Application the MABAC Method in Support of Decision-Making on the Use of Force in a Defensive Operation

Darko Božanić
University of defence in Belgrade

Dragan Pamucar
University of Defence

Samed Karovic
Vojna akademija Beograd

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DARKO I. BOŽANIĆ, University of Defence in Belgrade, Military Academy, Belgrade
DRAGAN S. PAMUČAR, University of Defence in Belgrade, Military Academy, Belgrade
SAMED M. KAROVIĆ, University of Defence in Belgrade, Military Academy, Belgrade.

Original scientific paper
UDC: 303.732.3:355/359
005:355/359
DOI: 10.5937/tehnika1601129B

This paper presents the application of a new method of multicriteria comparison of border approximate area - MABAC. The basis of the method is reflected in defining a distance of criterion function of each observed alternative from the border approximate area.

The border approximate area is defined by a separate procedure for each criteria and depends on the value of all alternatives according to the observed criteria. The method is shown through six simple steps made in order to support decision-making on the use of force in a defensive operation. Previous studies were used for the definition of criteria and their weight coefficients.

Key words*: MABAC (Multi-Attributive Border Approximation area Comparison), decision-making, course of action, defensive operation*

1. INTRODUCTION

The Serbian Armed Forces (SAF) and its sections are used in different types of combat and other operations [1]. In order to use the SAF in a defense and other operations, one of the most important issues is making the decision about how to use forces in reaching set target.

The military decision-making process is paid special attention to, because in the center of every decision is a human being, and not all people are expected to respond equally in situations in which they may find themselves [21]. Nevertheless, many decisions are not made based on a precisely elaborated system (criteria, weights of criteria and methods to be used are not specified, *etc*.), but these rely on the knowledge and experience of commanders and their staff (decision-makers in the army) and procedures that in certain situations do not reflect real operational environment.

In this paper is presented a key segment of a defense operation preparation of Land Forces (LF), based on which is improved the decision-making process concerning the use of forces - units. The criteria and weight coefficients of criteria are taken from previous research, while for the selection of the best course of action will be applied the method of multicriteria comparison of border approximate areas (MABAC - Multi-Attributive Border Approximation area Comparison). This method is selected because, in comparison to other methods of multi-criteria decision-making (SAW, COPRAS, MOORA, TOPSIS and VIKOR), it provides stable (consistent) solutions and it is considered a reliable tool for rational decision-making, as provided in detail in [20].

2. PROBLEM DESCRIPTION

The term "operation" is interpreted in different ways. Currently, in the SAF mostly applied definition, which shapes practical behavior, is provided in the Doctrine of the Serbian Armed Forces. Under the operation is understood "a collection of combat and/or non-combat activities, movements and other actions taken by a single concept, individually or in cooperation with other defense forces, in order to achieve the overall objective of different significance" [6]. "Defensive operations are the type of combat operations applied in cases in which the enemy has the initiative and seeks to occupy specific territory or strives

Author's address: Darko Božanić, University of Defence in Belgrade, Military Academy, Belgrade, Pavla Jurišića Šturma 1

Paper received: 12.11.2015.
Paper accepted: 16.11.2015.

to break into defended area" [6]. Regardless of how the operation is defined, constant changes of the operating environment and physiognomy of modern warfare require continuous development of techniques, processes and procedures in order to improve the planning, organization and realization of operations [1].

In the Instructions for Operational Planning and Commands in the Serbian Armed Forces (Instructions) [29] is elaborated the process of planning military operations. In fact, in the mentioned Instructions, but also in those who were in force before it, the planning process is realized in three phases: 1) prediction, 2) decision-making and 3) plan development [25]. One segment of the planning process is the development, analysis and comparison of courses of action. In the broadest sense, a course of action presents the way in which the mission can be executed [28]. With the development of courses of action it is defined the beginning and the end of activities, who performs the operation, where it is performed, why it is performed, how it is to be performed, etc. [28].

The essence of the problem is in the selection of a single course of action, which will be selected by the decision-maker (DM), based on the comparison of all elaborated courses (alternatives). The main problem occurring in official documents is that the evaluation of courses of action differs from mission to mission, as well as from persons participating in the decision-making process [29]. This creates room for error, expecially if the decision is made by less experienced persons. Taking into account that the reality of war has its differentia specifica, which is difficult to perceive through education, training, exercises and the like [2], the application of multiple criteria decision-making methods in the planning of operations is imposed as a necessity.

