The design and implementation of a Socca Editor

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1 Abstract

A prototype for a Socca editor was developed in Java. This master thesis describes the design of this prototype, some of the implementation trade-offs and a few of the more significant problems that were encountered. The reasons why Java was chosen as the programming language is also discussed. The thesis ends with a list of possible extensions to the editor and future work.
2 Introduction

The goal of the project was to create a prototype of a Socca editor. Socca (Specification Of Coordinated and Cooperative Activities) is a specification formalism for the description, analysis and specification of software processes that is being developed at the Computer Science department of the University of Leiden. Socca describes a software process from four different perspectives:

1. Data perspective: the class diagram, that is, the classes of the program, their attributes and operations and the relationships between the classes.

2. Behavior perspective: The behavior of the classes (external STD). This perspective describes the way a class may be used. There is a state transition diagram for each class.

3. Functionality perspective: the functionality of the operations (internal STD). There is a state transition diagram (possibly more than one) for each operation that describes which actions are performed (and their order) when the operations is called.

4. Communication perspective: the communication between objects (paradigm)

For a more detailed description of SOCCA, see [1] and [2].
3 Problem description

The prototype of the editor partially supports the syntax of Socca. The focus of implementation of the editor is currently on the data perspective; the other three perspectives may be implemented on a later date. Although the other perspectives aren’t implemented currently, the design of the editor anticipates their inclusion.

Socca is currently being developed at the University of Leiden. Because of this constant development, some areas of Socca are not thoroughly researched yet. Whenever this is the case, the Unified Modeling Language (UML) has been used as a guide. UML is likely to become the de-facto standard of modeling languages. So it is a good idea to follow UML whenever possible, unless a better alternative for certain aspects of UML are found. The result is an editor that implements UML but replaces some of the weaknesses of UML with Socca.

Pieter Jan ’t Hoen (hoen@wi.leidenuniv.nl) is currently working on integrating a module concept with Socca. Socca currently has no real support for modules or packages. Once modules have been added, a Socca model can be split up it smaller parts (modules) that are each somewhat independent of each other. If the modules are chosen in such a way that the number of interdependencies between the modules is kept low then the modules can be designed mostly independent of each other, possibly by different people. If, at a later date, a multi-user version is created of the editor, it can greatly benefit from this module concept.

Work in this area isn’t finished but to allow some initial experimentation with these new concepts, the editor has some very limited support for these modules. Since research is still ongoing, basing the modules of the editor on the current research was deemed problematic. Instead UML’s packages were used as basis for the module concept in the editor.

UML package concept is not much more than a way to group parts of the data model together. Such a group is placed in a rectangle and the name of the package is placed at the top of the rectangle. The packages of the editor work in the same way. One concept of Pieter Jan’s work was added; each data model element in a package is given a visibility icon. This visibility (public, protected or private) determines whether a data model element outside the package can have a relation with an element inside the package. If an element is public, it is visible to elements outside the package and so it can have relations with elements outside the package. If it is private, it is not visible outside the package and such relations are not possible. Protected elements are only different from private elements when one package inherits from another. Package inheritance is still work in progress and is as such not supported in the editor.

The data perspective is implemented using a graphical user interface that allows adding, deleting and editing of classes (and their attributes and operations) and packages. It also allows adding relationships between classes, editing them and removing them. These relationships include inheritance relationships, uses relationships, aggregations, associations and containment relationships (of a class within a package). The user can focus on a part of the model by opening new views and/or suppressing parts of the view.
4 The implementation

The editor is implemented in Java, version 1.1, using the Java Foundation Classes (JFC). Java was chosen because of its platform independent nature and its ability to be used within a WWW-browser.

One of the requirements of the editor was that the information in the model can be shown in multiple views. The editor had to support multiple windows that each show (a part of) the model. These views are kept consistent; changes in one view result in updates of the other views containing the same model elements. To support this type of behavior, the MVC (Module View Controller) design pattern was used to keep the views consistent.

4.1 The architecture

The editor uses the MVC (Module View Controller) concept that was first introduced by the language Smalltalk [3]. In Smalltalk the programs that used this design pattern were split up into a part that contained the data, the model, a part that presented the data to the user, the view, and a part that allowed the user to manipulate the data, the controller. The advantage of this approach is that, because there can be more than one view of a model, the data can be visualized in different ways at the same time. Another advantage is that the source code of a model or a view is easier to reuse in another program than a piece of source code that contains both the model and view as a monolithic whole.

Over time it was discovered that splitting in three parts is not always the best way. The controller has strong dependencies on the model and view parts. Because of these dependencies, the model and view It turned out to be better to split the program in a model and a view part and put the controller in the view and/or in the model. This is the approach that was taken while designing the editor. It is also the approach taken by the designers of the Java Foundation Classes (JFC, a.k.a. swing). As a result the JFC classes and the classes of the editor integrate quite naturally. This design pattern (using only model and view, no controller) is described in Design Patterns [4] under the name Observer.
The model (left) will send events (arrows in the middle) to the view (right) whenever a part of the model changes.

The editor consists of three parts. These parts are all put in a separate package. There is the model package that contains all the models. The view package contains all the views that correspond to the models in the model package. This package also contains the dialogs that are used by the view classes to interact with the user. There are some classes that don’t belong to the model or the view packages. These classes are put in the global (or root) package. All these classes in these packages are described below. There is a class diagram included in this paper of the model and the view packages, to clarify this description.
4.1.1 The model package

- At the base of the model hierarchy is the ModelBase class. This class contains all the functionality needed to send events to the views to notify them of a change in the model.

- There are several classes that inherit from the class ModelBase: ElementModel, ContainmentModel, GeneralizationModel, UsesRelationModel, AssociationModel, AssociationRoleModel and AggregateModel.

- ElementModel represents the basic elements of the data perspective, i.e. packages and classes (with the classes PackageModel and ClassModel to represent them).

- A package may contain other packages and classes. This is expressed with the ContainmentModel class. This class stores the visibility of the element outside of the package and possibly another name (an alias), for the element.

- A class can inherit some of its attributes and operations from another class. This relationship between classes is represented by the GeneralizationModel class. A generalization can optionally be given a name, for this reason the class has a name attribute.

- A class can use another class in the implementation of its behavior. To show this in the data perspective, an uses relation is drawn. Such a relation is represented by the class UsesRelationModel. This class will store the names of the operations that are used.

- When one class is in fact a composition of other classes, an aggregate relation is a relation between classes exists. This aggregate relation is represented by the class AggregateModel.

- All the relations that don’t fall into one of the above categories can be represented by the class AssociationModel. It represents a general relation between two or more classes. A name and an optional stereotype can be given to an association. Each class that is part of an association plays a certain role in the association. This role is described with the class AssociationRoleModel. It stores the name of the role of that class, the number of objects of that class that can participate in the association (multiplicity), whether the association is navigable in that direction and finally if there is an inherent ordering among the objects of that class that participate in the association.

- Classes can have members, i.e. operations and attributes. These members are represented by the model MemberModel. This model stores the name and visibility of the member and whether the member is part of an object or of the class itself (static in C++).

- The class AttributeModel is a subclass of MemberModel. It stores the type of the member, an optional initial value and whether the value of the member is derived from other members.
• OperationModel is also a subclass of MemberModel. The things it stores are an optional return type, whether the operation is implemented or abstract and the parameters that the operations needs. Of these parameters the type and optional default value are stored.

• Although StdModel, StateModel and TransitionModel are classes mentioned in the class diagram, these classes where not implemented due to time limitations. They were left in the design to aid the future addition of state transition diagrams to the editor.

Every class has an external STD (State Transition Diagram). This STD is represented with the StdModel class. The StdModel has states and transitions. The states are represented with the StateModel class. The states are connected to one another by transitions, represented with the TransitionModel class.
4.1.2 The view package

In this section the classes in the view package will be described. Most of the classes in this package are the view of the corresponding model in the model class. All the names of the views end with "View", the corresponding model has the same name, but the "View" suffix is replaced with "Model". For example, the class ElementView is the view of the model ElementModel.

- The class Movable contains the functionality that allows the user to move a component on the screen to a new location. The user can use the mouse to drag a component (that is a subclass of Movable) and this class will allow it to move.

- RelativeMovable inherits from Movable and allows a component on the screen to be moved relative to another component. For example, A is a Movable and B is a RelativeMovable that moves relative to A. The user can move B around and the RelativeMovable will keep track of the relative offset to A. If the user moves A around, B will move as well to keep the offset the same.

- BoundedMovable inherits from RelativeMovable. It restricts the movement of B, relative to A, so that B is always on the contours of A.

- The class ElementView is used to show an ElementModel on the screen. It is the base class of the classes ClassView and PackageView.

A ClassView that contains no attributes or operations.

- ClassView shows a ClassModel on the screen. At the top of the classview there are the stereotype and name labels and the visibility icon. The visibility icon uses the colors of a traffic light to show public visibility (green), protected visibility (yellow) and private visibility (red). Below the labels and icon there is a list of attributes (AttributesView). Below the attributes is a list of operations (OperationsView).

A part of a ClassView, the AttributesView, that shows three attributes.
The AttributesView class is used to show a list of attributes. It presents the attributes in a vertical list and allows the user to scroll through them. Each attribute in the list of attributes is shown using the AttributeView class. It shows the visibility (public, protected or private) of the argument, the name, the type and the initial value of the attribute.

Another part of a ClassView, the OperationsView, that shows three operations.

Just like there is an AttributesView class that shows the attributes of a class, there is an OperationsView class that shows the operations of a class. Each operation in the operation list is shown using the OperationView class. Besides the visibility and the name it also shows the parameters and the return type of the operation.

The objects of class PackageView are rectangles with the name and stereotype of the package at the left-upper corner. Inside the rectangle are the elements that are contained by the package.

The class PackageWindow inherits from Java’s Window class. Every instance of PackageWindow is a window on the screen. The window contains a menubar and a toolbar. Below the toolbar is an instance of PackageView.

At any given time the PackageWindow is in a certain mode. This can be the move mode that allows the user to move, resize or select elements or it can be the addClass, addPackage or addAssociation mode that allows the user to add a class, package or association to the PackageView. Mode is the class that stores the current mode the PackageWindow is in.
Most of the relations are drawn using lines between ClassViews. The Line draws the lines. A line can consist of one or more straight lines. Each of these straight lines is drawn by a LineSegment.

- The class AssociationView is used to show an association between classes. The class AssociationView has two ways to draw itself. One way is used when there is an association between exactly two classes. In that case the association is represented as a line between the classes. The other way is used when there are more than two classes. Then the AssociationView will draw a diamond with the name and the stereotype of the association inside the diamond. Each classes is connected to the diamond with a single line.

- Each class that is part of an association plays a certain role in that association. The name and multiplicity of that role is shown using the class AssociationRoleView.

- GeneralizationView, UsesRelationView, AggregateView: Although these classes are needed to create a full featured editor (and for that reason they are in the design of the editor) there was not enough time to implement these classes.
A ModelTree that shows two classes and a binary association between them. It also shows that the first class has two attributes and two operations.

- While writing the Socca Editor, it became clear that there are situations where one would like to have a PackageView that only partially shows the contents of a PackageModel. In other words, one might want to delete an element from the PackageView without deleting it from the PackageModel. In such a case, the user should be able to re-add the deleted elements.

To allow the user to add these deleted elements and to give the user a clear view of what is in the model, a tree was created that shows everything that is inside a PackageModel. This tree, ModelTree, shows all the elements in the PackageModel and everything that belongs to these elements.

To the right is a screen-shot of a ModelTree. It is the tree of the package "Global". It contains two classes ("class1" and "class2") and an association between these classes ("assoc1"). Class "class1" contains two attributes and two operations.

- The class ClassDialog is a dialog that is used to edit the properties of a ClassModel. The name, stereotype and visibility of a classes can be edited and attributes and operations can be added, edited and removed.
A Dialog allowing package "packageName" to be edited.

- Just like there is a ClassDialog to edit ClassModels, there is a PackageDialog to edit PackageModels. The name, stereotype and visibility of the package can be edited.

- The AttributeDialog class is used to edit the properties of an attribute. There is a text-field for the name, the data type and the initial value of the attribute. The drop-down box can be used to change the visibility of the attribute. Finally, there are two check boxes; if ‘Static member’ is checked it specifies that the attribute will part of the class and not of the object. ‘Derived attribute’ specifies that the value of the attribute will be derived from other attributes.
• Using the OperationDialog dialog one can change the name, visibility and return type of an operation. The table can be used to add, modify and remove the parameters of the operation. Each parameter has a name, data type and an optional default type. The ‘Static member’ check-box has the same function as the ‘Static member’ check-box of the AttributeDialog dialog. The ‘Abstract operation’ check-box specifies that the operation will not be implemented in the class it belongs to, but that it will be implemented in a derived class.

• The name and stereo type of an association can be changed with the AssociationDialog dialog.
5 Problems encountered

During the development of the editor numerous problems were encountered. Most of these were trivial and could easily be solved. Some of the problems however, required significantly more time and effort to overcome them. These problems are described below.

5.1 Event handling on Lines

The LineSegment class that is described above, is used to draw the lines that represent an association. There are two ways the lines can be drawn. One way is to draw directly on the PackageView. The disadvantage is that the PackageView is not aware of these lines and the lines will not be redrawn when an element inside the PackageView moves or resizes. Secondly, when the user wants to move a line to a different location, the line that was drawn is not automatically erased. The only way to remove the line on the old location is to tell the PackageView to redraw itself. This results in a lot of flickering.

The other way is to make every LineSegment a real AWT Component. The advantage of this approach is that AWT can then automatically handle the redraws and it can do this much more efficiently than the application itself can. Secondly lines can be moved around without flickering. There is, however, a disadvantage to using AWT’s Component. AWT keeps track of the component’s location and size. The location is the x and y coordinate of the left-upper corner of the Component and the size is a width, height pair. These four values only allow for rectangular shapes. Indeed, AWT does not support Components that are not rectangular.

In version 1.1 of Java, transparency was introduced. This transparency allows the Component to leave a part of its rectangle undrawn. The Component behind it will then show through. This can be used to simulate non-rectangular shapes. LineSegment uses this transparency to only draw the line itself. The rest of its rectangle is left untouched and will show the components that lie below the LineSegment. This was fairly easy to get working correctly. The real problems was with event handling.

Java’s event handling is currently quite complex. In Java 1.0 it was still pretty simple; when the user clicks a mouse button, an event is sent to the component the mouse is on. This event is sent to a method of the component. If the component decides to handle the event itself, it will do so and the method returns true. On the other hand, if the component doesn’t handle the event itself, it will return false. At that point AWT will sent the event to the parent component which itself can decide whether to handle the event or not, etc.

This way of handling events has several disadvantages. The events are sent to a component regardless of whether it is interested in them or not. This is a real problem with mouse-move events, hundreds can be sent to the components per second when the user is moving the mouse quickly and maybe there isn’t a single component interested in them. Performance noticeably suffers from the resulting number of method calls. A second disadvantage is that to react to an event, the programmer has to subclass the component. This leads to a explosion in the number of classes.
In Java 1.1 these problems were solved by introducing the concept of listeners. The programmer can register one or more listeners to a component. All the events are then sent to the listener(s). The advantage is that events are only sent to objects (the listeners) that are interested in them and listeners can be registered without deriving a new class from the component. This too is a concept that is easy enough to understand. What makes Java’s event handling so complex is the desire to be compatible with the 1.0 way of event handling while at the same time maximize the performance gains of the 1.1 way.

Back to LineSegment and its rectangular shape. The problem is that LineSegment either receives events on its entire rectangle or not at all. What is required is that only events that are generated when the mouse pointer is close to the line are intercepted by the LineSegment and the events that generated on other parts of the rectangle should be passed on to the component that lies behind it.

In the above picture, a schematic view of a PackageView is shown. Inside the PackageView are two ClassViews, on top of one of them is an AssociationView and on top of the AssociationView a LineSegment. When the user clicks the mouse on the line inside the LineSegment the LineSegment class should handle the event. If the user clicks on the LineSegment, but not on the line, the event should be handled by the AssociationView, the right ClassView or the PackageView, depending on the location of the click.

The first thing that was tried to solve this problem was to use the 1.0 way of event handling. It seemed like a perfect fit; the LineSegment returns true when the mouse is on the line and it returns false when the mouse is on a different part of the rectangle. Unfortunately,
because the application was written using Swing and Swing’s JComponent registers an event listener for its own use, the 1.0 compatibility code is disabled. The functions that were used for event handling in 1.0 are simply not called anymore once an event listener is registered (this is to maximize the performance gain of the new event handling code).

The only other option was to somehow adapt the 1.1 way of event handling to selectively pass the event to the LineSegment or to an underlying component. To achieve this, the AWT source code was studied extensively. It was discovered that AWT sends the event to the LineSegment if it has an event listener registered, LineSegment then sends the event to all the listeners. If LineSegment doesn’t have any listeners registered it doesn’t receive the event but the event is passed to an underlying component. The class that makes this decision is AWT’s Container, it has the function getMouseEventTarget(int x, int y) that will find a component that has listeners registered and contains the given location. If this function could somehow be influenced to return the LineSegment when the mouse is on the line and the underlying component otherwise, all event handling would work as desired. Frustratingly enough, the getMouseEventTarget function is a private function and cannot be overridden in a subclass.

The next approach that was tried was to receive the event in LineSegment and then, depending on the location of the mouse, send the event to the listeners or explicitly to the parent of the component (PackageView). The problem with this approach is that the parent will, upon receiving the event, look if there is a child component that lies on the location of the mouse and has any listeners registered. If so it will forward the event to this component. In this case the LineSegment is the component that lies on top and has listeners registered, and thus the LineSegment will receive the event. LineSegment will try to sent it back to the parent which will forward it again to the LineSegment. This recursive calling of event handler functions will never stop.

Somehow the event should be tagged once the LineSegment has rejected it and sent it to the parent component. The parent component should then check the event for this tag and not forward it if it is indeed tagged. Since events are generated internally in AWT the event cannot be subclassed (AWT would still use the original class, not the subclass). So a way of tagging the event should be found in the original event class. The AWT’s MouseEvent class indeed has a way of tagging the event: boolean consumed. This flag is meant to be used by the listeners to tell the component that the event has already been processed and the component itself should not take any more action. Although this flag is present in the MouseEvent class, there aren’t many components that use it for this purpose, they don’t check this flag. This flag could thus be misused for the tagging purpose. The source code of this solution didn’t look pretty and it isn’t completely correct either. It is possible (like in the picture above) that there is a component between the LineSegment and the PackageView. Sending the event from the LineSegment to the PackageView is thus not always correct. Moreover, since the consumed flag of the MouseEvent is used in a way it was to meant to be used, it is not guaranteed to even work in future versions of Java. A better solution had to be found.
After studying the source code of AWT some more, it was discovered that the method `getMouseEventTarget` calls the method `contains(int x, int y)` of each child in the container until it finds a child that returns `true`. It will start at the top and continue calling the `contains` method until it finds a child that says it contains the point. The method `contains` is public and can thus be overridden in the `MouseEvent` class. The `LineSegment` class can return `true` if the x and y coordinates are on or near the line and `false` otherwise. If it returns `false`, the `Container` automatically goes on to the child that lies underneath the `LineSegment` and calls the `contains` method of that child. This is exactly what is needed. This approach turned out to work very elegantly and efficiently. After optimizing the code a bit, this is the solution that is used in the editor.

## 5.2 Text-fields in dialogs

Although the editor is currently not capable of supporting multiple users at the same time, it was designed with a multi-user environment in mind. When multiple users are working on the same project, it is important that each of them knows what the others are doing. For this reason, their views of the model have to be up to date and consistent at all times.

So when one user changes some aspect of the model or adds something new to it, all the users should see this change immediately. In the current implementation of the editor, the views are even updated while the user is typing in or changing a name or other string.

Most of the changes of the model are done using dialog boxes. These dialog boxes contain text fields that can be used to change names, stereotypes, multiplicity, etc. When the user types in one of these field, the field generates an event for each key press. The dialog box receives this event and changes the underlying model accordingly. The model, in turn, will generate an event to alert all the views of the change. Since the dialogs have registered themselves with the model, they too receive the events and will update the fields. The result is that all the views and dialogs are always up to date and consistent.

The internal implementation of JFC’s text-fields make this process a little harder than it needs to be. These text-fields use the `Document` class to store their string. The `Document` class of JFC was meant to store and manipulate large text documents, but can also be (and is) used for the shorter strings of the text-fields.

The `Document` class has just two methods to change (part of) its contents: `insertString` and `remove`. `insertString` adds a string at a specified offset while `remove` can be used to remove a specified number of characters at a given offset.

The text-fields have only one method to change the string: `setText`. Internally the text-field calls `Document`'s `remove` to remove the whole string and then `insertString` to insert the parameter of `setText` into the `Document`.

