

Recitation 2

Finite-variable optimization examples

ME260 Indian Institute of Science

Structural Optimization: Size, Shape, and Topology

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Example 2

$$\text{Min}_{x,y} f = x^2 + y^2 - 2x$$

Subject to

$$\lambda: h = y - 2x^2 + 5x = 0$$

$$\mu: g = -3x - y + 6 \leq 0$$

Solve it by hand and then with *fmincon* function in Matlab.

Example 1

Fit optimal quadratic curve to the data:
(1,3), (2.5, 2.5), (3,4), (3.5,3.5), (4.5, 4.2)

$$y = ax^2 + bx + c$$

$$a = ?$$

$$b = ?$$

$$c = ?$$

Formulating an optimization problem

- (a) Given three points in a plane, find a fourth point such that the sum of its distances from the given three points is a minimum.
- (b) Given a triangle, circumscribe the largest possible equilateral triangle about it.

Steps

1. Identify the optimization variables
 - What you do not know define the optimization variables.
2. Write the objective function in terms of the optimization variables
3. Write the constraint function(s) in terms of the optimization variables
 - Is it an equality or inequality constraint?
4. Clearly state the data given in the problem
5. Read the mathematical optimization problem and check:
 - Is the problem statement complete?
 - Does it capture the intent of the verbal statement of the problem?