Introduction

A functor is a "structure preserving" interpretation of one finitely presented category into another.

A functor preserves the structure of a category because it sends:

> Objects to Objects
> Arrows to Arrows

and it preserves the composition that is provided by relations.

Functor File Types

In GDCT there are two different file types that are associated with functors.

*.fun
> These files are a text only representation of a functor. These files can be both opened and saved. Since a graphical representation of the two categories involved is not saved, the graphical representations are generated randomly upon opening the *.FUN file.

*.fgl
> These files contain both a text and graphical representation of the categories involved in a given functor as well as the functor information itself. This type of file can be both opened and saved.

FUN File Format

The text representation of functors is stored in the following three part format.

Part one consists of a category stored in the CAT file format.

Part two consists of a second category stored in the CAT file format.

Part three consists of the functor information. In this part, any line that is a comment must start with the "#" character. On the line following the word "functor" is the functor name. The mapping of objects to objects is listed between the words "objects" and "arrows". The mapping of arrows to paths is listed after the word "arrows".

NOTE: The words "category", "functor", "objects", "arrows", and "gml" are key words and cannot be used as the name of the categories, functors between them or as the name of an object or arrow within categories.

An example of a typical FUN file can be found in Appendix A.

FGL File Format

The text representation of functors is stored in the following three part format.

Part one consists of a category stored in the CGL file format.

Part two consists of a second category stored in the CGL file format.

Part three consists of the functor information. In this part, any line that is a comment must start with the "#"

character. On the line following the word "functor" is the functor name. The mapping of objects to objects is
listed between the words "objects" and "arrows". The mapping of arrows to paths is listed after the word "arrows".

NOTE: The words "category", "functor", "objects", "arrows", and "gml" are key words and cannot be used as the name of the categories, functors between them or as the name of an object or arrow within categories.

An example of a typical FGL file can be found in Appendix A.
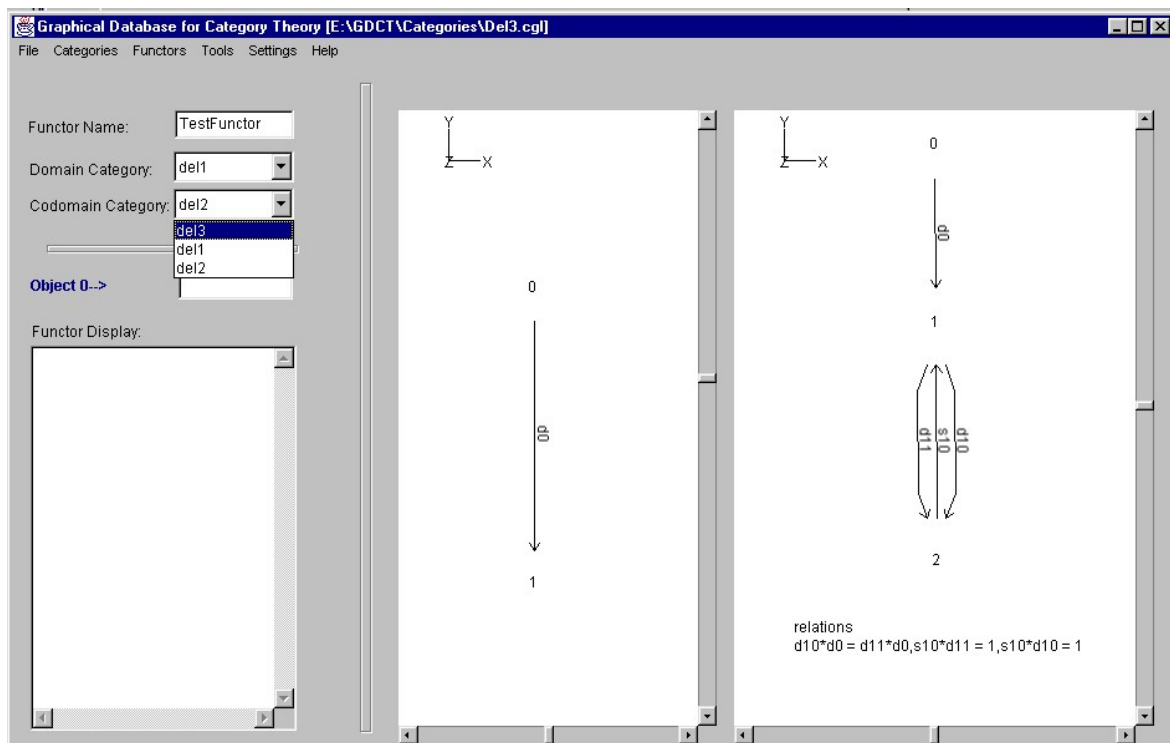
Creating Functors

To create a Functor in memory the user selects Functors | Create Functor.

First the domain and codomain categories must be selected from those in memory using the drop-down category lists. The categories will be displayed in two windows.

Enter a (descriptive!) name in the "Functor Name" box and type Enter.

For each object type the name of its image under the functor in the box which now appears and type Enter. For each arrow type the name of its image under the functor (which may be a composite arrow) in the box and type Enter.

During creation of a functor its action is displayed in the Functor display box.

WARNING: The image of an arrow must have domain and codomain which are the images of the domain and codomain of the arrow.

This completes the creation of the new functor. Following creation it is possible to animate the display of the functor using the buttons below the category display windows.

WARNING: The newly created functor is stored in memory. To save the functor to disk select File | Save Functor or Functors | Save Functor. The functor will be saved in the format selected using a save dialog.

