

Construction d'une Ontologie pour le Domaine d'Oncologie

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Résumé- Ce rapport présente notre démarche de la conception et du développement d'une ontologie désignée au domaine d'oncologie, par le biais de la plateforme Amine. Le but est de représenter ce domaine incluent les différents agents au sein d'un centre d'oncologie, les différents départements, les symptômes d'un cancer chez un patient, les diagnostics et les traitements possibles, les outils utilisés etc.

Nous allons commencer par la construction d'une représentation de la taxonomie d'Oncologie, puis l'identification des concepts, relations, individus et situations, en ajoutant des définitions et des canons. Ensuite on va réaliser des graphes conceptuels sur la plateforme et leur appliquer quelques opérations comme la généralisation, la jointure, la projection, et la contraction. Après on va élaborer l'inférence basée sur la mémoire pour tester la notion du déduction, d'abduction et d'analogie. Et enfin on va terminer avec la réalisation d'un processus sur Amine.

I.Introduction

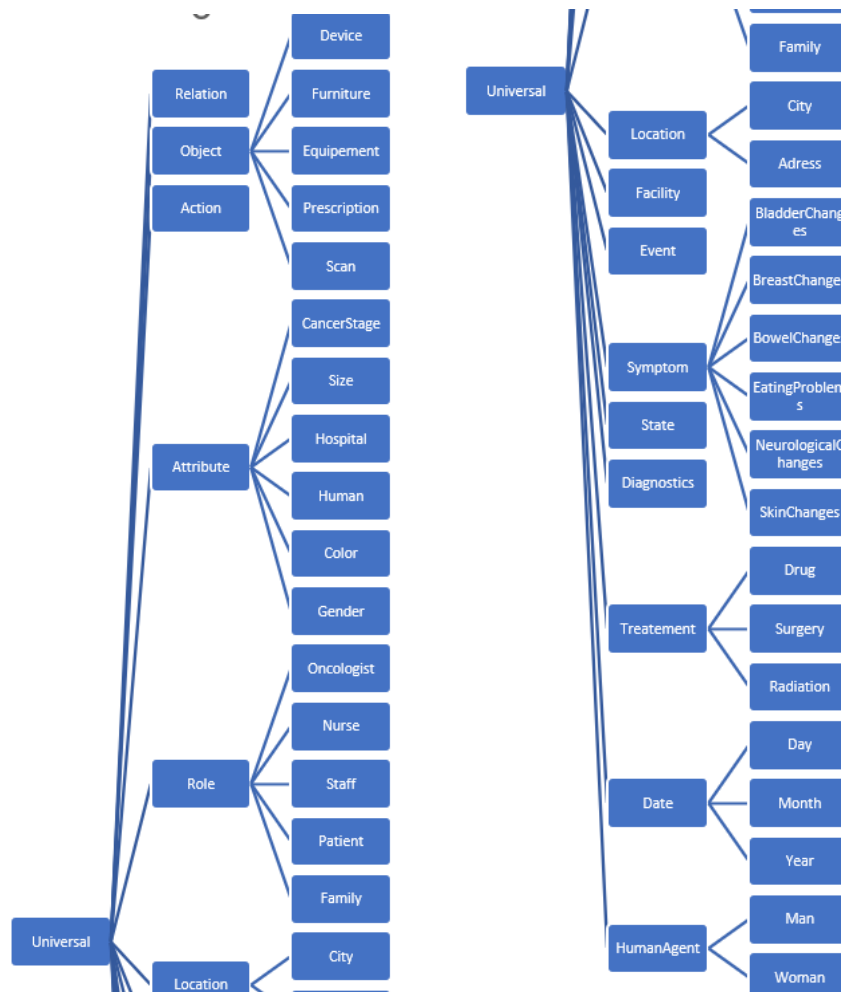
Une ontologie est une représentation explicite formelle de concepts dans un domaine, les propriétés de chaque concept décrivent les caractéristiques et les attributs du concept connus sous le nom de slots et les contraintes sur ces dernières fentes. Dans notre création d'ontologie, nous avons développé une ontologie dans le domaine de la santé, en particulier nous avons choisi l'ontologie du cancer création, et on a choisi l'anglais comme langue principale.

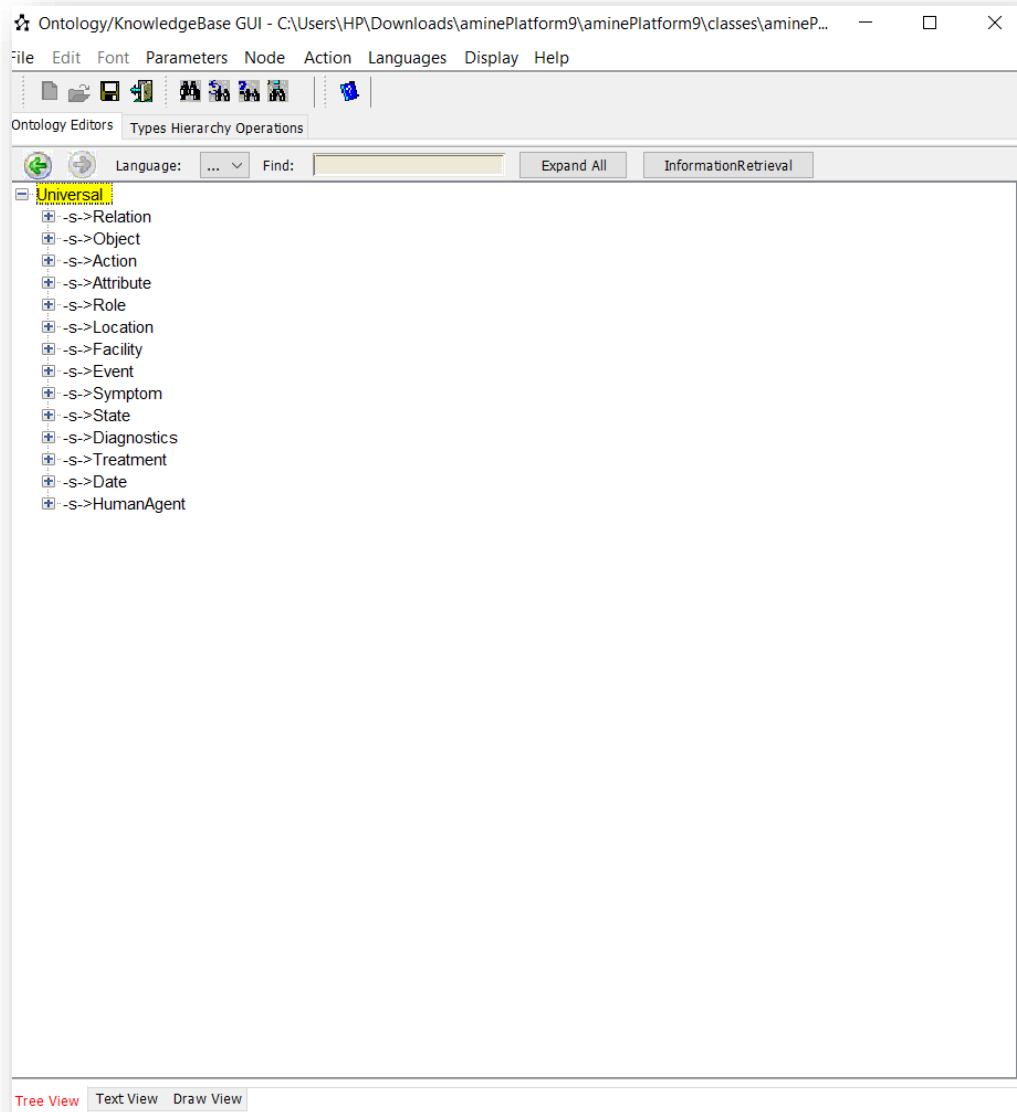
II.Taxonomie

La première étape pour la construction de la taxonomie est l'extraction des entités qu'on aura besoin, ou plus précisément les concepts de notre domaine.

Concepts			
Oncologist	Symptoms	Surgery	Date
Nurse	Diagnostics	Radiation	Cancer Stage
Patient	Treatment	Conferences	State
Family	Clinical Devices	Training	Paramedics
Staff	Furniture	Location	End of Life Care

Une fois avoir idée générale sur les concepts, on a construit la hiérarchie entre les classes :



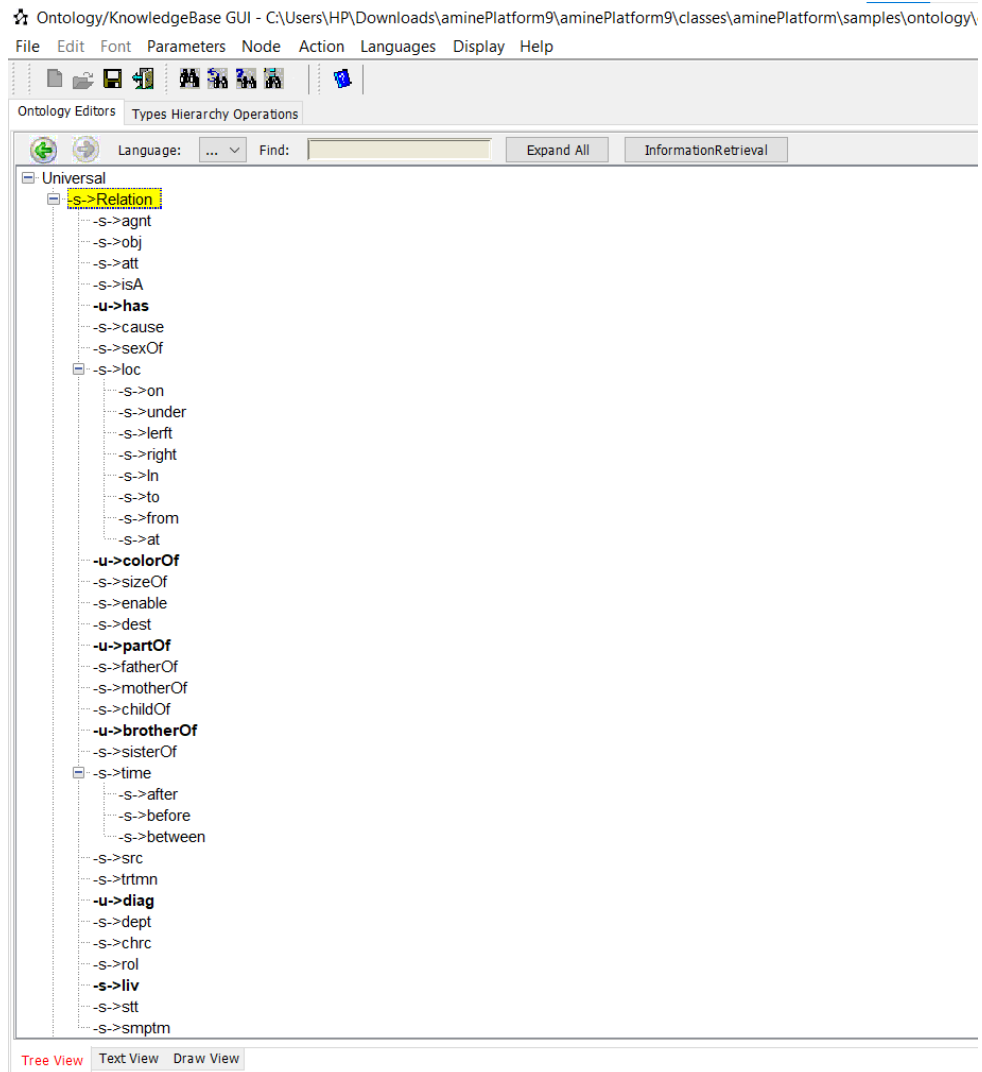


III.Ontologie

Maintenant on va construire notre ontologie en enrichissant chaque classe avec des sous-classes, en ajoutant des définitions, des canons, des situations et des règles.

Par la suite on va explorer chaque concept à part.

1. Relation



- *Définitions*

brotherOf

Locate brotherOf

Definition Set/Update Remove Clear

En [HumanAgent : "1"] -
Fr -childOf->[HumanAgent :y],
-childOf->[Man :x]

LF Editor CGIF Editor CG Graphic Editor

Canon Set/Update Remove Clear

En
Fr

LF Editor CGIF Editor CG Graphic Editor

The screenshot displays the 'colorOf' application interface, which is divided into two main sections: a top panel and a bottom panel.

Top Panel:

- Title Bar:** Labeled 'colorOf' with standard window controls (minimize, maximize, close).
- Buttons:** A row of four buttons: 'Locate colorOf' (highlighted with a blue dashed border), 'Definition', 'Set/Update', 'Remove', and 'Clear'.
- Text Area:** A large white area containing the text: `[Object : *x]-colorOf->[Color : *c]`.
- Bottom Bar:** A row of three buttons: 'LF Editor', 'CGIF Editor', and 'CG Graphic Editor'.

