

Gaigen Installation Manual

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November 24, 2003

Installing Gaigen is done in four steps. First you download the package, then you compile (if you want to) and copy files to the right locations, create an algebras directory and finally you have to edit a configuration file and make an environment variable point to it.

1 Download and extract

To install Gaigen on your computer or account, first download the latest version of the sourcecode and executables from the Gaigen homepage. Extract the zipped file to the location where you want to store Gaigen.

2 Compilation and installing the Gaigen files

2.1 Windows

If you run Windows, then you can directly use the executable files located at *gaigenui/release/gaigenui.exe* and *gaigenui/release/opt2c.exe* in the distribution. *gaigenui* is the user interface used to generate algebras and *opt2c* is the default computational layer (layer 0) code generator. If you want, you can copy these executables to some other location where you put all your executables, but you can also leave them where they are.

2.2 Unix

For certain flavours of Unix we have precompiled standalone executables. Currently this is for Sun/Solaris and Linux only. We do not support these executables. If they don't work on your platform or you work on another platform, you have to compile them yourself. Also, the provided Unix executables may not always be up to date with the source, because Windows is our main development platform.

To compile the executables yourself, you need the fltk user interface library. You can download it at <http://www.fltk.org>. We recommend version FLTK 1.1.4, because that is what we use ourselves.

After you have compiled and installed fltk, you have to adjust the *makefile* located in the *gaigenui* directory. The **INCDIR** and **LIBDIR** variables should include the directories where the FLTK include and library files are located. Also,

maybe you have to add or remove some libraries from the **XLIB** or **LIBFLTK** variables, depending on your platform. The *makefile* links Gaigen statically to FLTK so you'll have to change the the path to the library if it's not in the default */usr/local/lib/libfltk.a*.

Now execute *make*. If you are in luck, the programs will appear as executables named *gaigenui*, *opt2c* and *opt2c2*. You can copy these files to the directory where you store all your executables or leave them where they are. If something goes wrong during compilation, fiddle with the *makefile* some more.

Now test *gaigenui* by starting it like

```
>./gaigenui
```

Once you have started the executable, terminate it by pressing the **exit** button.

3 Algebras directory

Gaigen will output its generated source files in a central *algebras* directory. A sample of this directory is provided in the downloadable package. It currently contains the specification of the **e3ga** algebra (in the file *e3ga.gas*) and a sub-directory called *e3ga*, which contains the implementation of the 3d euclidean algebra **e3ga** (see tutorial 1). You can copy this directory to were you would like it to be, or leave it where it is now. In any case, make sure the files *gaspsectemplates*, *gaigenhl.h* and *gaigenhl.cpp* are present in the *algebras* directory, as they are in the sample directory. These files are required when you generate create or compile a Gaigen algebra.

4 Configuration file

The last thing you have to do is set an environment variable correctly and create a configuration file.

The *gaigenui* program needs to know where certain files are, and where to store the generated algebra implementations. These locations are read from a configuration file. You specify the location of the configuration file through a environment variable. If this environment variable or configuration file can not be found, *gaigenui* assumes defaults for the locations.

You first need to edit the default configuration file called *gaigen.config* which you can find in the root of the distribution. Open the file in a text editor. On the **gendir** line you should replace "**c:/gaigen/algebras**" with the name of the directory where you want your algebra implementations to go. On the **gaigendir** line you should replace "**c:/gaigen/gaigenui/release**" with the name of the directory where you stored the executables. Save the configuration file. Unix users may want to rename the file to *.gaigen* and move it to the root of their home directory. Windows users may want to rename or move the file to some safe location. In any case, make sure that when you download a new version of Gaigen, your configuration file does not get overwritten by the default which is supplied in the package.

Now you have to set the environment variable **GAIGEN_CONFIG** to point to the *gaigen.config* file.

- Windows 95/98/ME: You have to edit your *autoexec.bat*. Add a line reading

```
set GAIGEN_CONFIG c:\where_you_put\gaigen.config
```

and of course replace the directory name. Reboot to make the change effective.

- Windows NT 4.0: In Windows NT 4.0, open the system properties by right clicking **my computer** on your desktop. Click on the **environment** tab. As the variable name (bottom of the window) enter **GAIGEN_CONFIG** and as the variable value enter the name and directory of *gaigen.config*. Then click **set**.
- Windows 2000: In Windows 2000, open the system properties by right clicking **my computer** on your desktop. Click on the **advanced** tab. Click on **environment variables**. Now click on **new** in either the **user variables** or **system variables** area. As the variable name enter **GAIGEN_CONFIG** and as the variable value enter the name and directory of *gaigen.config*.
- Unix: If you use Unix, you have set to the environment variable **GAIGEN_CONFIG** manually, by typing using something like

```
set GAIGEN_CONFIG = ~/.gaigen
```

or

```
setenv GAIGEN_CONFIG ~/.gaigen
```

every time you want to use *gaigenui* at the command line, or add one of these lines to your startup file (e.g. *.cshrc* or *.bash*). If you linked *gaigenui* to the dynamic version of the fltk library, make sure you have set your **LD_LIBRARY_PATH** correctly.

5 Problems

Here are some problems you may encounter:

- *gaigenui* can't find *opt2c*, *opt2lapack*. Make sure *gaigenui* can find your configuration file (have you set the **GAIGEN_CONFIG** environment variable correctly?). Make sure you have set your **gaigendir** variables correctly in your configuration file. Make sure these files are actually present in that directory.
- When generating an algebra, Gaigen can't find *gaspectemplates.txt*: copy them to your *algebras* directory.
- When compiling an algebra, the compiler can't find *gaigenhl.cpp* or *gaigenhl.h*: copy them to your *algebras* directory.
- When compiling an algebra, compiler complains about products not present. Include at least the geometric, outer and scalar product and the left contraction in your algebra.

If your problem is not on this list, and you can't fix it yourself, mail Daniel Fontijne, fontijne@science.uva.nl. If you *do* fix it yourself, please mail the problem and solution so it can be included in this list.