Using a Degree of Interest Model for Adaptive Visualizations in Protégé

Tricia d'Entremont

Motivation

- Understanding the structure of and navigating within large ontologies is cognitively demanding
- Navigating the ontology is difficult
  - Long scrolling lists, expanding/collapsing nodes
  - Large number of irrelevant elements occlude relevant information
- Visualizations of structure often very dense and complex
  - Hard to know which elements to display

DIaMOND (Project)

- DIaMOND—Degree of Interest Modeling for Ontology Navigation and Development (http://www.thechiselgroup.org/diamond)
- Applies principles of attention-reactive interfaces (Card at PARC)
  - Mechanism to calculate user's degree of interest (DOI)
  - Dynamic display of information using the DOI
- Goals
  - Draw user's attention to interesting elements
  - Reduce navigation overhead

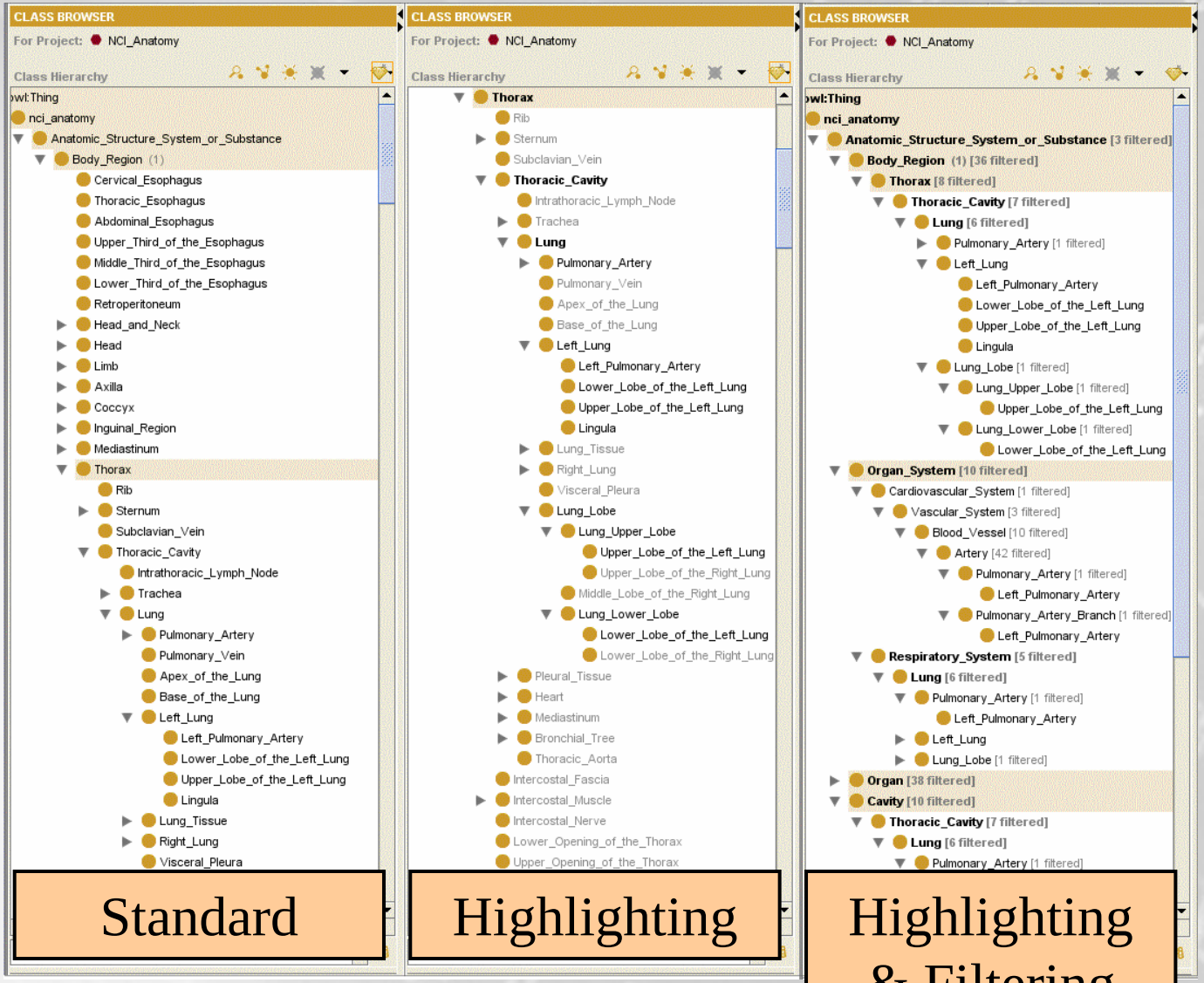
DIaMOND (Plug-in)