Bottom Panel:

- Title Bar:** Labeled 'Canon' with standard window controls.
- Buttons:** A row of four buttons: 'Definition', 'Set/Update', 'Remove', and 'Clear'.
- Text Area:** A large empty white area.
- Bottom Bar:** A row of three buttons: 'LF Editor', 'CGIF Editor', and 'CG Graphic Editor'.

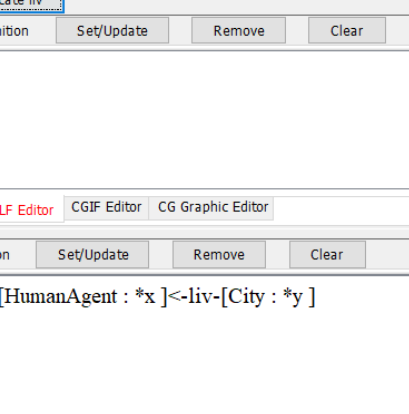
Common Elements:

- Vertical Toolbar (Left):** Each panel has a vertical toolbar on the left side with two buttons: 'En' (English) and 'Fr' (French).
- Horizontal Toolbar (Bottom):** Each panel has a horizontal toolbar at the bottom with three buttons: 'LF Editor', 'CGIF Editor', and 'CG Graphic Editor'.

The screenshot shows the 'partOf' dialog box. It has a title bar with a standard window icon and the text 'partOf'. Below the title bar is a button labeled 'Locate partOf'. The main area of the dialog contains a text field with the expression '[Object : *x]<-partOf-[Facility : *y]'. To the left of this text field are two buttons: 'En' and 'Fr'. Below the text field are three buttons: 'LF Editor', 'CGIF Editor', and 'CG Graphic Editor'. At the bottom of the dialog, there is a row of four buttons: 'Canon', 'Set/Update', 'Remove', and 'Clear'.

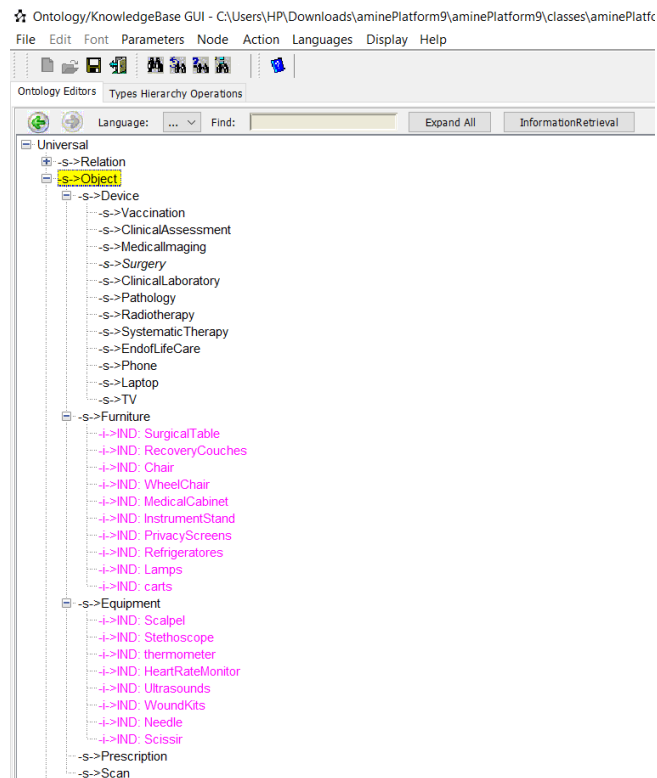
The screenshot shows the 'diag' application window. A 'Locate diag' dialog box is open, displaying the text '[Oncologist : *x]<-diag-[Patients : *y]'. The dialog box has a title bar with a close button and a 'Locate diag' button. Below the text field are buttons for 'Definition', 'Set/Update', 'Remove', and 'Clear'. The 'Locate diag' dialog box is highlighted with a red rectangle.

- *Canon*

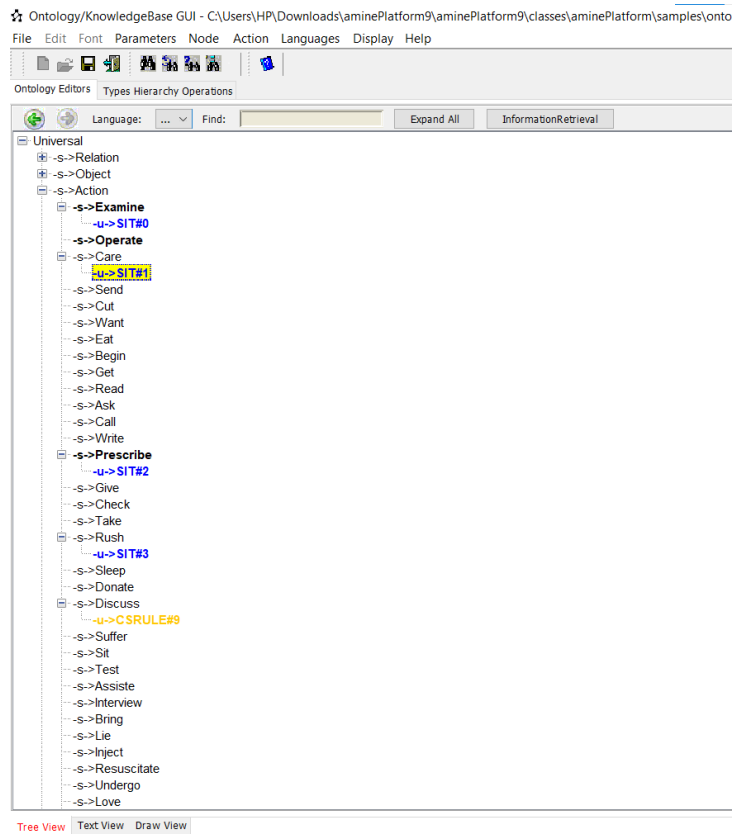


The screenshot shows the 'liv' application window. The title bar says 'liv'. The menu bar has four buttons: 'Definition', 'Set/Update', 'Remove', and 'Clear'. Below the menu bar is a text area with 'En' and 'Fr' tabs. The text area contains the text '[HumanAgent : *x]<-liv-[City : *y]'. At the bottom, there are three buttons: 'LF Editor', 'CGIF Editor', and 'CG Graphic Editor'. The 'Locate liv' button is highlighted with a red dashed box.

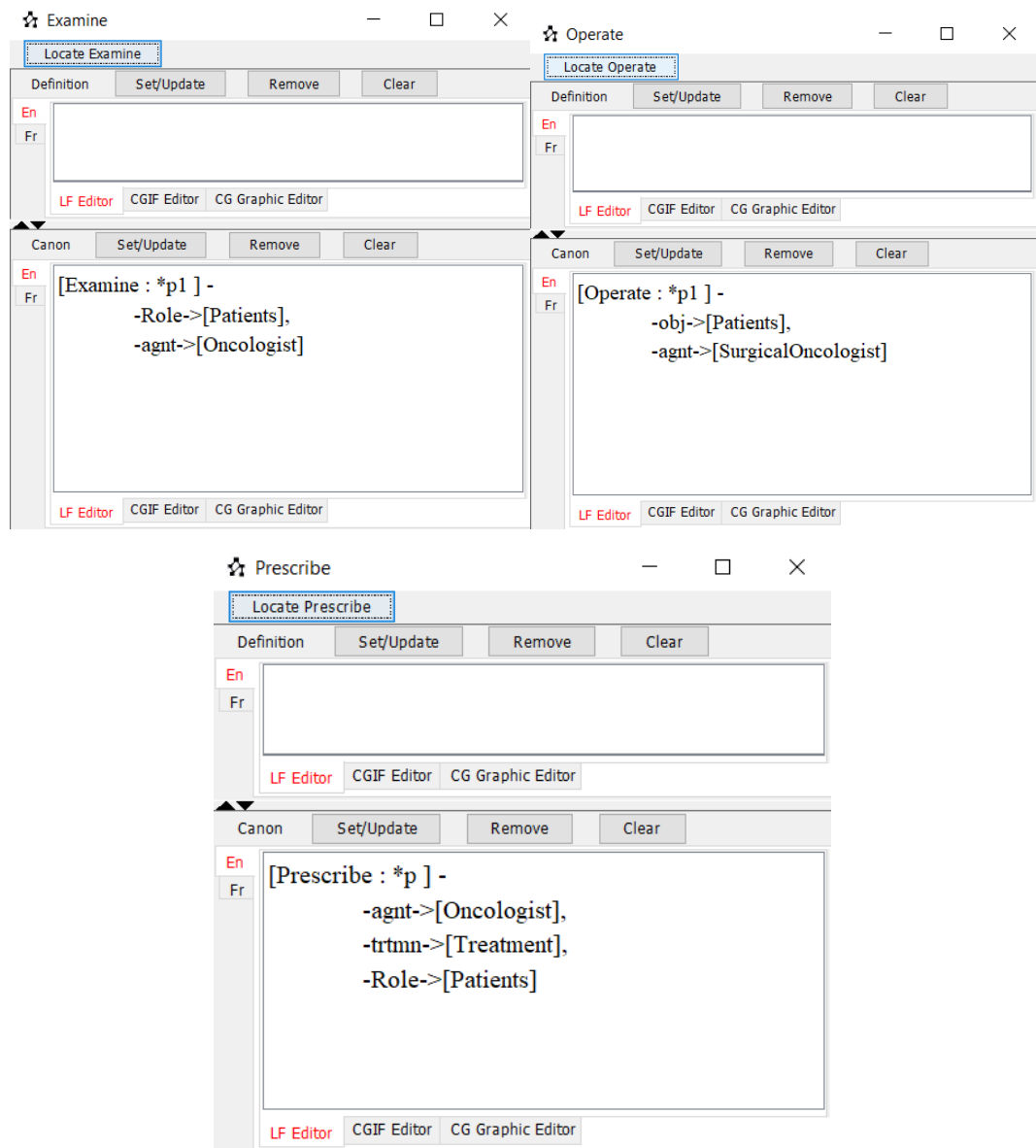
2. Object



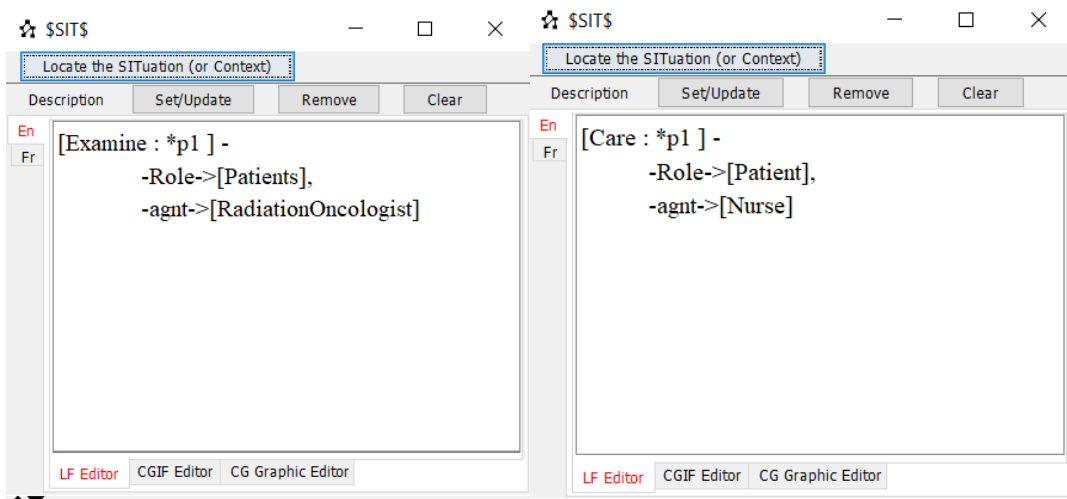
3. Action



- *Canons*



- *Situations*



☆ \$SIT\$

Locate the SITUation (or Context)

Description Set/Update Remove Clear ☐ IsCondition

En [Rush : "1"] -
Fr -agnt->[Paramedics : "2"]-att->[Attribute :Trained],
-Role->[Patients : "3"]-att->[Attribute :Dying],
-dept->[Emergency]

LF Editor CGIF Editor CG Graphic Editor

- Règle

☆ \$CSRULE\$:

Locate the CSRule Set/Update Remove

Antecedent Clear

En [Discuss :#1 "1"] -
Fr -obj->[EndofLifeCare :e],
-agnt->[Nurse :n]

LF Editor CGIF Editor CG Graphic Editor

Consequence Clear

En [Discuss : "1"] -
Fr -obj->[EndofLifeCare :s],
-chrc->[Attribute :Kind],
-agnt->[Nurse :n]

LF Editor CGIF Editor CG Graphic Editor

4. Attribute

☆ Ontology/KnowledgeBase GUI - C:\Users\HP\Downloads\☆ Ontology/KnowledgeBase GUI - C:\Users\HP\Downloads\amir

