Draft

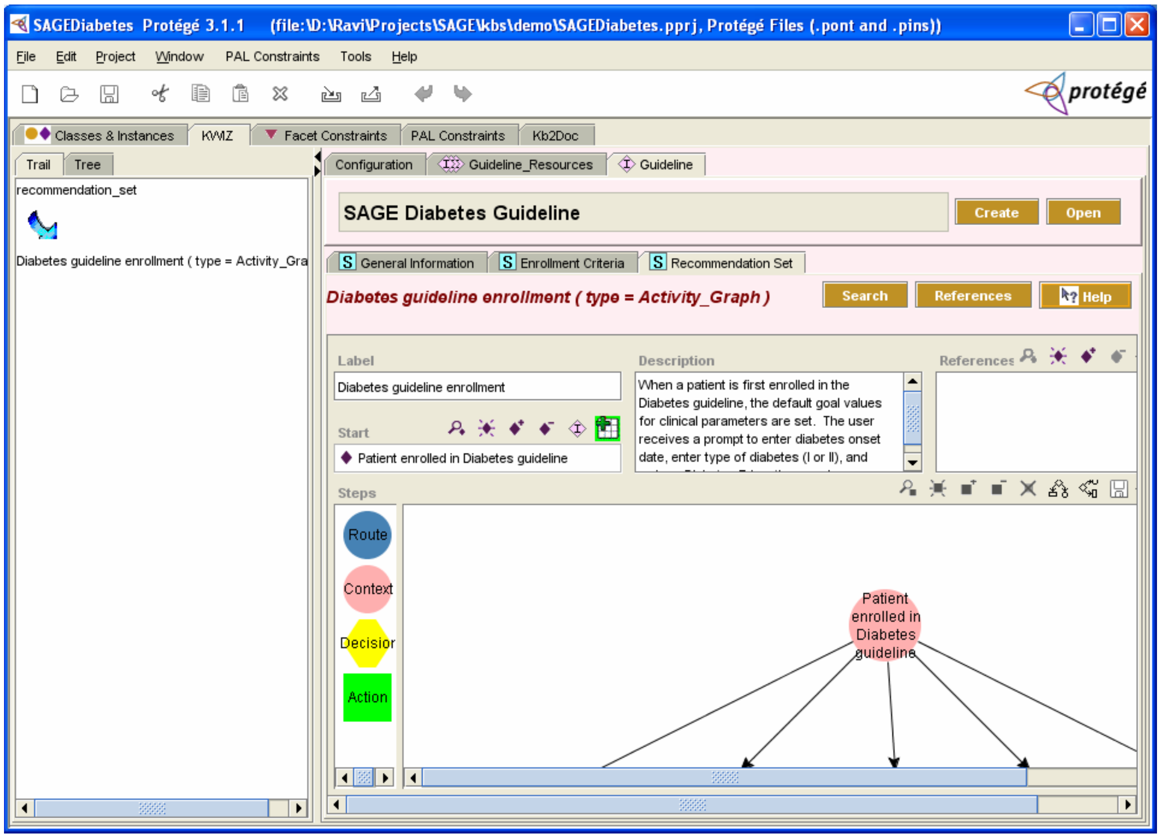
KWIZ, a Knowledge-Acquisition Framework

1 Introduction

KWIZ is built as an extension to Protégé to improve Protégé's knowledge-acquisition environment. The main components of KWIZ are:

- Customizable high-level views of the knowledge base
- Constrained navigation
- Reuse of existing knowledge bases
- Context-sensitive search and help

The KWIZ knowledge-acquisition environment is built as a tab-plugin of Protégé (Figure 1). In this document, we will first discuss the knowledge-base views supported by KWIZ and how to configure them using the KWIZ knowledge model. Next we will illustrate the main features of the KWIZ environment such as the views, the navigational modes to browse the knowledge base, the library facility and the search features.



When a patient is first enrolled in the Diabetes guideline, the default goal values for clinical parameters are set. The user receives a prompt to enter diabetes onset date, enter type of diabetes (I or II), and

Figure 1 KWIZ knowledge-acquisition environment

The KWIZ package also contains the kb2doc software and configuration files that are needed to generate HTML views of a SAGE guideline knowledge base.

2 Installation

The KWIZ software and the necessary Protégé projects are is available as part of the SAGE Guideline Workbench available from http://www.sageproject.net. The

“KwizTab Quick Start Notes.doc” file in the zip archive has installation instructions. It also appears as an appendix of this document.
The content of the installation package is configured to create KWIZ workbench for the SAGE guideline project. SAGE members can go directly to Section 4 and 5 for documentation on how to use KWIZ as a SAGE guideline workbench.

3 Configuration of KWIZ

3.1 Knowledge-base Views

KWIZ can provide a domain-specific view of the knowledge model concepts by creating forms that match a clinician’s cognitive model of the domain and that are mapped to components in the knowledge base. These views can be used to hide the complexities of the underlying computable model from the user. The views also allow compartmentalizing the knowledge base so that users are exposed only to parts of the knowledge base that are relevant to them. Views can be used to browse large knowledge bases effectively as they provide quick access to most used parts of the knowledge base.

In KWIZ, a view is a combination of three knowledge base components: a class of instances, a specific instance, and specific slots of an instance. We refer to these components as regions. Thus the ‘class of instances’ component is the Class region and the ‘specific instance’ component is the Instance region.

3.2 Configuration of Views

As part of KWIZ, we have developed a knowledge model that is used to specify the configuration of the knowledge-acquisition environment. Currently, the model is only used to define knowledge-base views. Thus, there are many other concepts such as knowledge-acquisition scripts included in the knowledge model but have not been implemented yet, and hence, the seeming complexity in defining views using the KWIZ model. Figure 2 shows the KWIZ model classes (as defined in the KWIZBase Protégé project). The highlighted classes are the only ones currently implemented and are necessary for specifying the views.

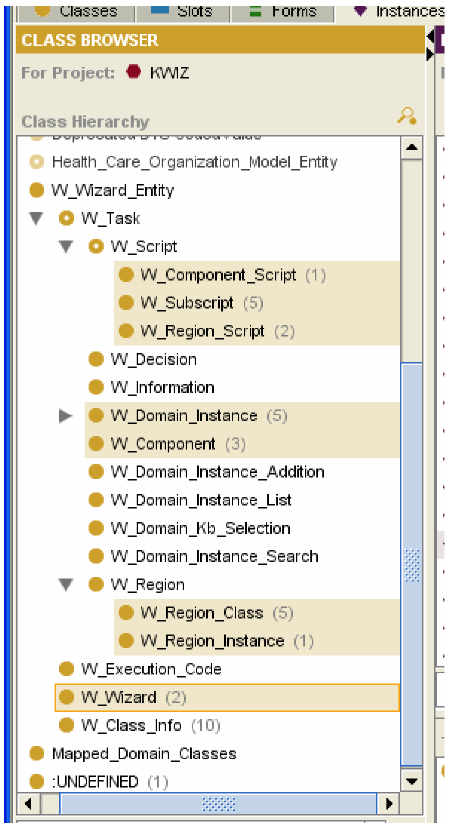


Figure 2 KWIZ knowledge model

In the following, we will use the terminology where a *domain model* means an ontology in an application domain (e.g., a model of clinical guideline) and a *domain knowledge base* means a knowledge base in that domain (e.g., a hypertension guideline as encoded in the specific guideline model). The major steps in configuring a KWIZ environment for a specific domain are:

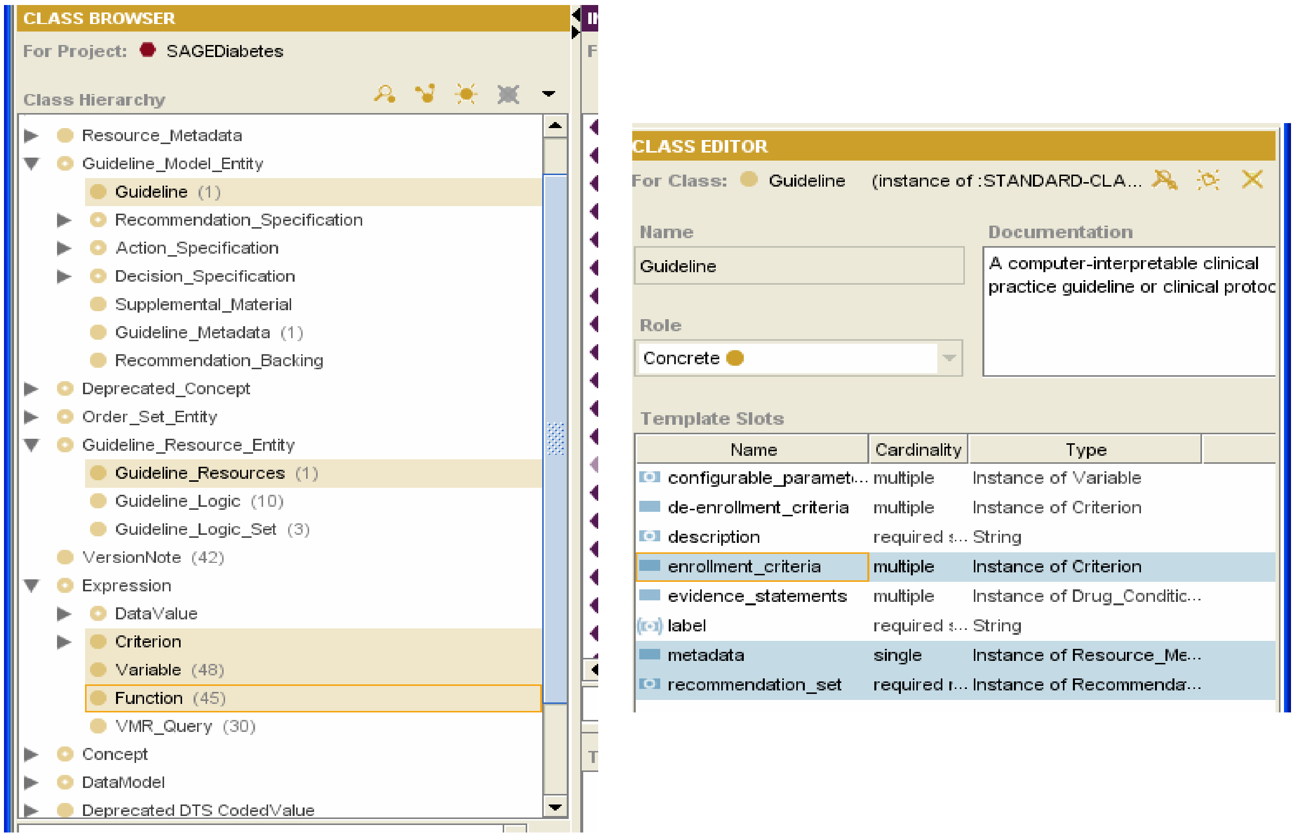
1. Copy the KWIZBase project to the directory that contains the domain model. Create an empty Protégé project in that directory, and name the project as, say, “KWIZinDomain.”Include in the KWIZinDomain project the KWIZBase project and the Protégé projects that specify the domain model.
2. Configure views using the KWIZ model and the domain model concepts.
3. Copy the KWIZinDomain project to the directory that contains a specific domain knowledge base project. Note that the same KWIZinDomain project can be used with multiple domain knowledge bases. In our example, if we configure KWIZinDomain to work with a clinical guideline model, that configuration can be used with different knowledge bases, such as the Immunization Guideline or the Diabetes Guideline, that use the same clinical guideline model.

