

## CONTOUR MAPS in MLAB

Gary D. Knott, Ph.D.  
Civilized Software, Inc.  
12109 Heritage Park Circle  
Silver Spring MD 20906 USA  
Tel.: (301)-962-3711  
email: csi@civilized.com  
URL: www.civilized.com

*MLAB* has a very powerful contour map algorithm. It computes a matrix holding the points on the individual level curves, so that their paths can be used in further computations, as well as graphed when desired. (Many contour algorithms produce plots, but do not produce explicit numbers, so nothing can be done with such algorithms, except look at the produced plot.) The paths generated with the *MLAB CONTOUR* operator are guaranteed to be non-self-intersecting. The most complex pattern that can arise is a four-leaf-clover shape.

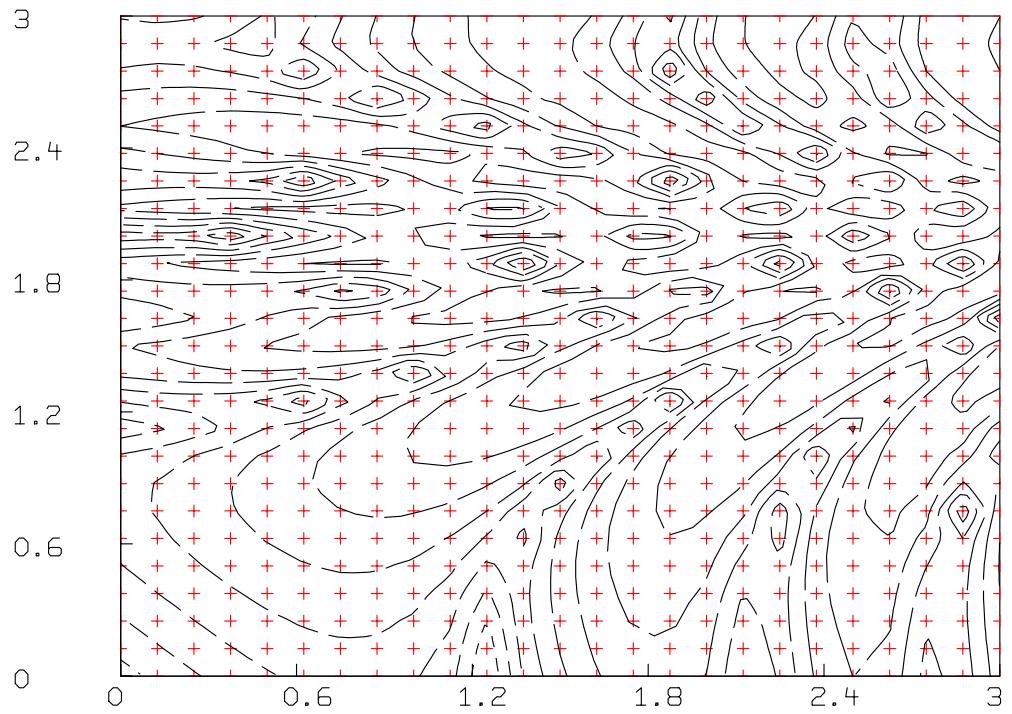
The *MLAB CONTOUR* operator does require that the data points of the surface to be “contoured” are given corresponding to a regular grid. If only irregularly-positioned points are known, the surface interpolation function can be used to obtain data points on a regular grid by nearest-neighbor average triangle interpolation.

Some examples of contour maps produced in *MLAB* are given below.

*Example 1:* Plot a contour map of the function

$$f(x, y) = \sqrt{|\cos(x^2 - y^3)|} + \log(|x + y| + 1)$$

in the rectangle  $[0, 3] \times [0, 3]$ .



The *MLAB* commands to do this are given below.

```

* FUNCTION F(x,y) = SQRT(ABS(COS(X^2-Y^3))) + LOG(1+ABS(X+Y))
* M = CROSS(0:3!25, 0:3!25)
* M COL 3 = F ON M
* DRAW CONTOUR(M) LINETYPE SVMARKER
* DRAW M COL 1:2, LINETYPE NONE, POINTTYPE CROSSPT, PTSIZE .01 COLOR YELLOW
* VIEW

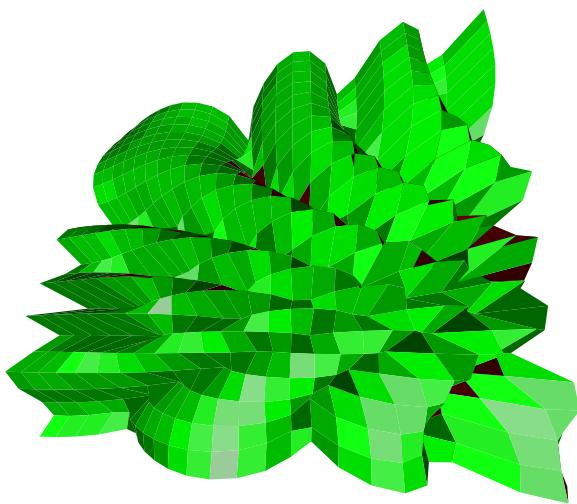
```

