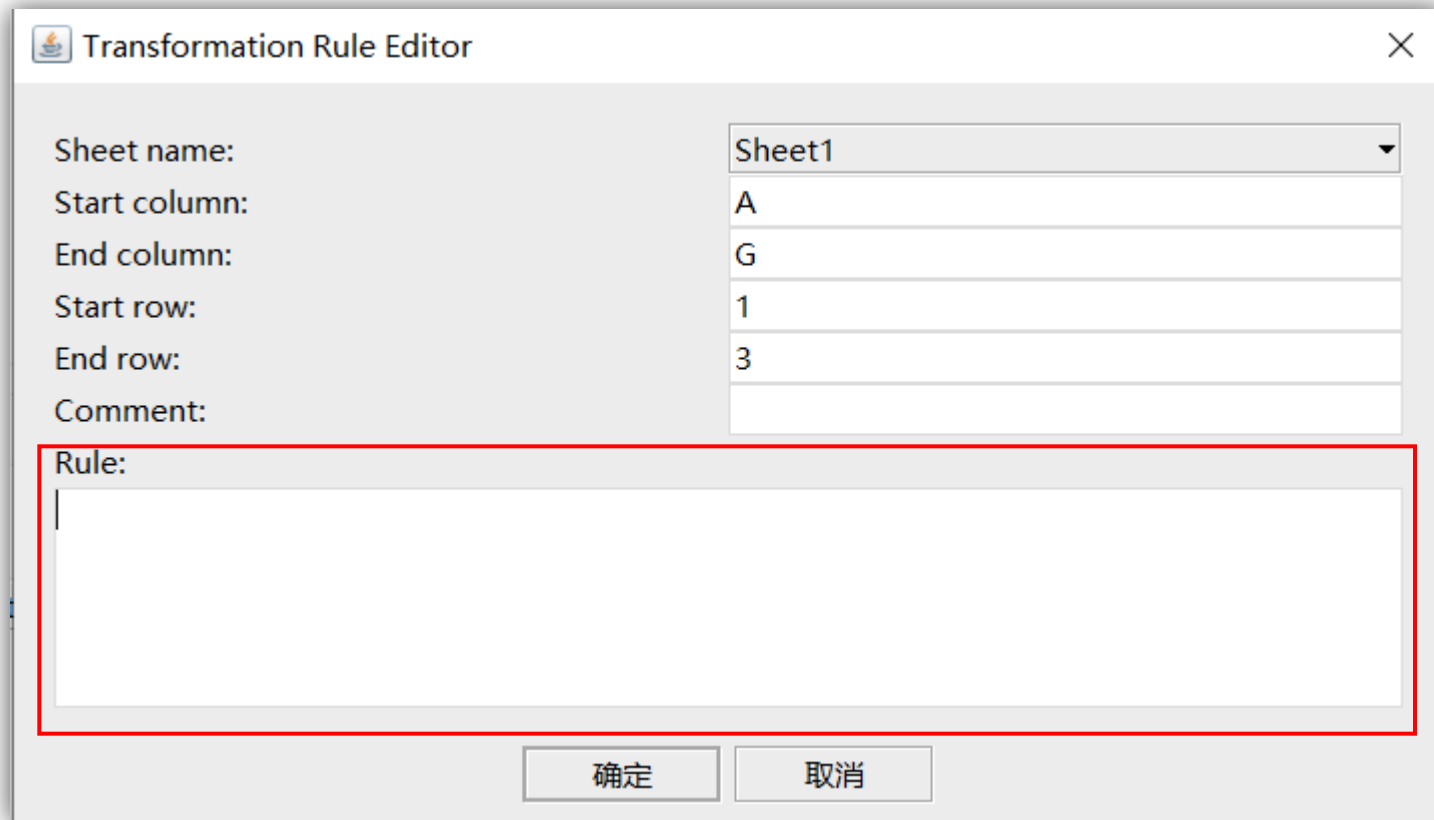
Transformation Rules

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*/

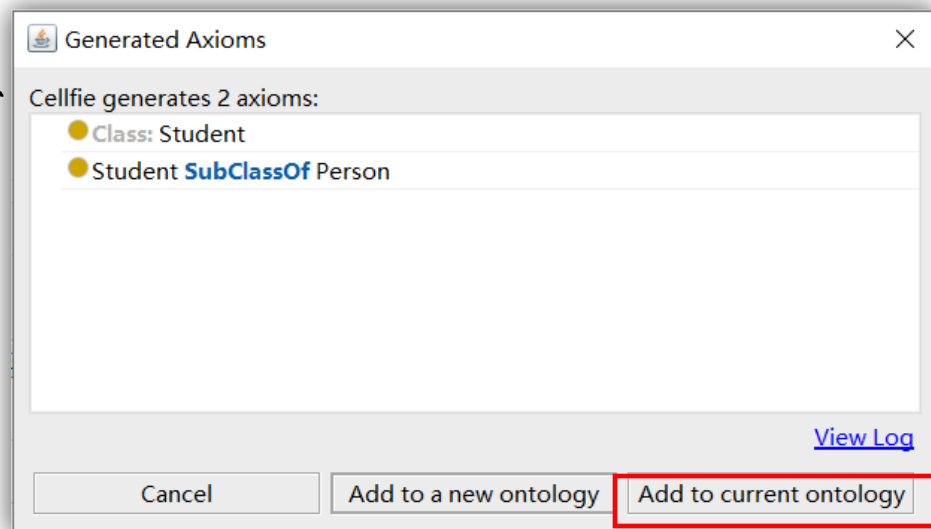
Class:@*1 /*指定第1行所有内容作为类名*/

	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*/

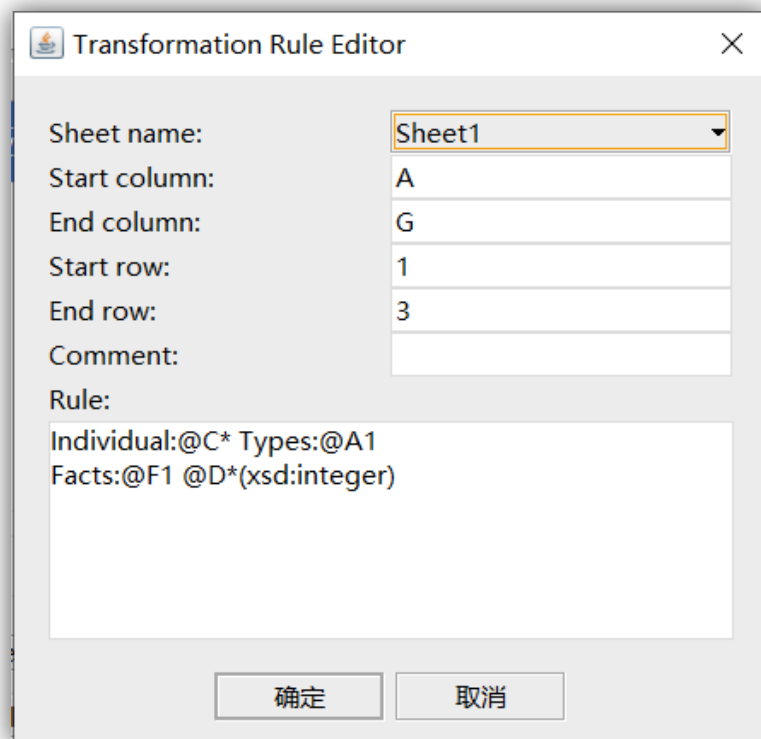
	A	B	C	D	E	F	G
1	Student		John	20		age	hasFriend
2	Employee		Mary	19			
3	Person						

- 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 'Comment' field is empty. The 'Rule' section contains the text: 'Individual:@C* Types:@A1' and 'Facts:@F1 @D*(xsd:integer)'. 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:	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*/