We will illustrate the configuration of the views using the KWIZ model with an example. Figure 3 shows parts of a clinical guideline model. In our example, we want to create views that will expose only the concepts that have been highlighted. We want to create two views: a *Clinical Guideline* view and an *Expressions* view. The *Clinical Guideline* view will include a specific instance of the **Guideline** class and all instances of the **Guideline_Resources** class. Further, we want to expose only the highlighted slots (see Figure 3) of the **Guideline** class. The *Expressions* view will refer to all instances of **Criterion**, **Variable** and **Function** classes.

Each view is specified as an instance of the **Wizard** class of the KWIZ model (Figure 2). Thus, in our example, we will create two instances: *Clinical Guideline* and *Expressions*. In the KWIZ knowledge-acquisition environment, these two instances will be presented as options in the configuration screen (Figure 12). The main slot of the **Wizard** class is:

Region Script – defines the regions of the view.

Figure 4 shows the regions of the *Clinical Guideline* view. It has two regions: **Guideline_Resources** (a Class region which specifies the class whose instances will be part of the configured KWIZ knowledge-acquisition environment for the domain) and **Guideline** (an Instance region which displays the content of



CLASS BROWSER

For Project: SAGEDiabetes

Class Hierarchy

- Resource_Metadata
- Guideline_Model_Entity
  - Guideline (1)
  - Recommendation_Specification
  - Action_Specification
  - Decision_Specification
  - Supplemental_Material
  - Guideline_Metadata (1)
  - Recommendation_Backing
- Deprecated_Concept
- Order_Set_Entity
- Guideline_Resource_Entity
  - Guideline_Resources (1)
  - Guideline_Logic (10)
  - Guideline_Logic_Set (3)
- VersionNote (42)
- Expression
  - DataValue
  - Criterion
  - Variable (48)
  - Function (45)
  - VMR_Query (30)
- Concept
- DataModel
- Deprecated DTS CodedValue

CLASS EDITOR

For Class: Guideline (instance of :STANDARD-CLA...

Name: Guideline

Documentation: A computer-interpretable clinical practice guideline or clinical protoc

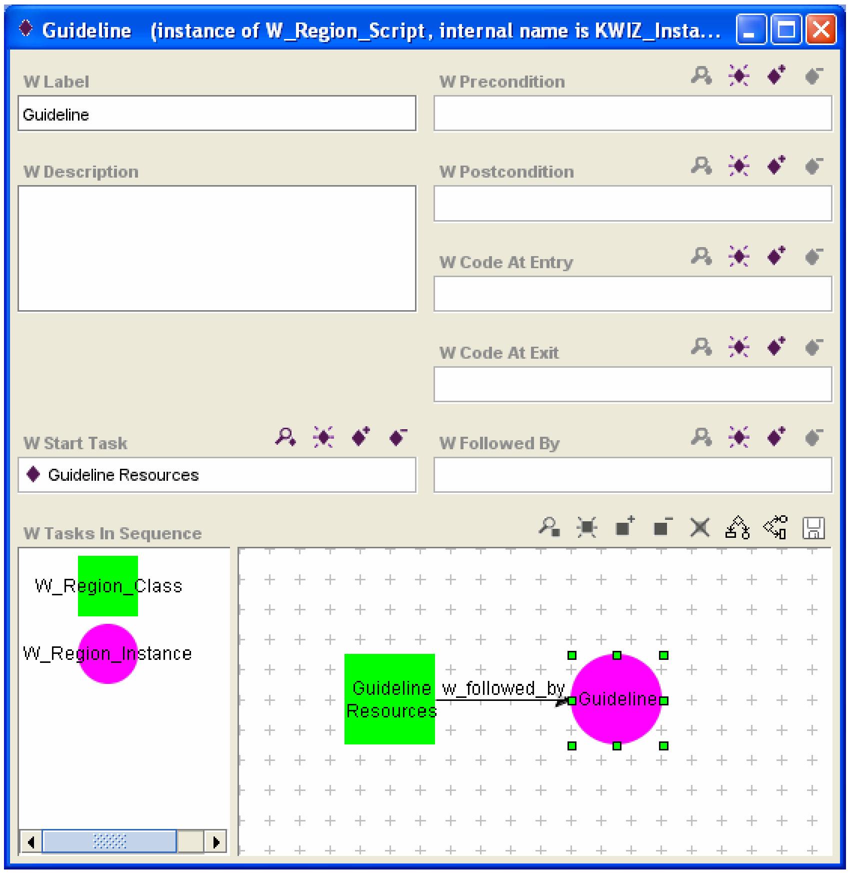
Role: Concrete

Template Slots

Name	Cardinality	Type
configurable_paramet...	multiple	Instance of Variable
de-enrollment_criteria	multiple	Instance of Criterion
description	required s...	String
enrollment_criteria	multiple	Instance of Criterion
evidence_statements	multiple	Instance of Drug_Conditic...
label	required s...	String
metadata	single	Instance of Resource_Me...
recommendation_set	required r...	Instance of Recommenda...

Figure 3 A clinical guideline model and the Guideline class

a particular instance). In the KWIZ environment, each region appear as tabs (Figure 1), and the order of the regions in the graph as seen in Figure 4 dictates the order of the tabs.


Guideline (instance of W_Region_Script, internal name is KWIZ_Insta...

W Label: Guideline

W Precondition:

W Description:

W Postcondition:

W Code At Entry:

W Code At Exit:

W Start Task: Guideline Resources

W Followed By:

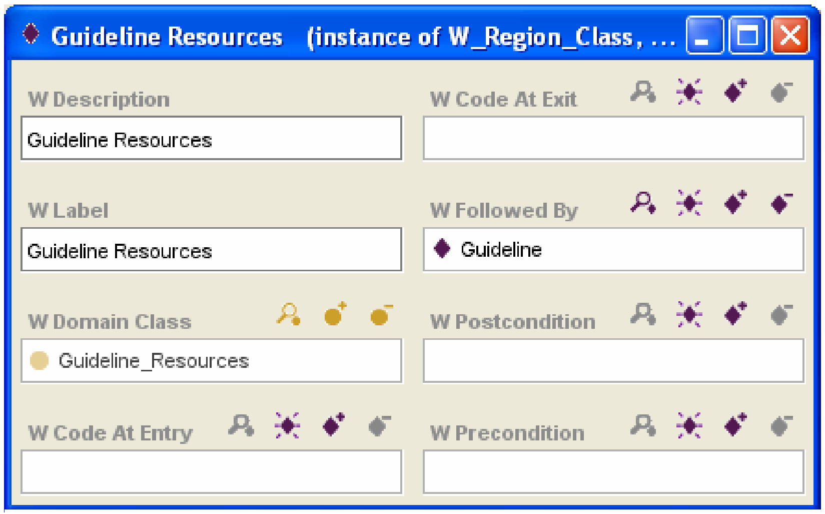
W Tasks In Sequence

Figure 4 Regions of the *Clinical Guideline* view

Figure 5 shows the Protégé form of a Class region. The main slot to be filled is:

Domain Class - the domain class that is associated with the Class region.

In our example, the clinical guideline domain class **Guideline_Resources** is associated with the Class region, Guideline_Resources (Figure 5). In the KWIZ environment, the tab *Guideline Resources* displays all instances of the domain class **Guideline_Resources** (Figure 11).


Guideline Resources (instance of W_Region_Class, ...