The problem with this is, that the `Document` emits an event on each change. So when the text-field calls the `remove` and then the `insertString` methods, two events are generated. One that clears the string and one that sets the string to its new value. The dialog box listens for document events and updates the model when one is received.
When two dialog boxes are visible on the screen and the user is typing in one of them, the Document of the active text-field generates events that are received by the dialog box. The dialog box updates the model and the model sends events to all the views, including the dialog boxes. The second dialog box also receives the event of the model and updates it’s text-field. This text-field, unfortunately, generates two events; an event that makes the string empty and an event that sets the string to its new value. Each of these events is received by the second dialog box and the model is updated twice. The model sends out two events, etc. The editor will end up in a never ending cycle of events.

The first solution that was tried was to ignore the ‘remove’ events and only handle the ‘insert’ events. This indeed worked correctly when the user typed in a new name, every text field had the correct value. But when the user used the backspace key to erase a part of the name, the generated ‘remove’ events were ignored and the text fields were no longer consistent. A different solution was needed.

After some investigation it was discovered that the ‘remove’ events that were generated due to the setText method removed the entire string, while ‘remove’ events that were due to use of the backspace key removed only one character of the string. The current implementation of the editor ignores ‘remove’ events that will remove the entire string while processing the other events. This works correctly unless the user wants to delete the last character of the string, in that case the last character is the entire contents of the string and the event is ignored.

5.3 Inter package associations

Associations between ClassViews are shown using lines or a combination of lines and a diamond. These lines are drawn using the LineSegment class as is described above. If the ClassView or the diamond is moved by the user, the LineSegment has to update its size and/or location. When the ClassViews that play a role in the association are not all inside the same package, things become a little more complicated.

If the user moves the package that contains the ClassView, the LineSegment has to update its size and location as well. Also, when the PackageView is showing its scrollbars and the user uses them to scroll the PackageView, the position of the ClassView on the screen changes and the LineSegment needs to update its size and location. When the user scrolls the PackageView so that the ClassView is no longer visible, the LineSegment should disappear as well.

Above, it was explained that the components in Java have a specific z-ordering. Some components are drawn in front of others. The editor should prevent a PackageView to be draw on top of the LineSegment that goes to one of the PackageView’s children.
6 An example of the use of the editor

6.1 Introduction

In this section a step by step walk-thru will be given of the editor. This is done by creating the producer-consumer pattern. The producer-consumer pattern consists of three classes: The Buffer, the Producer and the Consumer.

The Buffer: this class holds the items that are produced by the Producer until they are consumed by the Consumer. The Producer can add items to the buffer by calling the put(value: string) operation. The capacity of the buffer is limited so the Producer cannot add new items to the buffer if the operation isFull(): boolean returns true. The Consumer can take one item out of the buffer by calling the operation get(): string unless isEmpty(): boolean returns true in which case the buffer doesn’t contain any items anymore.

The Producer can be told to produce more items by calling the operation produce(amount: integer).

The Consumer consumes items when the consume(amount: integer) operation is called.

In the next part of this section, the producer-consumer pattern will be created. A fairly detailed description of the steps that are required are given so that the reader becomes familiar with the functionality of the editor.

6.2 Step by step walk-thru

When the editor is started (At Leiden run /home/most/run on a Sun Ultra), it will open two windows. The model tree at the left of the screen and a view of the ‘Global’ package at the center of the screen. This example will focus on the window in the center of the screen, the model tree will be ignored for now.
At the top of the package-view there is a menu bar with one menu item, the Mode menu. This menu allows the user to change the mode the window is in. Usually the window is in Move mode. In this mode the user can move and resize the contents of the package view and the user can select or deselect elements. The other modes allow the user to add new things to the package model (and thus the package view). There is a mode to add a new class to the package, a mode to add a new package inside the package, a mode to add a new association and a mode to add a new package role.

All the different modes that are in the Mode menu are also visible as icons on the toolbar just below the menu bar. Selecting a mode with the menu has the same effect as selecting one with an icon on the toolbar, so use the method that is more convenient to you.

The first thing to do is to add the Buffer class. For that, the window should be in the ‘Add new class’ mode. Either select the second menu item of the Mode menu or select the second icon of the toolbar. Move the mouse to the location where you want the buffer class to be created and press the left mouse button.

Within seconds a dialog should appear. This dialog shows the name, stereotype and visibility of the class. The newly created class doesn’t have a name yet, so the name text field is empty. To give the class a name, click the left mouse button on the white text field next to the
‘Name:’ label. Type the name of the class, for example ‘Buffer’. The buffer class has no stereotype, so the stereotype text field can be left empty. Below the stereotype, there is the visibility combo box. By default, the visibility is Private. To change this to Public, click on the word Private. A drop down box will appear with the three choices Public, Protected and Private. Click the left mouse button on the word Public. The drop down box will disappear and the visibility will now be Public.

At the top of the dialog there are the tabs General, Attributes and Operations. The General tab is the one that is selected. By clicking with the left mouse button on the Operations tab, the name, stereotype and visibility fields will disappear, the operations of the class will be shown. Because the class was just created, it doesn’t have operations yet. To create a new operation, click on the New button.

A new dialog will appear. This is the operations dialog. At the top there is the name text field. Click on the white text field next to the ‘Name:’ label to change the name. Enter the name of the operation, e.g. ‘put’.
Below the name text field there is the visibility combo box. It works just like the visibility field of the class. You can use it to change the visibility of the operation to public. Below the visibility field is the return type field. If the operation doesn’t return a value, you can leave it empty. If it does return a value, the type of the value can be specified here. Below the return type are the parameters. The information of the parameters is arranged in a grid. Each row represents one parameter. Each rows contains the name, type and default value of one parameter. To change a value, click on the cell and type in the new value. To give the ‘put’ operation one parameter, ‘value’, do the following: Click with the left mouse button on the top most field of the ‘Name’ column. Then enter the name of the parameter: ‘value’. Click the mouse on the field right next to it, in the ‘Type’ column. Enter the type of the parameter, ‘string’. To the right of the type field there is the field for the default value. You may leave this field empty if no default value is needed. Otherwise enter the default value in this field. Finally press enter to confirm your changes and click with the mouse on the ‘Close’ button to dismiss the dialog. The class dialog will become visible again. By pressing the ‘New’ button again the get, isFull and isEmpty operations can be added. Once this is done the ‘Close’ button can be used to close this dialog as well.

Now that the Buffer class is created, it is time to create the Producer class. Set the mode of the window to ‘Add new class’ and click the left mouse button where the Producer class should appear. Giving the class it’s name (‘Producer’) and changing the visibility (‘Public’) works the same as above with the Buffer.

Once the Producer is created create the Consumer in a similar fashion. Next are the associations between the Producer and the Buffer and between the Consumer and the Buffer. Normally associations are created by switching to the ‘Add new association’ mode. In this mode a new association, shown as a diamond, can be created. After the diamond is visible the different roles that the classes play in the association can be shown with the ‘Add new association role’ mode. However, in UML and thus in Socca binary associations aren’t usually shown with a diamond but simply with a straight line. To do this in the editor, don’t use the ‘Add new association’ mode (as that would create the diamond), but switch directly to the ‘Add new association role’ mode. Once in this mode, press the left mouse button on the Producer class and drag the mouse (while holding the mouse button down) to the Buffer class. Once the mouse is on the Buffer class, release the left mouse button. A line will appear, this is the binary association. Click on it with the left mouse button to raise and select it. At the end points of the line there are two yellow circles. By dragging these yellow circles around, the line can be moved.

The classes can be moved around by pressing the left mouse button on their name, drag it to the new location and release the mouse button. The class dialog can be shown by double clicking on the name of the class or selecting ‘Edit...’ from the pop-up menu. The pop-up menu is shown by pressing (and holding) the right mouse button on the class. Classes can be deleted by selecting ‘Delete’ from the pop-up menu. There are two other items in the pop-up menu: ‘Suppress’ and ‘Unsuppress’. Suppress will hide the contents of the class. This can be used when the contents of the class is not important in that window. E.g. when one wants to give a general overview of a large program, most of the details can be left out by suppressing the classes. The classes will still be visible, but their contents will be hidden, thereby simplifying the picture. When you want access to the contents, select the ‘Unsuppress’ item.
from the pop-up menu.
7 Advantages and disadvantages of Java

Right from the start of this project using Java as the programming language was a requirement. This choice was not arbitrary, there are some very compelling reasons to choose Java. Some of these advantages are discussed here. Some of the disadvantages of Java will be highlighted as well.

7.1 Advantages of Java

- Java is platform independent, a program can be used on every operating system that supports Java. When a Java program is compiled, the output of the compiler is not assembly like the output of a normal compiler but it is a platform independent byte code. This byte code can be interpreted by the Java Virtual Machine (JVM). Every operating system that has a JVM can be used to execute the program. The program doesn’t even need to be recompiled to work on a different platform. The result of this byte code is that processor specific details and operating specific details are dealt with on the target computer. The programmer will be able to create programs that run on every popular platform without worrying about machine specific details.

- Java is very object-oriented. This object oriented programming will lead to programs that are easier to understand, extent and maintain.

- Java has no pointers. The number one cause of bugs in programs written in C or C++ are incorrect use of pointers and incorrect memory management. Java uses references instead of pointers. A reference is similar to pointers, except that the programmer cannot use it as if it were an integer. This restriction has the effect that the language has more control over the things a reference can point to. The Java compiler makes sure that a reference only points to an object of the correct type or to null. Secondly, because the references cannot start to point to a different object without the JVM knowing about it, the JVM can deallocate a part of memory when the last reference to it disappears. This garbage collection greatly simplifies programming and prevents a large number of bugs.

- Several advanced programming concept are included in the language. Multi-threading, synchronization and exception handling and remote method invocation (RMI) are native parts of the language and not add-on libraries as in other languages. This means that the programmer can use these concepts easily and create programs that are more robust and react faster than variants of the same program written in a different language. These concepts are not used in the current state of the editor but will be essential once multi-user capabilities are introduced.

- Java can be used on the World Wide Web. Most popular browsers can run Java programs, called applets, inside a page. People will be able to use the editor everywhere on the world. They don’t need to explicitly download or install the program. In practice, however, it will take some time before this is a usable option. Most of the browsers only support Java 1.0 or a subset of Java 1.1. Since the editor uses Java 1.1 extensively it will
take several months, if not longer, before the editor can be used inside a browser.

- Java is so over-hyped that everybody is impressed when they learn that Java was used.

### 7.2 Disadvantages

- The object oriented nature of Java means that large portions of the Abstract Window Toolkit (AWT) and of the Java Foundation Classes (JFC) are private. If some functionality of these toolkits needs to be overridden by the programmer, but the designer of the toolkit had not anticipated this need, this encapsulation can complicate the life of the programmer. This frustrating effect has hindered the progress of the editor at several occasions. One of them is the event handling as discussed before.

- Java is a very young language. Support in operating systems and browsers has only been added recently. Support for the less popular platforms may not even exist yet. Bug fixes in the language, the libraries and the compiler are made on a regular basis.

- Java has been a popular language from the start. Backwards compatibility is an important issue that slows down progress. Some of the less fortunate choices in the earlier versions of Java (event handling and native peers) were corrected in Java 1.1 and Java 1.2 but their effect is still noticeable. If the growth of Java had been more gradual, the language could have been simpler and more elegant.
8 Future Work

The current implementation of the editor is limited in its functionality. Future versions might extend this functionality in certain areas. A few of these possible extensions are discussed here.

- More of UML’s class diagram. The editor supports only a subset of the class diagrams that UML allows. To equal UML the editor must be extended to allow more kinds of relations and the ability to add notes to parts of the model. Generalizations, aggregations and dependencies should be added and at the same time Socca’s uses-relations might be added.

- More of UML. Besides the class diagram, UML support many more diagrams. Some of these, if compatible with Socca, might be included. Beside the class diagrams UML also has use-case diagrams, sequence diagrams, collaboration diagrams, state diagrams, activity diagrams and implementation diagrams. The state diagrams and activity diagrams don’t add much if Socca’s internal and external STDs are supported. The other diagrams might add some useful functionality.

- Socca’s internal and external STDs. Socca has three types of diagrams, the class diagram, the internal STDs and the external STDs. To complete the Socca support, the editor has to support least these internal and external STDs.

- Automatic generation of code. Most of the modern CASE tools are able to automatically generate source code that the programmer can use as a basis of the program that is to be written. It would be nice if the editor is extended to generate source code for several popular programming languages.

- Full round-trip engineering. It happens quite often that while the programmers are implementing the program, a change has to be made to the design. If the editor supports full round-trip engineering, the code that has been generated by the editor and subsequently modified by the programmers can be read back in, changes can be made and the code can be written out again, without losing the implementation that was added by the programmers.

- Socca process simulation/enacting. Socca’s STDs can be used in a simulation of the program. Even before the program is fully implemented, certain aspects of the program can be shown using a simulation. Especially the interaction of the different parts of the program can be shown. The editor might show the STDs of the program and show which state it is currently in and which transition will be used in the next step.

- Multi-user. In most enterprises it is rare that a single person designs and implements a program. It is much more common that there is a small team of developers all working on the program. The editor should allow them all to work simultaneously on the design of the program.
Version control system. Several studies have been made of multi-user development environments and each time it was concluded that, if the group of developers is not very small, it is more efficient to have the developers work on a model that is known to be correct, rather than with the most up to date version. The model is incrementally created and each time a developer finishes a step in the development he/she ‘checks in’ his/her changes. Once the changes are checked in, they become available to the other developers. In other words, the other developers don’t see the inconsistent state the model is in while the developer is making his/her changes but only see the consistent end-result. The editor must use a version control system to support this.

Repository of patterns. Certain problems show up in different programs over and over again. It would be useful to have a collection of these problems and their solutions so that the developers don’t have to reinvent the wheel. Gamma et al. wrote the book Design Patterns[4] for this purpose, but it would be even more useful to be able to cut-and-paste these patterns into a design and to easily integrate them there. Over time this repository can be updated and extended to increase its usefulness.

Above it was mentioned that it is desirable to have an editor that is able to generate code. The Socca modeling techniques can describe the program in such detail that most of the program can be automatically generated from the model. There are, however, a few issues that have to be addressed before efficient programs can be generated.

The Socca architecture uses STDs to describe the behavior of a class. Each operation has one or more STDs and there are one or more STDs for the whole class. The STDs are assumed to be executed on state-machines that each run on its own CPU. This theoretical model is, although simple and powerful, very impractical. Current computers have one or in rare cases a few CPUs. There can be hundreds or even thousands of STDs when a non-trivial program is modeled. The state-machines for these STDs cannot each have their own CPU. Running each state-machine in a thread of a multi-threaded program isn’t practical either since the overhead of thread switching will make the program inefficient.

More research is needed to find a general method that will map the STDs of Socca onto a number of threads in such a way that most or all of the parallelism of the model is preserved while keeping the number of threads low so that the generated program runs efficiently. If the number of threads is too high, the user may be able to manually make a more efficient program and the code-generation becomes a less attractive feature of the editor.

One solution that was suggested is to extend Socca and add a notation to group parts of the model in a single thread. The user can use this notation to annotate the model and explicitly state that within a group of STDs, parallelism is not required. Since these STDs are then known not to run at the same time, the code generation portion of the editor can map the state-machines for these STDs to a single thread. An example of such a mapping is to interleave the instructions of the state-machines. This results in sequential execution that closely resembles parallel execution. This is exactly what an operation system would do when multiple threads are run on a single CPU, except that
the interleaving (scheduling) is not done at runtime but at code-generation time.

One intuitive grouping of STDs would be to group all STDs of a class together; in other words, within objects of such a class there is one thread to run the state-machines. The state machines would not run in parallel but their execution would be interleaved.
9 Conclusion

In this thesis the development of a prototype editor for Socca has been described. The general architecture of the prototype was discussed and the model-view architecture was highlighted. The classes of the editor were each shortly described. Some of the more significant problems that were encountered during the development of the prototype were discussed. After that, a step by step walk-thru was given so that the reader could become familiar with the functionality of the editor. The advantages and disadvantages of the Java programming languages were discussed to motivate the choice to use Java. And finally, a number of possible directions for future work were presented.
10 References


11 Appendix A: The documentation of the classes

11.1 Class SoccaEditor

```java
public class SoccaEditor extends JApplet
```

The class SoccaEditor is the main class. This class contains the "main" method that is called when the Socca editor is started. The "init" method is called when the editor is started as an applet inside a browser.

Constructor Index

- `SoccaEditor`)

Method Index

- `init(String[])` This method is called when the editor is run as an application.
- `main(String[])` This method is called when the editor is run as an application.

Constructors

- `SoccaEditor`
public SoccaEditor()

**Methods**

### main

public static void main(String args[])

This method is called when the editor is run as an application. It creates and shows a MainWindow

**See Also:**
- MainWindow

### init

public void init()

This method is called when the editor is run as an applet. It, too, creates and shows a MainWindow

**Overrides:**
- init in class Applet

**See Also:**
- MainWindow
11.2 Class ModelChangeEvent

```
java.lang.Object
 | +----java.util.EventObject
 |     +----ModelChangeEvent
``` 

public class ModelChangeEvent
extends EventObject

When something in a model changes, the model sends out a ModelChangeEvent. This event is send to all the views that have registered themselves as event listeners.

Variable Index

- **ABSTRACT**
  A function is now or is no longer abstract
- **AGGREGATE**
  A attribute is now or is no longer an aggregate
- **ASSOCIATIONS**
  An association was added to or removed from a class
- **ATTRIBUTES**
  An attribute was added to or removed from a class
- **CLASSMEMBER**
  An attribute or operation is now or is no longer a classmember
- **DERIVED**
  A attribute is now or is no longer derived from other attributes
- **ELEMENTS**
  An element (= a package or a class) was added to or removed from a package
- **GENERALIZATIONS**
  An generalization was added to or removed from a class
- **INITIAL VALUE**
  The initial value of an attribute has changed
- **MULTIPLICITY**
  The multiplicity of an association has changed
- **NAME**
  The name of a class/package/attribute/etc has changed
- **NAVIGABLE**
  An association is now or is no longer navigable
- **NOTES**
  There was a note added to or removed from a model
- **OPERATIONS**
  An operation was added to or removed from a class
The owner of an element or member has changed

The parameters of an operation have changed

The return type of an operation has changed

A role was added to or removed from an association

The stereotype of a class/package/association/etc has changed

The type of an attribute or parameter has changed

The type of the event.

A uses-relation was added to or removed from a class

The value of the changed variable at the moment the event was fired

A value was added to the model

A value in the model has changed

A value was removed from the model

The visibility of an element or member has changed

What has been changed, this one of the 22 constants above.

Constructor Index

ModelChangeEvent(Object, int, int, Object)
Create a new event.

Method Index

getType()
Return the type of the event; VALUE_CHANGED, VALUE_ADDED or VALUE_REMOVED

getValue()
Return the value of the changed variable at the moment the event was fired

getWhat()
Return what has been changed.
Variables

- VALUE_CHANGED
  public static final int VALUE_CHANGED
  A value in the model has changed

- VALUE_ADDED
  public static final int VALUE_ADDED
  A value was added to the model

- VALUE_REMOVED
  public static final int VALUE_REMOVED
  A value was removed from the model

- ABSTRACT
  public static final int ABSTRACT
  A function is now or is no longer abstract

- AGGREGATE
  public static final int AGGREGATE
  A attribute is now or is no longer an aggregate

- ASSOCIATIONS
  public static final int ASSOCIATIONS
  An association was added to or removed from a class

- ATTRIBUTES
  public static final int ATTRIBUTES
  An attribute was added to or removed from a class

- CLASSMEMBER
  public static final int CLASSMEMBER
  An attribute or operation is now or is no longer a classmember

- DERIVED
A attribute is now or is no longer derived from other attributes

An element (= a package or a class) was added to or removed from a package

An generalization was added to or removed from a class

The initial value of an attribute has changed

The multiplicity of an association has changed

The name of a class/package/attribute/etc has changed

An association is now or is no longer navigable

There was a note added to or removed from a model

An operation was added to or removed from a class
OWNER

public static final int OWNER

The owner of a element or member has changed

PARAMETERS

public static final int PARAMETERS

The parameters of an operation have changed

ROLES

public static final int ROLES

A role was added to or removed from an association

RETURNTYPE

public static final int RETURNTYPE

The return type of an operation has changed

STEREOTYPE

public static final int STEREOTYPE

The stereotype of a class/package/association/etc has changed

TYPE

public static final int TYPE

The type of an attribute or parameter has changed

USES_RELATIONS

public static final int USES_RELATIONS

A uses-relation was added to or removed from a class

VISIBILITY

public static final int VISIBILITY

The visibility of an element or member has changed

type

private int type
The type of the event. This is one of VALUE_CHANGED, VALUE_ADDED and VALUE_REMOVED.

See Also:

```
getType
```

**what**

```java
private int what
```

What has been changed, this one of the 22 constants above.

See Also:

```
getWhat
```

**value**

```java
private Object value
```

The value of the changed variable at the moment the event was fired.