A general approach to the selection of course of action is presented in [7], where through the process of war games are perceived advantages and disadvantages of the courses of action, i.e. well-developed courses of action are improved. The process itself is explained through general steps, and the DM should define criteria and their weight coefficients and the like. In addition to the approach provided in [7], papers can be found in which is shown a selection of courses of action (in different types of operations) by using various multiple criteria methods [1, 8, 10, 11, 14].

3. THE MABAC METHOD

The MABAC method is developed by Pamucar and Cirovic [20]. In the paper [20] it is used a hybrid model, DEMATEL-MABAC, in which the DEMATEL method is used to determine weight coefficients of criteria and the MABAC method is used for ranking alternatives. In this paper, weight coefficients of criteria are taken from [14] and used for further implementation of the MABAC method.

The basic assumption of the MABAC method is reflected in the definition of the distance of criteria function of each observed alternative from the border approximate area. In the following part is presented the procedure of implementing the MABAC method, *i.e.*, its mathematical formulation, which consists of 6 steps:

Step 1. Forming initial decision matrix (X). In the first step it is performed the evaluation of *m* alternatives by *n* criteria. The alternatives are presented with the vectors $A_i = (x_{i1}, x_{i2}, ..., x_{in})$, where x_{ij} is the value of the i alternative by j criterion ($i = 1, 2, ..., m;\ j = 1, 2, ..., n$).

$$X = \begin{array}{c} \\ A_1 \\ A_2 \\ ... \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & ... & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & ... & x_{1n} \\ x_{11} & x_{22} & & x_{2n} \\ ... & ... & ... & ... \\ x_{1m} & x_{2m} & ... & x_{mn} \end{bmatrix} \end{array} \tag{1}$$

where *m* is the alternative number, *n* is total number of criteria.

Step 2. Normalization of initial matrix (X) elements.

$$N = \begin{array}{c} \\ A_1 \\ A_2 \\ ... \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & ... & C_n \end{array} \\ \begin{bmatrix} t_{11} & t_{12} & ... & t_{1n} \\ t_{11} & t_{22} & & t_{2n} \\ ... & ... & ... & ... \\ t_{1m} & t_{2m} & ... & t_{mn} \end{bmatrix} \end{array} \tag{2}$$

Elements of normalized matrix (N) are obtained by applying the expression:

a) For benefit-type criteria

$$t_{ij} = \frac{x_{ij} - x_i^-}{x_i^+ - x_i^-} \tag{3}$$

b) For cost-type criteria

$$t_{ij} = \frac{x_{ij} - x_i^+}{x_i^- - x_i^+} \tag{4}$$

where x_{ij}, x_i^+ and x_i^- present the elements of initial decision matrix (X), wherein x_i^+ and x_i^- are defined as follows:

$x_i^+ = \max\left(x_1, x_2, ..., x_m\right)$ represents maximum values of the observed criterion by alternatives.

$x_i^- = \min\left(x_1, x_2, ..., x_m\right)$ represents minimal values of the observed criterion by alternatives.

Calculation of weighted matrix (V) elements.

$$V = \begin{bmatrix} v_{11} & v_{12} & ... & v_{1n} \\ v_{21} & v_{22} & ... & v_{2n} \\ ... & ... & ... & ... \\ v_{m1} & v_{m2} & ... & v_{mn} \end{bmatrix} \quad (5)$$

Weighted matrix (V) elements are calculated based on the expression (6):

$$v_{ij} = w_i \; t_{ij} + w_i \quad (6)$$

where t_{ij} presents the elements of normalized matrix (N), w_i presents weight coefficients of criteria. By applying the expression (6) it is obtained the weighted matrix V, which can also be written as follows:

$$V = \begin{bmatrix} w_1 \; t_{11} + w_1 & w_2 \; t_{12} + w_2 & ... & w_n \; t_{1n} + w_n \\ w_1 \; t_{21} + w_1 & w_2 \; t_{22} + w_2 & ... & w_n \; t_{2n} + w_n \\ ... & ... & ... & ... \\ w_1 \; t_{m1} + w_1 & w_2 \; t_{m2} + w_2 & ... & w_n \; t_{mn} + w_n \end{bmatrix} \quad (7)$$

where n presents total number of criteria, m presents total alternatives number.