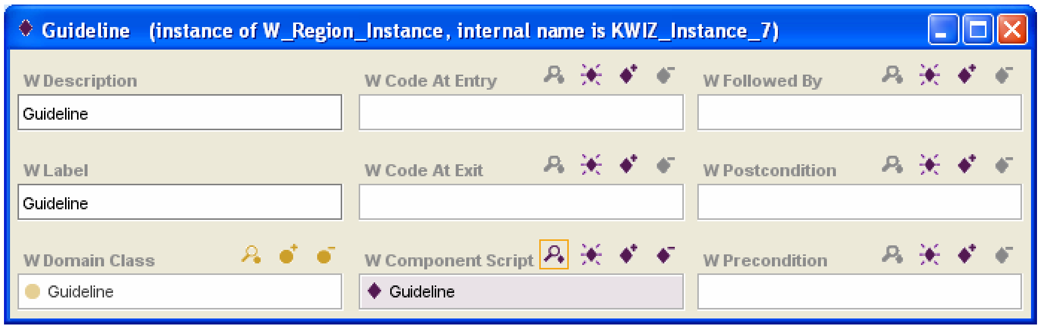
W Description: Guideline Resources	W Code At Exit:
W Label: Guideline Resources	W Followed By: ◆ Guideline
W Domain Class: ● Guideline_Resources	W Postcondition:
W Code At Entry:	W Precondition:

Figure 5 Guideline Resources, a Class region

Figure 6 shows the Protégé form of an Instance region. The main slots are:

Domain Class – the domain class associated with the Instance region

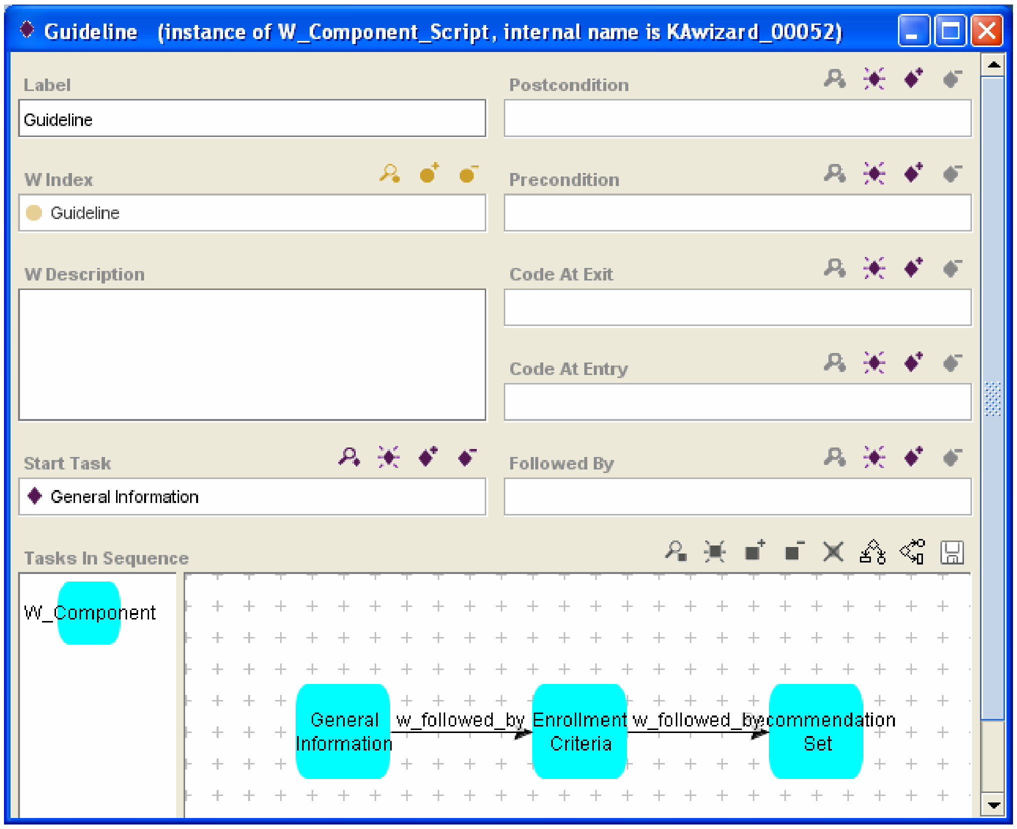
Component Script – the subset of slots of the domain class that should be shown with the instance.


Guideline (instance of W_Region_Instance, internal name is KWIZ_Instance_7)

W Description: Guideline	W Code At Entry:	W Followed By:
W Label: Guideline	W Code At Exit:	W Postcondition:
W Domain Class: ● Guideline	W Component Script: ◆ Guideline	W Precondition:

Figure 6 Guideline, an Instance region

As mentioned before, with an Instance region, we can choose to expose only a subset of slots of the associated domain instance. Figure 7 shows the Component Script for the Guideline region. This specification of the Guideline Instance region manifests in the KWIZ environment as the tab Guideline. The tab allows the user to view a specific instance of the domain class. The slots as specified in the Component Script appear as sub-tabs (Figure 16). As mentioned earlier, the KWIZ model allows the specification of complex knowledge-acquisition process that has not been implemented yet in the KWIZ GUI environment. Hence, specifying the components (slots of the domain instance) involves more steps than what may seem necessary. The two values necessary for specifying a component are the domain class and the appropriate slot of the


Guideline (instance of W_Component_Script, internal name is KAwizard_00052)

Label: Guideline
Postcondition:
W Index: Guideline
Precondition:
W Description:
Code At Exit:
Code At Entry:
Start Task: General Information
Followed By:
Tasks In Sequence: W_Component

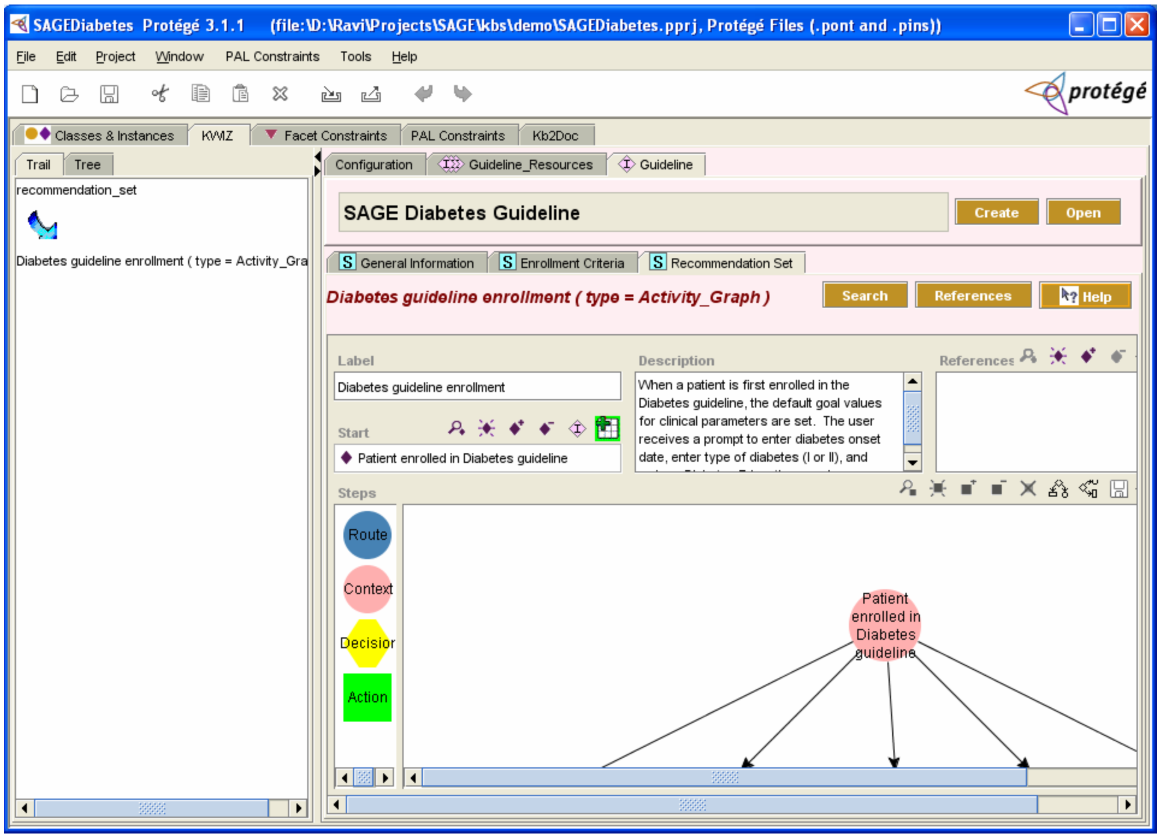
Figure 7 Components of the *Guideline* Instance region

domain class. In our example, for the Recommendation Set component, the domain class is **Guideline** and the domain slot is *recommendation_set,* both of which are part of the Clinical Guideline model. Figure 8 shows the *Recommendation Set* component that has a subscript. The subscript (Figure 9) has one task, a `Domain Instance`, in the task sequence. The Domain Instance task (Figure 10) has the slots *domain slot name* and *domain parent class* filled with the appropriate values.

Thus, the steps to configure views are: define the views, and, for each view, define the regions (Class region and/or Instance region) that make up the view, and then, for each Instance region define the domain slots that need to be exposed in the KWIZ environment.

4 The KWIZ Knowledge-acquisition Environment

KWIZ is a Protégé tab plugin. Once the KWIZ files have been appropriately installed, the user will be able to configure the Protégé environment to display the KWIZ tab as shown in Figure 11.



recommendation_set

Diabetes guideline enrollment (type = Activity_Gra

SAGE Diabetes Guideline

Diabetes guideline enrollment (type = Activity_Graph)