See Also:

```
getValue
```

** Constructors **

```java
public ModelChangeEvent(Object source,
    int type,
    int what,
    Object value)
```

Create a new event.

** Parameters:**

- source - the source of the event.
- type - the type of the event; VALUE_CHANGED, VALUE_ADDED or VALUE_REMOVED.
- what - what has been changed
- value - the value of the changed variable at the moment the event was fired

** Methods **

```java
public int getType()
```
Return the type of the event; VALUE_CHANGED, VALUE_ADDED or VALUE_REMOVED

getWhat

public int getWhat()

Return what has been changed.

getValue

public Object getValue()

Return the value of the changed variable at the moment the event was fired
11.3 Interface ModelChangeListener

public interface ModelChangeListener
extends EventListener

All views that are interested in receiving ModelChangeEvents should implement this interface and register themself with the model.

Method Index

- [valueAdded(ModelChangeEvent)]
  This method is called when a value is added to a model
- [valueChanged(ModelChangeEvent)]
  This method is called when a value in the model has changed
- [valueRemoved(ModelChangeEvent)]
  This method is called when a value is removed from a model

Methods

- **valueAdded**

  public abstract void valueAdded(ModelChangeEvent e)

  This method is called when a value is added to a model

- **valueRemoved**

  public abstract void valueRemoved(ModelChangeEvent e)

  This method is called when a value is removed from a model

- **valueChanged**

  public abstract void valueChanged(ModelChangeEvent e)

  This method is called when a value in the model has changed
11.4 Class Visibility

```java
public class Visibility
extends Object
implements Serializable
```

This class represents the visibility of classes, packages, attributes and operations. There are three types of visibility: public, protected and private. These visibility types correspond to the visibility that one might be familiar with from OO languages like C++ or Java. When the visibility of a class/package/attribute/operation is shown or the screen a little traffic light is shown. The colors red, yellow and green correspond to private, protected and public respectively.

**Variable Index**

- **PRIVATE**
  - Private visibility nobody but the class itself can access this element/member
- **PROTECTED**
  - Protected visibility, only the the subclasses can access it
- **PUBLIC**
  - Public visibility, everybody can access this element/member

**Constructor Index**

- `Visibility(String, Icon)`
  - This constructor is private since there are only three visibility types and they are already created as static members of this class, no other visibility types can be created.

**Method Index**

- `getRenderer()`
  - This method returns a ListCellRenderer that can be used to render listboxes in a dialog box.
Convert the visibility to a traffic light icon.

Convert the visibility one of the strings "Public", "Protected" or "Private"

**Variables**

- **PUBLIC**

  ```java
  public static final Visibility PUBLIC
  ```

  Public visibility, everybody can access this element/member

- **PROTECTED**

  ```java
  public static final Visibility PROTECTED
  ```

  Protected visibility, only the subclasses can access it

- **PRIVATE**

  ```java
  public static final Visibility PRIVATE
  ```

  Private visibility nobody but the class itself can access this element/member

- **text**

  ```java
  private String text
  ```

- **icon**

  ```java
  private Icon icon
  ```

- **label**

  ```java
  private JLabel label
  ```

**Constructors**

```java
private Visibility(String text,
                   Icon icon)
```

This constructor is private since there are only three visibility types and they are already created as static members of this class, no other visibility types can be created.

**Methods**

- **toIcon**
public Icon toIcon()

Convert the visibility to a traffic light icon.

**toString**

public String toString()

Convert the visibility one of the strings "Public", "Protected" or "Private"

**Overrides:**

toString in class Object

**getRenderer**

public static ListCellRenderer getRenderer()

This method returns a ListCellRenderer that can be used to render listboxes in a dialog box.

## 11.5 Class model.AssociationModel

```java
java.lang.Object
   +----model.ModelBase
         +----model.AssociationModel
```

public class AssociationModel extends ModelBase

The class AssociationModel represents an association between classes. Each of these classes play a certain role in the association. These roles are represented with the class AssociationRoleModel.

**See Also:**

AssociationRoleModel

### Variable Index

- **name**
  
The name of the association.

- **owner**
  
The owner of this association.

- **roles**
  
The AssociationRoleModels that are part of this association
**stereotype**

An optional stereotype of the association

**Constructor Index**

```java
AssociationModel()
```

The constructor of AssociationModel sets the name and stereotype to an empty string and the owner to null.

**Method Index**

```java
addRole(AssociationRoleModel)
```

Add a new AssociationRoleModel to the association.

```java
getName()
```

Return the name of the association.

```java
getOwner()
```

Return the PackageModel that owns this association or null if there is currently no owner.

```java
getRole(int)
```

Get one of the AssociationRoleModels.

```java
getRoleCount()
```

Return the number of AssociationRoleModels.

```java
getStereotype()
```

Return the stereotype of the association or null if there is none.

```java
removeRole(AssociationRoleModel)
```

Remove an AssociationRoleModel from the association.

```java
setName(String)
```

Change the name of the association.

```java
setOwner(PackageModel)
```

Set the owner of this association.

```java
setStereotype(String)
```

Set the stereotype.

```java
toString()
```

Convert this association to a string.

**Variables**

```java
private String name
```

The name of the association.
**stereotype**

private String stereotype

An optional stereotype of the association

**owner**

private PackageModel owner

The owner of this association.

**roles**

private Vector roles

The AssociationRoleModels that are part of this association

### Constructors

**AssociationModel**

public AssociationModel()

The constructor of AssociationModel sets the name and stereotype to an empty string and the owner to null.

### Methods

**getName**

public synchronized String getName()

Return the name of the association.

**setName**

public synchronized void setName(String name)

Change the name of the association. This method will send out an event to all the views to allow them to update themselves.

**Parameters:**

name - the new name

**getStereotype**

public synchronized String getStereotype()
Return the stereotype of the association or null if there is none.

**setStereotype**

```java
public synchronized void setStereotype(String stereotype)
```

Set the stereotype. This method will send out an event to all the views to allow them to update themselves.

**Parameters:**

- stereotype - the new stereotype, use null or "" if there is no stereotype

**getRoleCount**

```java
public synchronized int getRoleCount()
```

Return the number of AssociationRoleModels.

**getRole**

```java
public synchronized AssociationRoleModel getRole(int index)
```

Get one of the AssociationRoleModels.

**Parameters:**

- index - the number of the role. This index should be between 0 and getRoleCount()

**addRole**

```java
public synchronized void addRole(AssociationRoleModel a)
```

Add a new AssociationRoleModel to the association. An role model may only added once, adding it again will have no effect. This method will send out an event to all the views to allow them to update themselves.

**Parameters:**

- a - the new role-model that will be added.

**removeRole**

```java
public synchronized void removeRole(AssociationRoleModel a)
```

Remove an AssociationRoleModel from the association. If the role model is not part of the association calling this method will have no effect.

**Parameters:**

- a - the AssociationRoleModel that will be removed

**getOwner**
public synchronized PackageModel getOwner()

Return the PackageModel that owns this association or null if there is currently no owner.

**setOwner**

public synchronized void setOwner(PackageModel owner)

Set the owner of this association.

**toString**

public synchronized String toString()

Convert this association to a string. This will return the name of the association or if there is no name the string "<unnamed>"

**Overrides:**

toString in class Object
11.6 Class model.AssociationRoleModel

```java
public class AssociationRoleModel extends ModelBase
```

The class AssociationModel represents an association between classes. Each of these classes play a certain role in the association. These roles are represented with the class AssociationRoleModel.

See Also:
AssociationModel

---

Variable Index

- **AGGREGATE**
  - aggregate
    - The association can be a normal association, an aggregate or a composite; This variable specifies which it is.
- **association**
  - The association this role is a part of
- **COMPOSITE**
  - klass
    - The class that plays a role in the association
- **multiplicity**
  - The multiplicity of the role
- **name**
  - The name of the role
- **navigable**
  - Is this association navigable in this direction
- **NORMAL**
- **ordered**
  - Are the objects that play this role ordered or is there no inherent ordering

---

Constructor Index

- **AssociationRoleModel** (ClassModel)
Method Index

callMethod
getAggregate
Return whether the association is a NORMAL association, an AGGREGATE or a
COMPOSITE.
callMethod
getAssociation
Return the AssociationModel this role belongs to.
callMethod
getKlass
Return the class that plays this role in the association.
callMethod
getMultiplicity
Return the multiplicity of the role.
callMethod
getName
Return the name of the role.
callMethod
isNavigable
Return whether this role is navigable in this direction
callMethod
isOrdered
Return whether the objects that play this role are ordered or not.
callMethod
setAggregate
Change whether the association is a normal association, an aggregate or a composite.
callMethod
setAssociation
Change the association of which this role is a part.
callMethod
setMultiplicity
Change the multiplicity of the role.
callMethod
setName
Change the name of the role.
callMethod
setNavigable
Set whether this role is navigable in this direction
callMethod
setOrdered
Set whether the objects that play this role are ordered or not.
callMethod
toString
Convert this role to a string.

Variables

- NORMAL

public static final int NORMAL

- AGGREGATE

public static final int AGGREGATE

- COMPOSITE
public static final int COMPOSITE

private ClassModel klass

The class that plays a role in the association

private AssociationModel association

The association this role is a part of

private String name

The name of the role

private String multiplicity

The multiplicity of the role

private int aggregate

The association can be a normal association, an aggregate or a composite; This variable specifies which it is.

private boolean navigable

Is this association navigable in this direction

private boolean ordered

Are the objects that play this role ordered or is there no inherent ordering

**Constructors**

AssociationRoleModel

public AssociationRoleModel(ClassModel klass)

**Methods**
getAssociation

public synchronized AssociationModel getAssociation()

Return the AssociationModel this role belongs to.

setAssociation

synchronized void setAssociation(AssociationModel association)

Change the association of which this role is a part. This method does _NOT_ send out any events since it is meant to be used to change a role without an association into a role that belongs to an association, after that the role is not suppost to change associations.

getKlass

public synchronized ClassModel getKlass()

Return the class that plays this role in the association. This method is called getKlass and not getClass because java.lang.Object already contains a getClass operation that can’t be overwritten.

getName

public synchronized String getName()

Return the name of the role.

setName

public synchronized void setName(String name)

Change the name of the role. This method sends out an event to notify the views of the change.

getMultiplicity

public synchronized String getMultiplicity()

Return the multiplicity of the role.

setMultiplicity

public synchronized void setMultiplicity(String multiplicity)

Change the multiplicity of the role. This method sends out an event to notify the views of the change.

getAggregate

public synchronized int getAggregate()
Return whether the association is a NORMAL association, an AGGREGATE or a COMPOSITE.

**setAggregate**

```java
public synchronized void setAggregate(int aggregate)
```

Change whether the association is a normal association, an aggregate or a composite.

**Parameters:**
aggregate - valid values are NORMAL, AGGREGATE and COMPOSITE.

**isNavigable**

```java
public synchronized boolean isNavigable()
```

Return whether this role is navigable in this direction

**setNavigable**

```java
public synchronized void setNavigable(boolean navigable)
```

Set whether this role is navigable in this direction

**isOrdered**

```java
public synchronized boolean isOrdered()
```

Return whether the objects that play this role are ordered or not.

**setOrdered**

```java
public synchronized void setOrdered(boolean ordered)
```

Set whether the objects that play this role are ordered or not.

**toString**

```java
public synchronized String toString()
```

Convert this role to a string. This will return the name of the role or the string "<unnamed>" if it has no name.

**Overrides:**
toString in class Object
11.7 Class model.AttributeModel

public class AttributeModel
extends MemberModel

The class AttributeModel represents one attribute of a class.

Variable Index

- derived
  Is the attribute derived from other attributes and thus its value is determined based on these attributes.
- initialValue
  The initial value of the attribute.
- type
  The data type of the attribute.

Constructor Index

- AttributeModel()  

Method Index

- getInitialValue()  
  Return the initial value of the attribute.
- getType()  
  Return the data type of this attribute.
- isDerived()  
  Return whether the value of the attribute is derived from other attributes.
- setDerived(boolean)  
  Set whether the value of the attribute is derived from other attributes.
- setInitialValue(String)  
  Change the initial value of the attribute.
#### Class model.AttributeModel

The design and implementation of a Socca Editor

```java
public AttributeModel()
```

**Methods**

- **getType**

  ```java
  public synchronized String getType()
  ```

  Return the data type of this attribute.

- **setType**

  ```java
  public synchronized void setType(String type)
  ```

  Change the data type of the attribute. This method will notify the views by sending an event them.

---

**Variables**

- **type**

  ```java
  private String type
  ```

  The data type of the attribute.

- **initialValue**

  ```java
  private String initialValue
  ```

  The initial value of the attribute. That is, the value it will have before any value is assigned to it.

- **derived**

  ```java
  private boolean derived
  ```

  Is the attribute derived from other attributes and thus its value is determined based on these attributes.
getInitialValue

public synchronized String getInitialValue()

Return the initial value of the attribute.

setInitialValue

public synchronized void setInitialValue(String value)

Change the initial value of the attribute. This method will notify the views by sending an event to them.

isDerived

public synchronized boolean isDerived()

Return whether the value of the attribute is derived from other attributes.

setDerived

public synchronized void setDerived(boolean derived)

Set whether the value of the attribute is derived from other attributes.

toString

public synchronized String toString()

Convert the attribute to a string. This method calls toString(false)

Overrides:
    toString in class Object

toString

public synchronized String toString(boolean terse)

Convert the attribute to a string.

Parameters:
    terse - If true then only the name (or "<unnamed>" if there is no name) is returned. If false then the name is optionally prefixed with a "/" and/or a "$" to show that the attribute is derived or a class member, respectively. The name is followed by the data type and the initial value (if there is one).
11.8  Class model.ClassModel

public class ClassModel
extends ElementModel

The class ClassModel represents one class. This class keeps track of the attributes and
operations of the class and the relations it has.

### Variable Index

- **associationRoles**
  All the roles the class plays in various associations
- **attributes**
  The attributes of the class.
- **operations**
  The operations of the class.
- **usesRelations**
  All the uses-relations that class has

### Constructor Index

- **ClassModel()**

### Method Index

- **addAssociationRole(AssociationRoleModel)**
  Add a new role to the class.
- **addAttribute(AttributeModel)**
  Add a new attribute to the class.
- **addOperation(OperandModel)**
  Add a new operation to the class.
- **addUsesRelation(UsesRelationModel)**
- **getAssociationRole(int)**
  Return one specific association-role.
getAssociationRoleCount()  
Return the number of association-roles this class has.

getAttribute(int)  
Return one specific attribute.

getAttributeCount()  
Return the number of attributes this class has.

getOperation(int)  
Return one specific operation.

getOperationCount()  
Return the number of operations this class has.

getUsesRelation(int)  
getUsesRelationCount()  
removeAllAssociationRoles()  
Remove all roles from the class.

removeAllAttributes()  
Remove all attributes from the class.

removeAllOperations()  
Remove all operations from the class.

removeAllUsesRelations()  
removeAssociationRole(AssociationRoleModel)  
Remove a role from the class.

removeAttribute(AttributeModel)  
Remove an attribute from the class.

removeOperation(OperationModel)  
Remove an operation from the class.

removeUsesRelation(UsesRelationModel)

Variables

attributes

private Vector attributes

The attributes of the class.

operations

private Vector operations

The operations of the class.

associationRoles

private Vector associationRoles

All the roles the class plays in various associations
usesRelations

private Vector usesRelations

All the uses-relations that class has

Constructors

ClassModel

public ClassModel()

Methods

getAttributeCount

public synchronized int getAttributeCount()

Return the number of attributes this class has.

getAttribute

public synchronized AttributeModel getAttribute(int index)

Return one specific attribute.

Parameters:

index - the number of the attribute. This value should be between 0 and getAttributeCount()

addAttribute

public synchronized void addAttribute(AttributeModel a)

Add a new attribute to the class. If the attribute is already added, this method does nothing. In all other cases, the method will notify the views of the addition by sending out an event.

Parameters:

a - the new attribute

removeAttribute

public synchronized void removeAttribute(AttributeModel a)

Remove an attribute from the class. If the class doesn’t have the attribute, nothing happens. In all other cases, the method will notify the views of the removal by sending out an event.
Parameters:  
a - the attribute that will be removed.

**removeAllAttributes**

```java
public synchronized void removeAllAttributes()
```

Remove all attributes from the class. This method calls removeAttribute for all attributes of the class.

**getOperationCount**

```java
public synchronized int getOperationCount()
```

Return the number of operations this class has.

**getOperation**

```java
public synchronized OperationModel getOperation(int index)
```

Return one specific operation.

Parameters:

- `index` - the number of the operations. This value should be between 0 and getOperationCount()

**addOperation**

```java
public synchronized void addOperation(OperationModel o)
```

Add a new operation to the class. If the operation is already added, this method does nothing. In all other cases, the method will notify the views of the addition by sending out an event.

Parameters:

- `o` - the new operation

**removeOperation**

```java
public synchronized void removeOperation(OperationModel o)
```

Remove an operation from the class. If the class doesn’t have the operation, nothing happens. In all other cases, the method will notify the views of the removal by sending out an event.

Parameters:

- `o` - the operation that will be removed.

**removeAllOperations**
public synchronized void removeAllOperations()

Remove all operations from the class. This method calls removeOperation for all operations of the class.

- **getAssociationRoleCount**

public synchronized int getAssociationRoleCount()

Return the number of association-roles this class has.

- **getAssociationRole**

public synchronized AssociationRoleModel getAssociationRole(int index)

Return one specific association-role.

**Parameters:**
- index - the number of the role. This value should be between 0 and getAssociationRoleCount()

- **addAssociationRole**

synchronized void addAssociationRole(AssociationRoleModel a)

Add a new role to the class. If the role is already added, this method does nothing. In all other cases, the method will notify the views of the addition by sending out an event.

**Parameters:**
- o - the new role

- **removeAssociationRole**

public synchronized void removeAssociationRole(AssociationRoleModel a)

Remove a role from the class. If the class doesn’t have the role, nothing happens. In all other cases, the method will notify the views of the removal by sending out an event.

**Parameters:**
- a - the role that will be removed.

- **removeAllAssociationRoles**

public synchronized void removeAllAssociationRoles()

Remove all roles from the class. This method calls removeAssociationRole for all roles of the class.

- **getUsesRelationCount**

public synchronized int getUsesRelationCount()
public synchronized UsesRelationModel getUsesRelation(int index)

addUsesRelation

public synchronized void addUsesRelation(UsesRelationModel u)

removeUsesRelation

public synchronized void removeUsesRelation(UsesRelationModel u)

removeAllUsesRelations

public synchronized void removeAllUsesRelations()
11.9 Class model.ElementModel

```
java.lang.Object
  +----model.ModelBase
  |    +----model.ElementModel
```

public class ElementModel extends ModelBase

This class represents one element. It is the base class for ClassModel and PackageModel.

See Also:
    ClassModel, PackageModel

**Variable Index**

- `generalizations`
  The generalizations of this element
- `name`
  The name of the element
- `owner`
  The package that owns this element
- `stereotype`
  The stereotype of the element
- `visibility`
  The visibility (private, protected or public) of this element

**Constructor Index**

- `ElementModel()`
  This constructor is package private because ElementModel should never be directly
  instantiated, instead a ClassModel or a PackageModel should be created.

**Method Index**

- `addGeneralization(GeneralizationModel)`
  Add a new generalization to this element.
- `getGeneralization(int)`
  Return one specificie generalization model.
getGeneralizationCount()  
Return the number of generalizations this element has.

getName()  
Return the name of the element.

getOwner()  
Return the package that owns this element.

getStereotype()  
Return the stereotype of the element or null if there is none.

getVisibility()  
Return the visibility of this element.

removeGeneralization(GeneralizationModel)  
Remove a generalization from this element.

setName(String)  
Change the name of the association.

setOwner(PackageModel)  
Change the owner of this element.

setStereotype(String)  
Set the stereotype.

setVisibility(Visibility)  
Set the visibility of this element.

toString()  
Convert this element to a string.

# Variables

- **name**
  
  private String name

  The name of the element

- **stereotype**
  
  private String stereotype

  The stereotype of the element

- **owner**
  
  private PackageModel owner

  The package that owns this element

- **visibility**
  
  private Visibility visibility
The visibility (private, protected or public) of this element

**generalizations**

private Vector generalizations

The generalizations of this element

### Constructors

**ElementModel**

ElementModel()

This constructor is package private because ElementModel should never be directly instantiated, instead a ClassModel or a PackageModel should be created.

### Methods

**getName**

public synchronized String getName()

Return the name of the element.

**setName**

public synchronized void setName(String name)

Change the name of the association. This method will send out an event to all the views to allow them to update themselves.

**Parameters:**

- name - the new name

**getStereotype**

public synchronized String getStereotype()

Return the stereotype of the element or null if there is none.

**setStereotype**

public synchronized void setStereotype(String stereotype)

Set the stereotype. This method will send out an event to all the views to allow them to update themselves.