File Edit Font Parameters Node Action Languages File Edit Font Parameters Node Action Languages Dis

Ontology Editors Types Hierarchy Operations

Language: ... Find:

Universal

- s->Relation
- s->Object
- s->Action
- s->Attribute
 - s->CancerStage
 - i->IND: Stage1
 - i->IND: Stage2
 - i->IND: Stage3
 - i->IND: Stage4
 - s->Size
 - i->IND: Big
 - i->IND: Small
 - i->IND: Large
 - i->IND: Tiny
 - s->Hospital
 - i->IND: Public
 - i->IND: Private
 - i->IND: Local
 - i->IND: Rural
 - i->IND: Rehabilitation
 - i->IND: Research
 - i->IND: Safe
 - i->IND: Clean
 - i->IND: Crowded
 - i->IND: Scary
 - i->IND: Dark
 - i->IND: Unsafe
 - i->IND: Distressing
 - i->IND: Bright
- s->Human
- s->Color
- s->Gender

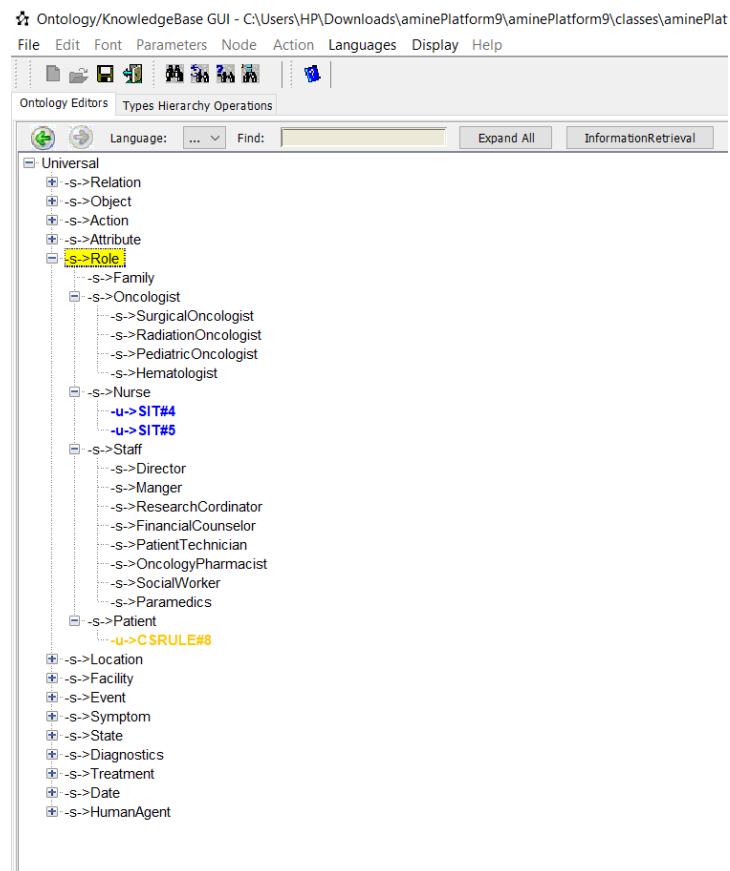
Ontology Editors Types Hierarchy Operations

Language: ... Find:

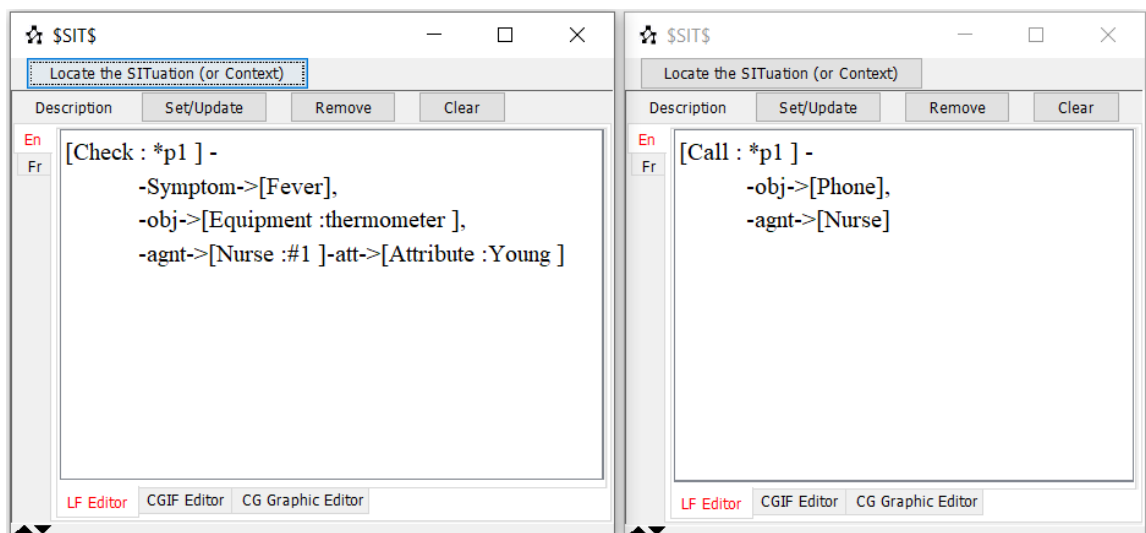
- s->Size
- s->Hospital
- s->Human
 - s->Doctor
 - i->IND: Busy
 - i->IND: Dedicated
 - i->IND: Devoted
 - i->IND: Harsh
 - i->IND: Cruel
 - i->IND: Kind
 - i->IND: Experienced
 - i->IND: Compassionate
 - s->Patients
 - i->IND: Ill
 - i->IND: Desperate
 - i->IND: Confused
 - i->IND: Resilient
 - i->IND: Healed
 - i->IND: Hurt
 - i->IND: Capable
 - i->IND: Dying
 - i->IND: Calm
 - i->IND: Caring
 - i->IND: Old
 - i->IND: Trained
 - i->IND: Energetic
 - i->IND: Young
 - i->IND: Junior
 - i->IND: Strong
 - i->IND: Nervous
 - i->IND: Careful
 - s->Color
 - u->IND: White
 - u->IND: Red
 - i->IND: Yellow
 - i->IND: Black
 - i->IND: Green
 - i->IND: Blue
 - s->Gender
 - i->IND: Male
 - i->IND: Female

Tree View Text View Draw View

5. Rôle



- Situations*



- Règle

✱ \$CSRULE\$:

Locate the CSRule Set/Update Remove

Antecedent Clear

En [Patient :p] <-agnt-[Suffer]
Fr

LF Editor CGIF Editor CG Graphic Editor

Consequence Clear

En [Patient :p] -
Fr -diag->[InstestinalCancer],
<-agnt-[Suffer]

LF Editor CGIF Editor CG Graphic Editor

6. Location

✱ Ontology/KnowledgeBase GUI - C:\Users\HP\Downloads\aminePlatform9\aminePlatform

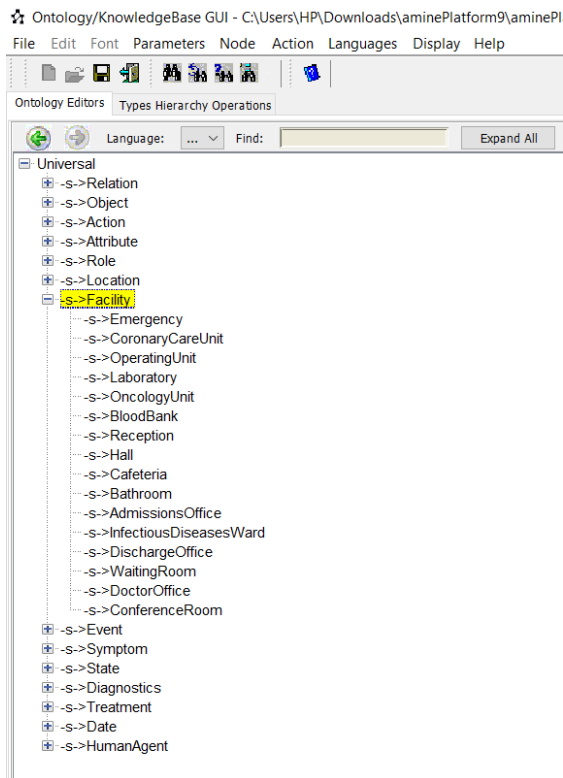
File Edit Font Parameters Node Action Languages Display Help

Ontology Editors Types Hierarchy Operations

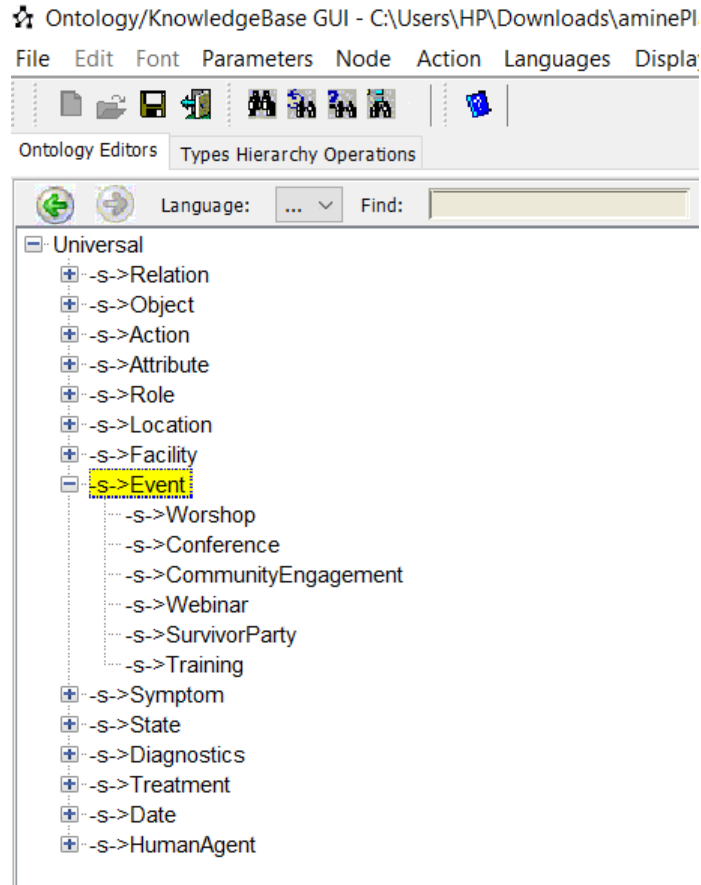
Language: ... Find: Expand All Inf

- [-] Universal
 - [-s->Relation
 - [-s->Object
 - [-s->Action
 - [-s->Attribute
 - [-s->Role
 - [-s->Location]
 - [-s->City
 - i->IND: Rabat
 - i->IND: Casablanca
 - i->IND: Tangier
 - i->IND: Meknes
 - i->IND: Fes
 - i->IND: BeniMellal
 - s->address
 - [-s->Facility
 - [-s->Event
 - [-s->Symptom
 - [-s->State
 - [-s->Diagnostics
 - [-s->Treatment
 - [-s->Date
 - [-s->HumanAgent