Label: Diabetes guideline enrollment

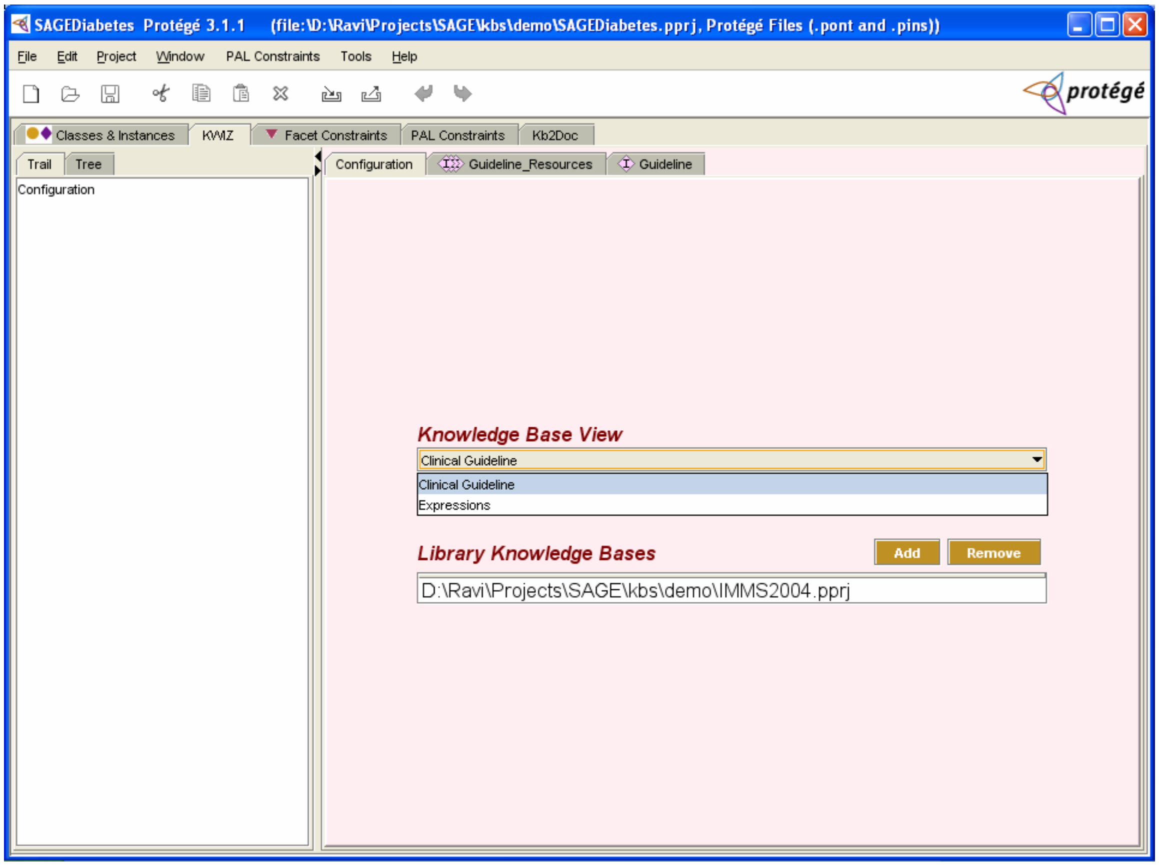
Description: When a patient is first enrolled in the Diabetes guideline, the default goal values for clinical parameters are set. The user receives a prompt to enter diabetes onset date, enter type of diabetes (I or II), and

Start: Patient enrolled in Diabetes guideline

Figure 11 KWIZ knowledge-acquisition environment

4.1 *The Configuration Screen*

The *Configuration* screen (Figure 12) allows the user to select a knowledge base view, and also to specify any previously developed knowledge bases as part of a library. KWIZ will load these knowledge bases in the background and the user will be able to view instances in the library and copy selected instances into the current knowledge base.

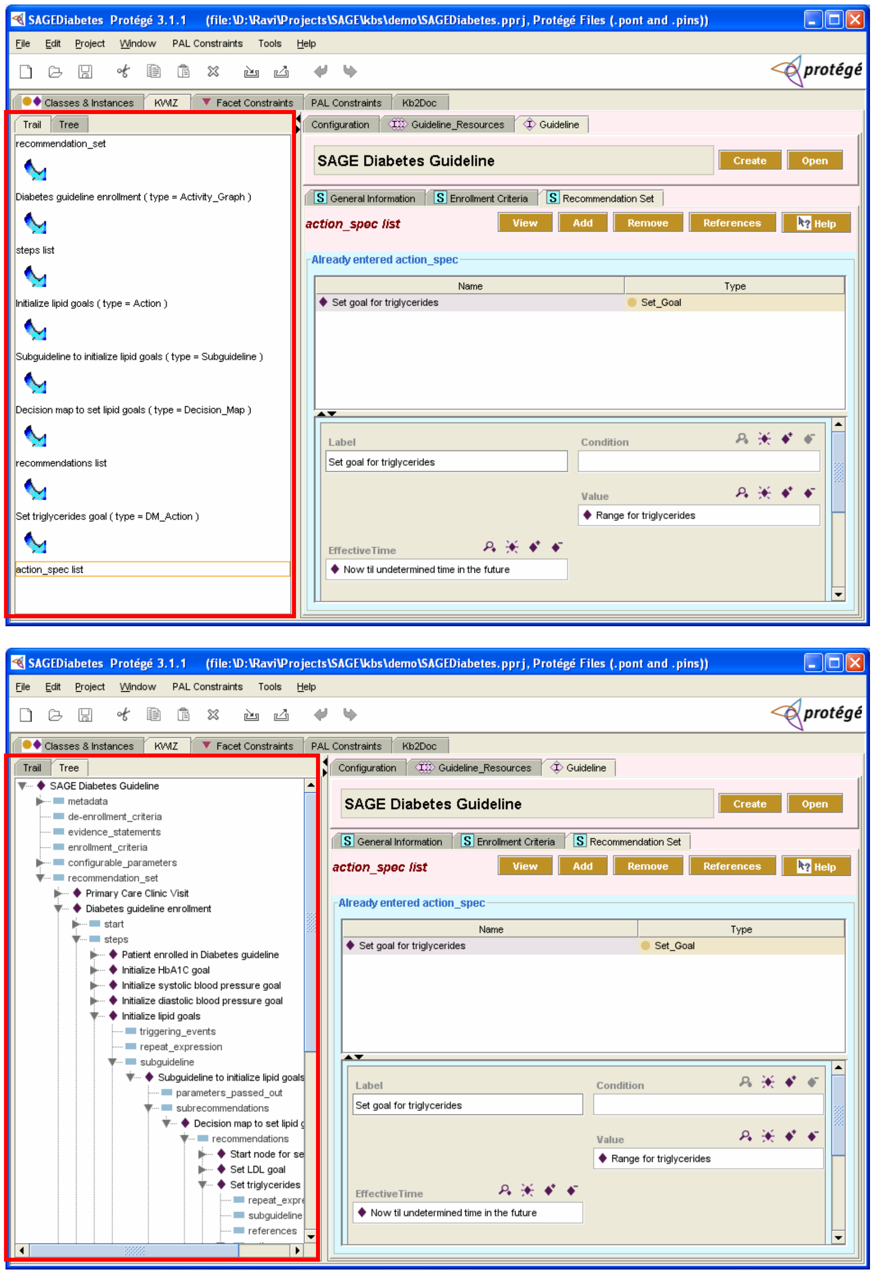

SAGEDiabetes Protégé 3.1.1 (file:\D:\Ravi\Projects\SAGE\kbs\demo\SAGEDiabetes.pprj, Protégé Files (.pont and .pins))
File Edit Project Window PAL Constraints Tools Help
protégé
Classes & Instances KWIZ Facet Constraints PAL Constraints Kb2Doc
Trail Tree
Configuration
Configuration Guideline_Resources Guideline
Knowledge Base View
Clinical Guideline
Clinical Guideline
Expressions
Library Knowledge Bases
Add
Remove

D:\Ravi\Projects\SAGE\kbs\demo\IMMS2004.pprj

Figure 12 KWIZ Configuration Screen

4.2 The Navigation Trail / Tree

As and when the user navigates to different parts of the knowledge base via the KWIZ screens, the Trail tab (Figure 13) on the navigation panel on the left-hand side of the KWIZ tab shows the path taken by the user. By double-clicking on any entry on the path, the user can back-track to that point. The Tree tab on the navigation panel displays the instance hierarchy. The user can double-click on a node (instance) on the tree to view that instance.


SAGEDiabetes Protégé 3.1.1 (file:\D:\Ravi\Projects\SAGE\kbs\demo\SAGEDiabetes.pprj, Protégé Files (.pont and .pins))
File Edit Project Window PAL Constraints Tools Help
protégé
Classes & Instances KWIZ Facet Constraints PAL Constraints Kb2Doc
Trail Tree
Configuration Guideline_Resources Guideline
Create Open
General Information Enrollment Criteria Recommendation Set
action_spec list
View Add Remove References Help
Already entered action_spec
Name Type
Label Condition Value EffectiveTime

recommendation_set
Diabetes guideline enrollment (type = Activity_Graph)
steps list
Initialize lipid goals (type = Action)
Subguideline to initialize lipid goals (type = Subguideline)
Decision map to set lipid goals (type = Decision_Map)
recommendations list
Set triglycerides goal (type = DM_Action)
action_spec list

SAGE Diabetes Guideline

Name	Type
Set goal for triglycerides	Set_Goal

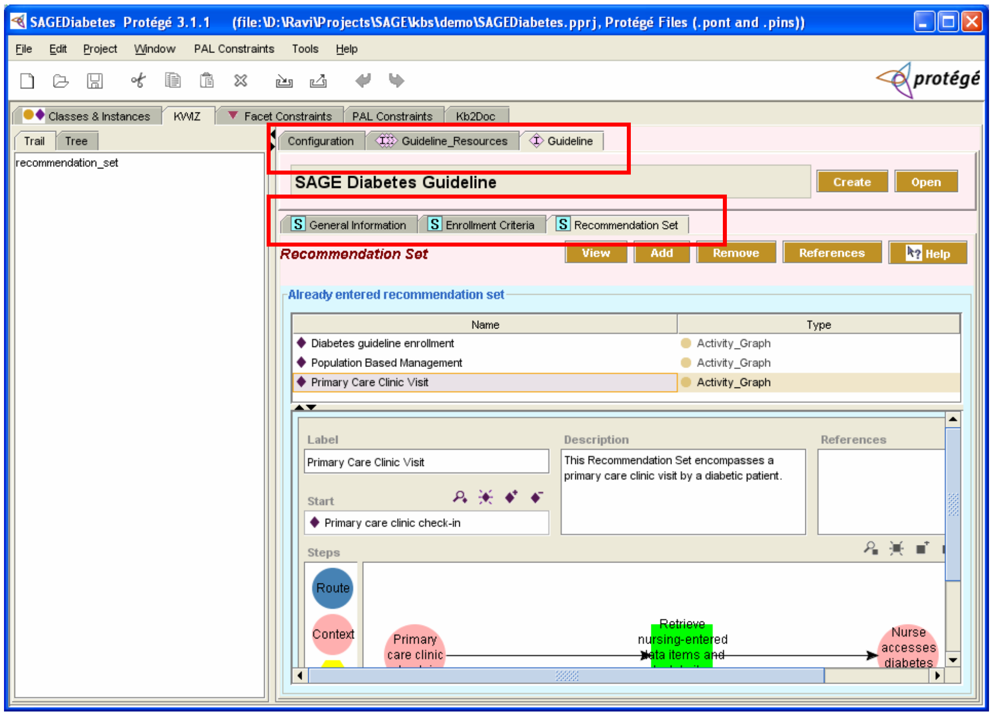
Label: Set goal for triglycerides
Value: Range for triglycerides
EffectiveTime: Now til undetermined time in the future

```
SAGE Diabetes Guideline
  metadata
  de-enrollment_criteria
  evidence_statements
  enrollment_criteria
  configurable_parameters
  recommendation_set
    Primary Care Clinic Visit
    Diabetes guideline enrollment
      start
      steps
        Patient enrolled in Diabetes guideline
        Initialize HbA1C goal
        Initialize systolic blood pressure goal
        Initialize diastolic blood pressure goal
        Initialize lipid goals
          triggering_events
          repeat_expression
          subguideline
            Subguideline to initialize lipid goals
              parameters_passed_out
              subrecommendations
                Decision map to set lipid g
                  recommendations
                    Start node for se
                    Set LDL goal
                    Set triglycerides
                      repeat_expre
                      subguideline
                      references
```

Figure 13 Navigation Trail and Tree

4.3 *The Tabs*

The regions of the knowledge base views are presented as subtabs of the KWIZ tab (Figure 14). With an Instance region tab, the sub-tabs display the slots of the domain instance. The configuration of the views, regions and slots is explained in the *Configuration of Views* section.


