Working with GMV under FEATFLOW

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1 Something about GMV

GMV is the abbreviation of “General Mesh Viewer”. This is a “free” visualization tool for viewing 2d or 3d simulation data on structured or unstructured meshes. It is currently available for Silicon Graphics, Sun, IBM, Hewlett Packard, DEC OSF1 and Linux platforms. The complete manual and binaries are available at http://www-xdiv.lanl.gov/XCM/gmv/GMVHome.html.

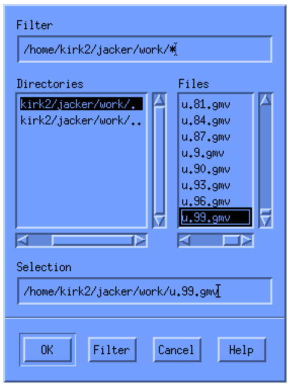

Figure 1: File selector

2 Generate GMV data with FEATFLOW

With a few changes only you can add GMV output to FEATFLOW (for further informations about FEATFLOW see [FEATFLOW]).

1. Copy the files named "fpost.f" and "gmv2d.f" from the directory "FEATFLOW/featflow/graphic/gmv" which are written to include additional temperature data (BOUSS) in the output files. You can easily modify them for the usage with PP2D, CC2D, CP2D, PP3D and CC3D.

2. Modify your makefile to compile and link "gmv2d.f". To avoid this step you can simply do "cat gmv2d.f >>fpost.f".

3. Create a subdirectory named "#gmv".

4. Start the program (BOUSS). The program can generate both AVS and GMV data at different levels. GMV output is controlled by **IBYU** and **DTBYU**.

5. To save space you can transform GMV data into a special binary format. You can do that e.g. by invoking "foreach test (#gmv/u.*.gmv); mv $test testtmp; ascii2bin testtmp $test; end; rm testtmp". Source code for ascii2bin is located at *ftp://lws.lanl.giv/pub/gmv/ascii2bin.tar.Z*.

3 Visualizing data

3.1 Loading data into GMV

At first you start GMV by invoking "gmv" (Mesa-Version) or "gmvgl" (OpenGL-Version). The main window appears with a file selector box. Mark the file you want to load and click at "OK". (Fig.1)

3.2 Viewing data with GMV

Since GMV has no information how to interpret your data at startup, you have to do some adjustments before displaying the graphical data.

3.2.1 Adjusting angle of View

By using the sliders "Twist", "Elevation" and "Azimut" you can adjust the angle of view. With default values you get a frontal view of the whole area (Fig.2). The slider "Mag" adjusts magnification.

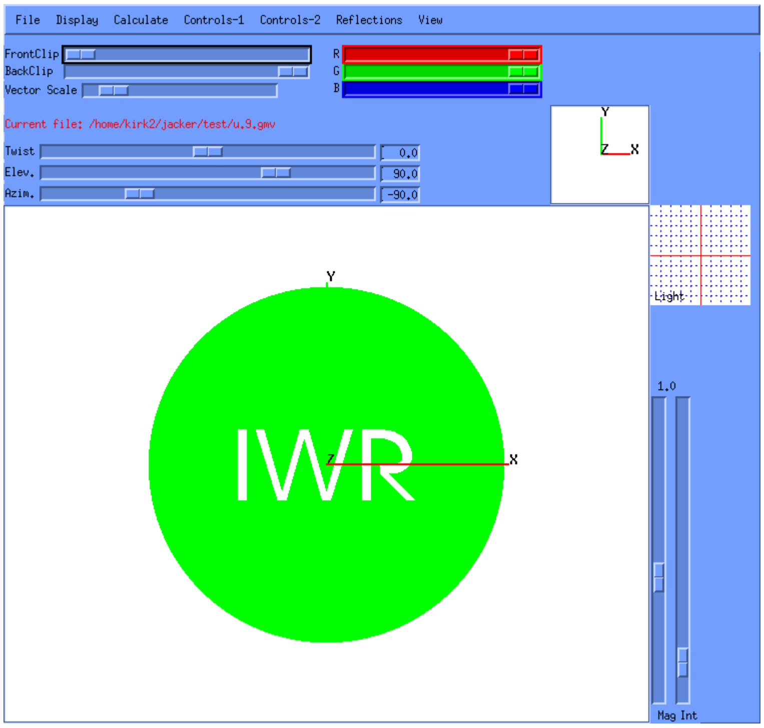

Figure 2: Main Window

3.2.2 Selecting Data

The window "cells" appears right beside the main window after loading data. You can find it also under "Display/Cells". Deactivate "Colored by Materials" and activate "Faces","Contours", "Shaded" and "Colored by Node Field". A selection box appears within you can select the data stream which you want to visualize. Close that box and click at "Apply" to redraw the display. The display in the main window will change (see Fig.3).