We can also look at our surface using the *MLAB 3D* graphics facilities as follows.

```

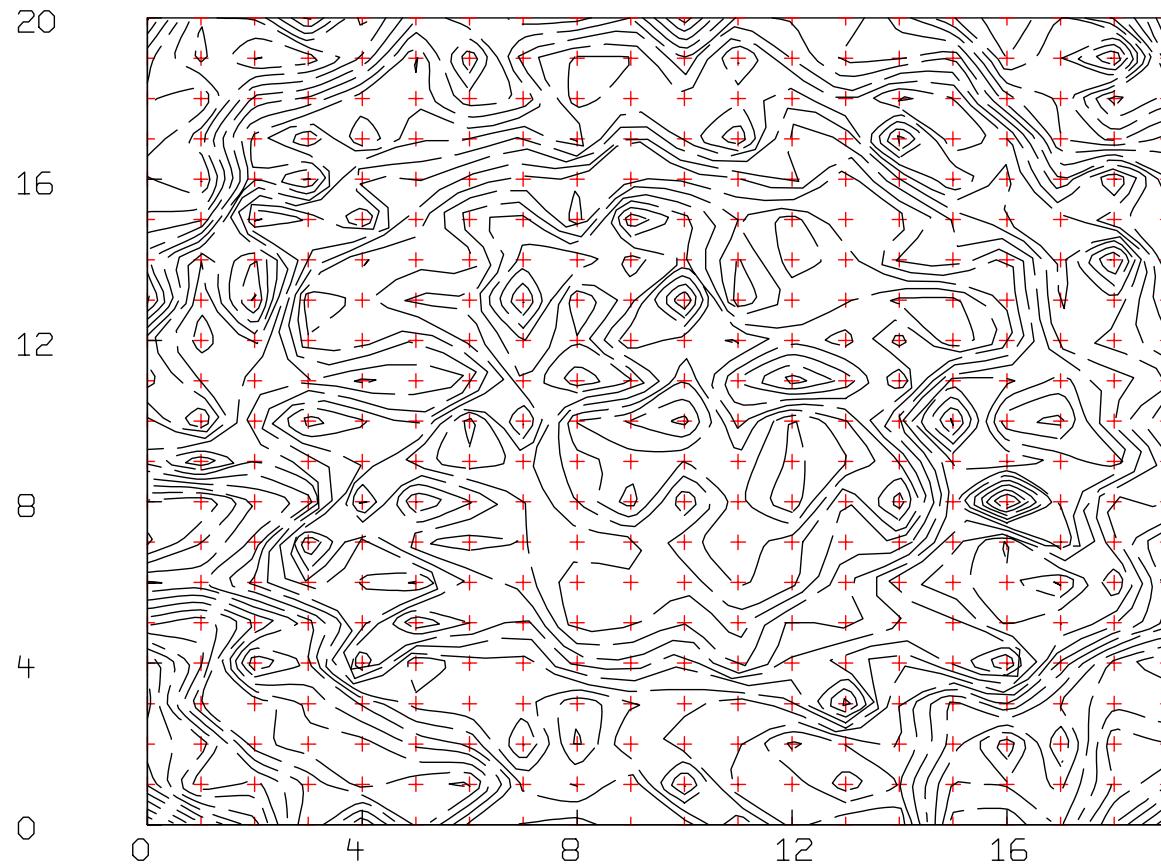
* DELETE W
* DRAW M LINETYPE HIDDEN
* VIEW

```



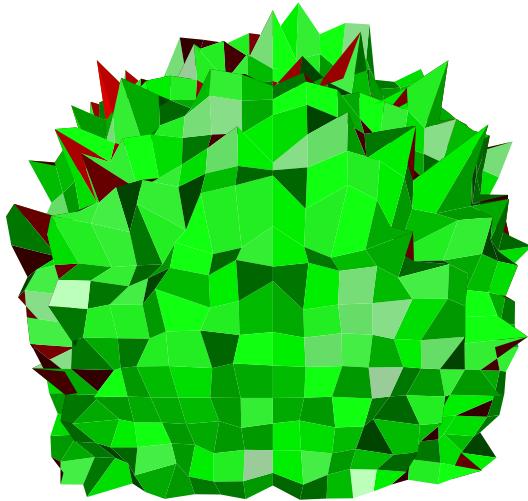
*Example 2:* Plot a contour map of the 441 data values stored in the file CDATA.DAT which are the elevations of a surface, stored by rows, corresponding to the grid  $\{0, 1, \dots, 20\} \times \{0, 1, \dots, 20\}$ .

```
* D = READ(CDATA,21,21)
* D = CROSS(0:20,0:20) & LIST(D)
* C = CONTOUR(D,30)
* DRAW C LINETYPE SVMARKER
* DRAW D COL 1:2, LT NONE, PT CROSSPT, PTSIZE .01, COLOR YELLOW
* VIEW
```



We can also look at our surface using the *MLAB 3D* graphics facilities as follows.

```
* DELETE W  
* DRAW M LINETYPE HIDDEN  
* VIEW
```



Note we have not described how hard-copy plots are made, but this document shows plotting can be easily done.

*MLAB* is available at [www.civilized.com](http://www.civilized.com).