SAGEDiabetes Protégé 3.1.1 (file:\D:\Ravi\Projects\SAGE\kbs\demo\SAGEDiabetes.pprj, Protégé Files (.pont and .pins))
File Edit Project Window PAL Constraints Tools Help
protégé
Classes & Instances KWIZ Facet Constraints PAL Constraints Kb2Doc
Trail Tree
recommendation_set
Configuration Guideline_Resources Guideline
SAGE Diabetes Guideline
Create Open
General Information Enrollment Criteria Recommendation Set
Recommendation Set
View Add Remove References Help
Already entered recommendation set
Label Description References
Start
Steps
Route
Context
Primary care clinic
Retrieve nursing-entered data items and
Nurse accesses diabetes

Name	Type
Diabetes guideline enrollment	Activity_Graph
Population Based Management	Activity_Graph
Primary Care Clinic Visit	Activity_Graph

Label: Primary Care Clinic Visit

Description: This Recommendation Set encompasses a primary care clinic visit by a diabetic patient.

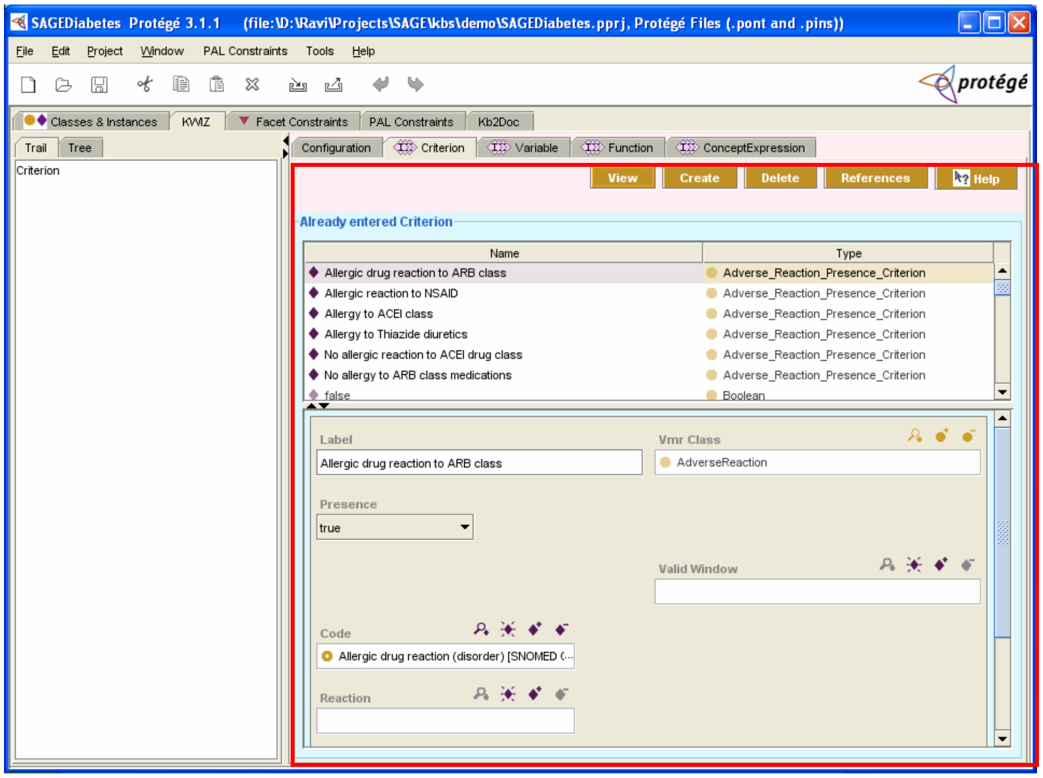
Start: Primary care clinic check-in

Figure 14 Components of a view presented as tabs

4.4 The Class Region screen

The *Class Region* screen displays all the instances of a domain class (Figure 15). This same UI is also used, when traversing the instance hierarchy, to display the values of a multiple-cardinality slot of *instance* value type (see Figure 16 that displays values of the *recommendation_set* slot of the Guideline instance). The screen has two main sections.
The top section displays a list of buttons that correspond to a set of tasks that the user can perform.
The main section displays a list of instances, and a preview area. The user can select any entry on the list to display the corresponding instance in the preview area.
The user can perform the following tasks:

- ***View*** Select the instance on the list. Click on the *View* button. A shortcut to this task is to double-click the instance on the list
- ***Create*** An instance can be added to the list by clicking on the *Create* button. This will take the user to another screen where the user can either create a new instance, copy one from the library, clone or refer to an already created instance in the current knowledge base
- ***Delete*** An instance can be deleted from the list by selecting the instance and clicking on the *Delete* button
- ***References*** Knowledge base elements (classes and instances) that refer to a selected instance can be displayed by clicking on the *References* button.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File Edit Project Window PAL Constraints Tools Help
protégé
Classes & Instances
KWMZ
Facet Constraints
PAL Constraints
Kb2Doc
Trail
Tree
Criterion
Configuration
Criterion
Variable
Function
ConceptExpression
View
Create
Delete
References
Help
Already entered Criterion

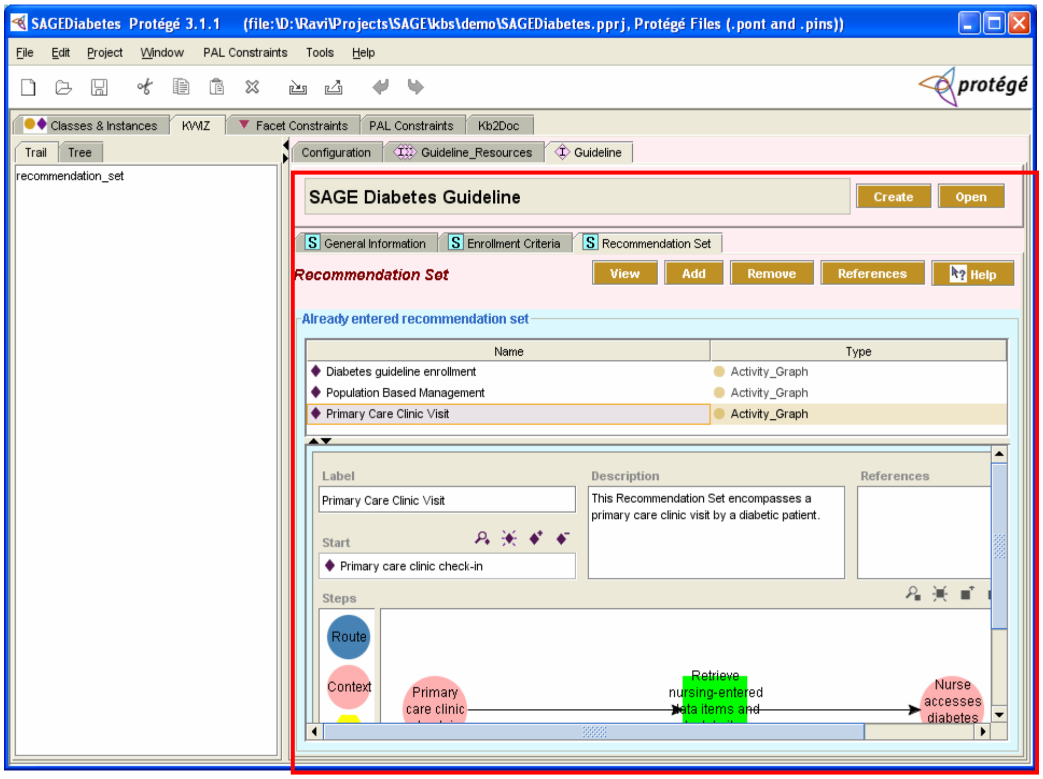
Name	Type
Allergic drug reaction to ARB class	Adverse_Reaction_Presence_Criterion
Allergic reaction to NSAID	Adverse_Reaction_Presence_Criterion
Allergy to ACEI class	Adverse_Reaction_Presence_Criterion
Allergy to Thiazide diuretics	Adverse_Reaction_Presence_Criterion
No allergic reaction to ACEI drug class	Adverse_Reaction_Presence_Criterion
No allergy to ARB class medications	Adverse_Reaction_Presence_Criterion
false	Boolean

Label: Allergic drug reaction to ARB class
Vmr Class: AdverseReaction
Presence: true
Valid Window:
Code: Allergic drug reaction (disorder) [SNOMED (...
Reaction:

Figure 15 A *Class Region* screen; also used to display a list of instances

4.5 The Instance Region screen

This screen allows the user to select a specific instance. It displays the configured slots of the instance as sub-tabs (Figure 16).