- Uses the Mylar degree of interest model plug-in for Eclipse (Kersten at UBC)
- Associates a degree of interest (DOI) value with elements in the ontology
  - Classes
  - Slots
  - Instances
- Uses the DOI value to provide adaptive visualizations of the ontology
  - highlight and filter elements within Protégé's views and Jambalaya's graph-based visualizations

DIaMOND (plug-in)

- Three levels of interest
  - Landmark: Hub concept
    - Manually specified by user
    - DOI value exceeds a *threshold* value
  - Interesting
    - Has been interacted with such that the DOI value exceeds a (lower) threshold value
  - Uninteresting
    - DOI value falls below the lower threshold value
- DOI calculation *decay* function
- Lightweight, easily reversible focus techniques
- Consistent with existing, familiar Protégé views.

Highlighting and Filtering in the Class Browser

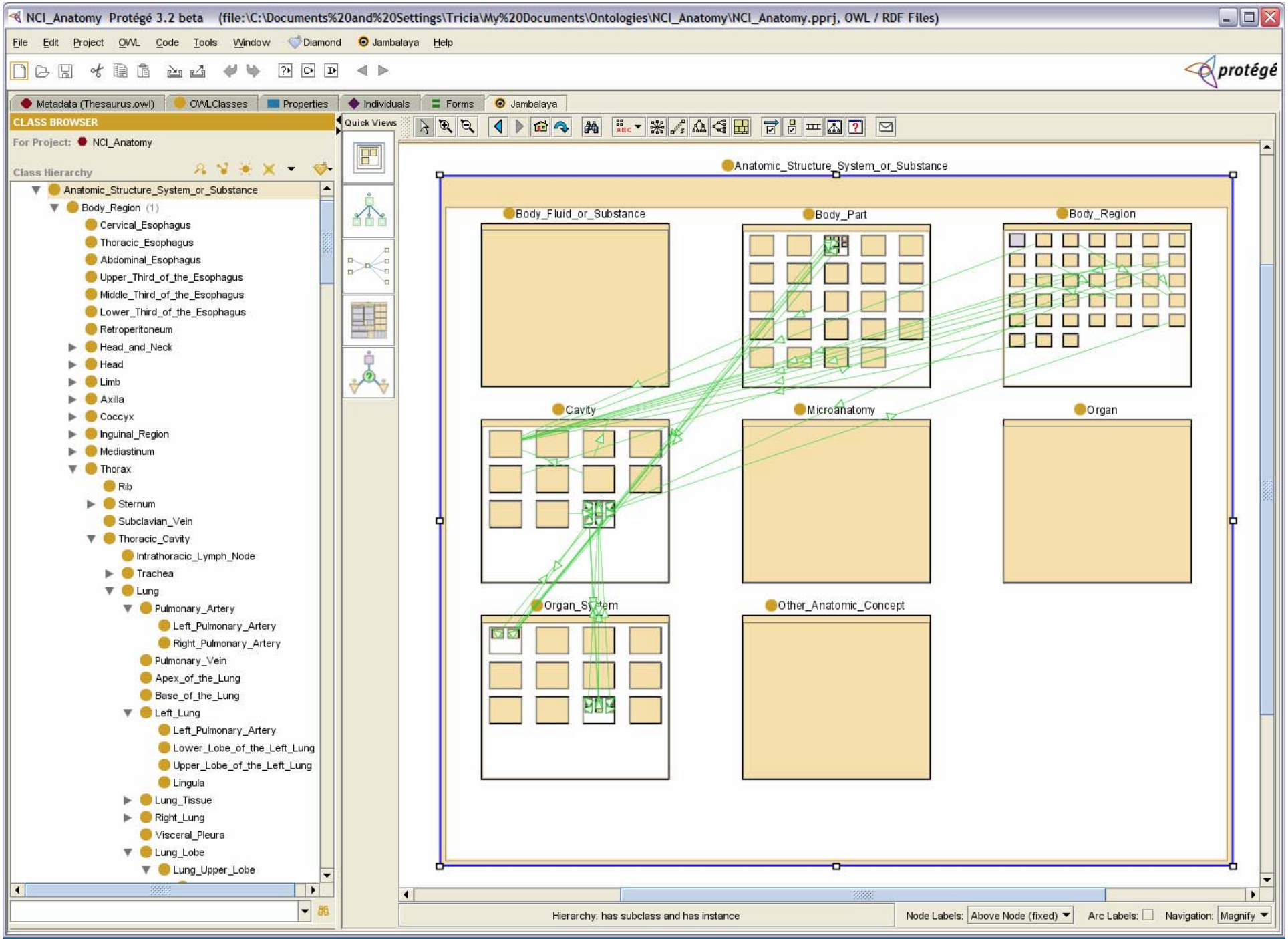


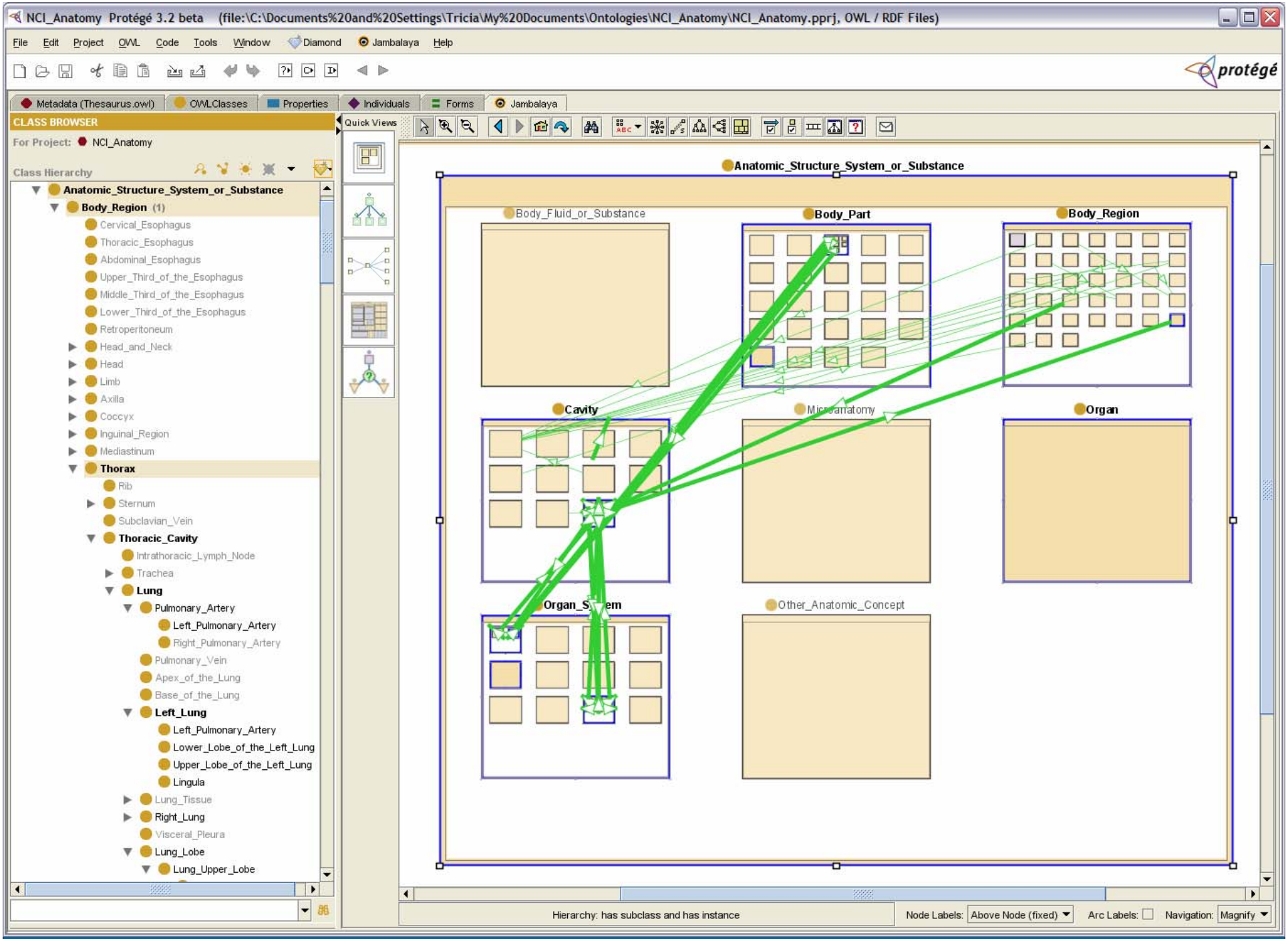
Jambalaya

- What is Jambalaya?
  - Protégé tab plug-in built on top of SHriMP
  - What is SHriMP?
    - Multiple, interchangeable, interactive graph views
    - Provides multiple perspectives at different levels of abstraction
    - Smooth animated zooming & layout transition
    - Embedded, editable Protégé forms
    - Originally for software comprehension
    - Also a plug-in for Eclipse *(Creole)*

Adaptive Visualizations—Jambalaya

- Currently:
  - Same three interest levels
    - Landmark, interesting, un-interesting
  - Font highlighting, bolding on node labels
  - Transparency used to “highlight” actual nodes
- In progress:
  - Motion techniques to capture user’s attention
  - Node size to show DOI value
  - Intelligent node label display