7. Facility



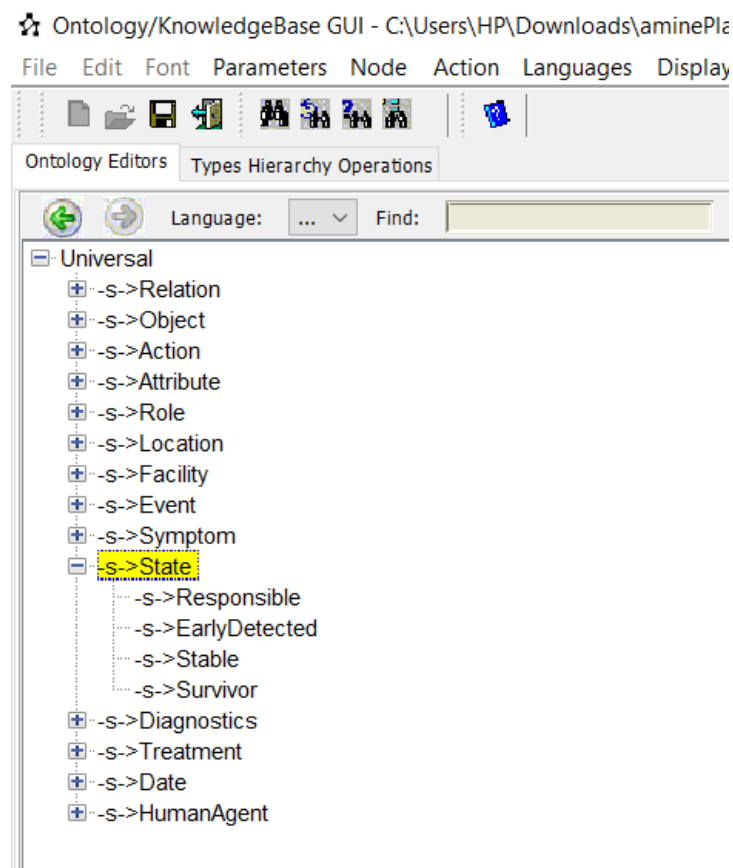
8. Event



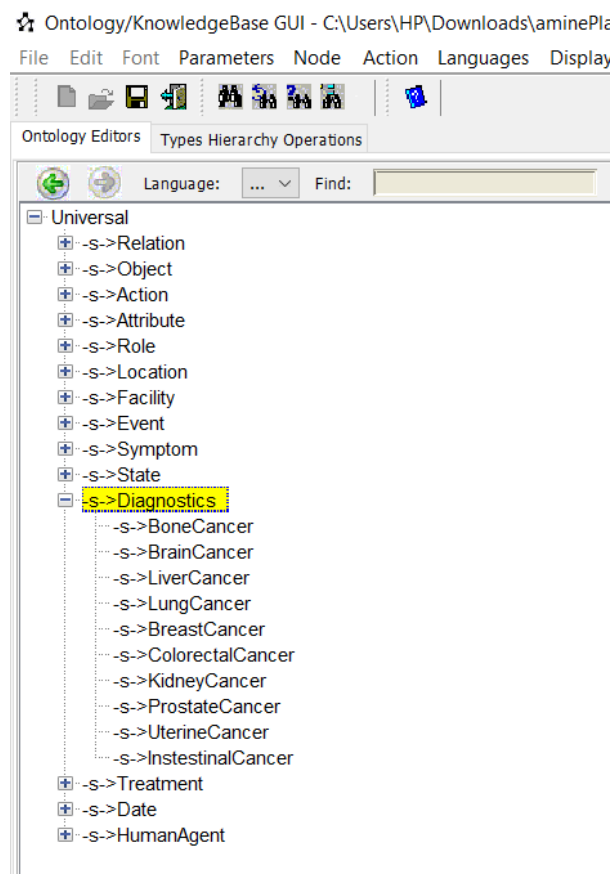
9. Symptoms



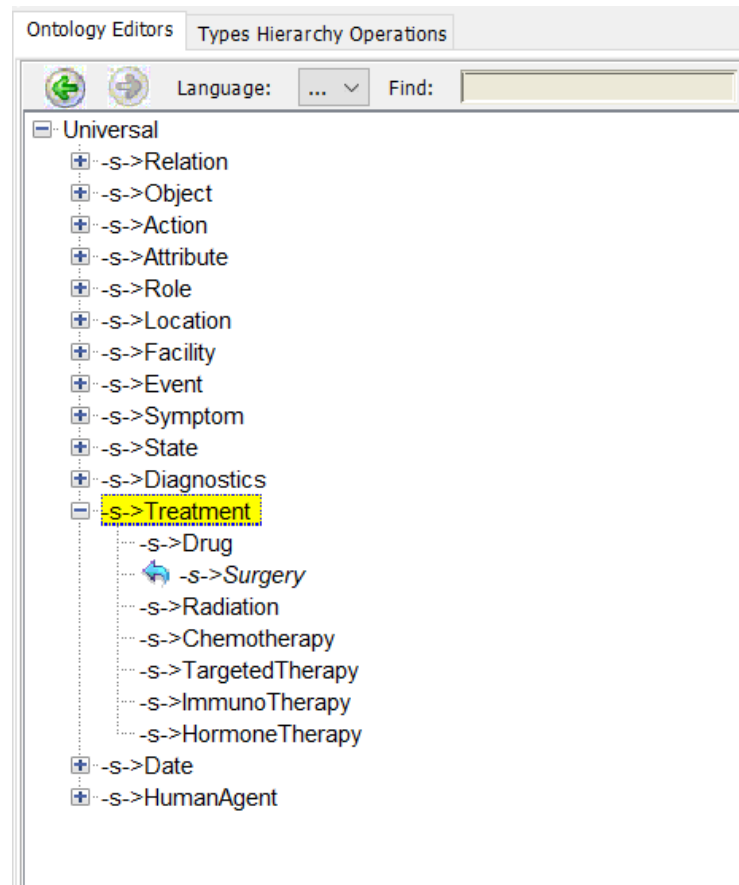
10. State



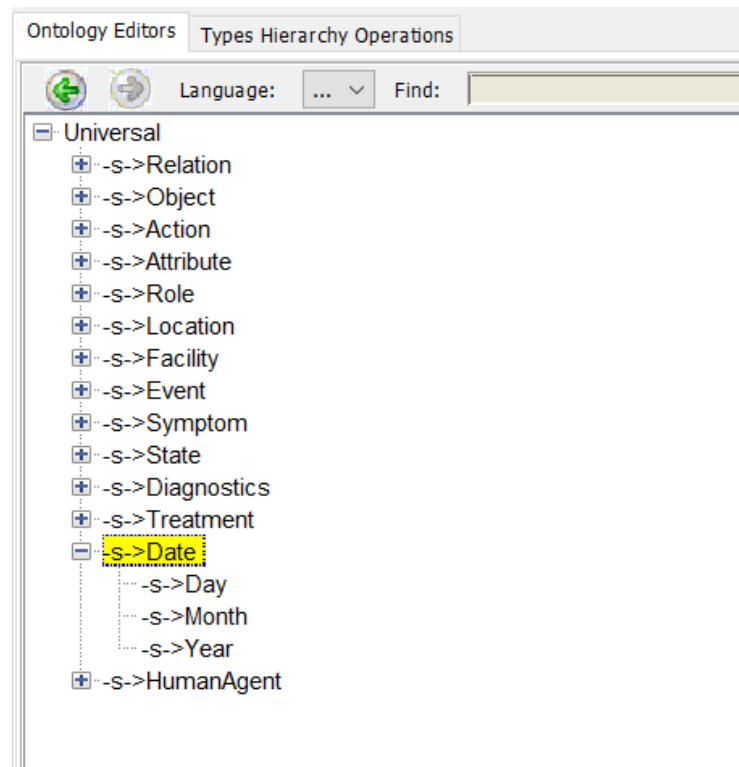
11. Diagnostics



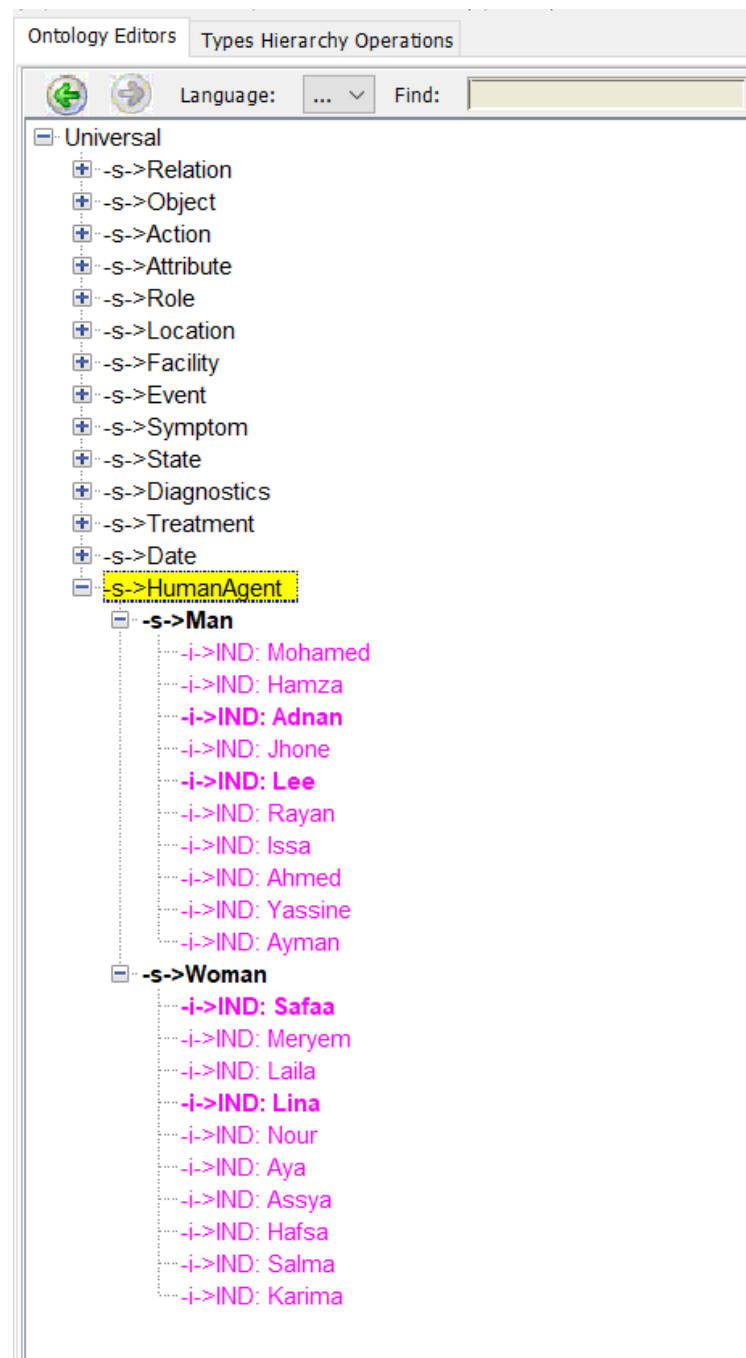
12. Treatment



13. Date



14. HumanAgent



- *Description d'individu*

Lee

Locate Lee

Description
Set/Update
Remove
Clear

En
Fr

[Man :Lee] -
-rol->[Oncologist],
-chrc->[Attribute : Experinced]

LF Editor
CGIF Editor
CG Graphic Editor

Adnan

Locate Adnan

Description
Set/Update
Remove
Clear

En
Fr

[Man :Adnan] -
-rol->[Patients :#1]-chrc->[Attribute :Despera
-has->[NeurologicalChanges]

LF Editor
CGIF Editor
CG Graphic Editor

Safaa

Locate Safaa

Description
Set/Update
Remove
Clear

En
Fr

[Woman :Safaa] -
-rol->[Director],
-chrc->[Attribute :Strong],
-liv->[City :Rabat]

LF Editor
CGIF Editor
CG Graphic Editor

Lina

Locate Lina

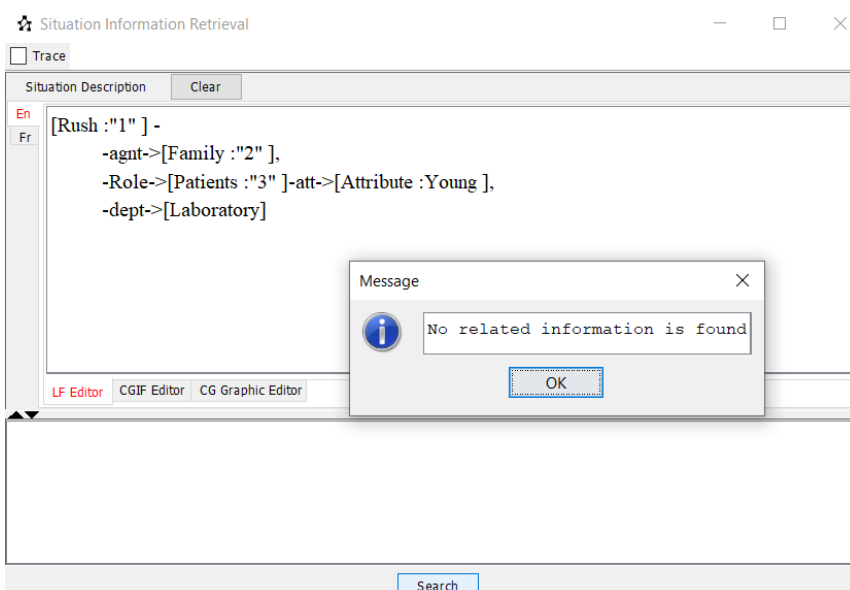
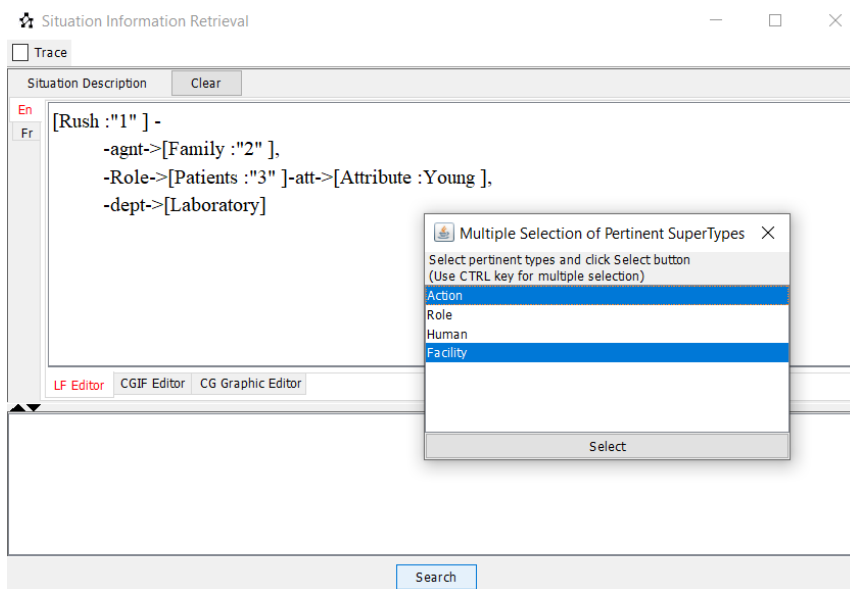
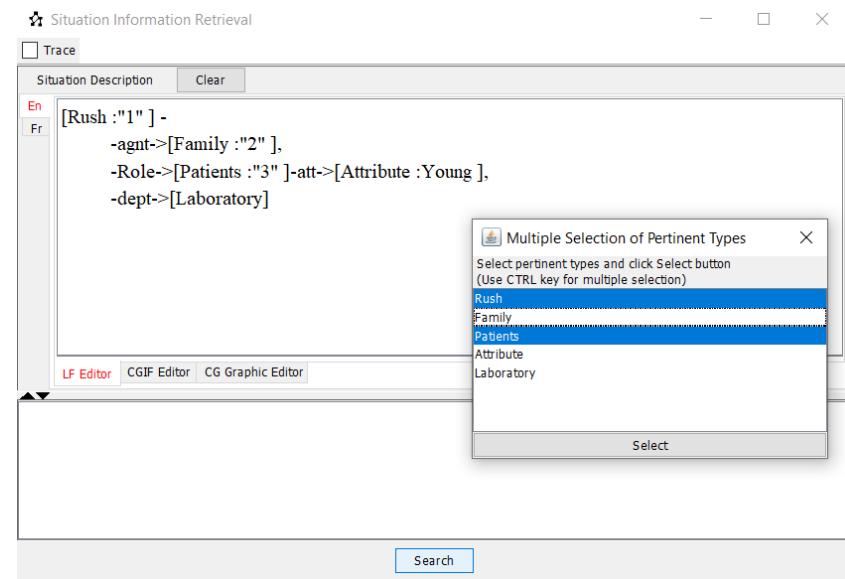
Description
Set/Update
Remove
Clear