SAGEDiabetes Protégé 3.1.1 (file:\D:\Ravi\Projects\SAGE\kbs\demo\SAGEDiabetes.pprj, Protégé Files (.pont and .pins))
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Trail Tree
recommendation_set
Configuration Guideline_Resources Guideline
SAGE Diabetes Guideline
Create Open
General Information Enrollment Criteria Recommendation Set
Recommendation Set
View Add Remove References Help
Already entered recommendation set
Label
Description
References
Start
Steps
Route
Context
Primary care clinic
Retrieve nursing-entered data items and
Nurse accesses diabetes

Name	Type
Diabetes guideline enrollment	Activity_Graph
Population Based Management	Activity_Graph
Primary Care Clinic Visit	Activity_Graph

Label: Primary Care Clinic Visit

Description: This Recommendation Set encompasses a primary care clinic visit by a diabetic patient.

Start: Primary care clinic check-in

Figure 16 An *Instance Region* screen

4.6 *The Instance Form screen*

The *Instance Form* screen (Figure 17) displays a Protégé instance. The screen has two main sections. The top section displays the name of the instance that you are browsing and a list of buttons that correspond to a set of tasks that can be performed. The main section displays the instance form that uses some special slot widget buttons.

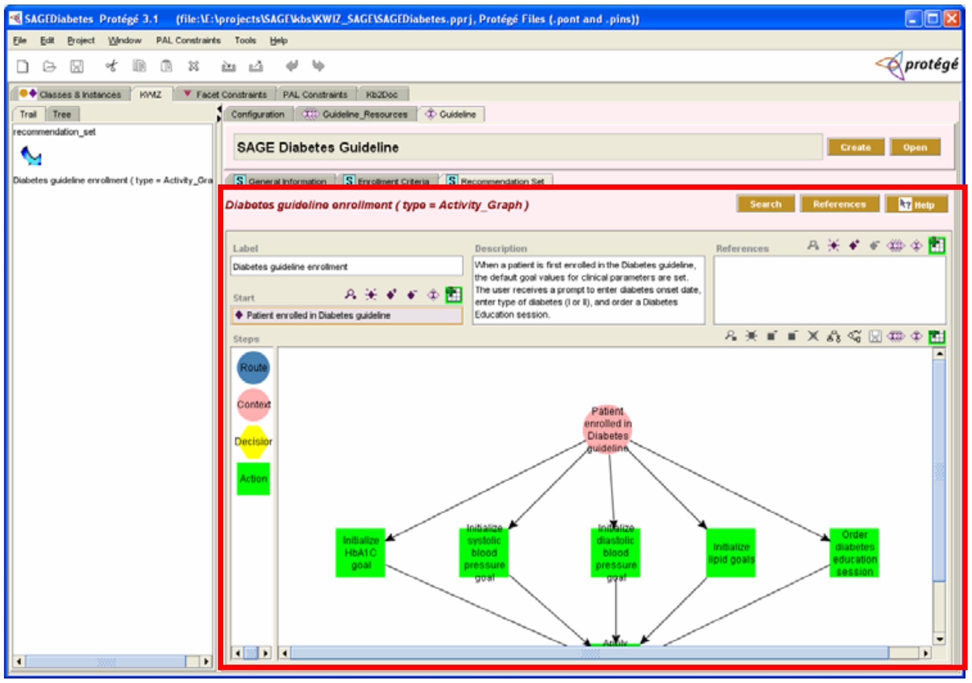
The buttons in the top section are:

- ***Search*** When the user clicks this button a search form is displayed that allows the user to search the instance tree with the current instance as the root (i.e., all instances that are referenced directly or directly from the root instance).
- ***References*** Knowledge base elements (frames) that refer to an instance can be displayed by selecting that instance and by clicking on the *References* button.

The special slot widget buttons are:

- Allows the user to zoom-in to a slot to display the form that lists the slot values.
- Allows the user to zoom-in to a slot of single cardinality to display the form that shows the slot value. The button can also be used to zoom-into a specific instance in the case of multiple cardinality slots.

Allows the user to add a value to the slot. The value can either be a new instance or an instance from the library or local knowledge bases.


SAGEDiabetes Protégé 3.1 (file:\E:\projects\SAGE\kbs\KWIZ_SAGE\SAGEDiabetes.pprj, Protégé Files (.pont and .pins))
File Edit Project Window PAL Constraints Tools Help
protégé
Classes & Instances
KWIZ
Facet Constraints
PAL Constraints
Kb2Doc
Trail Tree
recommendation_set
Diabetes guideline enrollment (type = Activity_Gra
Configuration
Guideline_Resources
Guideline
Create
Open
General Information
Enrollment Criteria
Recommendation Set
Search
References
Help
Label
Description
References
Start
Steps
Route
Context
Decision
Action
Patient enrolled in Diabetes guideline
Initialize HbA1C goal
Initialize systolic blood pressure goal
Initialize diastolic blood pressure goal
Initialize lipid goals
Order diabetes education session
Notify

SAGE Diabetes Guideline

Diabetes guideline enrollment (type = Activity_Graph)

Label: Diabetes guideline enrollment

Description: When a patient is first enrolled in the Diabetes guideline, the default goal values for clinical parameters are set. The user receives a prompt to enter diabetes onset date, enter type of diabetes (I or II), and order a Diabetes Education session.

Start: Patient enrolled in Diabetes guideline

Figure 17 An *Instance Form* screen

4.7 The Instance Creation screen

The *Instance Creation* screen (Figure 18) allows you to create an instance of a class. There are two situations where one would want to create an instance: 1) to add to the list of instances of a class (Figure 15), and 2) to add a value to a slot of type Instance (Figure 16). This screen has two main sections. The top *create / search* section displays a create interface that allows you to create a new instance of an allowed class type. It also displays a search interface that allows you to search for instances in the library or in the local (working) knowledge base.

The main *search results* section displays the results of the search and buttons corresponding to tasks that can be performed

4.7.1 How to create new instance

The *create / search* section allows you to create new instances. The first step is to specify the type of instance you want to create. When creating an instance to add to a list of instances of a class (situation 1), the allowed type will be the Class itself, and, if the Class is abstract, any of its concrete sub-classes. When creating an instance to be a value of a slot (situation 2), the allowed type will be the allowed types of the slot. If there is only one allowed type, then that type will already be populated in the Value Type(s) field. If there is more than one allowed type, click on the Select button to display the allowed types. Select the type from the list. The Value Type(s) field will be populated with that selection. Now click on the Create button. An instance of the specified type will be created and added to the list of instances of the class (situation 1) or as a value of a slot (situation 2). The new instance is then displayed for edition.

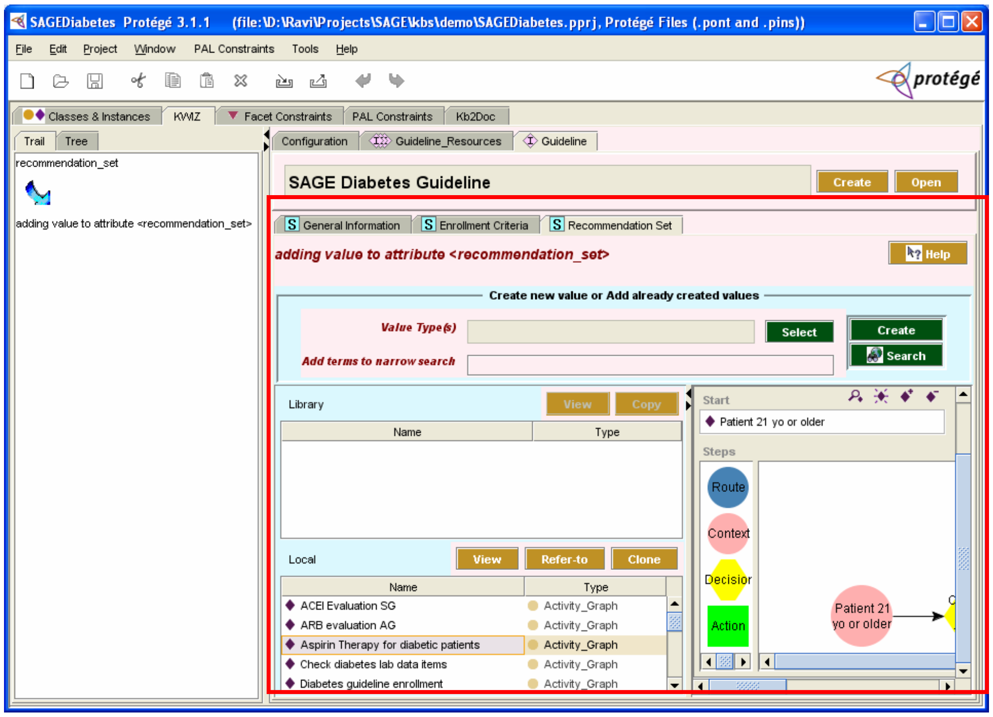
4.7.2 How to search for instances

The first step is to specify the search criteria in the top *create / search* section. There are two parts to the search criteria: 1), the types of instances you want to search and 2) the search terms to narrow the search further. If there is only one allowed type, then that type will already be populated in the Value Type(s) field. If there is more than one allowed type, click on the Select button to display the allowed types. Select the types of instances you want to search on from the list. The Value Type(s) field will be populated with that selection. You can further narrow the search by entering terms in the Add terms to narrow search text field. You can specify * as a wild card. These terms will be matched against the browser text of the instances. Click on the Search button to search the library and local knowledge bases.