NCI_Anatomy Protégé 3.2 beta (file:\C:\Documents%20and%20Settings\Tricia\My%20Documents\Ontologies\NCI_Anatomy\NCI_Anatomy.pprj, OWL / RDF Files)
File Edit Project OWL Code Tools Window Diamond Jambalaya Help
protégé
Metadata (Thesaurus.owl) OWLClasses Properties Individuals Forms Jambalaya
CLASS BROWSER
For Project: NCI_Anatomy
Class Hierarchy
Anatomic_Structure_System_or_Substance
Body_Region (1)
Cervical_Esophagus
Thoracic_Esophagus
Abdominal_Esophagus
Upper_Third_of_the_Esophagus
Middle_Third_of_the_Esophagus
Lower_Third_of_the_Esophagus
Retroperitoneum
Head_and_Neck
Head
Limb
Axilla
Coccyx
Inguinal_Region
Mediastinum
Thorax
Rib
Sternum
Subclavian_Vein
Thoracic_Cavity
Intrathoracic_Lymph_Node
Trachea
Lung
Pulmonary_Artery
Left_Pulmonary_Artery
Right_Pulmonary_Artery
Pulmonary_Vein
Apex_of_the_Lung
Base_of_the_Lung
Left_Lung
Left_Pulmonary_Artery
Lower_Lobe_of_the_Left_Lung
Upper_Lobe_of_the_Left_Lung
Lingula
Lung_Tissue
Right_Lung
Visceral_Pleura
Lung_Lobe
Lung_Upper_Lobe
Quick Views
Anatomic_Structure_System_or_Substance
Body_Fluid_or_Substance
Body_Part
Body_Region
Cavity
Microanatomy
Organ
Organ_System
Other_Anatomic_Concept
Hierarchy: has subclass and has instance
Node Labels: Above Node (fixed)
Arc Labels:
Navigation: Magnify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protégé
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Thoracic_Esophagus
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Upper_Third_of_the_Esophagus
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Retroperitoneum
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Base_of_the_Lung
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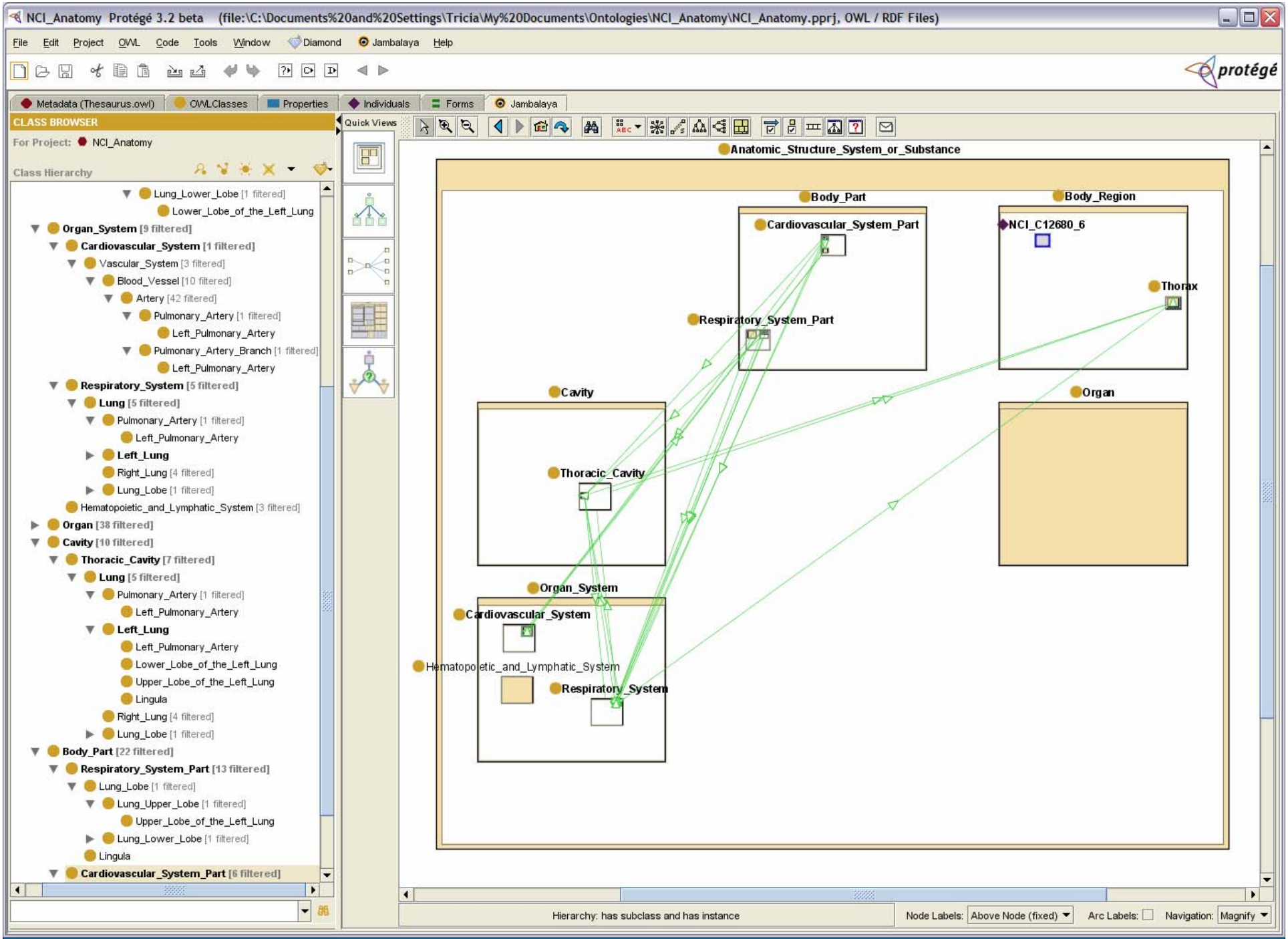
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protégé
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CLASS BROWSER
For Project: NCI_Anatomy
Class Hierarchy
Lung_Lower_Lobe [1 filtered]
Lower_Lobe_of_the_Left_Lung
Organ_System [9 filtered]
Cardiovascular_System [1 filtered]
Vascular_System [3 filtered]
Blood_Vessel [10 filtered]
Artery [42 filtered]
Pulmonary_Artery [1 filtered]
Left_Pulmonary_Artery
Pulmonary_Artery_Branch [1 filtered]
Left_Pulmonary_Artery
Respiratory_System [5 filtered]
Lung [5 filtered]