En
Fr

[Woman :Lina] -
-rol->[Nurse],
-chrc->[Attribute :Kind],
-chrc->[Attribute :Old],
-liv->[City :Rabat]

LF Editor
CGIF Editor
CG Graphic Editor

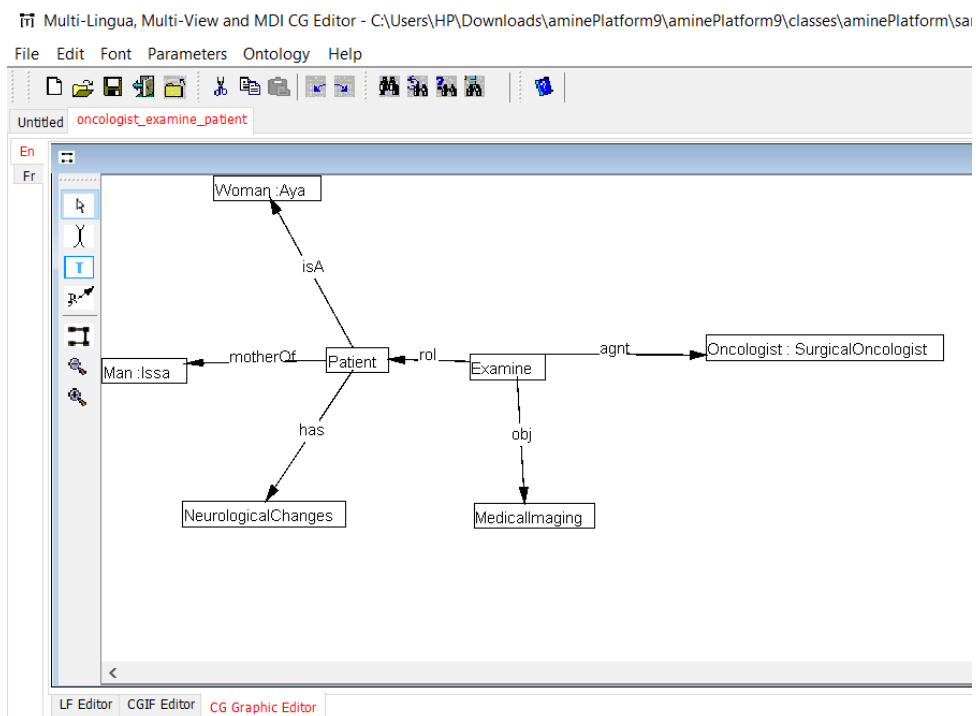
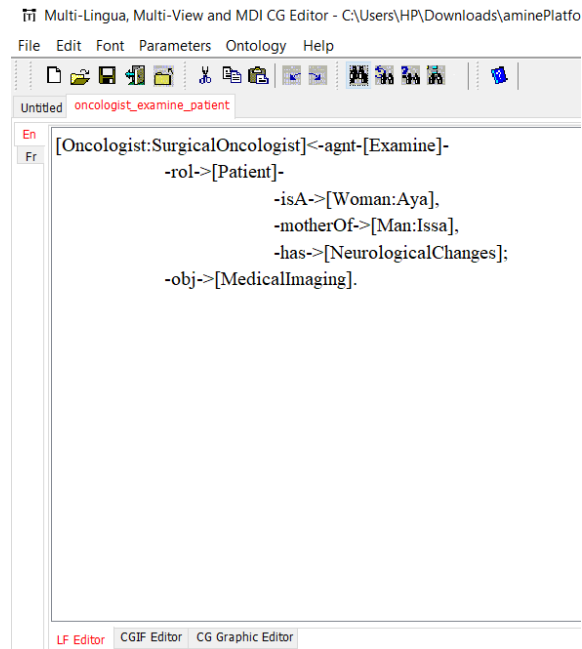
15. Information Retrieval



IV. Graphs Conceptuels

Dans cette section on va construire nos graphs conceptuels, et leur appliquer quelques opérations.

1. Graph1



2. Graph2

Multi-Lingua, Multi-View and MDI CG Editor - C:\Users\HP\Downloads\aminePlatform9\aminePlatform

File Edit Font Parameters Ontology Help

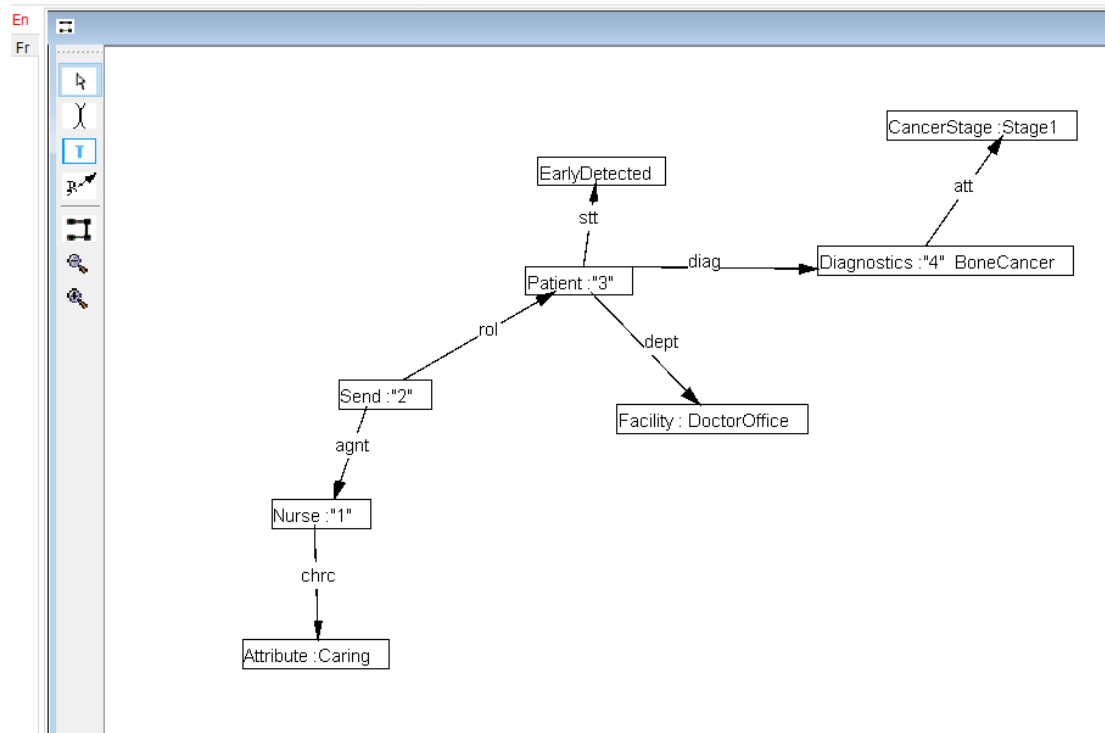
Untitled oncologist_examine_patient nurse_sen_patient

En
Fr
[Patient :#3] -
-diag->[Diagnostics :#4 BoneCancer]-att->[CancerStage :Stage1],
-stt->[EarlyDetected],
-dept->[Facility : DoctorOffice],
<-rol-[Send :#2]-agnt->[Nurse :#1]-chrc->[Attribute :Caring]

Multi-Lingua, Multi-View and MDI CG Editor - C:\Users\HP\Downloads\aminePlatform9\aminePlatform9\classes\aminePlatform\sam

