DECISION-MAKING IN TABLE GAMES

Norieva Aziza Jasur qizi
Jizzakh branch of National University of Uzbekistan
named after Mirzo Ulugbek, assistant.
noriyevaaziza@gmail.com

ABSTRACT

In this article, problem tasks related to tabular issues of game theory and process research are considered, and the article can be used by students of scientific educational institutions, young people, and professors. They can learn methods that determine game balance.

Keywords: *game theory, matrix, table game, optimal strategy, game evaluation.*

INTRODUCTION

There are conflict situations in almost all the processes taking place in nature and society. Therefore, how such conflict processes will proceed will, of course, completely depend on the behavior of the participants who define these conflict situations. Management of conflict situations is, in most cases, carried out by humans. So, with this, it becomes possible to change the course of conflicting processes, to decide the result in one's favor, in some sense. For example, in the course of their activity, product manufacturing enterprises consist of various management, production, product quality control, financial planning, sales, service and other departments. In this case, there may be conflict not only within divisions, but also between divisions.[1]

METHODS

Let us be given the following table game

$$\boldsymbol{A} = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix}$$

that is, the first player has m pure strategies, and the second player has n pure strategies.

Definition 1.

$$v_* = \max_{1 \le i \le m} \min_{1 \le j \le n} a_{ij}$$

The number determined by is called the lower value of the game.

Definition 2.

$$v^* = \max_{1 \le i \le m} \min_{1 \le j \le n} a_{ij}$$

The number determined by is called the high score of the game.

In this case, the following inequality is relevant

$$v_* \le v^* \text{ [1]}$$

RESULT

Matter. Find the low and high scores for the table game below.

$$\begin{vmatrix} 2 & 0 & -1 & 2 \\ -3 & 2 & 3 & -1 \\ 0 & 5 & 1 & 3 \\ 1 & 4 & 5 & -2 \end{vmatrix}$$

Solving. To do this, we determine the smallest of each element and the largest of each column element. We will write these numbers on the right side and in the lower part of the table, respectively.

$$\begin{vmatrix} 3 & 0 & -1 & 2 \\ -3 & 2 & 4 & -1 \\ 0 & 5 & 1 & 3 \\ 1 & 4 & 3 & -2 \end{vmatrix} \begin{matrix} 3 \\ 4 \\ 5 \\ 4 \end{matrix}$$
$$\begin{matrix} 3 & 5 & 4 & 3 \end{matrix}$$

Endi o‘ng tarafdagi sonlarning eng kattasi $v_* = 3$ va pastdagi sonlarning eng kichigi $v^* = 5$ bo‘ladi.

Now the largest of the numbers on the right $v_* = 3$ and the smallest number below is $v^* = 5$.

Answer: $v_* = 3, v^* = 5$.

Matter. Find the equilibrium state of the table game given above.

Solving. First, the smallest elements of each row are written to that row. Similarly, at the bottom of each column, a suitable large element is written. The smallest of the row elements is equal to 0, the smallest of the column elements is equal to 3. The row and column with these numbers together form a balance:

$$\begin{vmatrix} 3 & 0 & -1 & 2 \\ -3 & 2 & 4 & -1 \\ 0 & 5 & 1 & 3 \\ 1 & 4 & 3 & -2 \end{vmatrix} \begin{matrix} -1 \\ -3 \\ 0 \\ -2 \end{matrix}$$
$$\begin{matrix} 3 & 5 & 4 & 3 \end{matrix}$$

Answer: the equilibrium state of the game is equal to $(1;1),(1;3),(3;4)$.

Matter. Solve the following 2×2 board game:

$$A = \begin{pmatrix} 2 & -3 \\ 0 & 5 \end{pmatrix}$$

Solving. There is no pure optimal strategy in this game. Therefore, we determine the mixed optimal strategies of the players and the value of the game:

$$x_1^* = \frac{5-0}{2+5-0-(-3)} = \frac{5}{10} = \frac{1}{2}$$
$$x_2^* = \frac{2-(-3)}{2+5-0-(-3)} = \frac{5}{10} = \frac{1}{2}$$
$$y_1^* = \frac{5-(-3)}{2+5-0-(-3)} = \frac{8}{10} = \frac{4}{5}$$
$$y_2^* = \frac{3-(-2)}{2+5-0-(-3)} = \frac{5}{10} = \frac{1}{2}$$
$$v^* = \frac{2\times 5 - 0\times(-3)}{2+5-0-(-3)} = \frac{10}{10} = 1$$

Answer: the optimal strategy of the first player is $x^* = \left(\frac{3}{4};\frac{1}{4}\right)^T$, the optimal strategy of the second player is $y^* = \left(\frac{3}{8};\frac{5}{8}\right)^T$, the value of the game ; $v^* = 1\frac{3}{4}$ is equal to 3/4.

CONCLUSION

Process research gives students a full picture of the mathematical blinders of the subject and specific examples areas where process research methods are used must have shown. If the student solves his work When focused on the field of reception, the effort to absorb this information creates a lack of confidence in the student. The student has deep knowledge of the mathematical basis of process research after acquiring, mastering the achievements in this field and with a practical study of real problems in the field can increase his training level. [1]

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