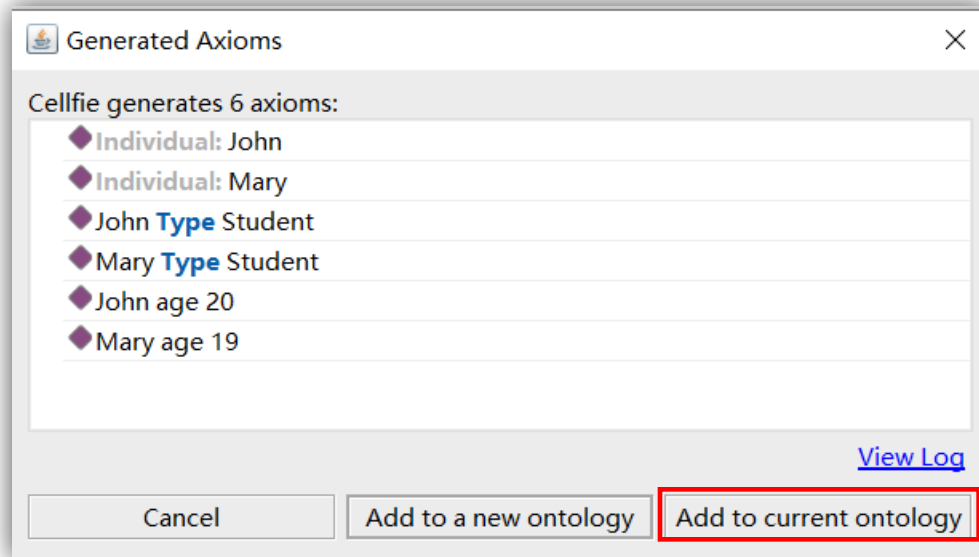
	A	B	C	D	E	F	G
1	Student		John	20		age	hasFriend
2	Employee		Mary	19			
3	Person						

- 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：

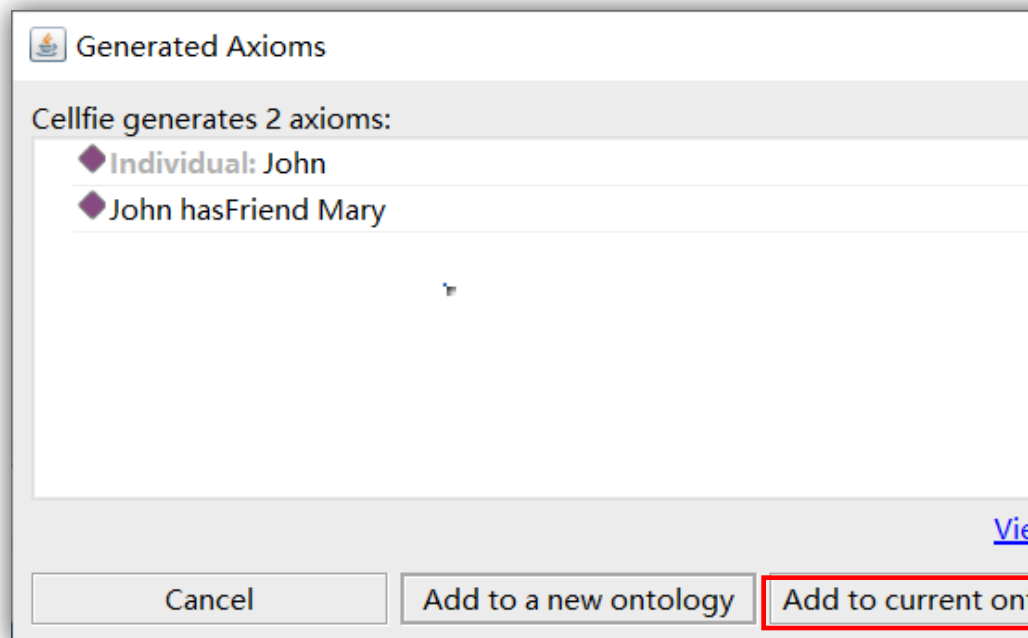
- 导入实例的同时，创建实例属性

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。