3.2.3 Adjusting linewidth

In Fig.2 and Fig.3 the lines are too thick. You can adjust linewidth under "Controls-2/Line Width" to "One". Don't forget to click at "Apply"!

3.2.4 Setting value ranges manually

If you don't want to restrict yourself to single pictures, you have to adjust the value ranges manually. Under "Controls-1/Data Limits/Node Fields" you can reach a menu within you can adjust value ranges for different data streams (Fig.5). You can select the data stream under "New Field". The needed values can be obtained from the output of "gmvextremes" for your GMV data. The source code of this program is located under "FEATFLOW/featflow/graphic/gmv".

3.2.5 Changing colormap

Under "Controls-1/Coloredit/Field Data Color Map" you can reach a menu within you can change the used colormap (Fig.6). If the offered colormaps don't satisfy your needs, you are able to load an external colormap (a colormap editor is planned).
Concerning this format: The first line contains the string "gmvcmap". The following 256 lines contain floatingpoint triples with value range 0.0..1.0, representing the RGB-values of single colormap entries.

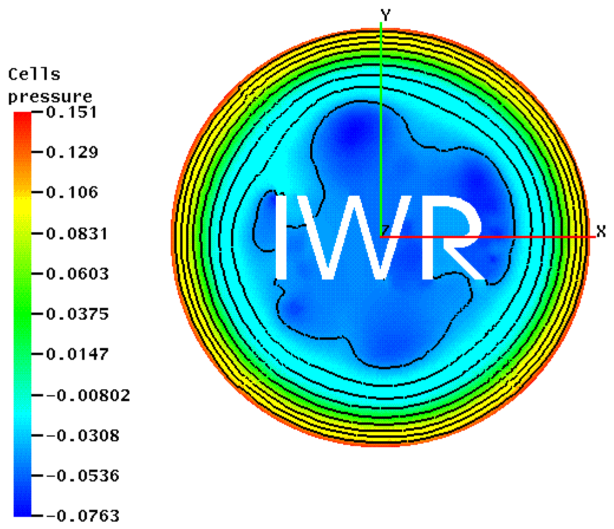

Figure 3: Display of Pressure Data

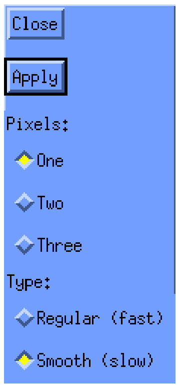

Figure 4: Menu "Line Width"

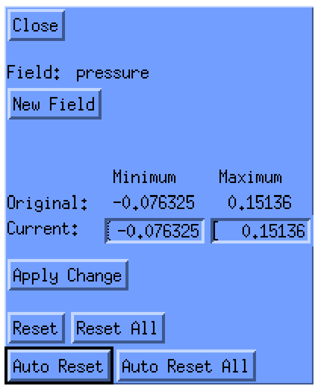

Figure 5: Menu "Set Node Field Limits"

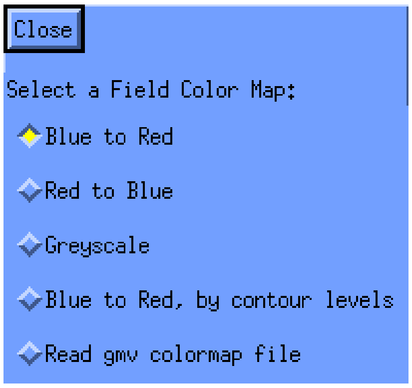

Figure 6: Menu “Field Color Map Selection”

3.2.6 How to remove axes and the colorbar

If you feel annoyed by axes, you can deactivate them by using “Controls-1/Axes”. If you want to deactivate the colorbar too, you can do that by using “Controls-1/Color Bar/On”.

3.2.7 Positioning display

You can rotate your mesh by holding the left mouse button while moving your mouse. If you want to displace it, you have to use the middle mouse button. Scaling of the mesh can be adjusted both with slider “Mag” and by using right mouse button.
Hint: Performing the later frame generation, the colorbar and your mesh may get closer. If you want to avoid them to collide, you should move your mesh close to the right margin!