**Parameters:**

- stereotype - the new stereotype, use null or "" if there is no stereotype
11.9 Class model.ElementModel

**getGeneralizationCount**

public synchronized int getGeneralizationCount()

Return the number of generalizations this element has.

**getGeneralization**

public synchronized GeneralizationModel getGeneralization(int index)

Return one specific generalization model.

**Parameters:**

index - the number of the generalization. This value should be between 0 and getGeneralizationCount()

**addGeneralization**

synchronized void addGeneralization(GeneralizationModel g)

Add a new generalization to this element. If the generalization is already added, this method does nothing. In all other cases, the method will notify the views of the addition by sending out an event.

**Parameters:**

g - the new generalization

**removeGeneralization**

public synchronized void removeGeneralization(GeneralizationModel g)

Remove a generalization from this element. If the element doesn’t have the generalization, nothing happens. In all other cases, the method will notify the views of the removal by sending out an event.

**Parameters:**

g - the generalization that will be removed.

**getOwner**

public synchronized PackageModel getOwner()

Return the package that owns this element.

**setOwner**

public synchronized void setOwner(PackageModel owner)

Change the owner of this element. This method will notify the views of the change by sending out an event.
getVisibility

public synchronized Visibility getVisibility()

Return the visibility of this element.

setVisibility

public synchronized void setVisibility(Visibility visibility)

Set the visibility of this element. This method will notify the views of the change by sending out an event.

toString

public synchronized String toString()

Convert this element to a string. This will return the name of the element or if there is no name the string "<unnamed>"

Overrides:

toString in class Object
11.10 Class model.GeneralizationModel

public class GeneralizationModel
extends ModelBase

This class represents a generalization relation between elements.

Variable Index

- **name**
  An optional name for the generalization, may be null

- **subtype**
  The element that is the sub-type

- **supertype**
  The element that is the super-type

Constructor Index

- (GeneralizationModel(ElementModel, ElementModel))

Method Index

- **getName()**
  Return the name of the generalization.

- **getSubtype()**
  Return the sub-type of the generalization.

- **getSupertype()**
  Return the super-type of the generalization.

- **setName(String)**
  Change the name of the generalization.

Variables

- **name**
private String name

        An optional name for the generalization, may be null

private ElementModel supertype

        The element that is the super-type

private ElementModel subtype

        The element that is the sub-type

Constructors

GeneralizationModel

        public GeneralizationModel(ElementModel supertype, 
                                    ElementModel subtype)

Methods

getName

        public synchronized String getName()

                Return the name of the generalization.

setName

        public synchronized void setName(String name)

                Change the name of the generalization. This method will send out an event to all the 
                views to allow them to update themselves.

getSupertype

        public synchronized ElementModel getSupertype()

                Return the super-type of the generalization.

getSubtype

        public synchronized ElementModel getSubtype()

                Return the sub-type of the generalization.
11.11 Class model.MemberModel

```java
public class MemberModel extends ModelBase
```

A class can have attributes and operations. This class has all the things that attributes and operation have in common.

### Variable Index
- `classMember`  
  Is the member part of an object or part of the class (static)
- `name`  
  The name of the member
- `owner`  
  The class which is the owner of this member
- `visibility`  
  The visibility (private, protected or public) of the member

### Constructor Index
- `MemberModel()`

### Method Index
- `getName()`  
  Return the name of the member
- `getOwner()`  
  Return the class which owns this member.
- `getVisibility()`  
  Return the visibility of the member
- `isClassMember()`  
  Is this member a class member (static).
- `setClassMember(boolean)`  
  Set whether the member is a class member.
**Variables**

- **name**
  
  private String name
  
  The name of the member

- **visibility**
  
  private Visibility visibility
  
  The visibility (private, protected or public) of the member

- **classMember**
  
  private boolean classMember
  
  Is the member part of an object or part of the class (static)

- **owner**
  
  private ClassModel owner
  
  The class which is the owner of this member

**Constructors**

- **MemberModel**

  MemberModel()

**Methods**

- **getName**

  public synchronized String getName()

  Return the name of the member

- **setName**
public synchronized void setName(String name)

    Change the name of the member. This method will send out an event to all the views to
    allow them to update themselves.

    **Parameters:**
    - name - the new name

getVisibility

public synchronized Visibility getVisibility()

    Return the visibility of the member

defVisibility

public synchronized void setVisibility(Visibility visibility)

    Change the visibility of the member. This method will send out an event to all the views
    to allow them to update themselves.

    **Parameters:**
    - visibility - the new visibility

descIsClassMember

public synchronized boolean isClassMember()

    Is this member a class member (static).

defSetClassMember

public synchronized void setClassMember(boolean classMember)

    Set whether the member is a class member. This method will send out an event to all the
    views to allow them to update themselves.

defgetOwner

public synchronized ClassModel getOwner()

    Return the class which owns this member.

defsetOwner

public synchronized void setOwner(ClassModel owner)

    Set the owner of this member. This method will send out an event to all the views to
    allow them to update themselves.

    **Parameters:**
    - owner - the new class that will own this member
11.11 Class model.MemberModel
11.12 Class model.ModelBase

```java
public class ModelBase
    extends Object
    implements Serializable
```

ModelBase is the base class of the model hierarchy. This class contains all the functionality needed to send events to the views when a model changes.

---

**Variable Index**

- `listenerList`  
  The list of listeners.
- `notes`  
  Each model can have a number of notes attached to it.
- `properties`  
  A set of properties that views can associate with a model.

---

**Constructor Index**

- `ModelBase()`  
  The constructor of ModelBase is package-private; use the constructor of a derived class to instantiate a model.

---

**Method Index**

- `addModelChangeListener(ModelChangeListener)`  
  Add a listener to the list that’s notified each time a change to the data model occurs.
- `addNote(NoteModel)`  
  Add a note to the model.
- `fireValueAdded(int, Object)`  
  Fire an event signaling that a value was added to the model.
- `fireValueChanged(int, Object)`  
  Fire an event signaling that a value of the model has changed.
- `fireValueRemoved(int, Object)`  
  Fire an event signaling that a value was removed from the model.
getNote(int)
Get a note.

getNoteCount()
Get the number of Notes.

getProperty(String)
Get a property that a view has associated with this model.

removeModelChangeListener(ModelChangeListener)
Remove a listener from the list that’s notified each time a change to the data model occurs.

removeNote(NoteModel)
Remove a note from the model.

setProperty(String, Object)
Set a property in the hashtable of this model.

Variables

- listenerList
  private transient EventListenerList listenerList
  The list of listeners. All objects that are interested in receiving events when the model changes should implement the interface ModelChangeListener and register themself with the addModelChangeListener method below. The addModelChangeListener method will add the interested object as a lister to this listenerList.

- properties
  private Hashtable properties
  A set of properties that views can associate with a model. The model itself will not use any of the information that is stored in this hashtable, but the views that store the information may later you it for themselves. Examples of things to store in here: the size and the location of a view.

  See Also:
  - getProperty
  - setProperty

- notes
  private Vector notes
  Each model can have a number of notes attached to it. This is currently not used/implemented in the views, but this vector can be used if such implementation is later added.

Constructors

- ModelBase
ModelBase()

The constructor of ModelBase is package-private; use the constructor of a derived class to instantiate a model.

Methods

getProperty

public synchronized Object getProperty(String propName)

Get a property that a view has associated with this model. Views can associate a property to this model by calling setProperty()

Parameters:
   propName - the name of the property

Returns:
   the value of the property

See Also:
   setProperty

setProperty

public synchronized void setProperty(String propName, Object value)

Set a property in the hashtable of this model. The model itself will not use any of the information that is stored in this hashtable, but the views that store the information may later use it for themselves. Examples of things that can be stored: the size of a view and the location of a view.

Parameters:
   propName - the name of the property
   value - the value of the property

See Also:
   getProperty

getNoteCount

public synchronized int getNoteCount()

Get the number of Notes.

Returns:
   the number of notes attached to this model

getNote
public synchronized NoteModel getNote(int index)

Get a note.

**Parameters:**
- index - the number of the note. The notes are numbered from 0 to getNoteCount().

**Returns:**
- the note

**See Also:**
- addNote, removeNote

### addNote

public synchronized void addNote(NoteModel n)

Add a note to the model.

**Parameters:**
- n - the note to add.

**See Also:**
- getNote, removeNote

### removeNote

public synchronized void removeNote(NoteModel n)

Remove a note from the model. Calling this method with a note that is not attached to the model is legal, it that case the call does nothing.

**Parameters:**
- n - the note to remove

**See Also:**
- getNote, addNote

### addModelChangeListener

public void addModelChangeListener(ModelChangeListener l)

Add a listener to the list that’s notified each time a change to the data model occurs.

**Parameters:**
- l - the ModelChangeListener

**See Also:**
- removeModelChangeListener

### removeModelChangeListener

public void removeModelChangeListener(ModelChangeListener l)
Remove a listener from the list that’s notified each time a change to the data model occurs.

**Parameters:**
- l - the ModelChangeListener

**See Also:**
- addModelChangeListener

### fireValueChanged

```java
protected void fireValueChanged(int what, Object value)
```

Fire an event signaling that a value of the model has changed.

**Parameters:**
- what - an integer identifying which type of value has been changed. See ModelChangeEvent for a list of valid values for parameter what.
- value - the new value of the variable.

**See Also:**
- ModelChangeEvent

### fireValueAdded

```java
protected void fireValueAdded(int what, Object value)
```

Fire an event signaling that a value was added to the model.

**Parameters:**
- what - an integer identifying which type of value has been added. See ModelChangeEvent for a list of valid values for parameter what.
- value - the new value.

**See Also:**
- ModelChangeEvent

### fireValueRemoved

```java
protected void fireValueRemoved(int what, Object value)
```

Fire an event signaling that a value was removed from the model.

**Parameters:**
- what - an integer identifying which type of value has been removed. See ModelChangeEvent for a list of valid values for parameter what.
- value - the value just before it was removed.

**See Also:**
- ModelChangeEvent
11.13 Class model.NoteModel

public class NoteModel
extends ModelBase

The class NoteModel allows notes to be added to another model. A note is just a piece of text that helps the designer to clarify the design but has no meaning to the computer.

Variable Index

owner
To which model this note belongs

text
The text of the note.

Constructor Index

NoteModel(ModelBase)
Constructor; creates an empty note.
NoteModel(ModelBase, String)
Constructor; creates an note with specified text.

Method Index

getOwner()
Return the model to which this note belongs.

getText()
Return the text of the note.

setOwner(ModelBase)
Change the owner of this note.

setText(String)
Change the text of the note.

Variables

- text
private String text

The text of the note.

owner

private ModelBase owner

To which model this note belongs

**Constructors**

**NoteModel**

public NoteModel(ModelBase owner)

Constructor; creates an empty note.

**NoteModel**

public NoteModel(ModelBase owner, String text)

Constructor; creates an note with specified text.

**Methods**

**getOwner**

public synchronized ModelBase getOwner()

Return the model to which this note belongs.

**setOwner**

public synchronized void setOwner(ModelBase owner)

Change the owner of this note.

**getText**

public synchronized String getText()

Return the text of the note.

**setText**

public synchronized void setText(String text)

Change the text of the note.
11.13 Class model.NoteModel
11.14  Class model.OperationModel

public class **OperationModel**
extends **MemberModel**

The class OperationModel represents one operation of a class.

### Variable Index

- **abstractOperation**
  Will this operation be implemented in the class to which it belongs or will it be abstract and be implemented in a subclass.

- **parameters**
  The parameter of the operation

- **returnType**
  The return type of the operation.

### Constructor Index

- **(OperationModel)**

### Method Index

- **addParameter(ParameterModel)**
  Add a new parameter

- **getParameter(int)**
  Return one specific parameter

- **getParameterCount()**
  Return the number of parameters this operation has.

- **getReturnType()**
  Return the return type of this operation

- **isAbstract()**
  Return if the operation is abstract.
removeParameter(int)
    Remove a parameter
setAbstract( boolean)
    Set whether the operation is abstract.
setParameter(int, ParameterModel)
    Set one parameter
setParameters(Vector)
    Set all the parameters of the operation
setReturnType(String)
    Change the return type of this operation.
toString()
    Convert the operation to a string.
toString(boolean)
    Convert the operation to a string.

Variables

- parameters
  private Vector parameters
    The parameter of the operation

- returnType
  private String returnType
    The return type of the operation.

- abstractOperation
  private boolean abstractOperation
    Will this operation be implemented in the class to which it belongs or will it be abstract and be implemented in a subclass.

Constructors

- OperationModel
  public OperationModel()

Methods

- getParameterCount
  public synchronized int getParameterCount()
Return the number of parameters this operation has.

- **getParameter**
  
  ```java
  public synchronized ParameterModel getParameter(int index)
  ```

  Return one specific parameter

- **setParameter**
  
  ```java
  public synchronized void setParameter(int index,
          ParameterModel param)
  ```

  Set one parameter

- **addParameter**
  
  ```java
  public synchronized void addParameter(ParameterModel param)
  ```

  Add a new parameter

- **removeParameter**
  
  ```java
  public synchronized void removeParameter(int index)
  ```

  Remove a parameter

- **setParameters**
  
  ```java
  public synchronized void setParameters(Vector newParams)
  ```

  Set all the parameters of the operation

- **getReturnType**
  
  ```java
  public synchronized String getReturnType()
  ```

  Return the return type of this operation

- **setReturnType**
  
  ```java
  public synchronized void setReturnType(String type)
  ```

  Change the return type of this operation. This method will notify the views by sending an event to them.

- **isAbstract**
  
  ```java
  public synchronized boolean isAbstract()
  ```

  Return if the operation is abstract.
setAbstract

public synchronized void setAbstract(boolean abstr)

Set whether the operation is abstract. This method will notify the views by sending an event to them.

toString

public synchronized String toString(boolean terse)

Convert the operation to a string.

Parameters:

   terse - If true then only the name (or "<unnamed>" if there is no name) is returned. If false then the name is optionally prefixed with a '$' to show that the operation is a class member. The name is followed by a list of parameters (if there are any) and an optional return type.

toString

public synchronized String toString()

Convert the operation to a string. This calls toString(false);

Overrides:

toString in class Object
11.15 Class model.PackageModel

This class contains the information about one package

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<td>getElementCount()</td>
</tr>
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<td>removeAssociation(AssociationModel)</td>
</tr>
</tbody>
</table>
### Methods

- **getElementCount**
  
  ```java
def getElementCount(): int```
  
  Return the number of elements in the package

- **getElement**
  
  ```java
def getElement(index: int): ElementModel```
  
  Get one specific element from the package

- **addElement**
  
  ```java
def addElement(element: ElementModel): void```
  
  Add a new element to the package

- **removeElement**
  
  ```java
def removeElement(element: ElementModel): void```
  
  Remove an element from the package
getAssociationCount
public synchronized int getAssociationCount()

Get the number of association between classes inside the package.

getAssociation
public synchronized AssociationModel getAssociation(int index)

Get one specific association.

addAssociation
public synchronized void addAssociation(AssociationModel a)

Add a new association.

removeAssociation
public synchronized void removeAssociation(AssociationModel a)

Remove an association from the package.
11.16 Class model.ParameterModel

java.lang.Object
   +----model.ParameterModel

public class ParameterModel
extends Object
implements Serializable

This class contains the information about one parameter of a operations.

**Variable Index**

- **defaultValue**
  The default value of the parameter, may be null
- **name**
  The name of the parameter
- **type**
  The data type of the parameter

**Constructor Index**

- [ParameterModel](String, String, String)
  Constructor; create a new parameter.

**Method Index**

- [getDefaultValue](
  Return the default value of the parameter
- [getName](
  Return the name of the parameter
- [getType](
  Return the data type of the parameter

**Variables**

- **name**

  private String name
The name of the parameter

**type**

private String type

The data type of the parameter

**defaultValue**

private String defaultValue

The default value of the parameter, may be null

### Constructors

ParameterModel

```java
public ParameterModel(String name,
                      String type,
                      String defaultValue)
```

Constructor; create a new parameter.

**Parameters:**

- name - the name of the parameter
- type - the data type of the parameter
- defaultValue - the default value of the parameter, may be null

### Methods

**getName**

```java
public synchronized String getName()
```

Return the name of the parameter

**getType**

```java
public synchronized String getType()
```

Return the data type of the parameter

**getDefaultValue**

```java
public synchronized String getDefaultValue()
```

Return the default value of the parameter
11.17  Class model.UsesRelationModel

class UsesRelationModel extends ModelBase

Variables

- **user**
  - private ClassModel user

- **provider**
  - private ClassModel provider

- **operations**
  - private Vector operations

Constructors

- public UsesRelationModel()
public class AssociationDialog extends JDialog
  implements ActionListener, DocumentListener, ModelChangeListener

This is a dialog box that allows the user to edit an Association and its roles

**Variable Index**

- closeButton
  The close button, when the user click on it, the dialog disappears
- model
  The model of which this is a view
- name
  A text-field that shows the name of the association
- stereotype
  A text-field that shows the stereotype of the association
- tabbedPane
  The TabbedPane in which the roles are shown

**Constructor Index**

- AssociationDialog(Frame, AssociationModel)
  Constructor; creates the dialog box for AssociationModel model

**Method Index**
**Variables**

- **model**
  
  private AssociationModel model

  The model of which this is a view

- **tabbedPane**
  
  private JTabbedPane tabbedPane

  The TabbedPane in which the roles are shown

- **name**
  
  private JTextField name

  A text-field that shows the name of the association

- **stereotype**
  
  private JTextField stereotype

  A text-field that shows the stereotype of the association
closeButton

private JButton closeButton

The close button, when the user click on it, the dialog disappears

Constructors

AssociationDialog

public AssociationDialog(Frame frame,
AssociationModel model)

Constructor; creates the dialog box for AssociationModel model

Parameters:
frame - the window this dialog belongs to.
model - the model of which this is a view

Methods

showRole

public void showRole(AssociationRoleModel arm)

This method makes sure that the tabbed pane shows the specified role.

Parameters:
arm - the role to show in the tabbed pane

actionPerformed

public void actionPerformed(ActionEvent e)

This method is called when the user has pushed a button or pressed the enter-key in a
text field. This method is public as an implementation detail and should not be called by
a programmer.

insertUpdate

public void insertUpdate(DocumentEvent e)

This method is called when the user has entered something in a text-field. This method is
public as an implementation detail and should not be called by a programmer.

removeUpdate

public void removeUpdate(DocumentEvent e)
This method is called when the user has removed something from a text-field. This method is public as an implementation detail and should not be called by a programmer.

**changedUpdate**

```java
public void changedUpdate(DocumentEvent e)
```

This method is called when the user has changed something in a text-field that is neither an insert nor a remove. This method is public as an implementation detail and should not be called by a programmer.

**handleDocumentEvent**

```java
private void handleDocumentEvent(DocumentEvent e)
```

This method is called when the value in the name or stereotype text-fields has changed. This method will call the setName or setStereotype methods of the model to propagate the change.

**valueChanged**

```java
public void valueChanged(ModelChangeEvent e)
```

This method is called when a value in the model has changed. This method will update the values in the text-fields. This method is public as an implementation detail and should not be called by a programmer.

**valueAdded**

```java
public void valueAdded(ModelChangeEvent e)
```

This method is called when a value is added to the model. This method is public as an implementation detail and should not be called by a programmer.

**valueRemoved**

```java
public void valueRemoved(ModelChangeEvent e)
```

This method is called when a value is removed from the model. This method is public as an implementation detail and should not be called by a programmer.
11.19  Class view.AssociationRoleView

public class AssociationRoleView
extends Handle
implements ModelChangeListener

This is a view of the AssociationRoleModel. It shows the name and multiplicity of the role.

Variable Index

- classView
  The view of the class that plays the role in the association
- container
  The container that is the parent of the name and multiplicity labels
- model
  The model of which this is a view
- multiplicity
  A label that shows the multiplicity of the role
- multiplicityContainer
  The container that is the parent of the multiplicity label.
- name
  A label that shows the name of the role
- nameContainer
  The container that is the parent of the name label, it moves relative to this.

Constructor Index
AssociationRoleView(AssociationRoleModel, ClassView, Container)

The constructor of the AssociationRoleView class.

**Method Index**

**getClassView()**

Return the view of the class that plays the role in the association.

**raise()**

Place the role-view at the front; raising it above all other components.

**remove()**

This method is called when the role-view is being removed.

**valueAdded(ModelChangeEvent)**

This method doesn’t do anything but needs to be there to satisfy the ModelChangeListener interface signature.

**valueChanged(ModelChangeEvent)**

This method is called when a value in the model changes.

**valueRemoved(ModelChangeEvent)**

This method doesn’t do anything but needs to be there to satisfy the ModelChangeListener interface signature.

**Variables**

**model**

private AssociationRoleModel model

The model of which this is a view

**classView**

private ClassView classView

The view of the class that plays the role in the association

**container**

private Container container

The container that is the parent of the name and multiplicity labels

**name**

private JLabel name

A label that shows the name of the role
nameContainer

private RelativeMovable nameContainer

The container that is the parent of the name label, it moves relative to this.

multiplicity

private JLabel multiplicity

A label that shows the multiplicity of the role

multiplicityContainer

private RelativeMovable multiplicityContainer

The container that is the parent of the multiplicity label.