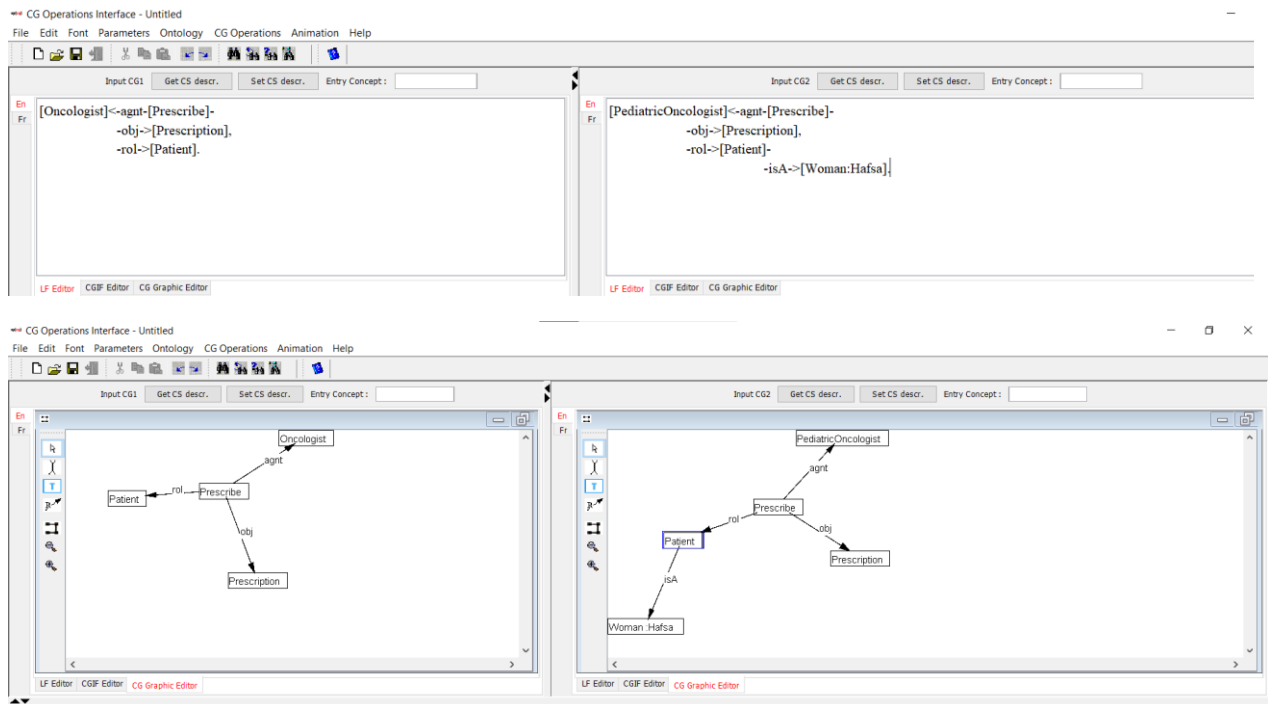
File Edit Font Parameters Ontology Help

Untitled oncologist_examine_patient nurse_sen_patient

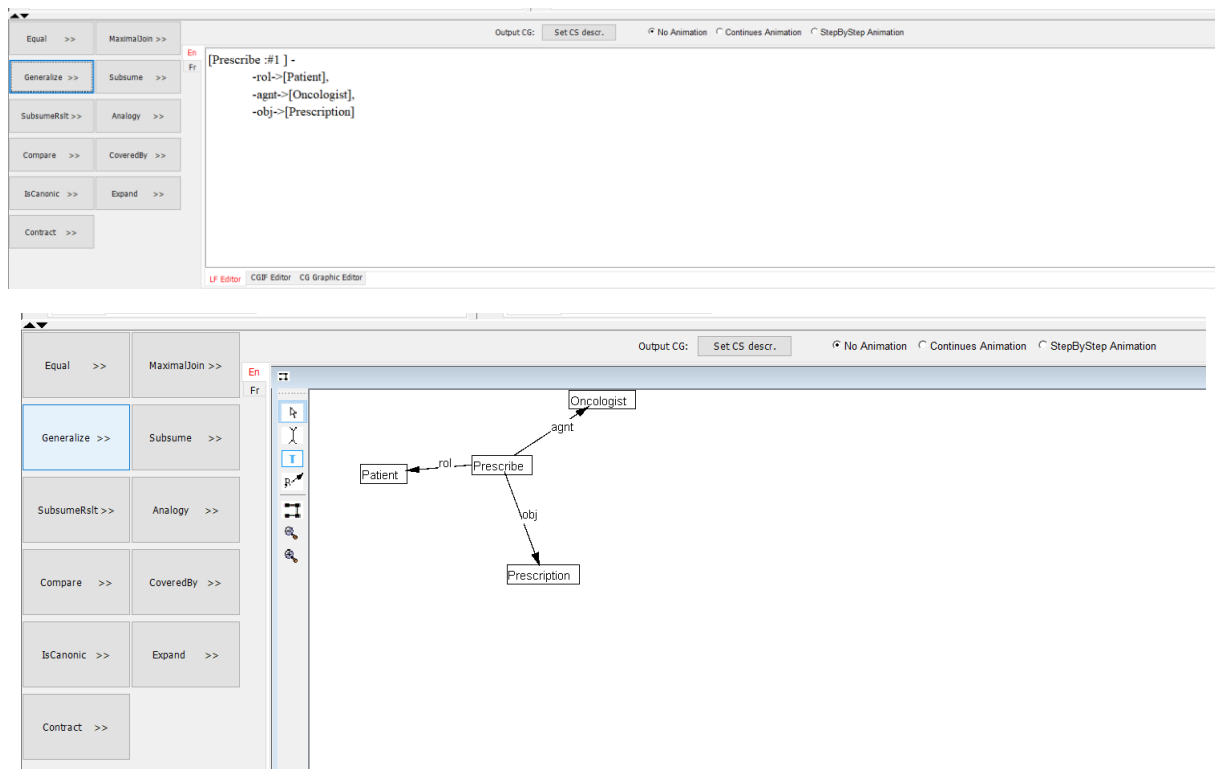


Opérations sur les graphes conceptuels

Example 1:



1. Généralisation



2. Jointure

Equal >> MaximalJoin >>

Generalize >> Subsume >>

SubsumeRslt >> Analogy >>

Compare >> CoveredBy >>

IsCanonic >> Expand >>

Contract >>

Output CG: Set CS descr. No Animation Continues Animation StepByStep Animation

En Fr

[Prescribe :#1] -> [Prescription],
-> [Patient :#2]-isA->[Woman :Hafsa],
-> [PediatricOncologist]

LF Editor CGF Editor CG Graphic Editor

Equal >> MaximalJoin >>

Generalize >> Subsume >>

SubsumeRslt >> Analogy >>

Compare >> CoveredBy >>

IsCanonic >> Expand >>

Contract >>

Output CG: Set CS descr. No Animation Continues Animation StepByStep Animation

En Fr

Prescription

obj

Prescribe :#1

role

Patient :#2

isA

Woman :Hafsa

agnt

PediatricOncologist

LF Editor CGF Editor CG Graphic Editor

3. Comparaison

CG Operations Interface - Untitled

File Edit Font Parameters Ontology CG Operations Animation Help

Input CG1 Get CS descr. Set CS descr. Entry Concept:

En Fr

[Oncologist]->[Prescribe]->[Prescription],
->[Patient].

LF Editor CGF Editor CG Graphic Editor

Input CG2 Get CS descr. Set CS descr. Entry Concept:

En Fr

[PediatricOncologist]->[Prescribe]->[Prescription],
->[Patient]->[Woman:Hafsa].

LF Editor CGF Editor CG Graphic Editor

Output CG: Set CS descr. No Animation Continues Animation StepByStep Animation

Equal >> MaximalJoin >>

Generalize >> Subsume >>

SubsumeRslt >> Analogy >>

Compare >> CoveredBy >>

IsCanonic >> Expand >>

Contract >>

Message

The first CG is/has MORE_GENERAL to/than/with the second CG

OK

LF Editor CGF Editor CG Graphic Editor

Matched Part of CG1:		Matched Part of CG2:	
<div>En</div> <div>Fr</div> <div> <p>[Prescribe :#1] -</p> <p>-rol->[Patient],</p> <p>-agnt->[Oncologist],</p> <p>-obj->[Prescription]</p> </div> <div> <div>LF Editor</div> <div>CGIF Editor</div> <div>CG Graphic Editor</div> </div>	<div>En</div> <div>Fr</div> <div> <p>[Prescribe :#1] -</p> <p>-rol->[Patient],</p> <p>-agnt->[PediatricOncologist],</p> <p>-obj->[Prescription]</p> </div> <div> <div>LF Editor</div> <div>CGIF Editor</div> <div>CG Graphic Editor</div> </div>		
Specific Part of CG1:		Specific Part of CG2:	
<div>En</div> <div>Fr</div> <div></div> <div> <div>LF Editor</div> <div>CGIF Editor</div> <div>CG Graphic Editor</div> </div>	<div>En</div> <div>Fr</div> <div> <p>[Patient]-isA->[Woman :Hafsa]</p> </div> <div> <div>LF Editor</div> <div>CGIF Editor</div> <div>CG Graphic Editor</div> </div>		

Example2:

1. Analogie

CG Operations Interface - Untitled

File Edit Font Parameters Ontology CG Operations Animation Help

Input CG1 Get CS descr. Set CS descr. Entry Concept :

En Fr

[SurgicalOncologist]<-agnt-[Examine]-
-rol->[Patient],
-isA->[Woman:Aya],
-motherOf->[Man:Issa],
-has->[NeurologicalChanges];
-obj->[MedicalImaging].

LF Editor CGIF Editor CG Graphic Editor

Input CG2 Get CS descr. Set CS descr. Entry Concept :

En Fr

[PediatricOncologist]<-agnt-[Prescribe]-
-obj->[Prescription],
-rol->[Patient]-
-isA->[Man:Issa].

LF Editor CGIF Editor CG Graphic Editor

Equal >> MaximalJoin >> Output CG: Set CS descr. No Animation Continues Animation StepByStep Animation

Generalize >> Subsume >> En Fr

SubsumeRslt >> **Analogie >>**

Compare >> CoveredBy >>

IsCanonic >> Expand >>

Contract >>

[Examine :#1] -
-rol->[Patient :#2]-isA->[Man :Issa],
-isA->[Woman :Aya],
-motherOf->[Man :Issa],
-has->[NeurologicalChanges],
-obj->[MedicalImaging],
-agnt->[SurgicalOncologist]

LF Editor CGIF Editor CG Graphic Editor

2. Généralisation

CG Operations Interface - Untitled

File Edit Font Parameters Ontology CG Operations Animation Help

Input CG1 Get CS descr. Set CS descr. Entry Concept :

En Fr

[Oncologist:SurgicalOncologist]<-agnt-[Examine]-
-rol->[Patient]-
-isA->[Woman:Aya],
-motherOf->[Man:Issa],
-has->[NeurologicalChanges];
-obj->[MedicalImaging].

LF Editor CGIF Editor CG Graphic Editor

Input CG2 Get CS descr. Set CS descr. Entry Concept :

En Fr

[PediatricOncologist]<-agnt-[Prescribe]-
-obj->[Prescription],
-rol->[Patient]-
-isA->[Woman:Aya].

LF Editor CGIF Editor CG Graphic Editor

Equal >> MaximalJoin >> Output CG: Set CS descr. No Animation Continues Animation StepByStep Animation

Generalize >> Subsume >> En Fr

SubsumeRslt >> Analogie >>

Compare >> CoveredBy >>

IsCanonic >> Expand >>

Contract >>

[Action :#2] -
-obj->[Object],
-rol->[Patient :#1]-isA->[Woman :Aya],
-agnt->[Oncologist]

LF Editor CGIF Editor CG Graphic Editor

CG Operations Interface - Untitled

File Edit Font Parameters Ontology CG Operations Animation Help

Input CG1 Get CS descr. Set CS descr. Entry Concept:

En Fr

[Oncologist:SurgicalOncologist]<-agent-[Examine]-
 -rol->[Patient]-
 -isA->[Woman:Aya],
 -motherOf->[Man:Issa],
 -has->[NeurologicalChanges];
 -obj->[MedicalImaging].

LF Editor CGF Editor CG Graphic Editor

Input CG2 Get CS descr. Set CS descr. Entry Concept:

En Fr

[Oncologist]<-agent-[Examine]-
 -rol->[Woman]-
 -att->[Attribute:Illl].

Message

The first CG is/has HAVE_AN_INTERSECTION to/than/with the second CG

OK

Equal >> Maximalion >>
 Generalize >> Subsume >>
 SubsumeRalt >> Analogy >>
 Compare >> CoveredBy >>
 IsCanonic >> Expand >>
 Contract >>

En Fr

[Patient :#2] -
 -isA->[Woman :Aya],
 -motherOf->[Man :Issa],
 -has->[NeurologicalChanges],
 -att->[Attribute :Illl],
 <-rol-[Examine :#1] -
 -obj->[MedicalImaging],
 -agent->[Oncologist : SurgicalOncologist]

LF Editor CGF Editor CG Graphic Editor

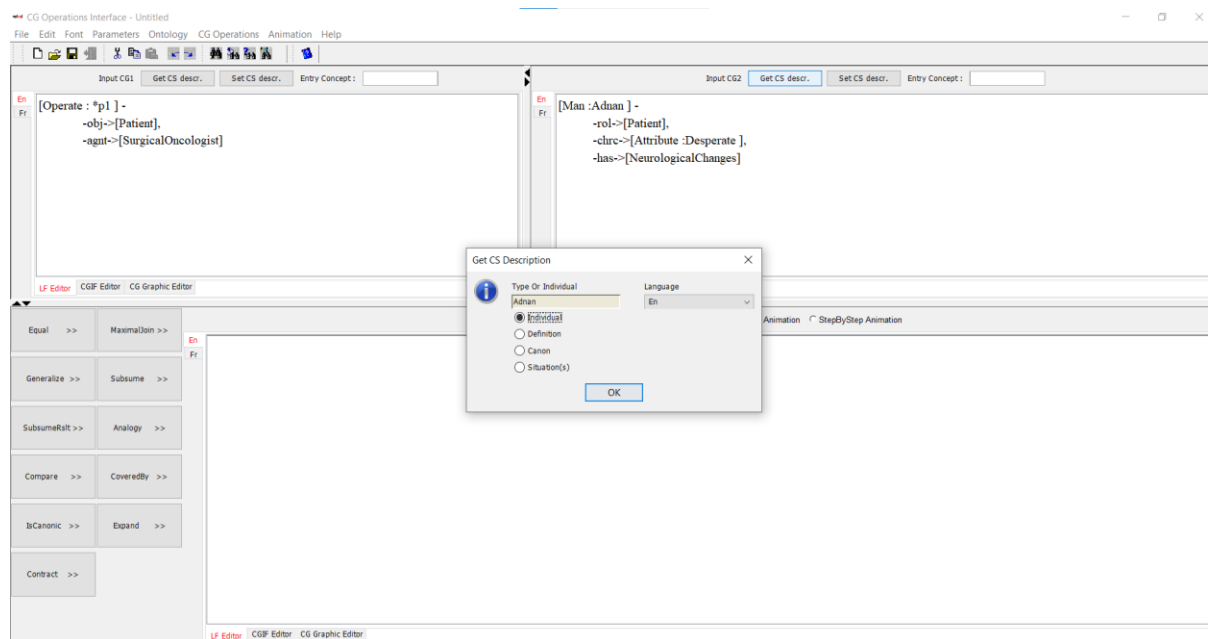
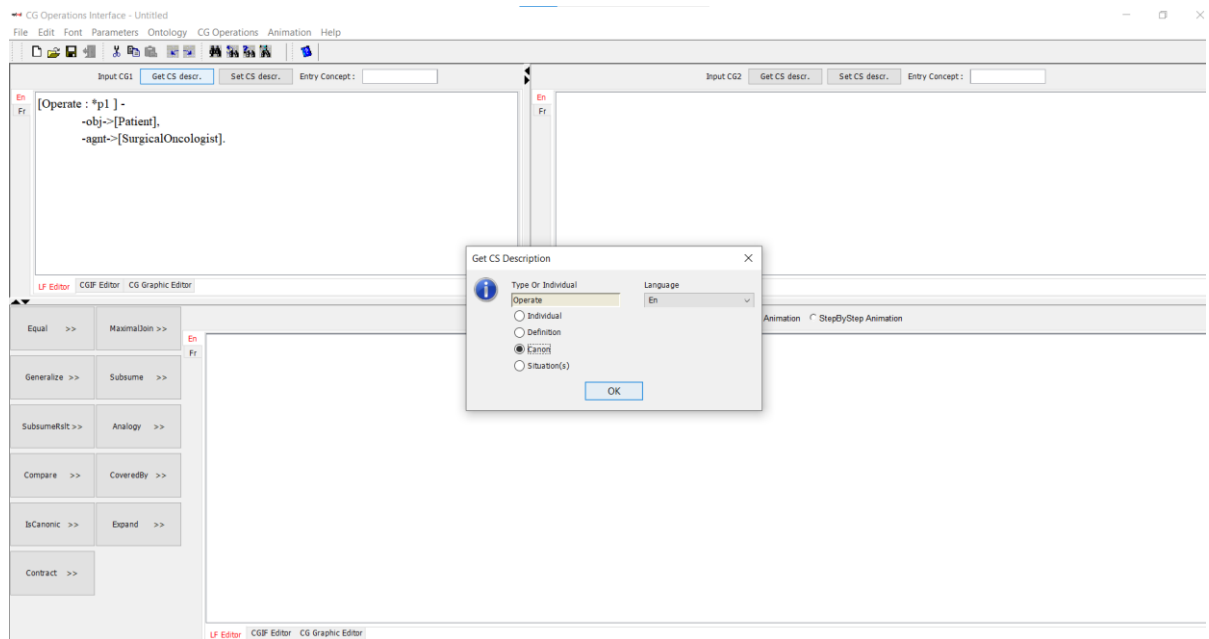
StepByStep Animation