The main *search results* section displays instances in the library and local knowledge base that match the search criteria. There are several tasks that the user can perform in the search results section:

Viewing an instance Select an instance on the list to display the instance form on the right. The instance can also be viewed as a pop-up by

selecting the instance on the list and clicking on the *View* buttons, or by just double-clicking on the instance.
Copying an instance from the library Select the instance from the library list. Click on the *Copy* button. The entire instance tree starting from the selected instance as the root is copied over to the local knowledge base. The copy function does not copy instances in the source instance tree for which there are instances that have identical slot values in the local knowledge base.
Referring-to an instance in the local knowledge base: Select the instance from the local list. Click on the *Refer-to* button.
Cloning an instance from the library Select the instance from the local list. Click on the *Clone* button. The selected instance is then cloned i.e. the instance is copied upto one-level.
Note that the instances created by any of these tasks are added to the list of instances of the class (situation 1) or as a value of a slot (situation 2). Also, the instances are displayed for any further editing after the task is performed.



adding value to attribute <recommendation_set>

Library

Name	Type

Local

Name	Type
ACEI Evaluation SG	Activity_Graph
ARB evaluation AG	Activity_Graph
Aspirin Therapy for diabetic patients	Activity_Graph
Check diabetes lab data items	Activity_Graph
Diabetes guideline enrollment	Activity_Graph

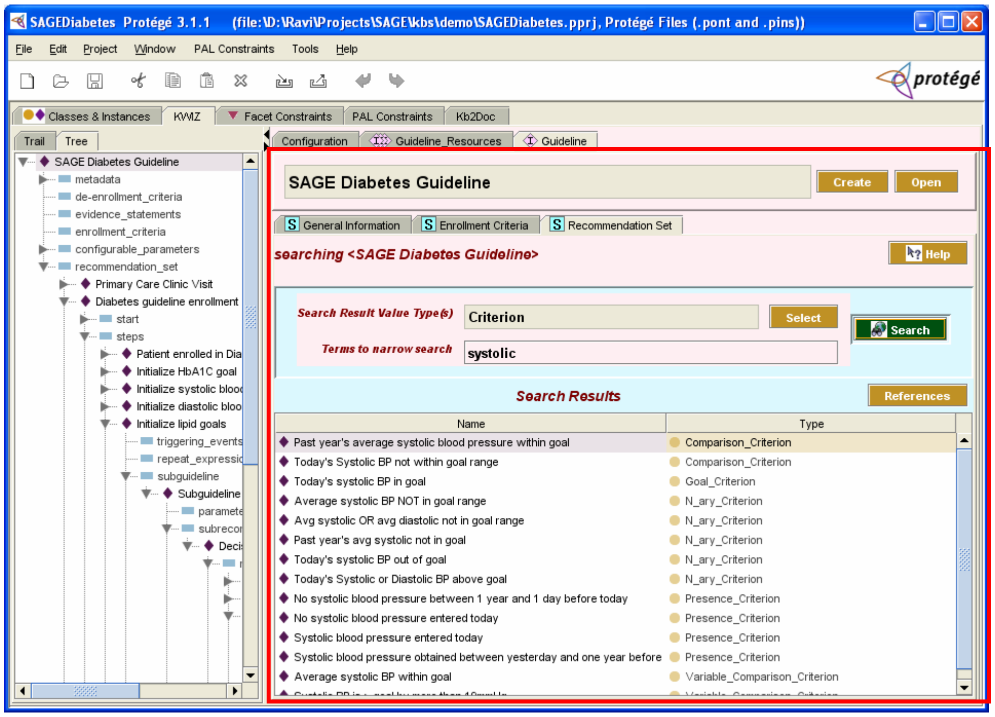
Figure 18 *Create Instance* screen

4.8 *The Instance Tree Search screen*

The search screen (Figure 19) has two main sections. The top ***search criteria*** section displays a search interface that allows you to search an instance tree for specific knowledge elements with the current instance as the root of the tree. The main ***search results*** section displays the results of the search.

4.8.1 How to search an instance tree

The first step is to specify the search criteria in the top ***search criteria*** section. There are two parts to the search criteria: 1), the types (classes) of instances you want to search and 2) the search terms to narrow the search further. Click on the Select button to display the types. Select the types of instances you want to search on from the list. The Value Type(s) field will be populated with that selection. You can further narrow the search by entering terms in the *Add terms to narrow search* text field. You can specify * as a wild card. These terms will be matched against the browser text of the instances on the instance tree. Click on the Search button to search the instance tree.
The main ***search results*** section displays instances in the instance tree that match the search criteria. The user can select an instance on the list and click on the ***References*** button to see what knowledge elements refer to the selected instance. The user can double-click on an instance to zoom-in to that instance (i.e. view that instance in the instance form).

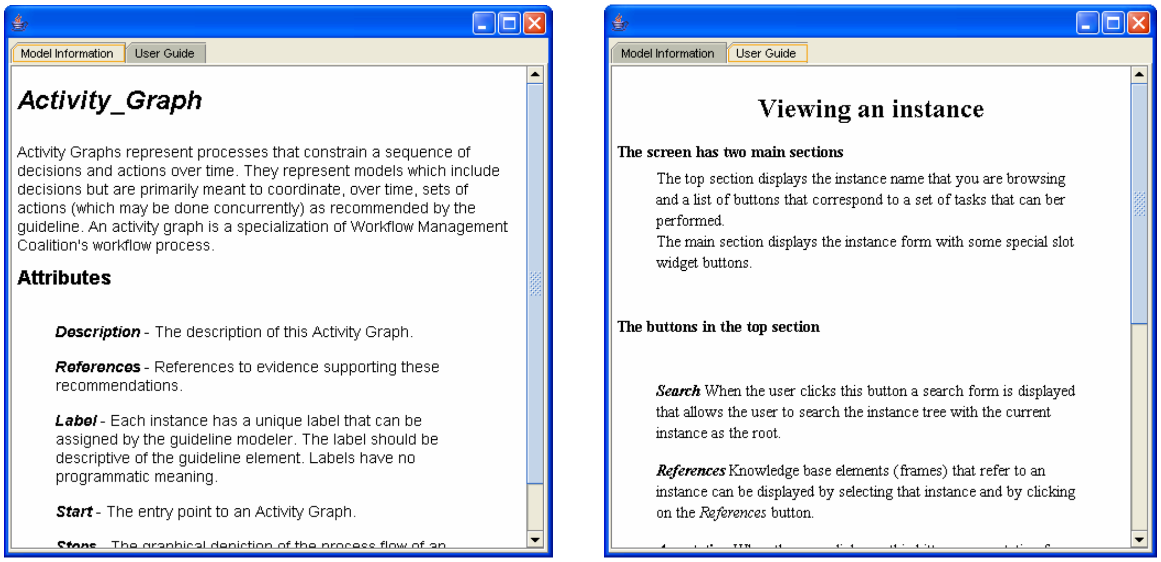


Name	Type
Past year's average systolic blood pressure within goal	Comparison_Criterion
Today's Systolic BP not within goal range	Comparison_Criterion
Today's systolic BP in goal	Goal_Criterion
Average systolic BP NOT in goal range	N_ary_Criterion
Avg systolic OR avg diastolic not in goal range	N_ary_Criterion
Past year's avg systolic not in goal	N_ary_Criterion
Today's systolic BP out of goal	N_ary_Criterion
Today's Systolic or Diastolic BP above goal	N_ary_Criterion
No systolic blood pressure between 1 year and 1 day before today	Presence_Criterion
No systolic blood pressure entered today	Presence_Criterion
Systolic blood pressure entered today	Presence_Criterion
Systolic blood pressure obtained between yesterday and one year before	Presence_Criterion
Average systolic BP within goal	Variable_Comparison_Criterion

Figure 19 ***Search the Instance Tree*** **screen**

4.9 *The Help screens*

Most of the KWIZ screens have a Help button. Users can access two types of help (Figure 20) by clicking on the Help button: (1) domain-specific information on the screen contents, and (2) KWIZ-specific information on what the screen is all about and the tasks that a user can perform on that screen.



Activity_Graph

Activity Graphs represent processes that constrain a sequence of decisions and actions over time. They represent models which include decisions but are primarily meant to coordinate, over time, sets of actions (which may be done concurrently) as recommended by the guideline. An activity graph is a specialization of Workflow Management Coalition's workflow process.

Attributes

Description - The description of this Activity Graph.

References - References to evidence supporting these recommendations.

Label - Each instance has a unique label that can be assigned by the guideline modeler. The label should be descriptive of the guideline element. Labels have no programmatic meaning.

Start - The entry point to an Activity Graph.

Viewing an instance

The screen has two main sections

The top section displays the instance name that you are browsing and a list of buttons that correspond to a set of tasks that can ber performed.
The main section displays the instance form with some special slot widget buttons.

The buttons in the top section

Search When the user clicks this button a search form is displayed that allows the user to search the instance tree with the current instance as the root.

References Knowledge base elements (frames) that refer to an instance can be displayed by selecting that instance and by clicking on the *References* button.

Figure 20 *Help* screens

5 Generating HTML Pages for SAGE Guideline Knowledge Bases

The capability to generating HTML pages for SAGE guideline knowledge bases is done through the Kb2Doc tab in Protégé. The software and necessary Protégé projects are part of the KWIZ package, which is available as part of the SAGE Guideline Workbench (http://www.sageproject.net). The “KwizTab Quick Start Notes” appendix of this document has installation instructions.
Start Protégé with the directory *edu.stanford.smi.protegex.kwiz* in your Protégé plugins directory. If Kb2Doc does not show up as one of the tabs, go to the Project/Configure menu item and check *Kb2DocTabWidget* in the list of available tab plugins.
Figure 21 shows the initial screen of the Kb2Doc tab. There are four configuration parameters:

1. *Doc Templates* is a Protégé project that specifies how the SAGE guideline ontology should be translated into XML. It should be kb2doc/sagekbdescription.pprj for the current KWIZ installation.
2. *Doc Style Sheet* is a file containing XSLT to translate XML to HTML. It should be kb2doc/sagekb2doc.xslt in the current KWIZ installation.

3. *Output File Name* is the base component of the XML and HTML files that will be generated (e.g., SAGECAPGuideline.xml and SAGECAPGuideline.html)
4. *Directory* is the path to the directory to which Kb2Doc will store the generated files.

Once the four parameters are specified, click the *Generate Doc View* button. Figure 22 shows the XML output for the SAGE CAP guideline. You can toggle between XML and HTML views by selecting the *XML View* and *HTML View* tabs. You can also use an external browser to view the XML and HTML output by clicking the *View in Browser* button.

If Kb2Doc tab fails to generate the proper XML and HTML files, the most likely cause is that kb2doc/sagekbdescription.pprj has not kept up with changes in the guideline model.