Constructors

AssociationRoleView

public AssociationRoleView(AssociationRoleModel model,
        ClassView classView,
        Container container)

The constructor of the AssociationRoleView class.

Parameters:
    model - the model of which this is a view
    classView - the view of the class that plays the role in the association
    container - the container that is the parent of the name and multiplicity labels.

Methods

raise

public void raise()

Place the role-view at the front; raising it above all other components.

Overrides:
    raise in class Movable

getClassView

public ClassView getClassView()

Return the view of the class that plays the role in the association.
The design and implementation of a Socca Editor

11.19 Class view.AssociationRoleView

- remove

public void remove()

This method is called when the role-view is being removed. It will remove the name and multiplicity containers of the screen.

- valueChanged

public void valueChanged(ModelChangeEvent e)

This method is called when a value in the model changes. This method is public as an implementation detail and should not be called by a programmer.

- valueAdded

public void valueAdded(ModelChangeEvent e)

This method is doesn’t do anything but needs to be there to satisfy the ModelChangeListener interface signature. This method is public as an implementation detail and should not be called by a programmer.

- valueRemoved

public void valueRemoved(ModelChangeEvent e)

This method is doesn’t do anything but needs to be there to satisfy the ModelChangeListener interface signature. This method is public as an implementation detail and should not be called by a programmer.
11.20  Class view.AssociationView

```
java.lang.Object
 | +----java.awt.Component
 |    +----java.awt.Container
 |           +----com.sun.java.swing.JComponent
 |                 +----view.Movable
 |                        +----view.Resizable
 |                               +----view.AssociationView
```

public class AssociationView
extends Resizable
implements ModelChangeListener

This class represents an association; it does this either with a line (in case of a binary association) or a diamond (is all other cases).

**Variable Index**

- **container**
- **diamondVisible**
  Whether the diamond is visible or not
- **lines**
  All the lines that are connected to the roles
- **mode**
  A reference to the Mode object, this is used to check in which mode the PackageWindow is
- **model**
  The model of this view
- **modelToViewMap**
  A hashtable to convert a model into a view
- **mouseDragPoint**
  The point where the user first pressed the mouse button when the user is dragging the mouse
- **name**
  The name label of the association
- **namePanel**
  The panel that contains the name and the stereotype labels
- **packageView**
roles
All the roles of this association

stereotype
The stereotype label of the association

Constructor Index

AssociationView(AssociationModel, PackageView, Container)

Method Index

addRole(AssociationRoleModel)
Add a new role to this association.

contains(int, int)
This method is called by the AWT event handling to determine whether the point (x, y) lies inside of this component.

doResize(int, int)
This method is called to resize the component.

findFrame()
Find the Frame ancestor of this component.

findMode(Component)
Find the PackageWindow ancestor of this component and get its Mode.

getModel()
Return the model of which this is a view.

mouseClicked(MouseEvent)
This method is called when the user clicks the mouse on the association-view.

mouseDragged(MouseEvent)
This method is called when the user drags the mouse on the association-view.

mousePressed(MouseEvent)
This method is called when the user presses a mouse button on the association-view.

mouseReleased(MouseEvent)
This method is called when the user releases the mouse button.

paintComponent(Graphics)
This method overrides the paintComponent of the super class to allow the diamond to be painted in a non-rectangular fashion.

remove()
This method is called when the association is being removed.

removeRole(AssociationRoleModel)
Remove a role from this association.

updateName()
Update the contents of the name label.

updatePoly()
updateStereotype
Update the contents of the stereotype label.

valueAdded(ModelChangeEvent)
This method is called when a role is added to the association model.

valueChanged(ModelChangeEvent)
This method is called when the name of the stereotype of the association model has changed.

valueRemoved(ModelChangeEvent)
This method is called when a role is removed from the association model.

Variables

model
private AssociationModel model

The model of this view

cpackageView
private PackageView packageView

container
private Container container

cname
private JLabel name

The name label of the association

cstereotype
private JLabel stereotype

The stereotype label of the association

cnamePanel
private JPanel namePanel

The panel that contains the name and the stereotype labels

croles
private Vector roles

All the roles of this association
private Hashtable lines

All the lines that are connected to the roles

private Hashtable modelToViewMap

A hashtable to convert a model into a view

private boolean diamondVisible

Whether the diamond is visible or not

private Mode mode

A reference to the Mode object, this is used to check in which mode the PackageWindow is

private Point mouseDragPoint

The point where the user first pressed the mouse button when the user is dragging the mouse

Constructors

AssociationView

public AssociationView(AssociationModel model,
                      PackageView packageView,
                      Container container)

Methods

getModel

public AssociationModel getModel()

Return the model of which this is a view

addRole

private void addRole(AssociationRoleModel roleModel)
Add a new role to this association. Called in response to an event from the model.

- **removeRole**
  
  ```java
  private void removeRole(AssociationRoleModel model)
  ```

  Remove a role from this association. Called in response to an event from the model.

- **remove**
  
  ```java
  void remove()
  ```

  This method is called when the association is being removed. It will remove all the lines to the class-views.

- **updateName**
  
  ```java
  private void updateName()
  ```

  Update the contents of the name label. Called in response to an event from the model.

- **updateStereotype**
  
  ```java
  private void updateStereotype()
  ```

  Update the contents of the stereotype label. If the stereotype is an empty string, the label is removed (so that only the name is visible and not the stereotype label). If the stereotype is not an empty string the label is added and it’s value is updated.

- **doResize**
  
  ```java
  protected void doResize(int deltaX, int deltaY)
  ```

  This method is called to resize the component.

  **Overrides:**
  
  doResize in class Resizable

- **valueAdded**
  
  ```java
  public void valueAdded(ModelChangeEvent e)
  ```

  This method is called when a role is added to the association model. This method is public as an implementation detail and should not be called by a programmer.

- **valueRemoved**
  
  ```java
  public void valueRemoved(ModelChangeEvent e)
  ```

  This method is called when a role is removed from the association model. This method is public as an implementation detail and should not be called by a programmer.
valueChanged

public void valueChanged(ModelChangeEvent e)

This method is called when the name of the stereotype of the association model has changed. This method is public as an implementation detail and should not be called by a programmer.

mouseClicked

public void mouseClicked(MouseEvent e)

This method is called when the user clicks the mouse on the association-view. When the user double clicks on the association-view an AssociationDialog is created and shown, allowing the user to edit the values in the association model. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
mouseClicked in class Movable

mouseDragged

public void mouseDragged(MouseEvent e)

This method is called when the user drags the mouse on the association-view. If the current mode is the AddAssociationRole mode a line is shown from the point where the user pressed the mouse button down to the current position of the mouse. If the user releases the mouse button on a class-view, a new association role is created. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
mouseDragged in class Resizable

mousePressed

public void mousePressed(MouseEvent e)

This method is called when the user presses a mouse button on the association-view. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
mousePressed in class Resizable

mouseReleased

public void mouseReleased(MouseEvent e)

This method is called when the user releases the mouse button. If the user has dragged the mouse to a class-view and the current mode is the AddAssociationRole mode, a new association role is created. This method is public as an implementation detail and should
Not be called by a programmer.

**Overrides:**

mouseReleased in class Resizable

**paintComponent**

```java
public void paintComponent(Graphics g)
```

This method overrides the `paintComponent` of the super class to allow the diamond to be painted in a non-rectangular fashion. This method is public as an implementation detail and should not be called by a programmer.

**Overrides:**

paintComponent in class JComponent

**updatePoly**

```java
private void updatePoly()
```

**contains**

```java
public boolean contains(int x, int y)
```

This method is called by the AWT event handling to determine whether the point (x, y) lies inside of this component. True is returned if this is the case, false otherwise. This method is public as an implementation detail and should not be called by a programmer.

**Overrides:**

contains in class JComponent

**findFrame**

```java
protected Frame findFrame()
```

Find the Frame ancestor of this component. The frame is needed to show dialog boxes.

**findMode**

```java
protected Mode findMode(Component c)
```

Find the PackageWindow ancestor of this component and get its Mode.
11.21 Class view.AttributeDialog

public class AttributeDialog
extends JDialog
implements ActionListener, DocumentListener, ModelChangeListener

This is a dialog box that allows the user to edit an attribute.

Variable Index

classMember
A checkbox that shows whether the attribute is a normal member or a class member (static)

closeButton
The close button, when the user click on it, the dialog disappears

derived
A checkbox that show whether the value of the attribute is derived from other attributes

initialValue
A text-field that shows the initial value of the attribute

model
The model of which this is a view

name
A text-field that shows the name of the attribute

type
A text-field that shows the data type of the attribute

visibility
A combobox that shows the visibility of the attribute

Constructor Index

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AttributeDialog(Frame, AttributeModel)
Constructor; creates the dialog box for AttributeModel model

Method Index

actionPerformed(ActionEvent)
This method is called when the user has pushed a button or pressed the enter-key in a text field.
changedUpdate(DocumentEvent)
This method is called when the user has changed something in a text-field that is neither an insert nor a remove.
handleDocumentEvent(DocumentEvent)
This method is called when the value in the name, type or initial value text-fields has changed.
insertUpdate(DocumentEvent)
This method is called when the user has entered something in a text-field.
removeUpdate(DocumentEvent)
This method is called when the user has removed something from a text-field.
valueAdded(ModelChangeEvent)
valueChanged(ModelChangeEvent)
valueRemoved(ModelChangeEvent)

Variables

model
private AttributeModel model
The model of which this is a view

name
private JTextField name
A text-field that shows the name of the attribute

initialValue
private JTextField initialValue
A text-field that shows the initial value of the attribute

type
private JTextField type
A text-field that shows the data type of the attribute

- **visibility**

  private JComboBox visibility

  A combobox that shows the visibility of the attribute

- **classMember**

  private JCheckBox classMember

  A checkbox that shows whether the attribute is a normal member or a class member (static)

- **derived**

  private JCheckBox derived

  A checkbox that show whether the value of the attribute is derived from other attributes

- **closeButton**

  private JButton closeButton

  The close button, when the user click on it, the dialog disappears

### Constructors

**AttributeDialog**

public AttributeDialog(Frame parent, AttributeModel model)

Constructor; creates the dialog box for AttributeModel model

**Parameters:**

- parent - the window this dialog belongs to.
- model - the model of which this is a view

### Methods

**actionPerformed**

public void actionPerformed(ActionEvent e)

This method is called when the user has pushed a button or pressed the enter-key in a text field. This method is public as an implementation detail and should not be called by a programmer.
insertUpdate

public void insertUpdate(DocumentEvent e)

This method is called when the user has entered something in a text-field. This method is public as an implementation detail and should not be called by a programmer.

removeUpdate

public void removeUpdate(DocumentEvent e)

This method is called when the user has removed something from a text-field. This method is public as an implementation detail and should not be called by a programmer.

changedUpdate

public void changedUpdate(DocumentEvent e)

This method is called when the user has changed something in a text-field that is neither an insert nor a remove. This method is public as an implementation detail and should not be called by a programmer.

handleDocumentEvent

private void handleDocumentEvent(DocumentEvent e)

This method is called when the value in the name, type or initial value text-fields has changed. This method will call the setName, setType or setInitialValue methods of the model to propagate the change.

valueAdded

public void valueAdded(ModelChangeEvent e)

valueRemoved

public void valueRemoved(ModelChangeEvent e)

valueChanged

public void valueChanged(ModelChangeEvent e)

This method is called when a value in the model has changed. This method will update the values in the text-fields. This method is public as an implementation detail and should not be called by a programmer.
11.22   Class view.AttributeView

This class shows one attribute on the screen. The attribute is shown as a traffic light icon showing the visibility, followed by the name, data type and initial value of the attribute.

Variable Index

model
The model of which this class is a view

Constructor Index

AttributeValue(AttributeModel)
Constructor: create an AttributeView for AttributeModel model

Method Index

deselected()
This method is called when the attribute is deselected.

getModel()
Return the model of which this class is a view.

selected()
This method is called when the attribute is selected.

valueAdded(ModelChangeEvent)
valueChanged(ModelChangeEvent)
This method is called when a value in the model has changed.
Variables

- model

private AttributeModel model

The model of which this class is a view

Constructors

- AttributeView

public AttributeView(AttributeModel model)

Constructor; create an AttributeView for AttributeModel model

Methods

- valueChanged

public void valueChanged(ModelChangeEvent e)

This method is called when a value in the model has changed. This method will update the label and the icon. This method is public as an implementation detail and should not be called by a programmer.

- valueAdded

public void valueAdded(ModelChangeEvent e)

- valueRemoved

public void valueRemoved(ModelChangeEvent e)

- selected

public void selected()

This method is called when the attribute is selected.

- deselected

public void deselected()

This method is called when the attribute is deselected.

- getModel
public AttributeModel getModel()

        Return the model of which this class is a view.
11.23 Class view.AttributesView

```java
java.lang.Object
    +----java.awt.Component
        +----java.awt.Container
            +----com.sun.java.swing.JComponent
                +----com.sun.java.swing.JPanel
                    +----view.AttributesView
```

public class AttributesView
extends JPanel
implements ModelChangeListener

This class show a list of attributes; all the attributes of a class.

### Variable Index

- **box**
  - The class model that owns the attributes that are shown by this class
- **model**
  - A hashtable that maps and attribute model to a view
- **modelToViewMap**
  - A hashtable that maps and attribute model to a view
- **MouseListener**
  - if this is not null than all mouse events that occur on the attribute views will be send to this listener.

### Constructor Index

- **AttributesView(ClassModel, MouseListener)**
  - The AttributesView constructor; show a list of the attributes of ClassModel model.

### Method Index

- **addAttribute(AttributeModel)**
  - Add a new attribute to the list
- **removeAttribute(AttributeModel)**
  - Remove an attribute from the list.
This method is called when an attribute was added to the model.

This method is called when an attribute was removed from the model.

Variables

- model

private ClassModel model

The class model that owns the attributes that are shown by this class

- modelToViewMap

private Hashtable modelToViewMap

A hashtable that maps and attribute model to a view

- box

private Box box

- mouseListener

private MouseListener mouseListener

if this is not null than all mouse events that occur on the attribute views will be send to this listener.

Constructors

AttributesView

public AttributesView(ClassModel model,
                       MouseListener mouseListener)

The AttributesView constructor; show a list of the attributes of ClassModel model.

Parameters:

model - the classmodel that owns the attributes that are to be shown by this class.
mouseListener - if this is not null than all mouse events that occur on the attribute views will be send to this listener.

Methods

- addAttribute
private void addAttribute(AttributeModel attrib)

    Add a new attribute to the list

- removeAttribute

private void removeAttribute(AttributeModel attrib)

    Remove an attribute from the list.

- valueAdded

public void valueAdded(ModelChangeEvent e)

    This method is called when an attribute was added to the model. This method is public as an implementation detail and should not be called by a programmer.

- valueRemoved

public void valueRemoved(ModelChangeEvent e)

    This method is called when an attribute was removed from the model. This method is public as an implementation detail and should not be called by a programmer.

- valueChanged

public void valueChanged(ModelChangeEvent e)
11.24 Class view.BoundedMovable

public class BoundedMovable
extends RelativeMovable

The class Movable contains the functionality that allows the user to move a component on the
screen to a new location. The user can use the mouse to drag a component (that is a subclass
of Movable) and this class will allow it to move.

RelativeMovable inherits from Movable and allows a component on the screen to be moved
relative to another component. For example, A is a Movable and B is a RelativeMovable that
moves relative to A. The user can move B around and the RelativeMovable will keep track of
the relative offset to A. If the user moves A around, B will move as well to keep the offset the
same.

BoundedMovable inherits from RelativeMovable. It restricts the movement of B, relative to
A, so that B is always on the contours of A.

Constructor Index

- BoundedMovable(Movable, ModelBase, String)
The constructor of the BoundedMovable

Method Index

- distance(Point, Point)
  Calculate the distance between points P and Q.
- project(Point, Point, Point)
  Project point P on the line between A and B.
- updateLocation()
**Constructors**

public BoundedMovable(Movable movable,  
ModelBase modelBase,  
String locationName)

The constructor of the BoundedMovable

**Parameters:**
- movable - the movable on which outline the BoundedMovable will move
- modelBase - the model in which the location of the BoundedMovable will be stored
- locationName - the name under which the location of the BoundedMovable will be stored in the model.

**Methods**

**updateLocation**

protected void updateLocation()

**Overrides:**
- updateLocation in class RelativeMovable

**project**

private Point project(Point p,  
Point a,  
Point b)

Project point P on the line between A and B. Return the point on the line after the projection of P. If the projection of P lies not between A and B, return A or B itself, whichever is closer.

**distance**

private int distance(Point p,  
Point q)

Calculate the distance between points P and Q. This method calculates (p.x - q.x)^2 + (p.y - p.y)^2. It does not take the square root. Thus it really returns the square of the distance instead of the distance itself. For the purpose of finding the point with minimal distance this doesn’t matter.
11.25  Class view.ClassDialog

public class ClassDialog
extends JDialog
implements ActionListener, DocumentListener, MouseListener, ModelChangeListener

This is a dialog box that allows the user to edit a ClassModel.

Variable Index

- attributesView
  A list which displays all the attributes of this class.
- closeButton
  The close button, when the user click on it, the dialog disappears
- deleteAttribButton
  Buttons to create a new attribute, edit an attribute or delete an attribute
- deleteOperButton
  Buttons to create a new operation, edit an operation or delete an operation
- editAttribButton
  Buttons to create a new attribute, edit an attribute or delete an attribute
- editOperButton
  Buttons to create a new operation, edit an operation or delete an operation
- frame
  The class model can be edited by this dialog.
- model
- name
  The text-field that shows the name of the class
- newAttribButton
  Buttons to create a new attribute, edit an attribute or delete an attribute
- newOperButton
  Buttons to create a new operation, edit an operation or delete an operation
operationsView
   A list which displays all the operations of this class.
selectedAttrib
   The attribute that is currently selected.
selectedOper
   The operation that is currently selected.
stereotype
   The text-field that shows the stereotype of the class
tabbedPane
   The TabbedPane that allows switching between general class pane and the attributes and
   operation panes.
visibility
   The combobox that shows the visibility of the class

Constructor Index

ClassDialog(Frame, ClassModel)
   Constructor; creates the dialog box for ClassModel model

Method Index

actionPerformed(ActionEvent)
   This method is called when the user has pushed a button or pressed the enter-key in a
text field.
changedUpdate(DocumentEvent)
   This method is called when the user has changed something in a text-field that is neither
   an insert nor a remove.
handleDocumentEvent(DocumentEvent)
   This method is called when the value in the name or stereotype text-fields has changed.
insertUpdate(DocumentEvent)
   This method is called when the user has entered something in a text-field.
mouseClicked(MouseEvent)
   This method is called when the user that clicked the mouse on an attribute or operation.
mouseEntered(MouseEvent)
mouseExited(MouseEvent)
mousePressed(MouseEvent)
mouseReleased(MouseEvent)
removeUpdate(DocumentEvent)
   This method is called when the user has removed something from a text-field.
valueAdded(ModelChangeEvent)
valueChanged(ModelChangeEvent)
   This method is called when a value in the model has changed.
private ClassModel model

The class model can be edited by this dialog.

private Frame frame

private JTabbedPane tabbedPane

The TabbedPane that allows switching between general class pane and the attributes and operation panes.

private JTextField name

The text-field that shows the name of the class

private JTextField stereotype

The text-field that shows the stereotype of the class

private JComboBox visibility

The combobox that shows the visibility of the class

private JButton closeButton

The close button, when the user click on it, the dialog disappears

private AttributesView attributesView

A list which displays all the attributes of this class.
- operationsView
  private OperationsView operationsView

  A list which displays all the operations of this class.

- selectedAttrib
  private AttributeView selectedAttrib

  The attribute that is currently selected.

- selectedOper
  private OperationView selectedOper

  The operation that is currently selected.

- newAttribButton
  private JButton newAttribButton

  Buttons to create a new attribute, edit an attribute or delete an attribute

- editAttribButton
  private JButton editAttribButton

  Buttons to create a new attribute, edit an attribute or delete an attribute

- deleteAttribButton
  private JButton deleteAttribButton

  Buttons to create a new attribute, edit an attribute or delete an attribute

- newOperButton
  private JButton newOperButton

  Buttons to create a new operation, edit an operation or delete an operation

- editOperButton
  private JButton editOperButton

  Buttons to create a new operation, edit an operation or delete an operation

- deleteOperButton
  private JButton deleteOperButton
Buttons to create a new operation, edit an operation or delete an operation

**Constructors**

`ClassDialog`

```java
public ClassDialog(Frame frame,
                   ClassModel model)
```

Constructor; creates the dialog box for ClassModel model

**Parameters:**

- frame - the window this dialog belongs to.
- model - the model of which this is a view

**Methods**

`actionPerformed`

```java
public void actionPerformed(ActionEvent e)
```

This method is called when the user has pushed a button or pressed the enter-key in a text field. This method is public as an implementation detail and should not be called by a programmer.