3.3 Creating attribut files

3.3.1 Why using attribut files

Because adjusting GMV in a repeated way is a very time consuming work, there is the posibility to save your current configuration in an attribut file (ending “*.attr”). But there are several limitations, e.g. data and screensize are ***not*** saved!

3.3.2 Saving and loading of attribut files

You can create or save an attribut file under “File/Put Attributes”. It appears a file selector, within you can select the desired name. If you want to load attributes later, you can do that under “File/Get Attributes”.

3.4 Generating frames

3.4.1 Installation of “mkyuv”

1. Copy the file “FEATFLOW/featflow/graphic/gmv/mkyuv.c”. If the netpbm utilities are not installed on your system, copy the file *ftp://wuarchive.wustl.edu/graphics/graphics/packages/NetPBM/netpbm-1mar-1994.tar.gz*. We refer for installation of the netpbm utilities to the “Readme” files in that compressed archive.

2. If it does not exist, create the directory “~/bin”.

3. Compile the program with “gcc -Wall -O2 -o ~/bin/mkyuv mkyuv.c” or something more appropriate for your system.

4. On some systems the shell has to be closed and reopened (or do “rehash”) to make them able to find the program.

3.4.2 Manual of "mkyuv"

For generating a movie from a collection of data files, you have to read them one after each other, adjust GMV or read an attribut file, make a snapshot of display and convert it to YUV format. This is a very time consuming work, that could be done automatically by our program "mkyuv". It is invoked at subdirectory "#gmv" in such a way:
mkyuv <xres> <yres> <attribut> <prefix> <start> <stop> [<add>]

<xres> Width of frames in pixel

<yres> Heigth of frames in pixel

<attribut> Name of attribut file

<prefix> The names of generated frames are all structured like "<prefix><frame number>.*"

<start> The first data file to be read is "u.<start>.gmv"

<stop> The last data file to be read is "u.<stop>.gmv"

<add> Optional parameter which gives the step size between data files. By default it is set to <add>:=<start>. When you use adaptive time stepping you should set <add> to value 0.

3.5 Generating MPEG movies

3.5.1 Installation of "mkmpeg"

1. Copy file "FEATFLOW/featflow/graphic/gmv/mkmpeg.c".
2. If it does not exist, create the directory "~/bin".
3. Compile the program with "gcc -Wall -O2 -o ~/bin/mkmpeg mkmpeg.c" or something more appropriate for your system.
4. The program uses the same MPEG encoder such as the AVS modules of FEATFLOW. Therefore, you have to install this encoder, too.
5. On some systems the shell has to be closed and reopened (or do "rehash") to make them able to find the program.

Note: Both "mkyuv" and "mkmpeg" are not part of GMV, but especially written for this work by me. When you have problems with those programs, you can reach me at *featflow@gaia.iwr.uni-heidelberg.de.*

3.5.2 Manual of "mkmpeg"

We wrote "mkmpeg" to simplify the usage of the standard MPEG encoder. It is invoked at subdirectory "#gmv" in such a way:
mkmpeg <xres> <yres> <prefix> <frames> [<max_MB>]

<xres> See section 3.4.2

<yres> See section 3.4.2

<prefix> See section 3.4.2

<frames> The program uses frames numbered from 1 to <frames>.

<max_MB> Optional parameter which gives the maximum size of the generated movie measured in megabytes. If not given the default bitrate of the encoder is used.

3.6 Example

In the previous sections you could see how to read and visualize data using GMV. By using a pressure distribution as an example, we will show how to generate an MPEG movie from your data files.

1. Change to subdirectory "#gmv".
2. Adjust GMV for displaying a pressure distribution (as e.g. Fig. 3).
3. Save your adjustments in an attribut (see section 3.3.2) file named "pressure.attr".
4. For processing data files "u.3.gmv" to "u.99.gmv" invoke "mkyuv 400 320 pressure.attr pressure 3 99".
5. Finally create "pressure.mpeg" by invoking "mkmpeg 400 320 pressure 33 0.5".

- To avoid an unnecessary regeneration of YUV frames while playing with different bitrates, we put the mpeg generation in a separate program.
- If you see that your data become stationary after a certain number of frames, you should restart "mkmpeg" with a decreased number of frames.

References

[FEATFLOW] Finite element software for the incompressible Navier-Stokes equations: User Manual. Release 1.1, 1998 (see also: *http://www.iwr.uni-heidelberg.de/~featflow*)