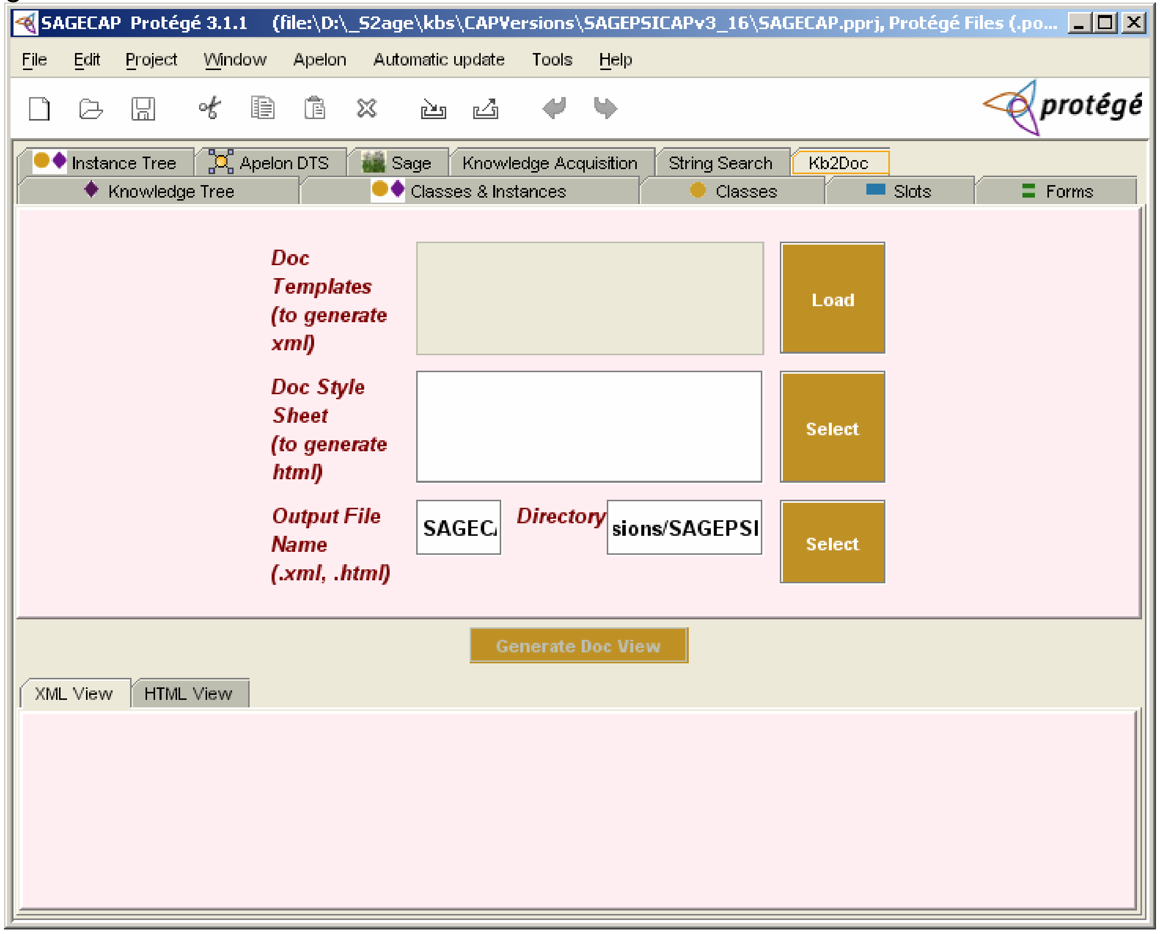
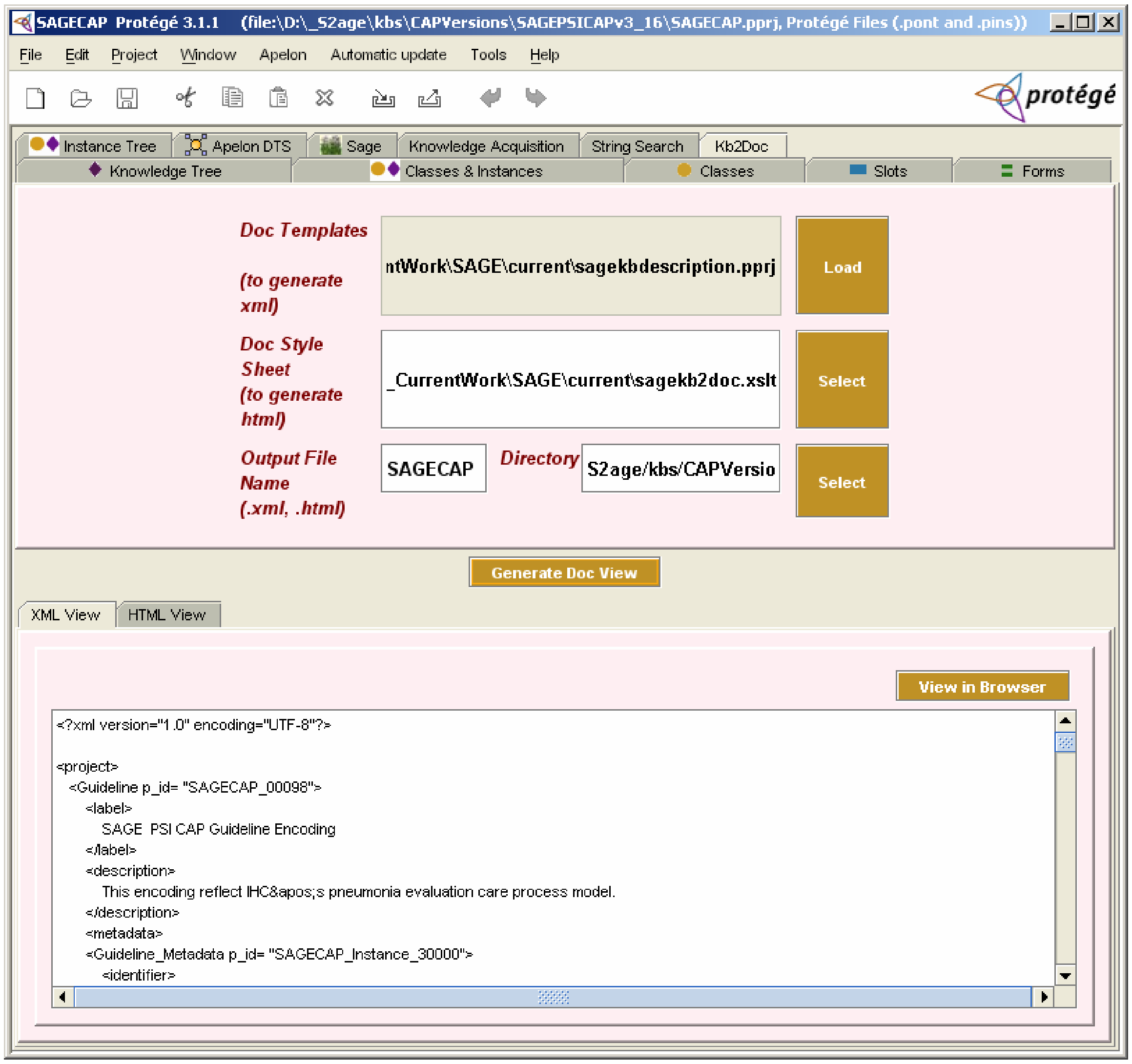


Figure 21 Initial screen of the Kb2Doc tab


SAGECAP Protégé 3.1.1 (file:\D:_S2age\kbs\CAPVersions\SAGEPSICAPv3_16\SAGECAP.pprj, Protégé Files (.pont and .pins))
File Edit Project Window Apelon Automatic update Tools Help
protégé
Instance Tree Apelon DTS Sage Knowledge Acquisition String Search Kb2Doc
Knowledge Tree Classes & Instances Classes Slots Forms
Load
Select
Select
Generate Doc View
XML View HTML View
View in Browser

Doc Templates (to generate xml): ntWork\SAGE\current\sagekbdescription.pprj

Doc Style Sheet (to generate html): _CurrentWork\SAGE\current\sagekb2doc.xslt

Output File Name (.xml, .html): SAGECAP Directory: S2age/kbs/CAPVersio

```
<?xml version="1.0" encoding="UTF-8"?>

<project>
  <Guideline p_id= "SAGECAP_00098">
     <label>
        SAGE  PSI CAP Guideline Encoding
     </label>
     <description>
        This encoding reflect IHC&apos;s pneumonia evaluation care process model.
     </description>
     <metadata>
     <Guideline_Metadata p_id= "SAGECAP_Instance_30000">
        <identifier>
```

Figure 22 A view of the XML generated for the SAGE CAP guideline

6 Appendix: KwizTab Quick Start Notes

1. Copy the directory edu.stanford.smi.protegex.kwiz to Protege plugins directory.
2. Copy the directory edu.stanford.smi.protegex.instance_tree to Protégé plugins directory.
3. Copy the kwiz project files (KWIZ and KWIZBase pins, .ponts and .pprj files) in SAGEkwizKb directory to *your guideline project directory*.
4. Copy the kb2doc directory to any location, preferably at the level of your other guideline projects.
5. Open your guideline project (e.g. SAGE_CAP.pprj)
6. In the top Protégé menu, go to Project / Configure. Select KwizTabWidget.
7. You should see the KWIZ tab and KB2DOC tab

8. In the KWIZ tab, select (from a drop-down list) the view that you want (currently only one view is available) and add the library projects that from which you want to copy instances
9. You'll see tabs like Variable, Function, Criterion, Recommendation_Set that display all instances of these classes, and a Guideline tab for which you have to "Open" an instance of Guideline to traverse the content of that instance.
10. Kb2Doc tab allows you to generate XML and HTML views of the guideline knowledge base. For doc template, specify kb2doc/sagekbdescription.pprj. For doc style sheet, specify kb2doc/sagekb2doc.xslt.
11. Now you can click on any other tab and start navigating.