`insertUpdate`

```java
public void insertUpdate(DocumentEvent e)
```

This method is called when the user has entered something in a text-field. This method is public as an implementation detail and should not be called by a programmer.

`removeUpdate`

```java
public void removeUpdate(DocumentEvent e)
```

This method is called when the user has removed something from a text-field. This method is public as an implementation detail and should not be called by a programmer.

`changedUpdate`

```java
public void changedUpdate(DocumentEvent e)
```

This method is called when the user has changed something in a text-field that is neither an insert nor a remove. This method is public as an implementation detail and should not be called by a programmer.

`handleDocumentEvent`
private void handleDocumentEvent(DocumentEvent e)

This method is called when the value in the name or stereotype text-fields has changed. This method will call the setName or setStereotype methods of the model to propagate the change.

• valueChanged

public void valueChanged(ModelChangeEvent e)

This method is called when a value in the model has changed. This method will update the values in the text-fields. This method is public as an implementation detail and should not be called by a programmer.

• valueAdded

public void valueAdded(ModelChangeEvent e)

• valueRemoved

public void valueRemoved(ModelChangeEvent e)

• mouseClicked

public void mouseClicked(MouseEvent e)

This method is called when the user that clicked the mouse on an attribute or operation. This selects the attribute/operation and if the click was a double-click that a dialog box is shown that allows the user to edit the attribute/operation. This method is public as an implementation detail and should not be called by a programmer.

• mousePressed

public void mousePressed(MouseEvent e)

• mouseReleased

public void mouseReleased(MouseEvent e)

• mouseEntered

public void mouseEntered(MouseEvent e)

• mouseExited

public void mouseExited(MouseEvent e)
11.26 Class view.ClassView

public class ClassView
extends ElementView

This class shows one class element on the screen. At the top of the classview there are the stereotype and name labels and the visibility icon. The visibility icon uses the colors of a traffic light to show public visibility (green), protected visibility (yellow) and private visibility (red). Below the labels and icon there is a list of attributes (AttributesView). Below the attributes is a list of operations (OperationsView).

Variable Index

attributesView
The list of attributes

type
A reference to the PackageWindow’s Mode.

type
The class model that this class is a view of

type
The point where the mouse was dragged to.

operationsView
The list of operations

popup
The menu that pops up when the user presses the right mouse button on the class view

Constructor Index
Constructor; create a view of the class model.

Method Index

- `addNotify()`
- `doResize(int, int)`
  - This method is called to resize the component.
- `findMode(Component)`
  - Find the PackageWindow ancestor of this component and get its Mode.
- `getModel()`
  - Return the model that is shown with this view.
- `mouseClicked(MouseEvent)`
  - This method is called when the user clicks a mouse button.
- `mouseDragged(MouseEvent)`
  - This method is called when the user drags the mouse while holding a mouse button down.
- `mousePressed(MouseEvent)`
  - This method is called when the user presses a mouse button.
- `mouseReleased(MouseEvent)`
  - This method is called when the user releases a mouse button.
- `paintComponent(Graphics)`
  - Override paintComponent in the super class to clear the background of the class view before drawing the component.
- `updatePoly()`
  - Update the outline polygon.

Variables

- `model`
  - private ClassModel model
  - The class model that this class is a view of
- `attributesView`
  - private AttributesView attributesView
  - The list of attributes
- `operationsView`
  - private OperationsView operationsView
The list of operations

- **popup**
  
  private JPopupMenu popup

  The menu that pops up when the user presses the right mouse button on the class view

- **mouseDragPoint**
  
  private Point mouseDragPoint

  The point where the mouse was dragged to.

- **mode**
  
  private Mode mode

  A reference to the PackageWindow’s Mode.

### Constructors

- **ClassView**
  
  public ClassView(ClassModel model, PackageView parentPackage)

  Constructor; create a view of the class model.

  **Parameters:**
  
  - model - the model that will be shown with this view
  - parentPackage - the package that owns this class

### Methods

- **addNotify**
  
  public void addNotify()

  **Overrides:**
  
  addNotify in class Movable

- **getModel**
  
  public ClassModel getModel()

  Return the model that is shown with this view.

- **mousePressed**
public void mousePressed(MouseEvent e)

This method is called when the user presses a mouse button. If the mouse button is the right mouse button, the popup menu is shown. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
mousePressed in class ElementView

mouseClicked

public void mouseClicked(MouseEvent e)

This method is called when the user clicks a mouse button. If the user double-clicks, then a dialog box is shown allowing the user to edit the class. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
mouseClicked in class Movable

mouseDragged

public void mouseDragged(MouseEvent e)

This method is called when the user drags the mouse while holding a mouse button down. If the current mode is AddAssociationRole then a line from the class to the current mouse position is drawn. If the mouse button is release over another class or over a AssociationView, a new association role will be created. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
mouseDragged in class Resizable

mouseReleased

public void mouseReleased(MouseEvent e)

This method is called when the user releases a mouse button. If the current mode is AddAssociationRole and the mouse button is release over another class or over a AssociationView, a new association role will be created. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
mouseReleased in class Resizable

doResize

protected void doResize(int x, int y)
This method is called to resize the component.

**Overrides:**
doResize in class ElementView

- **updatePoly**
  
  private void updatePoly()
  
  Update the outline polygon.

- **findMode**
  
  protected Mode findMode(Component c)
  
  Find the PackageWindow ancestor of this component and get its Mode.

- **paintComponent**
  
  public void paintComponent(Graphics g)
  
  Override paintComponent in the super class to clear the background of the class view before drawing the component.

  **Overrides:**
paintComponent in class JComponent
11.27  Class view.ElementView

```java
public class ElementView
    extends Resizable
    implements ModelChangeListener, SelectionListener

Class ElementView is the base class of ClassView and PackageView. It contains the things
ClassView and PackageView have in common.

See Also:
    ClassView, PackageView
```

**Variable Index**

- `contentPanel`
  - The panel that shows the rest of the information of the element.
- `model`
  - The model that is shown with this view.
- `nameLabel`
  - The label that is used to show the name of the element.
- `namePanel`
  - The panel that shows the name and stereotype of the element.
- `parentPackage`
  - The package that owns this element
- `stereotypeLabel`
  - The label that is used to show the stereotype of the element.
- `suppressed`
  - If the element is suppressed, only the name and stereotype is shown.
- `unsuppressedSize`
  - When the element is suppressed, remember the size of the element it had when it was not suppressed.
Constructor Index

`(ElementView)(ElementModel, PackageView)`
Constructor; create a view of the element model.

Method Index

`deselected()`
This method is called when the element is deselected.

`doResize(int, int)`
This method is called to resize the component.

`findFrame()`
Find the Frame ancestor of this component.

`getParentPackage()`
Return the package that owns this element.

`isSuppressed()`
Return whether the element is currently suppressed.

`mousePressed(MouseEvent)`
This method is called when the user pressed a mouse button on this element.

`selected()`
This method is called when the element is selected.

`setName(String)`
Change the name that is shown in the name label.

`setStereotype(String)`
Change the stereotype that is shown in the stereotype label.

`setSuppressed(boolean)`
Suppress or unsuppress this element.

`setVisibility(Visibility)`
Change the visibility that is shown in the visibility icon.

`valueAdded(ModelChangeEvent)`

`valueChanged(ModelChangeEvent)`
This method is called when the name, stereotype or visibility of the model has changed.

`valueRemoved(ModelChangeEvent)`

Variables

`model`

private ElementModel model

The model that is shown with this view.
**parentPackage**

protected PackageView parentPackage

The package that owns this element

**namePanel**

protected JPanel namePanel

The panel that shows the name and stereotype of the element.

**contentPanel**

protected JPanel contentPanel

The panel that shows the rest of the information of the element.

**nameLabel**

private JLabel nameLabel

The label that is used to show the name of the element.

**stereoTypeLabel**

private JLabel stereoTypeLabel

The label that is used to show the stereotype of the element.

**suppressed**

private boolean suppressed

If the element is suppressed, only the name and stereotype is shown.

**unsuppressedSize**

private Dimension unsuppressedSize

When the element is suppressed, remember the size of the element it had when it was not suppressed.

**Constructors**

**ElementView**

ElementView(ElementModel model, PackageView parentPackage)

Constructor; create a view of the element model.
Parameters:
model - the model that will be shown with this view
parentPackage - the package that owns this element.

Methods

- `getParentPackage`

  public PackageView getParentPackage()

  Return the package that owns this element.

- `setSuppressed`

  public void setSuppressed(boolean suppressed)

  Suppress or unsuppress this element. When the element is suppressed, only the name and stereotype is shown.

- `isSuppressed`

  public boolean isSuppressed()

  Return whether the element is currently suppressed.

- `setName`

  public void setName(String name)

  Change the name that is shown in the name label.

  Overrides:
  setName in class Component

- `setStereotype`

  public void setStereotype(String stereotype)

  Change the stereotype that is shown in the stereotype label.

- `setVisibility`

  public void setVisibility(Visibility visibility)

  Change the visibility that is shown in the visibility icon.

- `valueChanged`

  public void valueChanged(ModelChangeEvent e)
This method is called when the name, stereotype or visibility of the model has changed. This method calls setName, setStereotype or setVisibility to propagate the change.

- **valueAdded**
  
  public void valueAdded(ModelChangeEvent e)

- **valueRemoved**
  
  public void valueRemoved(ModelChangeEvent e)

- **selected**
  
  public void selected()
  
  This method is called when the element is selected. It changes the color of the name and stereotype labels.

- **deselected**
  
  public void deselected()
  
  This method is called when the element is deselected. It changes the color of the name and stereotype labels back to normal.

- **mousePressed**
  
  public void mousePressed(MouseEvent e)
  
  This method is called when the user pressed a mouse button on this element. This will select the element.
  
  **Overrides:**
  mousePressed in class Resizable

- **doResize**
  
  protected void doResize(int x, int y)
  
  This method is called to resize the component.
  
  **Overrides:**
  doResize in class Resizable

- **findFrame**
  
  protected Frame findFrame()
  
  Find the Frame ancestor of this component. The frame is needed to show dialog boxes.
11.28 Class view.Handle

A Handle is a little yellow circle that can be used to move the lines of the associations.

Constructor Index

Handle(Movable movable, ModelBase modelBase, String locationName)

The constructor the the Handle.

Method Index

paintComponent(Graphics)

Paint a little yellow circle.

Constructors

public Handle(Movable movable, ModelBase modelBase, String locationName)

The constructor the the Handle.

Parameters:
movable - the movable on which outline the handle will move
modelBase - the model in which the location of the handle will be stored
locationName - the name under which the location of the handle will be stored in
the model.

**Methods**

- **paintComponent**

```java
public void paintComponent(Graphics g)

    Paint a little yellow circle.

Overrides:
    paintComponent in class JComponent
```
11.29 Class view.Line

public class Line
extends Component
implements MouseListener, MouseMotionListener, SelectionListener

Most of the relations are drawn using lines between ClassViews. The class Line draws the lines. A line can consist of one or more straight lines. Each of these straight lines is drawn by the class LineSegment.

See Also:
  LineSegment

Variable Index

| a | One side of the line |
| b | The other side of the line |
| container | The container to which the line segments are added |
| lineSegments | All the line segments of the line |

Constructor Index

| Line(Handle, Handle, Container) | The constructor |

Method Index

| deselected() | This method is called when the line is deselected. |
| mouseClicked(MouseEvent) |
| mouseDragged(MouseEvent) |
mouseEntered(MouseEvent)
mouseExited(MouseEvent)
mouseMoved(MouseEvent)
mousePressed(MouseEvent)
mouseReleased(MouseEvent)
raise()
remove()
selected()

This method is called when the user presses a mouse button on a line segment.
Raise all the line segments to the front.
This method is called when the line is about to be removed, it will remove all the line segments from the screen.
This method is called when the line is selected.

Variables

private Handle a
One side of the line
private Handle b
The other side of the line
private Container container
The container to which the line segments are added
private Vector lineSegments
All the line segments of the line

Constructors

public Line(Handle a,
            Handle b,
            Container c)
The constructor

**Parameters:**
- a - one side of the line
- b - the other side of the line
- c - the container to which the line segments are added

**Methods**

- **selected**
  
  public void selected()

  This method is called when the line is selected. This method calls the selected() method of all the line segments of this line.

- **deselected**
  
  public void deselected()

  This method is called when the line is deselected. This method calls the deselected() method of all the line segments of this line.

- **mousePressed**
  
  public void mousePressed(MouseEvent e)

  This method is called when the user presses a mouse button on a line segment. This will raise all the line segments to the front and set the line as selection.

- **mouseDragged**
  
  public void mouseDragged(MouseEvent e)

- **mouseClicked**
  
  public void mouseClicked(MouseEvent e)

- **mouseReleased**
  
  public void mouseReleased(MouseEvent e)

- **mouseEntered**
  
  public void mouseEntered(MouseEvent e)

- **mouseExited**
  
  public void mouseExited(MouseEvent e)

- **mouseMoved**
public void mouseMoved(MouseEvent e)

raise

public void raise()

Raise all the line segments to the front.

remove

public void remove()

This method is called when the line is about to be removed, it will remove all the line segments from the screen.
11.30 Class view.LineSegment

```java
public class LineSegment extends JComponent implements ComponentListener, ChangeListener
```

Most of the relations are drawn using lines between ClassViews. The class Line draws the lines. A line can consist of one or more straight lines. Each of these straight lines is drawn by the class LineSegment.

See Also:
- Line

### Variable Index

- `a` One side of the line
- `b` The other side of the line
- `x`  
- `y1`  
- `y2`  

### Constructor Index

- `LineSegment(Handle, Handle)`  
  Create a new LineSegment that draws a line between a and b

### Method Index

- `addListeners()`  
- `addNotify()`
componentHidden(ChangeEvent)
componentMoved(ChangeEvent)
  This method is called when handle a or handle b has been moved.
componentResized(ChangeEvent)
componentShown(ChangeEvent)
contains(int, int)
  Return true if point (ex, ey) is on or close by the line, false otherwise.
deselected()
  This method is called when the line segment is deselected.
paint(Graphics)
raise()
  Bring the line segment to the front.
selected()
  This method is called when the line segment is selected.
stateChanged(ChangeEvent)
  This method is called when a scrollpane has been scrolled.
updateLocationAndSize()
  If handle A or handle B have changed position this method is called to change the
  location and the size of the line.

**Variables**

* a

private Handle a

   One side of the line

* b

private Handle b

   The other side of the line

* x

private int x

* y1

private int y1

* y2

private int y2

**Constructors**

LineSegment
public LineSegment(Handle a, Handle b)

Create a new LineSegment that draws a line between a and b

Methods

• addNotify

public void addNotify()

Overrides:
    addNotify in class JComponent

• addListeners

private void addListeners()

• raise

public void raise()

Bring the line segment to the front.

• selected

public void selected()

This method is called when the line segment is selected.

• deselected

public void deselected()

This method is called when the line segment is deselected.

• updateLocationAndSize

private void updateLocationAndSize()

If handle A or handle B have changed position this method is called to change the location and the size of the line.

• paint

public void paint(Graphics g)

Overrides:
    paint in class JComponent

• contains
public boolean contains(int ex,
   int ey)

   Return true if point (ex, ey) is on or close by the line, false otherwise.

   Overrides:
   contains in class JComponent

componentMoved
public void componentMoved(ComponentEvent e)

   This method is called when handle a or handle b has been moved. This method calls
   updateLocationAndSize();

componentResized
public void componentResized(ComponentEvent e)

componentShown
public void componentShown(ComponentEvent e)

componentHidden
public void componentHidden(ComponentEvent e)

stateChanged
public void stateChanged(ChangeEvent e)

   This method is called when a scrollpane has been scrolled. This method calls
   updateLocationAndSize();
11.31  Class view.MainWindow

java.lang.Object
  │
  │ +----java.awt.Component
  │     │
  │     │ +----java.awt.Container
  │     │     │
  │     │     │ +----java.awt.Window
  │     │     │     │
  │     │     │     │ +----java.awt.Frame
  │     │     │     │ +----com.sun.java.swing.JFrame
  │     │     │
  │     │ +----view.MainWindow

public class MainWindow
  extends JFrame
  implements ActionListener

This class creates the main window of the editor. It shows the main menu bar, allows files to be loaded and saved and it shows the model tree of the global package.

---

Variable Index

- **globalScopePackage**
  The top most package, the global scope.
- **mainWindow**
  A static reference to the (only) instance of this class
- **modelTree**
  The model tree that shows the global scope package.
- **windows**
  A list of PackageWindows

Constructor Index

- **MainWindow(String)**
  Create a new main window, load the file with the name filename if filename is not null.

Method Index

- **actionPerformed(ActionEvent)**
  This method is called when the user has chosen a new look and feel from the menu.
addWindow(Window)
Add a new window to the list of windows.
closeAllWindows()
Close all the windows in the list of windows.
isModelTree()
Return the model tree of the global scope package.
load(String)
Load a global scope package and its contents from file.
quit()
Quit the editor.
setGlobalScopePackage(PackageModel)
Change the global scope package.

Variables

*mainWindow*

public static MainWindow mainWindow
A static reference to the (only) instance of this class

globalScopePackage

private PackageModel globalScopePackage
The top most package, the global scope.

modelTree

private ModelTree modelTree
The model tree that shows the global scope package.

windows

private Vector windows
A list of PackageWindows

Constructors

MainWindow

public MainWindow(String filename)
Create a new main window, load the file with the name filename if filename is not null.

Methods

getModelTree
public ModelTree getModelTree()

    Return the model tree of the global scope package.

● actionPerfomed

public void actionPerformed(ActionEvent event)

    This method is called when the user has chosen a new look and feel from the menu. Try
to load the new look and feel and if that fails, disable the menu entry.

● addWindow

public void addWindow(Window w)

    Add a new window to the list of windows.

● closeAllWindows

private void closeAllWindows()

    Close all the windows in the list of windows.

● setGlobalScopePackage

private void setGlobalScopePackage(PackageModel globalScopePackage)

    Change the global scope package. Close all the windows that show the old package and
create a new window.

● quit

private void quit()

    Quit the editor.

● load

private void load(String filename)

    Load a global scope package and its contents from file.
11.32  Class view.MenuFactory

public class MenuFactory
extends Object

This class contains only static methods that are used to create menus and toolbars.

Variable Index

resources

Constructor Index

resources

Method Index

()  
createMenu(String, MyAction[])  
Create a normal menu with the actions given in parameter actions.
createPopupMenu(MyAction[])  
Create a popup menu with the actions given in parameter actions.
createRadioMenu(String, MyAction[])  
Create a menu with radio items with the actions given in parameter actions.
createRadioToolbar(MyAction[])  
Create a tool bar with radio buttons with the actions given in parameter actions.
createToolbar(MyAction[])  
Create a tool bar with the actions given in parameter actions.
getResourceString(String)

Variables

resources

private static ResourceBundle resources

Constructors

MenuFactory
public MenuFactory()

Methods

createMenu

public static JMenu createMenu(String name,
       MyAction actions[])

Create a normal menu with the actions given in parameter actions.

createRadioMenu

public static JMenu createRadioMenu(String name,
       MyAction actions[])

Create a menu with radio items with the actions given in parameter actions.

createPopupMenu

public static JPopupMenu createPopupMenu(MyAction actions[])

Create a popup menu with the actions given in parameter actions.

createToolBar

public static JToolBar createToolBar(MyAction actions[])

Create a tool bar with the actions given in parameter actions.

createRadioToolBar

public static JToolBar createRadioToolBar(MyAction actions[])

Create a tool bar with radio buttons with the actions given in parameter actions.

getResourceString

public static String getResourceString(String nm)

static void ()
11.33  Class view.Mode

```java
public class Mode extends Object
```

At any given time the PackageWindow is in a certain mode. This can be the move mode that allows the user to move, resize or select elements or it can be the addClass, addPackage or addAssociation that allows the user to add a class, package or association to the PackageView. Mode is the class that stores the current mode the PackageWindow is in.

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<td><code>Mode</code> PackageView)</td>
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Method Index

- `createMenu()`
  Create a mode menu and return it.
- `createToolbar()`
  Create a mode toolbar and return it.
- `getCurrentMode()`
  Return the currently active mode.
- `getCurrentMode(Component)`
  Return the currently active mode.
- `isAddAssociation()`
  Return whether the current mode is the add association mode.
- `isAddAssociationRole()`
  Return whether the current mode is the add association role mode.
- `isAddClass()`
  Return whether the current mode is the add class mode.
- `isAddPackage()`
  Return whether the current mode is the add package mode.
- `isMove()`
  Return whether the current mode is the move mode.
- `setCurrentMode(Component, int)`
  Change the current mode to a new mode.
- `setCurrentMode(int)`
  Change the current mode to a new mode.

