

Multiple-Choice Test

Chapter 09.03

Multidimensional Direct Search Method

1. Which of the following statement is FALSE?
 - (A) Multidimensional direct search methods are similar to one-dimensional direct search methods.
 - (B) Enumerating all possible solutions in a search space and selecting the optimal solutions is an effective method for problems with very high dimensional solution spaces.
 - (C) Multidimensional direct search methods do not require a twice differentiable function as an optimization function
 - (D) Genetic Algorithms belong to the family of multidimensional direct search methods.
2. Which of the following statements is FALSE?
 - (A) Multidimensional direct search methods require an upper and lower bound for their search region.
 - (B) Coordinate cycling method relies on single dimensional search methods to determine an optimal solution along each coordinate direction iteratively.
 - (C) If the optimization function is twice differentiable, multidimensional direct search methods cannot be used to find an optimal solution.
 - (D) Multidimensional direct search methods are not guaranteed to find the global optimum.
3. The first cycle of Example 1 in Chapter 09.03 results in an optimal solution of $f(2.6459, 0.8668) = 4.8823$ for the gutter design problem. The next iteration starts with a search along dimension l (length) looking for the optimal solution of the function $f(l, 0.8668)$ as shown in Table 3 and reproduced below where $\theta = 0.8668$ and $f(x_i) = (6 - 2l + l \cos(0.8668)) / \sin(0.8668)$. What is the optimal solution for the length of the gutter side at the end of iteration 10?

Iteration	x_l	x_u	x_1	x_2	$f(x_1)$	$f(x_2)$	ϵ
1	0.0000	3.0000	1.8541	1.1459	4.9354	3.8871	3.0000
2	1.1459	3.0000	2.2918	1.8541	5.0660	4.9354	1.8541
3	1.8541	3.0000	2.5623	2.2918	4.9491	5.0660	1.1459

4	1.8541	2.5623	2.2918	2.1246	5.0660	5.0627	0.7082
5	2.1246	2.5623	2.3951	2.2918	5.0391	5.0660	0.4377
6	2.1246	2.3951	2.2918	2.2279	5.0660	5.0715	0.2705
7	2.1246	2.2918	2.2279	2.1885	5.0715	5.0708	0.1672
8	2.1885	2.2918	2.2523	2.2279	5.0704	5.0715	0.1033
9	2.1885	2.2523	2.2279	2.2129	5.0715	5.0716	0.0639
10	2.1885	2.2279	2.2129	2.2035	5.0716	5.0714	0.0395

- (A) 2.1885
 (B) 2.2279
 (C) 5.0715
 (D) 2.2082
4. What is the maximum size for the area of gutter at the optimal point determined in multiple-choice question 3? (Hint: You do not need to do any calculations to answer this question)
 (A) 5.0716
 (B) 5.0714
 (C) 5.0715
 (D) 2.2082
5. To find the minimum of the function $f(x, y) = 5x^2 - 6xy + 5y^2 - 2$ hold $y = 0$ and use 2 and -2 as your upper and lower bounds for your one-dimensional search along the x coordinate using golden search method. What would be the optimal solution for x after the first iteration?
 (A) 3.1146
 (B) 0.4721
 (C) 0
 (D) 0.0015
6. Considering the scenario in Question 5, what would be the optimal solution for x after the first iteration? (Can you explain the difference?)
 (A) 0
 (B) 0.7639
 (C) 0.4721
 (D) 7.5728