The screenshot displays the "Compare CG Results" application window, which is divided into four quadrants for side-by-side comparison of two datasets, CG1 and CG2.

- Top-Left Panel (Matched Part of CG1):** Shows a single entry: `[Examine]-agent->[Oncologist : SurgicalOncologist]`. The left margin contains labels "En" (English) and "Fr" (French).
- Top-Right Panel (Matched Part of CG2):** Shows a single entry: `[Examine]-agent->[Oncologist]`. It also has "En" and "Fr" labels in the left margin.
- Bottom-Left Panel (Specific Part of CG1):** Displays a list of entries:
 - `at :#2] -`
 - `-isA->[Woman :Aya],`
 - `-motherOf->[Man :Issa],`
 - `-has->[NeurologicalChanges],`
 - `<-rol-[Examine :#1]-obj->[MedicalImaging]`
- Bottom-Right Panel (Specific Part of CG2):** Displays a list of entries:
 - `[Woman :#1] -`
 - `-att->[Attribute :Ill],`
 - `<-rol-[Examine]`

Each panel includes a horizontal scrollbar at the bottom and three tabs labeled "LF Editor", "CGIF Editor", and "CG Graphic Editor". The "LF Editor" tab is currently selected in all four panels.

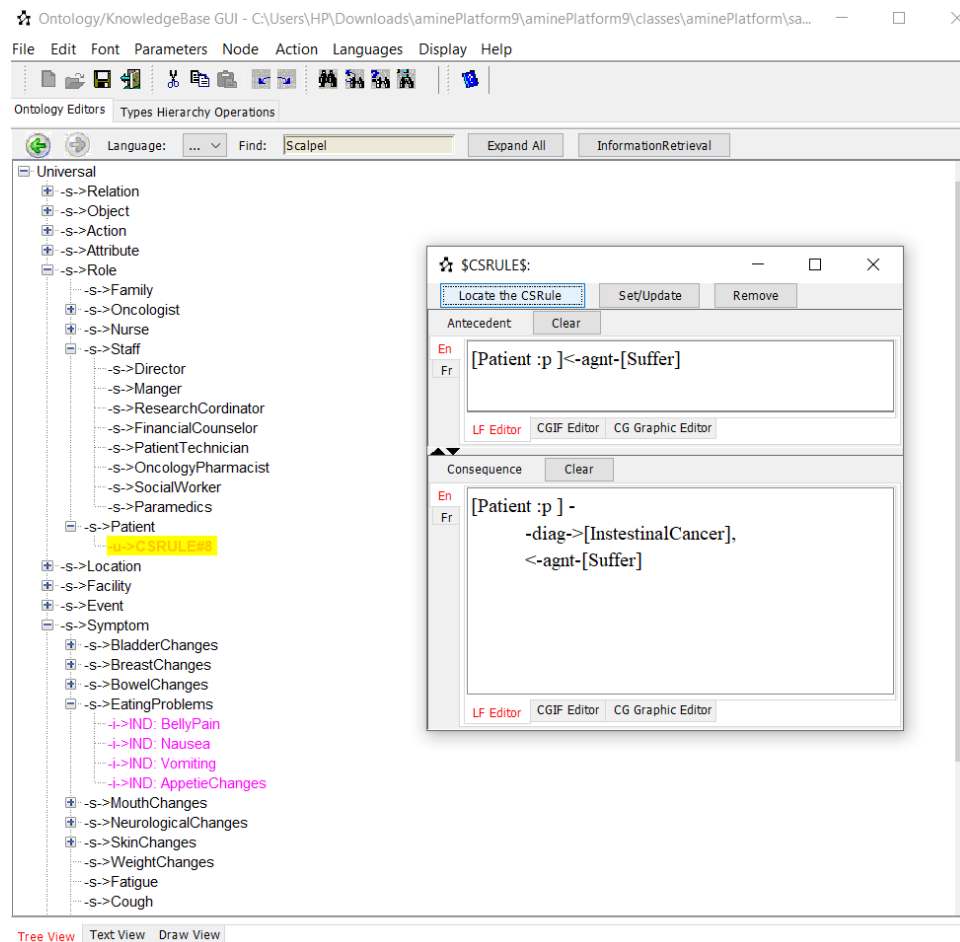
Example 3 :



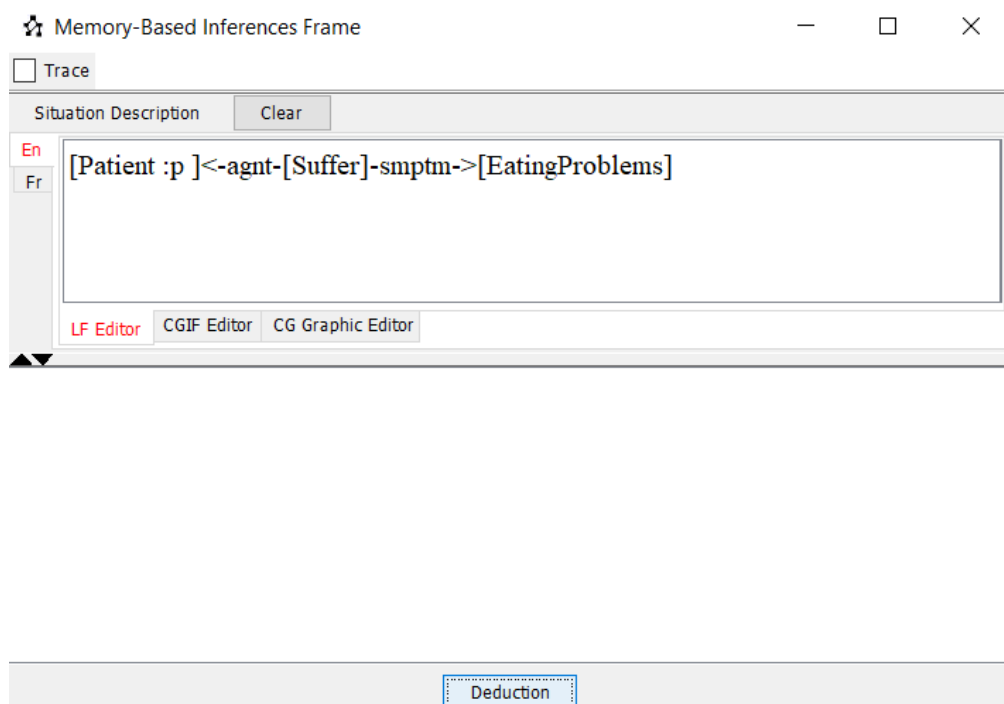
Inférence basée sur la mémoire

Dans l'approche classique, les faits et les règles à utiliser sont fournis au moteur d'inférence et il devrait chercher et identifier lui-même les faits et les règles à activer.

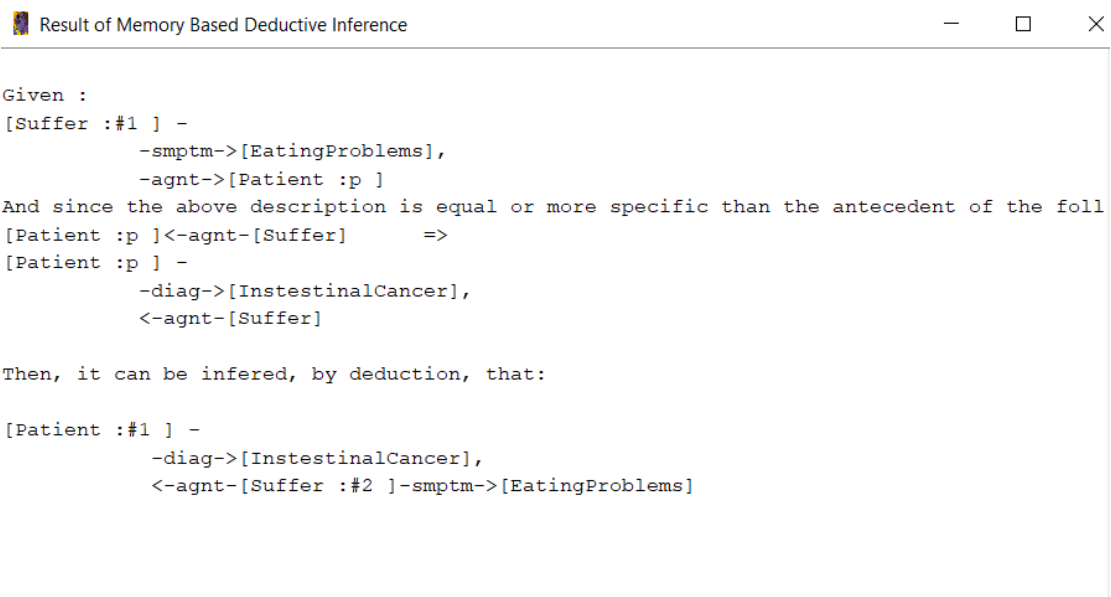
Dance cette partie on va tester la déduction, l'abduction et l'analogie.



1.Déduction



The window titled "Memory-Based Inferences Frame" contains a "Trace" checkbox, a "Situation Description" label, and a "Clear" button. A text area displays the logical expression: `[Patient :p]<-agnt-[Suffer]-smptm->[EatingProblems]`. Below the text area are three tabs: "LF Editor" (selected), "CGIF Editor", and "CG Graphic Editor". A "Deduction" button is located at the bottom right of the window.