Step 4. Determination of border approximate area matrix (G).The border approximate area for every criterion is defined according to the expression (8)

$$g_i = \left(\prod_{j=1}^{m} v_{ij} \right)^{1/m} \quad (8)$$

where v_{ij} presents weighted matrix elements (V), m presents total alternatives number.

After calculating the values g_i by criteria, it is formed the matrix of border approximate area G (9) in the form $n \; x \; 1$ (n presents total number of criteria by which is performed the selection of the alternatives offered).

$$\begin{matrix} & C_1 & C_2 & ... & C_n \\ G = [& g_1 & g_2 & ... & g_n] \end{matrix} \quad (9)$$

Step 5. Calculation of matrix elements of alternative distance from the border approximate area (Q)

$$Q = \begin{bmatrix} q_{11} & q_{12} & ... & q_{1n} \\ q_{21} & q_{22} & & q_{2n} \\ ... & ... & ... & ... \\ q_{m1} & q_{m2} & ... & q_{mn} \end{bmatrix} \quad (10)$$

The alternative distance from the approximate border area (q_{ij}) is determined as the difference of weighted matrix elements (V) and the values of border approximate area (G)

$$Q = V - G \quad (11)$$

which can be written in another way:

$$Q = \begin{bmatrix} v_{11} - g_1 & v_{12} - g_2 & ... & v_{1n} - g_n \\ v_{21} - g_1 & v_{22} - g_2 & ... & v_{2n} - g_n \\ ... & ... & ... & ... \\ v_{m1} - g_1 & v_{m2} - g_2 & ... & v_{mn} - g_n \end{bmatrix} \quad (12)$$

where g_i presents the border approximate area for the C_i criterion, v_{ij} presents weighted matrix elements (V), n presents the number of criteria, m presents the alternatives number.

The alternative A_i can belong to the border approximate area (G), upper approximate area (G^+) or lower approximate area (G^-), *i.e.*, $A_i \in \left\{G \vee G^+ \vee G^-\right\}$.

The upper approximate area (G^+) presents the area where the ideal alternative is located (A^+), while the lower approximate area (G^-) presents the area where the anti-ideal alternative is located (A^-) (Figure 1).

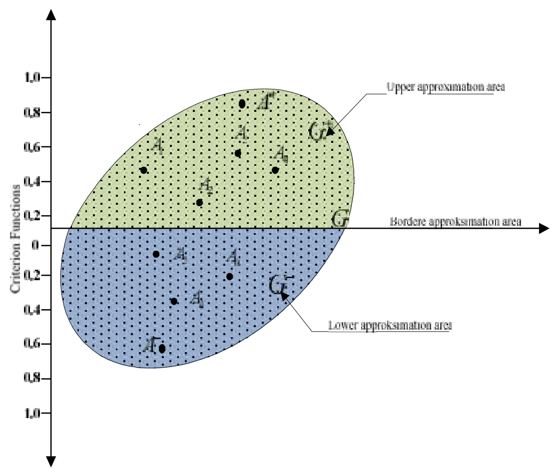

Figure 1 - Display of upper (G^+), lower (G^-) and border (G) approximate area [20]

Belonging of the alternative A_i to the approximate area (G, G^+ or G^-) is determined based on the expression (13)

$$A_i \in \begin{cases} G^+ \ if \ q_{ij} > 0 \\ G \ if \ q_{ij} = 0 \\ G^- \ if \ q_{ij} < 0 \end{cases} \quad (13)$$

In order to be selected as the best one from the set, the alternative A_i should belong to the upper approximate area (G^+) by as many criteria as possible. For instance, if the alternative A_i belongs to upper approximate area by 5 criteria (out of total of 6 criteria), and by one criterion it belongs to lower approximate area (G^-), this means that according to 5 criteria it is close or equal to the ideal alternative, but by one criterion it is close or equal to the anti-ideal alternative. A higher value $g_i \in G^+$ shows that the alternative A_i is closer to the ideal alternative, while a smaller value $g_i \in G^-$ shows that the alternative A_i is closer to the anti-ideal alternative.

Step 6. Ranking alternatives. The calculation of the values of criteria functions by alternatives (14) is obtained as the sum of the alternatives distances from the border approximate area (q_i). Summing the matrix elements Q by lines are obtained final values of criteria function of alternatives

$$S_i = \sum_{j=1}^{n} q_{ij},\ j = 1, 2, ..., n,\ i = 1, 2, ..., m \quad (14)$$

where n presents the number of criteria, m presents the number of alternatives.