Pulmonary_Artery [1 filtered]
Left_Pulmonary_Artery
Left_Lung
Right_Lung [4 filtered]
Lung_Lobe [1 filtered]
Hematopoietic_and_Lymphatic_System [3 filtered]
Organ [38 filtered]
Cavity [10 filtered]
Thoracic_Cavity [7 filtered]
Lung [5 filtered]
Pulmonary_Artery [1 filtered]
Left_Pulmonary_Artery
Left_Lung
Left_Pulmonary_Artery
Lower_Lobe_of_the_Left_Lung
Upper_Lobe_of_the_Left_Lung
Lingula
Right_Lung [4 filtered]
Lung_Lobe [1 filtered]
Body_Part [22 filtered]
Respiratory_System_Part [13 filtered]
Lung_Lobe [1 filtered]
Lung_Upper_Lobe [1 filtered]
Upper_Lobe_of_the_Left_Lung
Lung_Lower_Lobe [1 filtered]
Lingula
Cardiovascular_System_Part [6 filtered]
Quick Views
Anatomic_Structure_System_or_Substance
Body_Part
Cardiovascular_System_Part
Respiratory_System_Part
Body_Region
NCI_C12680_6
Thorax
Cavity
Thoracic_Cavity
Organ
Organ_System
Cardiovascular_System
Hematopoietic_and_Lymphatic_System
Respiratory_System
Hierarchy: has subclass and has instance
Node Labels: Above Node (fixed)
Arc Labels:
Navigation: Magnify

DIaMOND plug-in features

- Integrated with Classes, Slots, Forms, Instances, and Instance Tree Tabs
- Integrated with Owl Classes, Properties, Individual and Forms Tabs
- Synchronized across tabs (almost)
- Threshold values are user configurable
- Highlighting of uninteresting, interesting and landmark concepts is user configurable
  - Font colour
  - Font weight
  - Font style (italics?)

Future Work

- Evaluation
  - Beginning initial evaluation
  - Interested in feedback from the community
  - Shameless plea for participants ☺
- Sharing DOI among users
- Role-based modeling
- Task-based DOI calculations
- Use of instance data to supplement DOI calculations

Conclusion

- Acknowledgements
  - Mik Kersten
  - Chris Callendar
  - National Center for Biomedical Ontology

References

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- http://www.eclipse.org/mylar
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- Kersten, M. and Murphy, G. C. 2005. Mylar: a Degree-of-Interest Model for IDEs. In Proceedings of the 4th International Conference on Aspect-Oriented Software Development. March 14-8, 2005.

Thank You.

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