Computational Lab Group Project Journal

Laurynas Mince

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Today I have done the following:

1. Improved the GNUPLOT script to plot the equipotential lines. The script and its output can be found at the end of this entry.

Appendix

Listing 1: Gnuplot script to plot the equipotential lines of the numerical solution to the problem A

```
1  ########################################
2  # GNUPLOT script to plot the equipotential lines of the
       numerical solution
3  # to the problem A.
4  #
5  # It is showing equipotential lines with a palette-
       mapped data of potentials.
6  #
7  # Things to improve:
8  #   >> set x- and y-axis ranges automatically depending
       on the
9  #      grid size produced
10 #   >> run gnuplot from c++ code
11 #   >> change palette
12 #   >> the key of the plot seems to be slightly out of
       place --
```

```
#       adjust location or remove it at all.
#
# FOLLOW THE COMMENTS FOR EXPLANATIONS OR CHANGING THE PLOT
#
########################################

set term postscript
set output "equipotential.eps"

set title "Equipotential Lines of the Numerical Solution"

# Specify the size of x-axis and y-axis
# NOTE (TO DO): use shell script to adjust these values automatically
set xrange[0:99]
set yrange[0:99]

# The key set to be outside of the plot; possible to change position and turn it off by typing "off" as an option.
# DO WE WANT KEY???
##########
set key outside vertical
set key left top

set pm3d map

# Comment out if surface is needed -- will give a grid of lines
unset surface

set size square

# Palette of colours that are used to draw a surface and indicate different potentials
set palette defined ( 0 0 0 0, 0.25 0 0 1, 0.5 0 1 0,\
     0.75 1 0 0, 1 1 1 1 )

```

```
46 # Specify where to draw a contour; base - on the grid
     base; surface - on the surfaces themselves; both -
     draws on both the base and contour
47 #########
48 set contour surface
49
50 # Type of approximation; can change bspline to linear
     or cubicspline; bspline is supposed to be the
     smoothest approximation
51 ##########
52 set cntrparam bspline
53
54 # Sets the order of bspline approximation -- higher the
      order, smoother the approximation; relevant if
     bspline approximation is used in the first place
55 ##########
56 set cntrparam order 4
57
58 # Contour levels - set how many equipotential lines are
      needed; incremental mode starts at the potential of
      -2.5 and increments in steps of 0.5 for 11 times (
     in this case); auto mode requires to provide a
     number of contour lines and then it adjust actual
     number and equipotentials to output the best graph.
     CHOOSE EITHER ONE
59 ####################
60 #set cntrparam levels incremental -2.5,0.2,26
61 set cntrparam level auto 26
62
63 splot "matrix_potential.dat" matrix with image notitle,
      "potential.dat" with lines lt 1 lw 2 title "
     Potential"
```

Figure 1: Plot of the equipotential lines. Solution of the problem A using numerical techniques.