University of Liège
Faculty of Applied Sciences
Aerospace and Mechanical Department

MECA0027: Structural and Multidisciplinary Optimization

Project1 : Unconstrained Optimization

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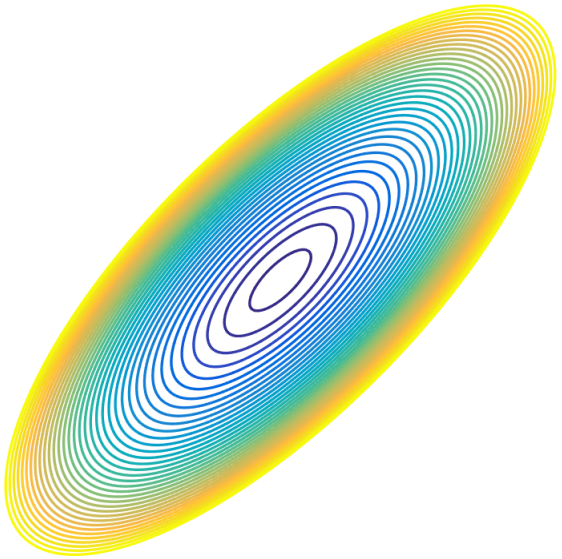
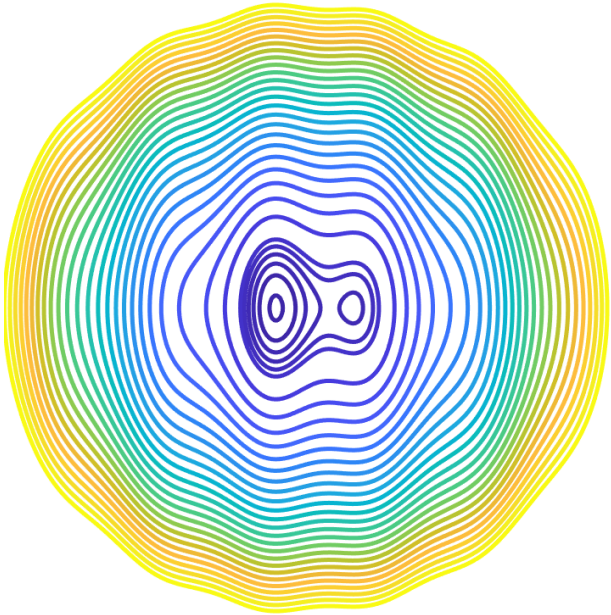
Instructions

- To minimize:

$$f_1(x,y) = 2x^2 + 2y^2 - 3xy - 2x + 10y - 1$$
$$f_2(x,y) = 0.4x^2 + 0.4y^2 + cos(\pi/2x) + 0.5x$$



- Using the following methods:
  1. Steepest descent
  2. Conjugate gradient (Fletcher and Reeves)
  3. Basic Newton
  4. Newton-like
  5. Quasi-Newton (BFGS)



Instructions

- Prepare a report in power point (25 slides at most) with the following information:
  - Graphical representation of the functions and the chosen starting points (at least two).
  - Explain the chosen stopping criteria.
  - Discuss the differences between the results obtained for f_1 and f_2.
  - Compare the steepest descent with the conjugate gradient method and the basic Newton with the Newton-like/Quasi-Newton methods.

- Send a .rar or .zip file named as « student1_student2 » with the slides and the Matlab code to efsanchez@uliege.be and palarcon@uliege.be

- What we will evaluate?
  - Quality of the report (content, design, figures, text, tables, etc)
  - Results (implementation of the methods)
  - Analysis (comments)

Advice

- For those unfamiliar with Matlab, if necessary, revisit the Matlab training session held on September 18 and 19. We can send the PDF file if necessary.

- Use the provided Matlab functions
  - plotOptimizationPath.m to plot the functions and the optimization path.
  - getObjFVal.m to obtain the value of the function on a point.

- Use the following convention for the variables
  - $x = \begin{bmatrix} x_0 & x_1 \dots & x_n \\ y_0 & y_1 \dots & y_n \end{bmatrix}$ contains the pair of coordinates during the optimization

  - "functionID" values either 1 or 2 depending on which function do you want to work with.
  - "fval" is the value of the function at the point

Deadline Project 1 – November 3th at midnight