Opening Functors

In order to open a text functor file (.fun) select File | Open Functor | Open Functor(FUN) or Functors | Open Functor | Open Functor(FUN). This opens a file selection window. Opening graphical functor files (.fgl) is similar. A shortcut to open a .fgl functor file is to press CTRL+F. To open a functor simply double click on the functor's name or click once on the functor name and press the OK button.

If there is any error in the format of the selected file an error message is displayed and the open is aborted.

Downloading Functors

In order to download a text functor file (.fun) select File | Open Functor | Download Functor(FUN) or Functors | Open Functor | Download Functor(FUN).

Downloading a graphical functor file (.fgl) is similar, select File | Open Functor | Download Functor(FGL) or Functors | Open Functor | Download Functor(FGL).

Choosing any of the above options will display a list of functors in a selection box in a new frame. The functors listed are located on the server specified in the frame's title bar. To select a functor to download simply double click on the functor's name or click once on the functor name and press the OK button. Either of these methods will display the downloaded functor. If the program cannot locate the files on the server an error message will be displayed. This could result from the user not being connected to the Internet or as a result of a server error.

To change the settings for downloading functors, select Settings | Set Server. This displays a dialog for changing the default server and directories from which categories and functors can be loaded using the appropriate load command.

Saving Functors

In order to save a functor in memory as a graphical file (.fgl) select File | Save Functor | Save Functor(FGL) or Functors | Save Functor | Save Functor(FGL). This opens a file selection window. To save a functor to an existing file simply double click on the functor file name. A new file is created by typing its name in the dialogue and clicking OK.

Saving functor files as text only (.fun) is similar.

Printing Functors

To print the text version of the currently displayed functor, select File | Print | Print Functor (Text).

Functor Animation

The mappings on objects and arrows defined by a functor can be highlighted through the use of animation. There are two ways to animate a functor.

The first way is to use the Back and Forward buttons below the graphical display of the functor to step though all of the mappings. The animation can be restarted by pressing the Reset button.

The second way to animate a functor is to press the Auto Animate button which will animate all of the mappings at the animation speed indicated in Settings | Functor Animation Settings.
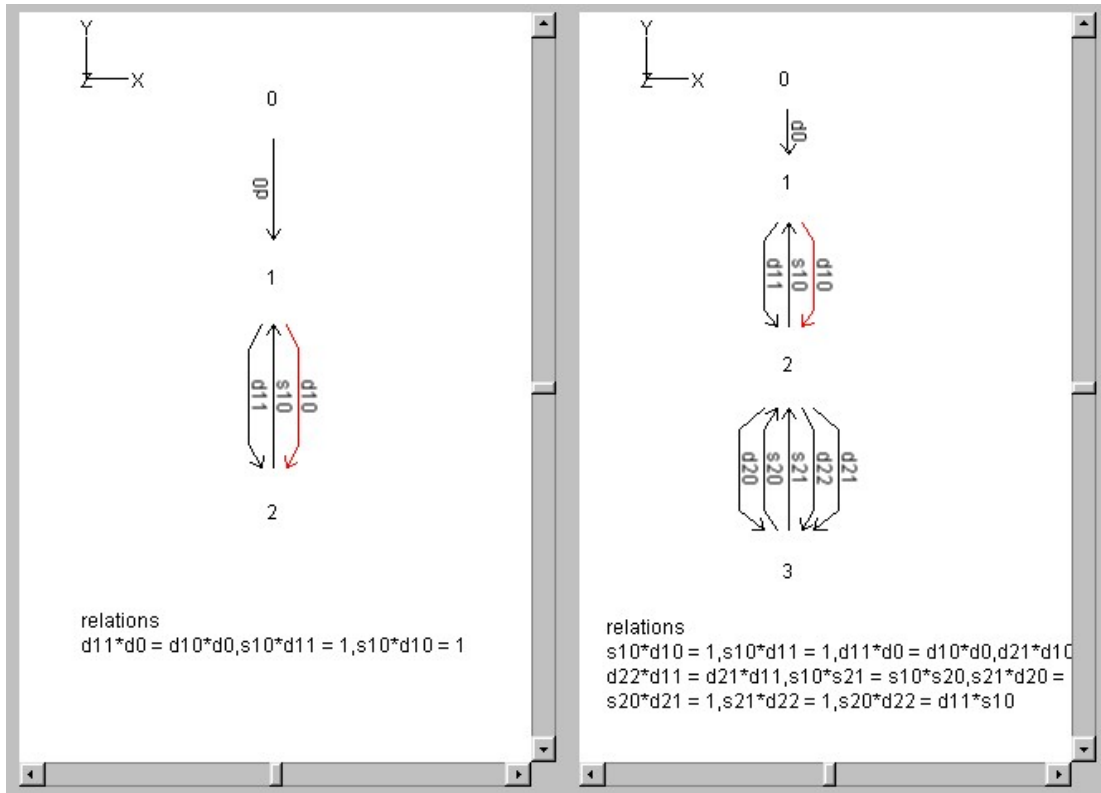

Diagram Display

Functors can also be viewed as diagrams, with the graphical display taken from the domain category and the object and arrow names taken from the codomain category. To view a functor as a diagram, click the "Diagram Display" button in the top left corner when a functor is open. To switch back to normal functor display mode, click the "Two Category Display" button.

NOTE: When first opened, a functor's diagram display has a newly created graph with object positions taken from the domain category. A diagram graph is NOT saved in either functor file format.