IMPROVING THE QUALITY OF EDUCATION BY SOLVING PROBLEM OPTIMIZATION USING THE MATHCAD PROGRAM

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ABSTRACT

This article explores the solution of a nonlinear programming problem using a mathematical program. A method for solving an economic problem using the MathCAD program is described.

Keywords: Optimization, conditional, unconditional, extremum, limitation, cost, maximum, minimum.

INTRODUCTION

Digitalization requires a trained specialist not only to compete in specialization, to find the optimal solution to relevant economic issues within his or her function, and to quickly develop the right decision-making skills. This is done on the basis of the formation of his mathematical competence. Solving the issue of optimization based on mathematical programs improves the quality and effectiveness of the lesson. It especially plays an important role in analyzing economic issues using a mathematical program, planning production, and analyzing actions in increasing income. Below we will show you how to solve the problem of nonlinear programming using the MathCAD program. [1],[2].

Example: The enterprise produces and markets three different resource products. x_1- sh.b. Type I product, x_2- sh.b. Type II product, x_3-sh.b. Type III product. The price of a unit of these products is $x_1 - 20$, $20 - x_2$, $60 - 2x_1 - x_2$ soums, respectively. In order for the total profit to be maximum, it is necessary to produce from each product in how much. To solve the problem, we build a mathematical model of it and solve it in the MathCAD program.

$$ORIGIN := 1$$

$$F(x1,x2,x3) := 12\cdot x1 + 20\cdot x2 + 60\cdot x3 - x1^2 - x2^2 - 2\cdot x3^2 - x2\cdot x3$$

Hosila olamiz

$$f1(x1,x2,x3) := \frac{\partial}{\partial x1}F(x1,x2,x3) \rightarrow 12 - 2\cdot x1$$

$$f2(x1,x2,x3) := \frac{\partial}{\partial x2}F(x1,x2,x3) \rightarrow 20 - x3 - 2\cdot x2$$

$$f3(x1,x2,x3) := \frac{\partial}{\partial x3}F(x1,x2,x3) \rightarrow 60 - 4\cdot x3 - x2$$

$$x1 := 0 \qquad x2 := 0 \qquad x3 := 0$$

we solve the system of tags and find stationary points.

Given

$$f1(x1,x2,x3) = 0$$

$$f2(x1,x2,x3) = 0$$

$$f3(x1,x2,x3) = 0 \qquad x1 \ge 0 \qquad x2 \ge 0 \qquad x3 \ge 0$$

$$\text{Find}(x1,x2,x3) \rightarrow \begin{pmatrix} 6 \\ \frac{20}{7} \\ \frac{100}{7} \end{pmatrix}$$

We find the second orderly harvest.

$$f4(x1,x2,x3) := \frac{d}{dx1} f1(x1,x2,x3) \rightarrow -2 \qquad f7(x1,x2,x3) := \frac{d}{dx1} f2(x1,x2,x3) \rightarrow 0$$

$$f5(x1,x2,x3) := \frac{d}{dx2} f1(x1,x2,x3) \rightarrow 0 \qquad f8(x1,x2,x3) := \frac{d}{dx2} f2(x1,x2,x3) \rightarrow -2$$

$$f6(x1,x2,x3) := \frac{d}{dx3} f1(x1,x2,x3) \rightarrow 0 \qquad f9(x1,x2,x3) := \frac{d}{dx3} f2(x1,x1,x3) \rightarrow -1$$

$$f10(x1,x2,x3) := \frac{d}{dx1} f3(x1,x2,x3) \rightarrow 0 \qquad f11(x1,x2,x3) := \frac{d}{dx2} f3(x1,x2,x3) \rightarrow -1$$

$$f12(x1,x2,x3) := \frac{d}{dx3} f3(x1,x2,x3) \rightarrow -4$$

Gesse matritsasi

$$H := \begin{pmatrix} f4(x1,x2,x3) & f5(x1,x2,x3) & f6(x1,x2,x3) \\ f7(x1,x2,x3) & f8(x1,x2,x3) & f9(x1,x2,x3) \\ f10(x1,x2,x3) & f11(x1,x2,x3) & f12(x1,x2,x3) \end{pmatrix} = \begin{pmatrix} -2 & 0 & 0 \\ 0 & -2 & -1 \\ 0 & -1 & -4 \end{pmatrix}$$

We find the specific number of matrixes

$$\text{eigenvals}(H) = \begin{pmatrix} -4.414 \\ -2 \\ -1.586 \end{pmatrix}$$

The Gesse matrix is negatively defined, which means that the function has a maximum.

$$x1 := 6 \qquad x2 := \frac{20}{7} \qquad x3 := \frac{100}{7}$$

$$F(x1, x2, x3) = 493.143$$

Example 2

The demand for a particular commodity on the market is 300. This product is produced in 4 factories. x_1- sh.b. Type I product, x_2- sh.b. Type II product, x_3-sh.b. Type III product. The price of a unit of these products corresponds to $4x_1^2 + x_1$, x_2^2, $x_3^2 + x_3$ is made up of soums. How much from each product needs to be produced so that the total cost is minimal. To solve the problem, we build a mathematical model of it and solve it in the MathCAD program.

$$L(x1, x2, x3) := 4 \cdot x1^2 + x1 + x2^2 + x3^2 + x3$$

$$x1 := 0 \qquad x2 := 0 \qquad x3 := 0$$

Given

$$x1 + x2 + x3 = 300$$

$$x1 \geq 0 \qquad x2 \geq 0 \qquad x3 \geq 0$$

$$\begin{pmatrix} x1 \\ x2 \\ x3 \end{pmatrix} := \text{Minimize}(L, x1, x2, x3)$$

$$\begin{pmatrix} x1 \\ x2 \\ x3 \end{pmatrix} = \begin{pmatrix} 33.278 \\ 133.611 \\ 133.111 \end{pmatrix}$$

$$L(x1, x2, x3) = 4.017 \times 10^4$$

CONCLUSION

1. Students develop the skills to build a mathematical model of economic issues and use the method of optimal solution.
2. Develops the ability to find optimal solutions to practical issues in the economy based on mathematical programs and to analyze the solution.

REFERENCES

1.Abdurazakov A., Mirzamaxmudova N., Maxmudova N. – 2021. – No. 11-1 (90). – C. 48-52.

2.Abdurazakov A., Mirzamahmudova N., Maxmudova N. METHODOLOGY FOR TEACHING MATHEMATICS IN THE PREPARATION OF "ECONOMICS" SPECIALISTS – 2021. – T. 2. – No. 7. – C. 728-736.