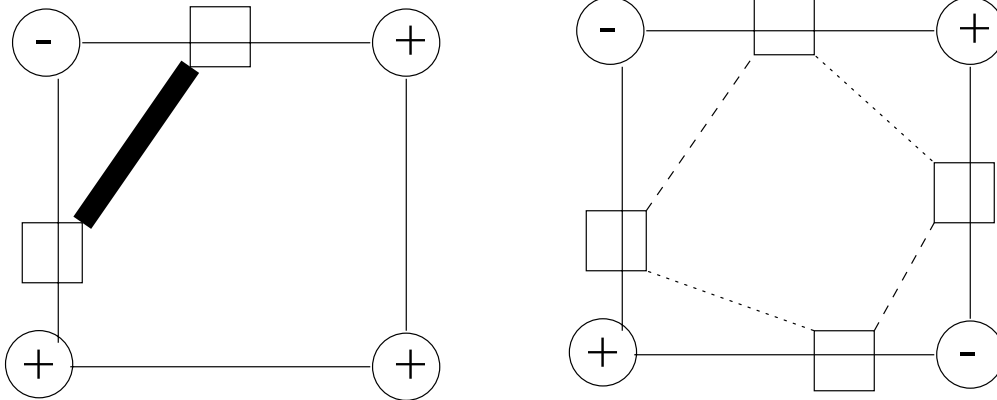


**MAT 5932 — Scientific Visualization – Lesson 1 – 26 Aug 1996**

- Course Details.
  - About the instructor.
- I. What is scientific visualization?
- A. Difference between the goals of computer graphics and scientific visualization.
  - B. Virtual and Transparent.
  - C. Continuous vs Discrete.
  - D. Massive Data Handling, fast interactive viewing graphical representations of the data.

II. Project 1.

- A. Contour Plots (2D). Definition. Examples. How to generate them in Maple and Mathematica. Topographical maps. Mathematica: `ContourPlot[Sin[x]*Sin[y],x,-Pi,Pi,y,-Pi,Pi, ContourShading->False]`. Maple: `with(plots):contourplot(sin(x)*sin(y),x=-Pi..Pi,y=-Pi..Pi)`;
- B. Almost enough Postscript. Commands: `moveto`, `lineto`, `stroke`, `showpage`. Approximating curves by straight line segments. Device Independent co-ordinates (vs device dependent co-ordinates of say X-windows). 72 points to an inch. Does y start at the top or bottom of the page? How to see postscript, `gs` and `ghostview`. How to print postscript (the “magic” %!). Asides: why the name, why points, how popular, how general. Programs write postscript, people usually do not.
- C. The contour plot algorithm. Input grid. The several cases, a picture is worth how many words? Suppose we are drawing the contour line for the value  $C$ . Consider the data values at the four corners and assume none of these values is exactly  $C$ . Then there can be 0, 1, 2, 3 or 4 of the values above  $C$ . Only one case presents problems.



- D. Philosophy of problem cases. Improve sampling. Subdivide the cell (several versions). Vary the level value slightly. Be arbitrary and hope it doesn't happen very often. Never believe close connectivity or Dis-connectivity on a contour plot, where close means below the sampling frequency/wavelength.
- E. Text in postscript `moveto`, `show`, `strings`, and `"/Courier findfont 12 scalefont setfont"`.
- F. Colors in postscript. Graphic contexts. Red `"0 1 1 sethsbcolor"`; Yellow `"0.17 1 1 sethsbcolor"`; Green `"0.33 1 1 sethsbcolor"`; Cyan `"0.5 1 1 sethsbcolor"`; Blue `"0.67 1 1 sethsbcolor"`; Magenta `"0.83 1 1 sethsbcolor"` Black `"0 0 0 sethsbcolor"`; White `"0 0 1 sethsbcolor"`. `setrgbcolor`.
- G. Paths in postscript. `closepath`, `fill`, `setlinewidth`, `setdash`, `setlinecap`, `setlinejoin`.
- H. Encapsulated Postscript `%%BoundingBox 0 0 x2 y2`.