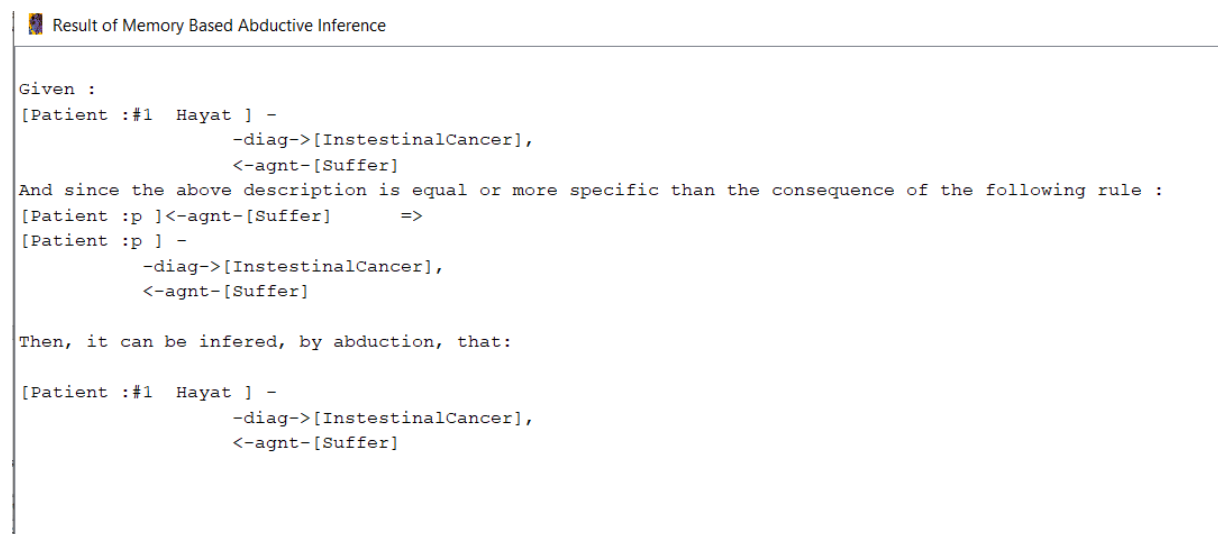
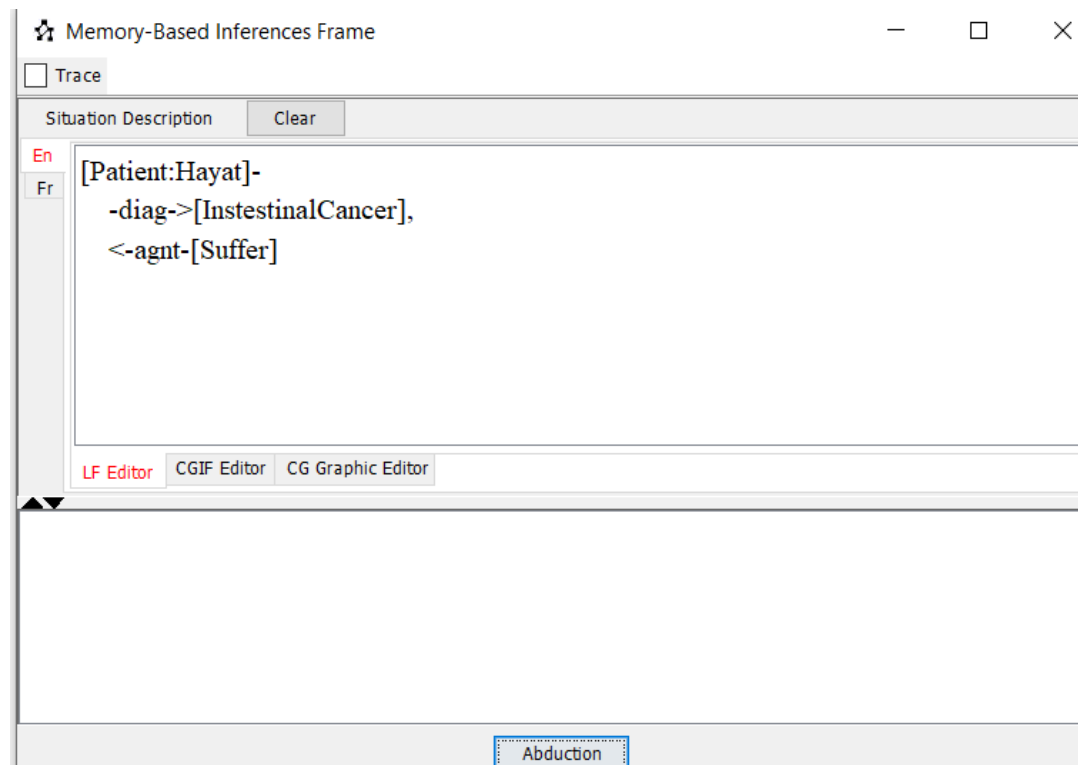
The window titled "Result of Memory Based Deductive Inference" displays the following text:

```
Given :
[Suffer :#1 ] -
    -smptm->[EatingProblems],
    -agnt->[Patient :p ]
And since the above description is equal or more specific than the antecedent of the foll
[Patient :p ]<-agnt-[Suffer]      =>
[Patient :p ] -
    -diag->[InstestinalCancer],
    <-agnt-[Suffer]

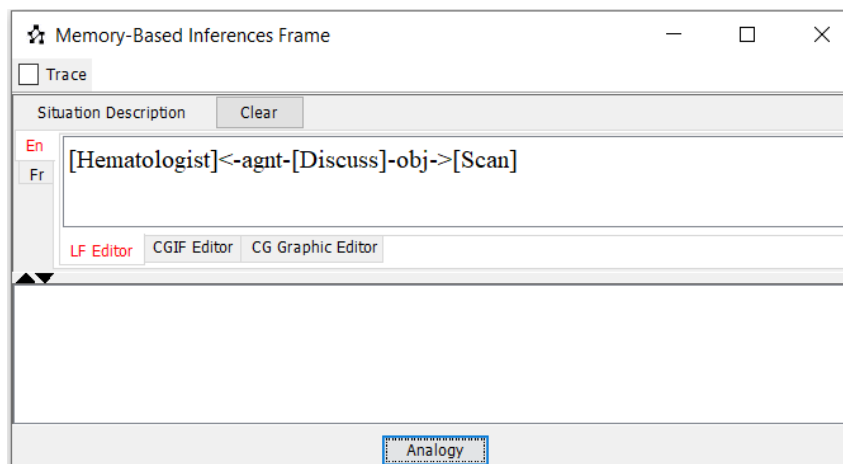
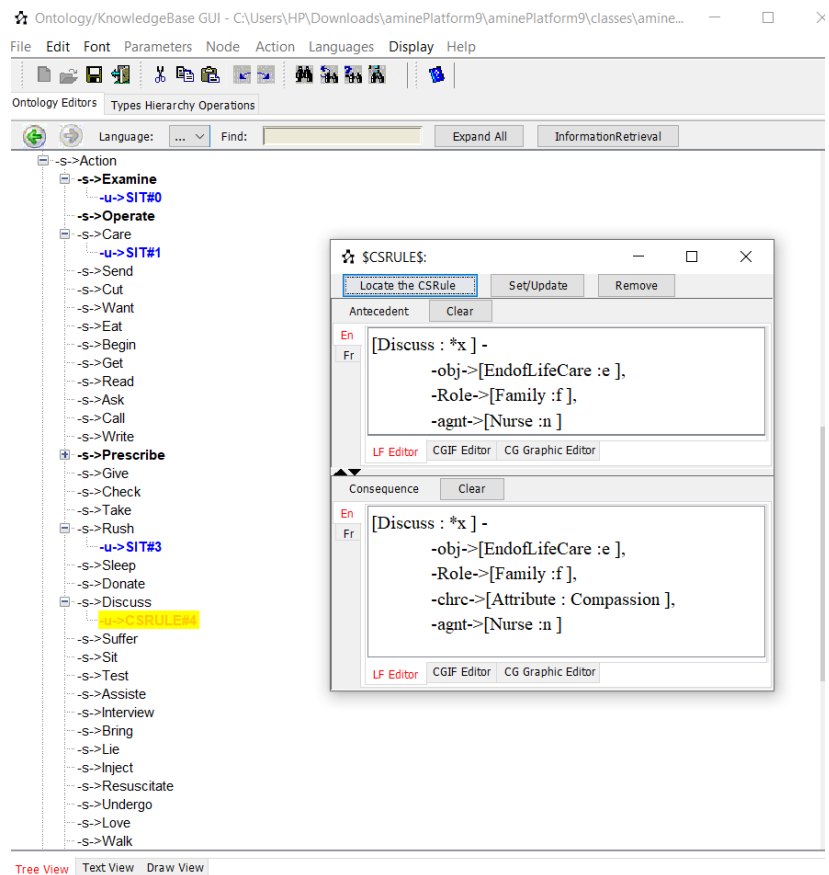
Then, it can be infered, by deduction, that:

[Patient :#1 ] -
    -diag->[InstestinalCancer],
    <-agnt-[Suffer :#2 ]-smptm->[EatingProblems]
```

2.Abduction



3. Analogue



Given :

```
[Discuss :_v171 ] -  
    -obj->[Scan :_v173 ],  
    -agnt->[Hematologist :_v172 ]
```

And since an analogical mapping has been created between the description and the antecedent of the fol

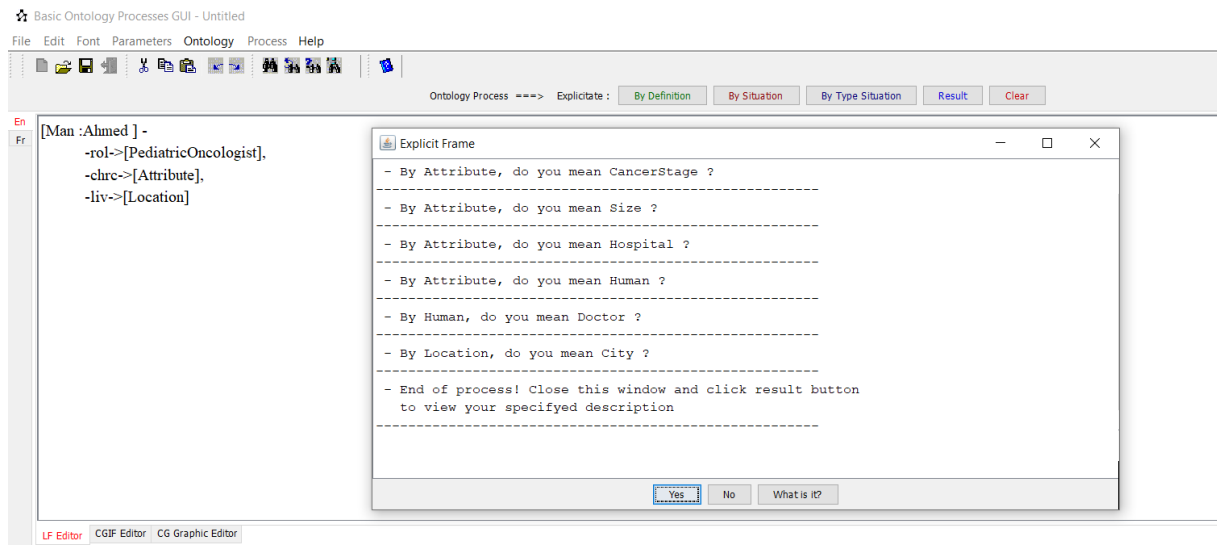
```
[Discuss : "1" ] -  
    -obj->[EndofLifeCare :e ],  
    -agnt->[Nurse :n ]      =>
```

```
[Discuss :#1 ] -  
    -obj->[EndofLifeCare :s ],  
    -chrc->[Attribute :Kind ],  
    -agnt->[Nurse :n ]
```

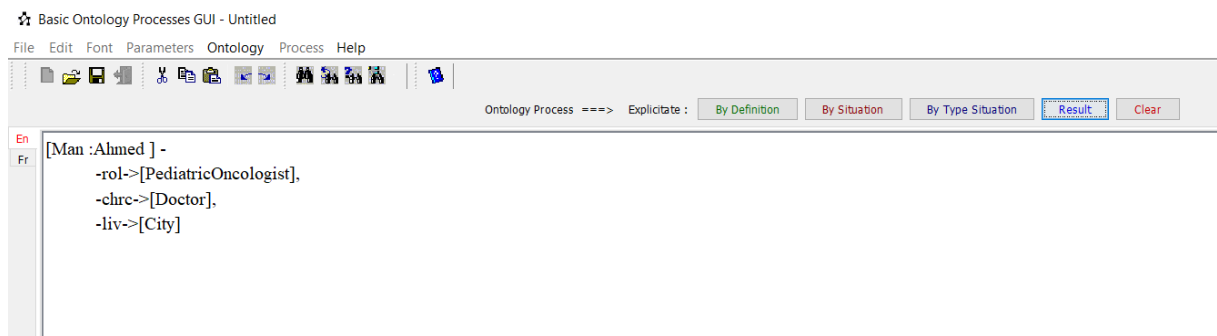
Then, it can be infered, by analogy, that:

```
[Discuss :#1 ] -  
    -obj->[EndofLifeCare :s ],  
    -chrc->[Attribute :Kind ],  
    -agnt->[Hematologist :_v172 ]
```

Processus



Résultat



Conclusion

Ce rapport discute et met en évidence les problèmes et la méthodologie de conception et de développement d'une ontologie et illustre l'utilisation de la plateforme Amine et de la hiérarchie des classes et sous-classes.

Différents concepts et ses membres de l'ontologie d'oncologie sont construits, et sont également expliquées à l'aide d'une capture d'écran. Avec l'implémentation de définitions, canons, descriptions, règles et situations, en utilisant les différents outils présentés par la plateforme, incluant : `Ontology/KB Editor`, `CGEditor`, `CGOperations`, `MemoryBaseInferences`, et `BasicOntologyKBProcess`.

Cela peut être utile pour les chercheurs qui souhaitent commencer avec la conception et le développement d'une ontologie et ses aspects connexes.

À l'avenir, il pourra être étendu au déploiement, à l'évaluation et à d'autres problèmes d'ontologie. L'ontologie est en cours d'extension pour couvrir différents types de cancers, avec leurs spécifique définitions, symptômes, diagnostics et traitements possibles.