Variables

- **MOVE_MODE**
  
  public static final int MOVE_MODE

  The mode that allows the user to move, resize or select elements

- **ADD_CLASS_MODE**
  
  public static final int ADD_CLASS_MODE

  The mode that allows the user to add a new class to the model

- **ADD_PACKAGE_MODE**
  
  public static final int ADD_PACKAGE_MODE

  The mode that allows the user to add a new package to the model
ADD_ASSOCIATION_MODE

public static final int ADD_ASSOCIATION_MODE

    The mode that allows the user to add a new association

ADD_ASSOCIATIONROLE_MODE

public static final int ADD_ASSOCIATIONROLE_MODE

    The mode that allows the user to add a new role to the model

ADD_GENERALIZATION_MODE

public static final int ADD_GENERALIZATION_MODE

    The mode that allows the user to add a new generalization

actions

private MyAction actions[]

    The actions of the mode menu and the mode toolbar.

currentMode

private int currentMode

    The mode the PackageWindow is currently in.

menu

private JMenu menu

    The mode menu

toolbar

private JToolBar toolbar

    The mode toolbar

Constructors

Mode

public Mode(PackageView packageView)

Methods

createMenu


public JMenu createMenu()

    Create a mode menu and return it.

createToolbar
public JToolBar createToolbar()

    Create a mode toolbar and return it.

setCurrentMode
public void setCurrentMode(int mode)

    Change the current mode to a new mode.

    Parameters:
    mode - the new mode

setCurrentMode
public static void setCurrentMode(Component c, int mode)

    Change the current mode to a new mode.

currentMode
public int getCurrentMode()

    Return the currently active mode.

getCurrentMode
public static int getCurrentMode(Component c)

    Return the currently active mode.

isMove
public boolean isMove()

    Return whether the current mode is the move mode.

isAddClass
public boolean isAddClass()

    Return whether the current mode is the add class mode.

isAddPackage
public boolean isAddPackage()

    Return whether the current mode is the add package mode.

isAddAssociation

public boolean isAddAssociation()

    Return whether the current mode is the add association mode.

isAddAssociationRole

public boolean isAddAssociationRole()

    Return whether the current mode is the add association role mode.
11.34  Class view.ModelTree

```
java.lang.Object
   +----java.awt.Component
        +----java.awt.Container
             +----com.sun.java.swing.JComponent
                   +----com.sun.java.swing.JPanel
                        +----view.ModelTree
```

public class ModelTree
extends JPanel
implements ModelChangeListener

This widget shows a package model and all it contents as a tree. The user can use this tree to manipulate the model.

---

**Variable Index**

- **associationIcon**
  An icon that represents a association

- **associationRoleIcon**
  An icon that represents a association role

- **classIcon**
  An icon that represents a class

- **modelToNodeMap**
  A hashtable that maps a model to a node

- **packageIcon**
  An icon that represents a package

- **tree**
  The actual tree

- **treeModel**
  The model of the tree

---

**Constructor Index**

- **ModelTree(PackageModel)**
  Create a tree using the model packageModel
Method Index

- **findFrame**
  - This method is called when something is added to a model.

- **valueAdded** (ModelChangeEvent)
  - This method is called when something is added to a model.

- **valueChanged** (ModelChangeEvent)
  - This method is called when some value of a model has changed.

- **valueRemoved** (ModelChangeEvent)
  - This method is called when something is removed from a model.

Variables

- **tree**
  - private JTree tree
    - The actual tree

- **treeModel**
  - private DefaultTreeModel treeModel
    - The model of the tree

- **modelToNodeMap**
  - private Hashtable modelToNodeMap
    - A hashtable that maps a model to a node

- **classIcon**
  - private static ImageIcon classIcon
    - An icon that represents a class

- **packageIcon**
  - private static ImageIcon packageIcon
    - An icon that represents a package

- **associationIcon**
  - private static ImageIcon associationIcon
    - An icon that represents a association
**associationRoleIcon**

private static ImageIcon associationRoleIcon

An icon that represents a association role

**Constructors**

- ModelTree

public ModelTree(PackageModel packageModel)

Create a tree using the model packageModel

**Methods**

- valueAdded

public void valueAdded(ModelChangeEvent e)

This method is called when something is added to a model. This method adds a node to the tree to represent the new addition to the model.

- valueRemoved

public void valueRemoved(ModelChangeEvent e)

This method is called when something is removed from a model. This method will remove the corresponding node from the tree.

- valueChanged

public void valueChanged(ModelChangeEvent e)

This method is called when some value of a model has changed. This method will reload that part of the tree so that the tree show the up to date value.

- findFrame

protected Frame findFrame()
The class Movable contains the functionality that allows the user to move a component on the screen to a new location. The user can use the mouse to drag a component (that is a subclass of Movable) and this class will allow it to move.

**Variable Index**

- **locationName**
  The name under which the location of the Movable will be stored in the model.
- **modelBase**
  The model in which the location of this Movable will be stored.
- **mouseDownPoint**
  The point at which the user first pressed a mouse button.
- **outlinePolygon**
  A polygon with the shape of the outline of this Movable

**Constructor Index**

- **Movable(ModelBase, String)**
  The constructor of the Movable

**Method Index**

- **addNotify()**
- **doMove(int, int)**
  This method is called to move the component to a new location.
- **getPolygon()**
  Return the outline polygon
mouseClicked(MouseEvent)
This method is public as an implementation detail and should not be called by a programmer.
mouseDragged(MouseEvent)
This method is public as an implementation detail and should not be called by a programmer.
mouseEntered(MouseEvent)
This method is public as an implementation detail and should not be called by a programmer.
mouseExited(MouseEvent)
This method is public as an implementation detail and should not be called by a programmer.
mouseMoved(MouseEvent)
This method is public as an implementation detail and should not be called by a programmer.
mousePressed(MouseEvent)
This method is called when the user presses a mouse button.
mouseReleased(MouseEvent)
This method is called when the user releases a mouse button.
raise()
Bring this movable to the front.
setLocation(Point)

Variables

mouseDownPoint
protected Point mouseDownPoint
The point at which the user first pressed a mouse button.

modelBase
protected ModelBase modelBase
The model in which the location of this Movable will be stored.

locationName
protected String locationName
The name under which the location of the Movable will be stored in the model.

outlinePolygon
protected Polygon outlinePolygon
A polygon with the shape of the outline of this Movable

**Constructors**

```
public Movable(ModelBase modelBase,
               String locationName)
```

The constructor of the Movable

**Parameters:**
- modelBase - the model in which the location of the Movable will be stored
- locationName - the name under which the location of the Movable will be stored in the model.

**Methods**

```
public void addNotify()
```

**Overrides:**
- addNotify in class JComponent

```
public void raise()
```

Bring this movable to the front.

```
public void mousePressed(MouseEvent e)
```

This method is called when the user presses a mouse button. This movable is raised to the front and this method registers the point at which the button was pressed. This method is public as an implementation detail and should not be called by a programmer.

```
public void mouseReleased(MouseEvent e)
```

This method is called when the user releases a mouse button. This method is public as an implementation detail and should not be called by a programmer.

```
public void mouseDragged(MouseEvent e)
```
This method is public as an implementation detail and should not be called by a programmer.

**mouseClicked**

```java
public void mouseClicked(MouseEvent e)
```

This method is public as an implementation detail and should not be called by a programmer.

**mouseEntered**

```java
public void mouseEntered(MouseEvent e)
```

This method is public as an implementation detail and should not be called by a programmer.

**mouseExited**

```java
public void mouseExited(MouseEvent e)
```

This method is public as an implementation detail and should not be called by a programmer.

**mouseMoved**

```java
public void mouseMoved(MouseEvent e)
```

This method is public as an implementation detail and should not be called by a programmer.

**doMove**

```java
protected void doMove(int deltaX, int deltaY)
```

This method is called to move the component to a new location.

**Parameters:**
- deltaX - the amount to move in the X direction
- deltaY - the amount to move in the Y direction

**setLocation**

```java
public void setLocation(Point newLocation)
```

**Overrides:**
- setLocation in class Component

**getPolygon**
public Polygon getPolygon()

    Return the outline polygon
11.36 Class view.MyAction

java.lang.Object
   +----com.sun.java.swing(AbstractAction
   |   +----view.MyAction

public abstract class MyAction
extends AbstractAction

This is an abstraction of the action that results from a menu selection or a button click on a toolbar.

Variable Index

**accelerator**
The key the user key use to activate the action without using the menu.

**label**
The label that will be shown in a menu.

**mnemonic**
One character of the label in the menu that is underlined.

**resources**

**tooltip**
The tooltip that will be shown when the mouse is over a button in the toolbar.

Constructor Index

**[MyAction]**(String)

Method Index

**()**

**getAccelerator()**
Return the accelerator of the action.

**getIcon()**
Return the icon of the action.

**getLabel()**
Return the label of the action.

**getMnemonic()**
Return the mnemonic of the action.
getName()  
Return the name of the action.

getResource(String)  
Load the resource (image, ...) with name s from the resource file or return null if it was not found.

getResourceString(String)  
Load string with the name s from the resource file or return null if it was not found.

getTooltip()  
Return the tooltip of the action.

loadInfo()  
Load the information for this action from the resource file.

setLocale(Locale)  
Change to a different locale.

Variables

label
private String label

The label that will be shown in a menu.

tooltip
private String tooltip

The tooltip that will be shown when the mouse is over a button in the toolbar.

mnemonic
private char mnemonic

One character of the label in the menu that is underlined. If the user presses this character on the keyboard while the menu if open the action is activated.

accelerator
private char accelerator

The key the user key use to activate the action without using the menu. The value in this variable is combined with the Control key to create the actual accelerator.

resources
private static ResourceBundle resources

Constructors

MyAction
public MyAction(String name)

**Methods**

- loadInfo

  public void loadInfo()

  Load the information for this action from the resource file.

- getName

  public String getName()

  Return the name of the action.

- getLabel

  public String getLabel()

  Return the label of the action.

- getTooltip

  public String getTooltip()

  Return the tooltip of the action.

- getMnemonic

  public char getMnemonic()

  Return the mnemonic of the action.

- getAccelerator

  public char getAccelerator()

  Return the accelerator of the action.

- getIcon

  public Icon getIcon()

  Return the icon of the action.

- getResourceString

  private String getResourceString(String s)

  Load string with the name s from the resource file or return null if it was not found.
**getResource**

private URL getResource(String key)

Load the resource (image, ...) with name s from the resource file or return null if it was not found.

**setLocale**

public static void setLocale(Locale locale)

Change to a different locale. The caller is responsible to call loadInfo() for each action that should be changed to the new locale.
11.37 Class view.OperationDialog

```java
public class OperationDialog
    extends JDialog
    implements ActionListener, DocumentListener, ModelChangeListener

This is a dialog box that allows the user to edit an operation.
```

### Variable Index

- **abstractOperation**: A checkbox that show whether the operation is abstract or not.
- **classMember**: A checkbox that shows whether the attribute is a normal member or a class member (static)
- **closeButton**: The close button, when the user click on it, the dialog disappears
- **model**: The model of which this is a view
- **name**: A text-field that shows the name of the operation
- **returnType**: A text-field that shows the return type of the operation
- **tm**: A combobox that shows the visibility of the attribute

### Constructor Index
class OperationDialog (Frame, OperationModel)
    Constructor; creates the dialog box for OperationModel model

Method Index

- actionPerformed(ActionEvent)
  This method is called when the user has pushed a button or pressed the enter-key in a
  text field.
- changedUpdate(DocumentEvent)
  This method is called when the user has changed something in a text-field that is neither
  an insert nor a remove.
- handleDocumentEvent(DocumentEvent)
  This method is called when the value in the name, type or initial value text-fields has
  changed.
- insertUpdate(DocumentEvent)
  This method is called when the user has entered something in a text-field.
- removeUpdate(DocumentEvent)
  This method is called when the user has removed something from a text-field.
- valueAdded(ModelChangeEvent)
- valueChanged(ModelChangeEvent)
  This method is called when a value in the model has changed.
- valueRemoved(ModelChangeEvent)

Variables

- model
  
  private OperationModel model

  The model of which this is a view

- name
  
  private JTextField name

  A text-field that shows the name of the operation

- returnType
  
  private JTextField returnType

  A text-field that shows the return type of the operation

- visibility
  
  private JComboBox visibility
A combobox that shows the visibility of the attribute

- **classMember**

  private JCheckBox classMember

  A checkbox that shows whether the attribute is a normal member or a class member (static)

- **abstractOperation**

  private JCheckBox abstractOperation

  A checkbox that show whether the operation is abstract or not.

- **closeButton**

  private JButton closeButton

  The close button, when the user click on it, the dialog disappears

- **tm**

  private ParameterTableModel tm

### Constructors

- **OperationDialog**

  public OperationDialog(Frame parent, OperationModel model)

  Constructor; creates the dialog box for OperationModel model

  Parameters:
  
  - parent - the window this dialog belongs to.
  - model - the model of which this is a view.

### Methods

- **actionPerformed**

  public void actionPerformed(ActionEvent e)

  This method is called when the user has pushed a button or pressed the enter-key in a text field. This method is public as an implementation detail and should not be called by a programmer.

- **insertUpdate**
public void insertUpdate(DocumentEvent e)

This method is called when the user has entered something in a text-field. This method is public as an implementation detail and should not be called by a programmer.

- **removeUpdate**

public void removeUpdate(DocumentEvent e)

This method is called when the user has removed something from a text-field. This method is public as an implementation detail and should not be called by a programmer.

- **changedUpdate**

public void changedUpdate(DocumentEvent e)

This method is called when the user has changed something in a text-field that is neither an insert nor a remove. This method is public as an implementation detail and should not be called by a programmer.

- **handleDocumentEvent**

private void handleDocumentEvent(DocumentEvent e)

This method is called when the value in the name, type or initial value text-fields has changed. This method will call the setName or setReturnType methods of the model to propagate the change.

- **valueAdded**

public void valueAdded(ModelChangeEvent e)

- **valueRemoved**

public void valueRemoved(ModelChangeEvent e)

- **valueChanged**

public void valueChanged(ModelChangeEvent e)

This method is called when a value in the model has changed. This method will update the values in the text-fields. This method is public as an implementation detail and should not be called by a programmer.
public class OperationView
extends JLabel
implements ModelChangeListener

This class shows one operation on the screen. The operation is shown as a traffic light icon showing the visibility, followed by the name, parameters and optional return type of the operation.

Variable Index

model
The model of which this class is a view

Constructor Index

OperationView(OperationModel)
Constructor; create an OperationView for OperationModel model

Method Index

deselected
This method is called when the attribute is deselected.

getModel
Return the model of which this class is a view.

selected
This method is called when the attribute is selected.

valueAdded(ModelChangeEvent)
This method is called when a value was added to the model.
valueChanged(ModelChangeEvent)
This method is called when a value in the model has changed.

valueRemoved(ModelChangeEvent)
This method is called when a value was removed from the model.

Variables

model

private OperationModel model

The model of which this class is a view

Constructors

OperationView

public OperationView(OperationModel model)

Constructor; create an OperationView for OperationModel model

Methods

valueChanged

public void valueChanged(ModelChangeEvent e)

This method is called when a value in the model has changed. This method will update the label and the icon. This method is public as an implementation detail and should not be called by a programmer.

valueAdded

public void valueAdded(ModelChangeEvent e)

This method is called when a value was added to the model. This method will update the label. This method is public as an implementation detail and should not be called by a programmer.

valueRemoved

public void valueRemoved(ModelChangeEvent e)

This method is called when a value was removed from the model. This method will update the label. This method is public as an implementation detail and should not be called by a programmer.
selected

public void selected()

This method is called when the attribute is selected.

deselected

public void deselected()

This method is called when the attribute is deselected.

getModel

public OperationModel getModel()

Return the model of which this class is a view.
11.39 Class view.OperationsView

public class OperationsView
extends JPanel
implements ModelChangeListener

This class show a list of operations; all the operations of a class.

Variable Index

| box | The class model that owns the operations that are shown by this class |
| model | |
| modelToViewMap | A hashtable that maps attribute model to a view |
| mouseListener | if this is not null then all mouse events that occur on the attribute views will be send to this listener |

Constructor Index

| OperationsView(ClassModel, MouseListener) | The OperationsView constructor; show a list of the operations of ClassModel model |

Method Index

| addOperation(OperationModel) | Add a new operation to the list. |
| removeOperation(OperationModel) | Remove an operation from the list. |
valueAdded(ModelChangeEvent)
This method is called when an operation was added to the model.

valueChanged(ModelChangeEvent)

valueRemoved(ModelChangeEvent)
This method is called when an operation was removed from the model.

Variables

• model

private ClassModel model

The class model that owns the operations that are shown by this class.

• modelToViewMap

private Hashtable modelToViewMap

A hashtable that maps an attribute model to a view.

• box

private Box box

• mouseListener

private MouseListener mouseListener

if this is not null than all mouse events that occur on the attribute views will be send to this listener.

Constructors

• OperationsView

public OperationsView(ClassModel model,
MouseListener mouseListener)

The OperationsView constructor; show a list of the operations of ClassModel model.

Parameters:
model - the classmodel that owns the operations that are to be shown by this class.
mouseListener - if this is not null than all mouse events that occur on the operation views will be send to this listener.

Methods

• addOperation
private void addOperation(OperationModel oper)

   Add a new operation to the list.

private void removeOperation(OperationModel oper)

   Remove an operation from the list.

public void valueAdded(ModelChangeEvent e)

   This method is called when an operation was added to the model. This method is public as an implementation detail and should not be called by a programmer.

public void valueRemoved(ModelChangeEvent e)

   This method is called when an operation was removed from the model. This method is public as an implementation detail and should not be called by a programmer.

public void valueChanged(ModelChangeEvent e)
11.40  Class view.PackageDialog

```java
java.lang.Object
  +----java.awt.Component
    +----java.awt.Container
      +----java.awt.Window
        +----java.awt.Dialog
          +----com.sun.java.swing.JDialog
            +----view.PackageDialog
```

public class PackageDialog extends JDialog
  implements ActionListener, DocumentListener, ModelChangeListener

This is a dialog box that allows the user to edit a PackageDialog

---

**Variable Index**

- **closeButton**
  The close button, when the user click on it, the dialog disappears

- **model**
  The package model can be edited by this dialog.

- **name**
  The text-field that shows the name of the class

- **stereotype**
  The text-field that shows the stereotype of the class

- **visibility**
  The combobox that shows the visibility of the class

---

**Constructor Index**

- **PackageDialog(Frame, PackageModel)**
  Constructor; creates the dialog box for PackageModel model.

---

**Method Index**
This method is called when the user has pushed a button or pressed the enter-key in a text field.

This method is called when the user has changed something in a text-field that is neither an insert nor a remove.

This method is called when the value in the name or stereotype text-fields has changed.

This method is called when the user has entered something in a text-field.

This method is called when the user has removed something from a text-field.

This method is called when a value in the model has changed.

The package model can be edited by this dialog.

The text-field that shows the name of the class

The text-field that shows the stereotype of the class

The combobox that shows the visibility of the class

The close button, when the user click on it, the dialog disappears
Constructors

**PackageDialog**

```java
public PackageDialog(Frame frame,
                     PackageModel model)
```

Constructor; creates the dialog box for PackageModel model.

**Parameters:**
- frame - the window this dialog belongs to.
- model - the model of which this is a view

Methods

**actionPerformed**

```java
public void actionPerformed(ActionEvent e)
```

This method is called when the user has pushed a button or pressed the enter-key in a text field. This method is public as an implementation detail and should not be called by a programmer.

**insertUpdate**

```java
public void insertUpdate(DocumentEvent e)
```

This method is called when the user has entered something in a text-field. This method is public as an implementation detail and should not be called by a programmer.

**removeUpdate**

```java
public void removeUpdate(DocumentEvent e)
```

This method is called when the user has removed something from a text-field. This method is public as an implementation detail and should not be called by a programmer.

**changedUpdate**

```java
public void changedUpdate(DocumentEvent e)
```

This method is called when the user has changed something in a text-field that is neither an insert nor a remove. This method is public as an implementation detail and should not be called by a programmer.

**handleDocumentEvent**

```java
private void handleDocumentEvent(DocumentEvent e)
```
This method is called when the value in the name or stereotype text-fields has changed. This method will call the setName or setStereotype methods of the model to propagate the change.

**valueChanged**

```java
public void valueChanged(ModelChangeEvent e)
```

This method is called when a value in the model has changed. This method will update the values in the text-fields. This method is public as an implementation detail and should not be called by a programmer.

**valueAdded**

```java
public void valueAdded(ModelChangeEvent e)
```

**valueRemoved**

```java
public void valueRemoved(ModelChangeEvent e)
```
11.41 Class view.PackageLayout

```
java.lang.Object
    +----view.PackageLayout
```

class PackageLayout
extends Object
implements LayoutManager

This is a layout manager that is used to layout the package views.

