

SECTION 2: CATEGORIES

Introduction

A finitely presented category can be considered a “directed graph with relations between paths of its edges.”

Our notation for category data is:

Objects:

A, B, C, D, ...

Maps/Arrows:

$e: A \rightarrow A$, $f: A \rightarrow B$, $g: B \rightarrow C$, $h: A \rightarrow C$...

Identity Maps/Arrows:

$1: A \rightarrow A$, ... (one for each object)

Composition of Maps/Arrows defined by Relations:

$e = 1$, $g * f = h$, ... (path of arrows)

NOTE: The identity Maps/Arrows are not explicitly stored or displayed but they are used and should not be added manually.

File Types, Categories

In GDCT, there are three different file types associated with categories:

*.cat

These files are a text only representation of a category. These files can be both opened and saved. Since a graphical representation of the category is not saved one is generated randomly upon opening the *.cat file.

*.cgl

These files contain both text and graphical representations of a category and can be both opened and saved. They are a concatenation of a .cat file and a .gml file.

*.gml

These files contain only a graphical representation of a category. These files can only be saved (and may be used by the VGJ applet), they cannot be opened.

CAT File Format

The text representation of categories is stored in the following format. Any line that is a comment must start with the “#” character. On the line following the word “category” is the category name. Objects are listed between the words “objects” and “arrows”. Arrows are listed between the words “arrows” and “relations.” Relations are listed after the word “relations.”

NOTE: The words “category”, “objects”, “arrows”, “relations”, and “gml” are key words and cannot be used as the name of the category or as the name of an object or arrow within the category.

Objects and arrows can be a string of any length and can contain any ASCII characters excluding blank and “: - > * # . = ,”

Relations are composed using the composition symbol “*”.

An example of a typical CAT file can be found in Appendix C.

CGL File Format

A CGL file contains the information for both a text representation and a graphical representation.

The text representation is the same as the file format for CAT files. Any line that is a comment must start with the “#” character. On the line following the word “category” is the category name. Objects are listed between the words “objects” and “arrows”. Arrows are listed between the words “arrows” and “relations”. Relations are listed after the word “relations”.

NOTE: The words “category”, “objects”, “arrows”, “relations”, and “gml” are key words and cannot be used as the name of the category or as the name of an object or arrow within the category.

CGL File Format



Objects and arrows can be a string of any length and can contain any ASCII characters excluding “: - > * # . = ,”

Arrows are composed using the composition symbol “*”.

The graphical representation uses a format known as gml which was developed at Auburn

University for use with the Visualizing Graphs with Java (VGJ) project. It is incorporated into the cgl format by placing it at the end of the file after the keyword “gml”. For more information consult the VGJ Documentation.

An example of a typical CGL file can be found in Appendix C.

Creating Categories

To create a category in memory the user selects File | New Category.

The names of objects and arrows can be strings of any length except for reserved words and may contain any ASCII characters excluding “: - > * # . = ,”

To add an object to the category, type the name of the object into the field labeled “Object (s):” and click “Add Object.” The object will appear in the table.

To add an arrow to the category, type the name of the arrow into the field labeled “Arrow (s):”; then select a domain and codomain from the objects in the drop-down list; when finished, click “Add Arrow.” The arrow, domain and codomain will appear in the table.

To add a relation, type in the equation, with composable arrows separated by the composition symbol “*” (e.g. $f * g = h$), then click “Add Relation”.

NOTE: Only valid equations are accepted. An equation is invalid if it contains arrows that are not in the category, or an undefined composition, or if the domain and codomain of the left side do not equal the domain and codomain of the right side.

Opening Categories

In order to open a stored category file (.cgl or .cat) select File | Open Category. This opens a file selection window. If there is an error in the format of the selected file an error message is displayed and the open is aborted.

Downloading Categories

In order to download a category file (.cgl or .cat) select File | Download Category. This will display a list of categories. 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 categories, select Settings | Set Server. This displays a dialog for changing the default server and directories from which categories and functors can be downloaded.

Saving Categories

In order to save a category file select (in its category window) File | Save or File | Save As. The latter option opens a file selection window.

Adding Data

Selecting File | Add Data (in a category window) opens a dialog that allows the user to add information to the category

Adding Objects: go to the “Objects” tab, type an object name into the field, then click “Add Object”.

Adding Arrows: go to the “Arrows” tab, type an arrow name into the field, select a domain and codomain from the drop-down lists, and click “Add Arrow”

Adding Relations: go to the “Relations” tab, type a valid relation into the field, and click add relation.

Adding Comments: go to the “Comments” tab, type comments directly in the text area.

If the input is correct, the added attribute will appear immediately in the appropriate text area. You may also change the category name; when finished, click “Done”. If the changes are not acceptable to you, click “Cancel”.

Removing Data

To remove data from a category, the user selects any and all attributes to remove, and then clicks “Cancel”. If there are any problems with the removal, the details will be listed in the text area below. When removal is complete, the user may click “Close” to implement the changes, or “Cancel” to cancel them.