

MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING
ME 310 NUMERICAL METHODS
FALL 2014
PROGRAMMING PROJECT 3

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The programming project will be submitted through METU-Class, as described in the "Programming Project Assignment Guidelines", which is posted on METU-Class.

Write a computer program to find the location of the maximum for a given $f(x, y)$ using unidirectional optimization method. In this method, the search for the maximum starts from an initial point (x_0, y_0) and the maximum of the two variable function $f(x, y)$ is found for $x = x_0$ along the y direction to become $y = y_1$ using any of the single variable optimization techniques. Then the same procedure is repeated and the maximum of the two variable function $f(x, y)$ is found for $y = y_1$ along the x direction to become $x = x_1$. Iterations are stopped when a pre-defined error value is reached.

Your code should do the following:

- Use Parabolic Interpolation as your optimization method where the points used are selected sequentially.
- User defines the function $f(x, y)$, the coordinates of the initial point (x_0, y_0) and error tolerance ε_s . Write your code as a function that can accept user defined variables and functions or main code that calls a function written as a separate file (a separate m file in MATLAB, a separate C/C++, Fortran, etc. file in other programming languages. Not applicable to MATHCAD).
- Also find the maximum of the given function using built-in capabilities of the software/computer language you are using. Compare the results. (If you are using a programming language such as C/C++, Fortran, etc. compare the result of your code and the result of a built-in function in a software package only in your report)
- Present the results by displaying them on the screen. Give the number of iterations (inner iterations in x and y directions in addition to the outer iterations), the approximate percent relative error for each outer iteration and the final optimal point.

Present your results in a short report (a few pages of a word document only, saved as a pdf document) which should include the following:

- A basic introduction paragraph,
- Necessary hand calculations to write your code (type it in the word document)
- Formulations used in the calculations,
- Your numerical results,

- Discussion of the results and conclusion,
- Appendix section including your code.