*This class is not public and therefore cannot be used outside this package.*
11.42 Class view.PackageView

```
java.lang.Object
    +----java.awt.Component
      +----java.awt.Container
        +----com.sun.java.swing.JComponent
          +----view.Movable
            +----view.Resizable
              +----view.ElementView
                +----view.PackageView
```

public class PackageView
extends ElementView

This class shows one package element on the screen. At the top of the package there are the stereotype and name labels and the visibility icon. The visibility icon uses the colors of a traffic light to show public visibility (green), protected visibility (yellow) and private visibility (red). Below the labels and icon the content of the package is shown.

Variable Index

- `elementLayer`
  The layer in which the elements are shown

- `model`
  The package model that this class is a view of

- `modelToViewMap`
  This hashtable that maps element models to their views.

- `packagePopup`
  The menu that pops up when the user presses the right mouse button on the package view

- `relationLayer`
  The layer in which the relation are shown, this layer lies on top of the element layer.

- `topLevel`
  Is this a top level package (direct child of a PackageWindow).
**Method Index**

- **addAssociation** (AssociationModel)
  This method is called in response to an event to add a new association to the package.
- **addElement** (ElementModel)
  This method is called in response to an event to add a new element to the package.
- **addNewAssociation** (int, int)
  This method is called when the user wants to add a new association to the package.
- **addNewClass** (int, int)
  This method is called when the user wants to add a new class to the package.
- **addNewPackage** (int, int)
  This method is called when the user wants to add a new package to the package.
- **doMove** (int, int)
  This method is called to move the component to a new location.
- **doResize** (int, int)
  This method is called to resize the component.
- **findClassView** (ClassModel)
- **findComponentAt** (int, int)
- **getElementLayer**()
  Return the layer that contains the elements.
- **getModel**()
  Return the model of this view.
- **getRelationLayer**()
  Return the layer that contains the relations.
- **mouseClicked** (MouseEvent)
  This method is called when the user clicks a mouse button.
- **mousePressed** (MouseEvent)
  This method is called when the user presses a mouse button.
- **removeAssociation** (AssociationModel)
  This method is called in response to an event to remove an association from the package.
- **removeElement** (ElementModel)
  This method is called in response to an event to remove an element from the package.
- **valueAdded** (ModelChangeEvent)
  This method is called when an element or association is added to the package model.
- **valueRemoved** (ModelChangeEvent)
  This method is called when an element or association is removed from the package model.

**Variables**

- **model**
private PackageModel model

The package model that this class is a view of

.packagePopup

private JPopupMenu packagePopup

The menu that pops up when the user presses the right mouse button on the package view

.elementLayer

private JPanel elementLayer

The layer in which the elements are shown

.relationLayer

private JPanel relationLayer

The layer in which the relation are shown, this layer lies on top of the element layer.

.modelToViewMap

private Hashtable modelToViewMap

This hashtable that maps element models to their views.

topLevel

private boolean topLevel

Is this a top level package (direct child of a PackageWindow).

Constructors

.packageView

public PackageView(PackageModel model, PackageView parentPackage, boolean topLevel)

Constructor; create a view of the package model.

Parameters:
model - the model that will be shown with this view
parentPackage - the package that owns this class
topLevel - whether this is a top level package; that is, a direct child of a PackageWindow.
**Methods**

- **getModel**
  
  public PackageModel getModel()
  
  Return the model of this view.

- **getElementLayer**
  
  public JPanel getElementLayer()
  
  Return the layer that contains the elements.

- **getRelationLayer**
  
  public JPanel getRelationLayer()
  
  Return the layer that contains the relations.

- **mousePressed**
  
  public void mousePressed(MouseEvent e)
  
  This method is called when the user presses a mouse button. If the mouse button is the right mouse button, the popup menu is shown. If the mouse button is the left mouse button and the current mode is ADD_CLASS_MODE, ADD_PACKAGE_MODE, or ADD_ASSOCIATION_MODE a new class/package/association is created.

  **Overrides:**
  
  mousePressed in class ElementView

- **mouseClicked**
  
  public void mouseClicked(MouseEvent e)
  
  This method is called when the user clicks a mouse button. If the user double-clicks, then a dialog box is shown allowing the user to edit the package. This method is public as an implementation detail and should not be called by a programmer.

  **Overrides:**
  
  mouseClicked in class Movable

- **doMove**
  
  public void doMove(int deltaX, int deltaY)
  
  This method is called to move the component to a new location.
Overrides:
doMove in class Movable

**doResize**

```java
protected void doResize(int x, int y)
```

This method is called to resize the component.

Overrides:
doResize in class ElementView

**valueAdded**

```java
public void valueAdded(ModelChangeEvent event)
```

This method is called when an element or association is added to the package model. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
valueAdded in class ElementView

**valueRemoved**

```java
public void valueRemoved(ModelChangeEvent event)
```

This method is called when an element or association is removed from the package model. This method is public as an implementation detail and should not be called by a programmer.

Overrides:
valueRemoved in class ElementView

**addElement**

```java
private void addElement(ElementModel e)
```

This method is called in response to an event to add a new element to the package.

**removeElement**

```java
private void removeElement(ElementModel model)
```

This method is called in response to an event to remove an element from the package.

**addAssociation**

```java
private void addAssociation(AssociationModel associationModel)
```
This method is called in response to an event to add a new association to the package.

- **`removeAssociation`**

  ```java
  private void removeAssociation(AssociationModel model)
  ```

  This method is called in response to an event to remove an association from the package.

- **`addNewClass`**

  ```java
  private void addNewClass(int x,
                   int y)
  ```

  This method is called when the user wants to add a new class to the package.

- **`addNewPackage`**

  ```java
  private void addNewPackage(int x,
                   int y)
  ```

  This method is called when the user wants to add a new package to the package.

- **`addNewAssociation`**

  ```java
  private void addNewAssociation(int x,
                   int y)
  ```

  This method is called when the user wants to add a new association to the package.

- **`findComponentAt`**

  ```java
  public Component findComponentAt(int x,
                   int y)
  ```

- **`findClassView`**

  ```java
  public ClassView findClassView(ClassModel model)
  ```
11.43  Class view.PackageWindow

```java
public class PackageWindow
extends JFrame
implements ModelChangeListener
```

The package window is a window that shows one package and all its contents. It has a menubar and toolbar at the top, at ModelTree at the left and a PackageView at the right.

See Also:
ModelTree, PackageView, Mode, Selection
getSelection()
Return the selection of this window
valueAdded(ModelChangeEvent)
valueChanged(ModelChangeEvent)
This method is called when the name, stereotype or owner of the package changes.
valueRemoved(ModelChangeEvent)

Variables

model
private PackageModel model

selection
private Selection selection

mode
private Mode mode

modelTree
private ModelTree modelTree

Constructors

PackageWindow
public PackageWindow(PackageModel model)

Methods

getSelection
public Selection getSelection()
Return the selection of this window

getMode
public Mode getMode()
Return the Mode object that keeps track of the current mode.

getModelTree
public ModelTree getModelTree()
Return the model tree

- **valueAdded**

  public void valueAdded(ModelChangeEvent event)

- **valueRemoved**

  public void valueRemoved(ModelChangeEvent event)

- **valueChanged**

  public void valueChanged(ModelChangeEvent e)

  This method is called when the name, stereotype or owner of the package changes.
11.44 Class view.ParameterTableModel

```java
java.lang.Object
   +----com.sun.java.swing.table.AbstractTableModel
      +----view.ParameterTableModel
```

class **ParameterTableModel**
extends AbstractTableModel

This class is used to control the table that shows the parameters of an operation.

*This class is not public and therefore cannot be used outside this package.*
11.45 Class view.RelativeMovable

```java
public class RelativeMovable
    extends Movable
    implements ComponentListener
```

The class Movable contains the functionality that allows the user to move a component on the screen to a new location. The user can use the mouse to drag a component (that is a subclass of Movable) and this class will allow it to move.

RelativeMovable inherits from Movable and allows a component on the screen to be moved relative to another component. For example, A is a Movable and B is a RelativeMovable that moves relative to A. The user can move B around and the RelativeMovable will keep track of the relative offset to A. If the user moves A around, B will move as well to keep the offset the same.

### Variable Index

- movable
  - The RelativeMovable moves relative to this Movable.
- offsetX
  - The offset in the X direction
- offsetY
  - The offset in the Y direction

### Constructor Index

- (RelativeMovable(Movable, ModelBase, String))
  - The constructor the RelativeMovable

### Method Index
addNotify()

addComponentHidden(ComponentEvent)

addComponentMoved(ComponentEvent)

This method is called when the Movable moves to a new location.

addComponentResized(ComponentEvent)

This method is called when the Movable changes size.

doMove(int, int)

This method is called to move the component to a new location.

setLocation(Point)

Override the setLocation method of the superclass to update the offsetX and offsetY variables when the RelativeMovable moves.

updateLocation()

Variables

movable

protected Movable movable

The RelativeMovable moves relative to this Movable.

offsetX

protected int offsetX

The offset in the X direction

offsetY

protected int offsetY

The offset in the Y direction

Constructors

RelativeMovable

public RelativeMovable(Movable movable, ModelBase modelBase, String locationName)

The constructor the RelativeMovable

Parameters:
movable - the RelativeMovable will move relative to this Movable.
modelBase - the model in which the location of the RelativeMovable will be stored
locationName - the name under which the location of the RelativeMovable will be stored in the model.
Methods

- addNotify

  public void addNotify()

    Overrides:
    addNotify in class Movable

- setLocation

  public void setLocation(Point newLocation)

    Override the setLocation method of the superclass to update the offsetX and offsetY variables when the RelativeMovable moves.

    Overrides:
    setLocation in class Movable

- doMove

  protected void doMove(int deltaX,
                        int deltaY)

    This method is called to move the component to a new location.

    Overrides:
    doMove in class Movable

- updateLocation

  protected void updateLocation()

- componentResized

  public void componentResized(ComponentEvent e)

    This method is called when the Movable changes size.

- componentMoved

  public void componentMoved(ComponentEvent e)

    This method is called when the Movable moves to a new location.

- componentShown

  public void componentShown(ComponentEvent e)

- componentHidden
public void componentHidden(ComponentEvent e)
11.46 Class view.Resizable

public class Resizable
extends Movable

The class Resizable contains the functionality that allows the user to resize a component. The user can use the mouse to drag a border of the component (that is a subclass of Resizable) and this class will allow it to change its size.

Variable Index

- **E_Cursor**: The east resize cursor
- **mouseDownSide**: The side of the component where the mouse was pressed down.
- **N_Cursor**: The north resize cursor
- **NE_Cursor**: The north east resize cursor
- **NW_Cursor**: The north west resize cursor
- **S_Cursor**: The south resize cursor
- **SE_Cursor**: The south east resize cursor
- **SIDE_E**: The east (right) side of the component
- **SIDE_N**: The north (top) side of the component
- **SIDE_NE**: The north east (top right) corner of the component
- **SIDE_NW**: The north west (top left) corner of the component
SIDE_S
The south (bottom) side of the component
SIDE_SE
The south east (bottom right) corner of the component
SIDE_SW
The south west (bottom left) corner of the component
SIDE_W
The west (left) side of the component
sizeName
The name of the property under which the size of the component is stored in the model.
SW_Cursor
The south west resize cursor
W_Cursor
The west resize cursor

Constructor Index

Resizable(ModelBase, String, String)

Method Index

doResize(int, int)
This method is called to resize the component.
getSide(MouseEvent)
Determin if the mouse pointer is currently over a corner or size of the component.
mouseDragged(MouseEvent)
This method is called when the user drags the mouse.
mouseMoved(MouseEvent)
This method is called when the user moves the mouse without pressing a mouse button.
mousePressed(MouseEvent)
This method is called when the user pressed a mouse button.
mouseReleased(MouseEvent)
This method is called when the user release the mouse button.

Variables

mouseDownSide
protected int mouseDownSide
The side of the component where the mouse was pressed down.
protected String sizeName

The name of the property under which the size of the component is stored in the model.

private static final int SIDE_N

The north (top) side of the component

private static final int SIDE_NE

The north east (top right) corner of the component

private static final int SIDE_E

The east (right) side of the component

private static final int SIDE_SE

The south east (bottom right) corner of the component

private static final int SIDE_S

The south (bottom) side of the component

private static final int SIDE_SW

The south west (bottom left) corner of the component

private static final int SIDE_W

The west (left) side of the component

private static final int SIDE_NW
The north west (top left) corner of the component

**NW_Cursor**

private static final Cursor NW_Cursor

The north west resize cursor

**N_Cursor**

private static final Cursor N_Cursor

The north resize cursor

**NE_Cursor**

private static final Cursor NE_Cursor

The north east resize cursor

**E_Cursor**

private static final Cursor E_Cursor

The east resize cursor

**SE_Cursor**

private static final Cursor SE_Cursor

The south east resize cursor

**S_Cursor**

private static final Cursor S_Cursor

The south resize cursor

**SW_Cursor**

private static final Cursor SW_Cursor

The south west resize cursor

**W_Cursor**

private static final Cursor W_Cursor

The west resize cursor

**Constructors**

- **Resizable**
public Resizable(ModelBase modelBase, 
    String locationName, 
    String sizeName)

Methods

mousePressed

public void mousePressed(MouseEvent e)

This method is called when the user pressed a mouse button. If the current mode is 
MOVE_MODE then the user may change the size of the component.

Overrides:
mousePressed in class Movable

mouseDragged

public void mouseDragged(MouseEvent e)

This method is called when the user drags the mouse. If the user started the drag at a side 
of the component that call doResize() to resize the component.

Overrides:
mouseDragged in class Movable
See Also:
doResize

mouseReleased

public void mouseReleased(MouseEvent e)

This method is called when the user release the mouse button.

Overrides:
mouseReleased in class Movable

mouseMoved

public void mouseMoved(MouseEvent e)

This method is called when the user moves the mouse without pressing a mouse button. 
When the mouse pointer is positioned above a side or a corner of the component the 
mouse pointer changes shape to reflect the ability to resize the component.

Overrides:
mouseMoved in class Movable

doResize
protected void doResize(int x,
            int y)

This method is called to resize the component. The parameters x and y represent the increase or decrease in width/height.

getSide

protected int getSide(MouseEvent e)

Determin if the mouse pointer is currently over a corner or size of the component.
11.47 Class view.RolePanel

class RolePanel extends JPanel
implements ActionListener, DocumentListener, ModelChangeListener

class RolePanel is used to display a AssociationRoleModel in a AssociationDialog.

See Also:
AssociationRoleModel, AssociationDialog

This class is not public and therefore cannot be used outside this package.
11.48 Class view.Selection

java.lang.Object

public class Selection
extends Object

This class keeps track of the selected components within a PackageWindow. There are two
types of methods: normal methods that set, add to or remove from the selection and static
methods that first find a PackageWindow, request the selection of that PackageWindow and
call the normal methods of that selection.

Variable Index

selection
The selected components

Constructor Index

Selection()

Method Index

add(Component)
Add component c to the selection, the previous selection is not deselected.
addToSelection(Component)
Add component c to the selection, the previous selection is not deselected.
clear(Component)
Clear the selection, deselect all components in the current selection.
clearSelection(Component)
Clear the selection, deselect all components in the current selection.
findWindow(Component)
Find the PackageWindow that is the ancestor of component c
remove(Component)
Remove component c from the selection, the previous selection (except component c) is
not deselected.
removeFromSelection(Component)
Remove component c from the selection, the previous selection (except component c) is
not deselected.
**Variables**

- `selection`

  private Vector selection

  The selected components

**Constructors**

- `Selection`

  public Selection()

**Methods**

- `findWindow`

  private static PackageWindow findWindow(Component c)

  Find the PackagWindow that is the ancestor of component c

- `setSelection`

  public static void setSelection(Component c)

  Set the selection to component c, the previous selection is deselected

- `set`

  public void set(Component c)

  Set the selection to component c, the previous selection is deselected

- `addToSelection`

  public static void addToSelection(Component c)

  Add component c to the selection, the previous selection is not deselected

- `add`

  public void add(Component c)
Add component c to the selection, the previous selection is not deselected.

*removeFromSelection*

public static void removeFromSelection(Component c)

Remove component c from the selection, the previous selection (except component c) is not deselected.

*remove*

public void remove(Component c)

Remove component c from the selection, the previous selection (except component c) is not deselected.

*clearSelection*

public static void clearSelection(Component c)

Clear the selection, deselect all components in the current selection.

*clear*

public void clear(Component c)

Clear the selection, deselect all components in the current selection.
11.49  Interface view.SelectionListener

public interface SelectionListener
extends EventListener

All components that can be selected by the user should implement this interface. When the user selects the component the method selected() is called. When the user selects another component the method deselected() is called.

---

Method Index

- deselected
  This method is called when the user has selected another component.
- selected
  This method is called when the user has selected the component.

Methods

- selected
  public abstract void selected()
  This method is called when the user has selected the component.

- deselected
  public abstract void deselected()
  This method is called when the user has selected another component.

---
11.50  Class Hierarchy

- class java.lang.Object
    - class view.MyAction
  - class com.sun.java.swing.table.AbstractTableModel (implements com.sun.java.swing.table.TableModel, java.io.Serializable)
    - class view.ParameterTableModel
    - class java.awt.Container
      - class com.sun.java.swing.JComponent (implements java.io.Serializable)
          - class view.AttributeView (implements ModelChangeListener)
          - class view.OperationView (implements ModelChangeListener)
          - class Renderer (implements com.sun.java.swing.ListCellRenderer)
    - class com.sun.java.swing.JPanel (implements com.sun.java.accessibility.Accessible)
      - class view.AttributesView (implements ModelChangeListener)
      - class view.ModelTree (implements ModelChangeListener)
      - class view.OperationsView (implements ModelChangeListener)
    - class view.LineSegment (implements java.awt.event.ComponentListener, com.sun.java.swing.event.ChangeListener)
    - class view.Movable (implements java.awt.event.MouseListener, java.awt.event.MouseMotionListener)
      - class view.RelativeMovable (implements java.awt.event.ComponentListener)
        - class view.BoundedMovable
          - class view.Handle
        - class view.AssociationRoleView (implements ModelChangeListener)
      - class view.Resizable
        - class view.AssociationView (implements ModelChangeListener)
        - class view.ElementView (implements ModelChangeListener)
ModelChangeListener, view.SelectionListener)
  ○ class view.ClassView
  ○ class view.PackageView

○ class java.awt.Panel
  ● class java.applet.Applet
    ○ class com.sun.java.swing.JApplet (implements
      com.sun.java.accessibility.Accessible,
      com.sun.java.swing.RootPaneContainer)
    ● class SoccaEditor

○ class java.awt.Window
  ● class java.awt.Dialog
    ○ class com.sun.java.swing.JDialog (implements
      com.sun.java.swing.WindowConstants,
      com.sun.java.accessibility.Accessible,
      com.sun.java.swing.RootPaneContainer)
    ● class view.AssociationDialog (implements
      java.awt.event.ActionListener,
      com.sun.java.swing.event.DocumentListener,
      ModelChangeListener)
    ● class view.AttributeDialog (implements
      java.awt.event.ActionListener,
      com.sun.java.swing.event.DocumentListener,
      ModelChangeListener)
    ● class view.ClassDialog (implements
      java.awt.event.ActionListener,
      com.sun.java.swing.event.DocumentListener,
      java.awt.event.MouseListener, ModelChangeListener)
    ● class view.OperationDialog (implements
      java.awt.event.ActionListener,
      com.sun.java.swing.event.DocumentListener,
      ModelChangeListener)
    ● class view.PackageDialog (implements
      java.awt.event.ActionListener,
      com.sun.java.swing.event.DocumentListener,
      ModelChangeListener)
  ● class java.awt.Frame (implements java.awt.MenuContainer)
    ○ class com.sun.java.swing.JFrame (implements
      com.sun.java.swing.WindowConstants,
      com.sun.java.accessibility.Accessible,
      com.sun.java.swing.RootPaneContainer)
    ● class view.MainWindow (implements
      java.awt.event.ActionListener)
    ● class view.PackageWindow (implements
      ModelChangeListener)
  ● class view.Line (implements java.awt.event.MouseListener,
java.awt.event.MouseMotionListener, view.SelectionListener)
- class java.util.EventObject (implements java.io.Serializable)
  - class ModelChangeEvent
- class view.MenuFactory
- class view.Mode
- class model.ModelBase (implements java.io.Serializable)
  - class model.AssociationModel
  - class model.AssociationRoleModel
  - class model.ElementModel
    - class model.ClassModel
    - class model.PackageModel
  - class model.GeneralizationModel
  - class model.MemberModel
    - class model.AttributeModel
    - class model.OperationModel
  - class model.NoteModel
  - class model.UsesRelationModel
- interface ModelChangeListener (extends java.util.EventListener)
- class view.PackageLayout (implements java.awtLayoutManager)
- class model.ParameterModel (implements java.io.Serializable)
- class view.Selection
- interface view.SelectionListener (extends java.util.EventListener)
- class Visibility (implements java.io.Serializable)