

Contour Plots

Contour plots can be generated using a variety of different packages, such as *Gnuplot*, *Matlab*, *Tecplot*. Only *gnuplot* and *matlab* are discussed here.

Gnuplot The *help plot* command gives extensive information on the plotting of 2D and 3D data. Suppose that data is generated from a code and stored in a file called *results*.. The easiest is to generate data in the form of columns in the form say with

```
OPEN(UNIT=10, file='results')
DO  j=1,m
  do i=1,n
    write(10,1000)x(i),y(j),z(i,j)
  enddo
  write(10,1000)
enddo
1000 format(3(e12.5,1x))
CLOSE(UNIT=10)
```

Notice that a gap is left before the next set of *y* values. To generate a contour plot in *gnuplot*, the following commands are needed.

```
set parametric
set view 0,0,1
set nosurface
set contour
set cntrparam levels discrete 1.,2.,3.,4.,5.
splot 'results' u 1:2:3 w li
```

The *set parametric* is needed because of the way the data is generated. The *set view* means that the view point is at $z = 1$ looking down at the $x - y$ plane. The *set cntrparam ..* gives the values of the contour levels to be plotted. It can be omitted in which case the default values will be used. You can experiment and see the effect of omitting some of the commands above. Some sample data has been put in a file called *results* in the directory

`/home/ftp/pub/gajjar/cfdI/plotting`

and the *gnuplot.com* file contains the plotting commands above. Invoke *gnuplot* and try

load 'gnuplot.com'

to see a sample plot. Note that $x, y, z(x, y)$ values are in columns 3,4,5 respectively in the data file.

Matlab. This is a symbolic manipulation package and used extensively in scientific and engineering work. There is not enough space to describe all the wonderful features of matlab. If you have not used it before, it is best to first look at an introductory tutorial. There are plenty available online, and I have put a copy of one produced by David Griffiths at Dundee University in a file called *matlab.ps* in the same directory mentioned above. The file called *stream.m* contains sample matlab instructions to generate a contour plot for the data contained in the file results. To try it out type *matlab* in an xterm window. Then you need to type *stream* in the matlab window with the `>>` prompt. This will execute the commands in the *stream.m* file. Notice that in this file that the vector V contains the contour levels to be plotted. The labelling of these levels is done via the $V1$ vector. For filled contours try *contourf* instead of *contour*.