4. PROBLEM SOLVING

Solving problem of decision support in forces use in a defensive operation, or selection of course of action, is performed through some steps that make that process. These include: defining criteria and weight coefficients; ranking alternatives and sensitivity analysis of output results.

4.1. Defining criteria and weight coefficients

Defining of the criteria by which the alternatives are evaluated is one of the most important segments of decision-making. For this purpose, a large number of methods is developed. Recently, methods of group decision-making are increasingly being used, in which a single attitude is based on the attitudes and opinions of DM/experts.

One of the most commonly used methods for "harmonization of different opinions of experts about a phenomenon that will happen in the future" is the Delphi method [18]. The method is based on an examination of highly qualified experts in one or more areas, with the help of questionnaires, in order to collect information that will be processed specifically into the data useful for analysis or prognosis [22]. The examination is performed in several rounds, until obtaining valid data. Based on this method a study is conducted, results of which were published in [14]. In the paper mentioned are defined applicable criteria that influence the final decision, as well as the weight coefficients of the criteria. The weight coefficients of criteria are obtained using the method of the analytic hierarchy process (AHP) developed by Thomas L. Saaty [23].

The AHP method is a widely applied method, more about which can be seen in considerable number of papers, such as [3, 5, 9, 12, 14, 16, 19, 23, 26] and others. This method provides good conditions for application, both in individual and group decision-making [27, 31].

Applying the foregoing method are obtained the following criteria that influence the selection of course of action of units in a defensive operation, which are taken from [14]:

- Maneuver (C_1) - "skillful use of movements and fire to bring one's own forces in a more favorable position in relation to the enemy on strategic, operational and tactical level" [6]. When talking about maneuver, Jovanovic [13] points out the fire maneuver, forces maneuver and resources maneuver, which is integrated in this criterion;
- Fire (C_2) – activity that directly leads to achieving the defined goal [14]
- Command (C_3) – "activity of system guidance towards a single goal by linking and coordinating all activities" [7];
- Intelligence activities (security) (C_4) – total knowledge of the enemy, which represents the basis for one's own ideas and actions [15];
- Mobility (C_5) – the ability of the armed forces, as a whole or individual arms, branches and units, to master the space (land, sea, air space) in different soil, climatic and combat conditions, on the battlefield or outside of it [30];
- Logistics (C_6) – organization of material support and treatment of the armed forces in peace and war [30];
- Simplicity (C_7) – qualitative ability of leaders to realize successfully the assignments received from a superior officer, in optimal time [4];

- Anti-aircraft warfare (C_8) – content of combat operations causing losses to the enemy air forces on land, in air and their infrastructure [6].

All listed criteria are developed in detail and presented in [14]. These criteria are the same for both the defense and the attack operation, which is specifically covered in [1]. The main difference appears in the weight coefficients of criteria. The weight coefficients of criteria in a defensive operation are taken from [14], Table 1.

Table 1. Weight coefficients of criteria

Criterion	Weight coefficient of criteria
Maneuver (C_1)	0.178
Fire (C_2)	0.284
Command (C_3)	0.207
Intelligence activities (security) (C_4)	0.100
Mobility (C_5)	0.057
Logistics (C_6)	0.064
Simplicity (C_7)	0.044
Anti-aircraft warfare (C_8)	0.066

Since all criteria have descriptive (linguistic) character, the values of criteria are defined through fuzzy linguistic descriptors, figure 2.

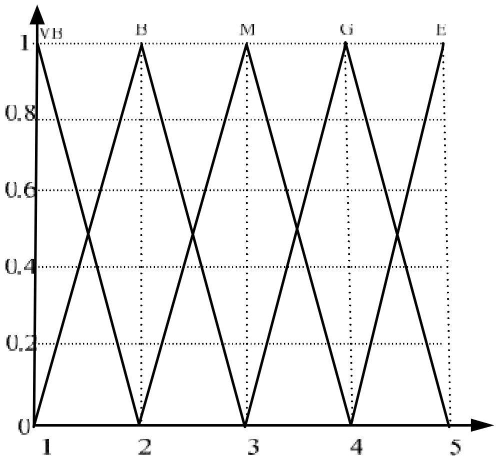

Figure 2 - Graphic display of fuzzy linguistic descriptors

Every criterion can be described with 5 values: VB – very bad, B – bad, M – medium, G – good and E – excellent. The membership functions of fuzzy linguistic descriptors are defined through the expressions:

$$\mu_{l_{VB}}=\begin{cases}1, & 1\geq x\\ 2-x, & 1\leq x\leq 2\end{cases} \quad (15)$$

$$\mu_{l_{B}}=\begin{cases}x-1, & 1\leq x\leq 2\\ 3-x, & 2\leq x\leq 3\end{cases} \quad (16)$$

$$\mu_{l_{M}}=\begin{cases}x-2, & 2\leq x\leq 3\\ 4-x, & 3\leq x\leq 4\end{cases} \quad (17)$$

$$\mu_{l_{G}}=\begin{cases}x-3, & 3\leq x\leq 4\\ 5-x, & 4\leq x\leq 5\end{cases} \quad (18)$$

$$\mu_{l_{E}}=\begin{cases}x-4, & 4\leq x\leq 5\\ 1, & x\geq 5\end{cases} \quad (19)$$

Defuzzification of fuzzy linguistic descriptors is performed with one of the famous expressions [24]:

$$A=((t_3-t_1)+(t_2-t_1))/3+t_1 \quad (20)$$

$$A=\left[\lambda t_3+t_2+(1-\lambda)t_1\right]/2 \quad (21)$$

where λ presents the degree of certainty of the DM (in the interval [0,1], depending on the certainty of the DM in a given statement, where λ=1 corresponds to the maximal value and *vice versa*), t_1 is the left distribution of the fuzzy number, t_2 is where the membership function of the fuzzy number is equal to 1 and t_3 is the right distribution of the fuzzy number.

4.2. Ranking alternatives

The MABAC method shall be shown on the example of ranking five illustrated alternatives, through the criteria defined earlier (real presentation would require setting up a complete tactical situation, which is graded as military secret). The first step in the implementation of the MABAC method is defining the initial decision matrix (X). The initial decision matrix is obtained with the defuzzification of fuzzy linguistic descriptors by each criterion using the expression (21).

$$X=\begin{matrix} A_1\\ A_2\\ A_3\\ A_4\\ A_5\end{matrix}\overset{\begin{matrix}C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8\end{matrix}}{\begin{bmatrix}1.10 & 3.12 & 3.89 & 4.2 & 2.21 & 1.03 & 3.00 & 5.00\\ 3.05 & 3.98 & 2.96 & 3.02 & 4.10 & 2.99 & 1.10 & 4.03\\ 1.90 & 4.95 & 3.01 & 2.90 & 4.96 & 4.06 & 5.00 & 1.10\\ 2.85 & 3.87 & 3.12 & 1.05 & 2.98 & 4.89 & 3.30 & 4.90\\ 4.77 & 3.00 & 4.87 & 3.01 & 1.97 & 3.99 & 2.04 & 4.00\end{bmatrix}}$$

The second step is the normalization of the initial matrix elements. Since all the criteria for making normalized matrix (N) are benefit-type, it is used the expression (3).

$$N=\begin{matrix} A_1\\ A_2\\ A_3\\ A_4\\ A_5\end{matrix}\overset{\begin{matrix}C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8\end{matrix}}{\begin{bmatrix}0.00 & 0.06 & 0.49 & 1.00 & 0.08 & 0.00 & 0.49 & 1.00\\ 0.53 & 0.50 & 0.00 & 0.63 & 0.71 & 0.51 & 0.00 & 0.75\\ 0.22 & 1.00 & 0.03 & 0.59 & 1.00 & 0.78 & 1.00 & 0.00\\ 0.48 & 0.45 & 0.08 & 0.00 & 0.34 & 1.00 & 0.56 & 0.97\\ 1.00 & 0.00 & 1.00 & 0.62 & 0.00 & 0.77 & 0.24 & 0.74\end{bmatrix}}$$

The third step is the calculation of weighted matrix V. The calculation is performed by using the expression (6).

$$V = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ A_4 \\ A_5 \end{array} \begin{array}{c} \begin{array}{cccccccc} C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8 \end{array} \\ \begin{bmatrix} 0.18 & 0.30 & 0.31 & 0.20 & 0.06 & 0.06 & 0.07 & 0.13 \\ 0.27 & 0.43 & 0.21 & 0.16 & 0.10 & 0.10 & 0.04 & 0.12 \\ 0.22 & 0.57 & 0.21 & 0.16 & 0.11 & 0.11 & 0.09 & 0.07 \\ 0.26 & 0.41 & 0.22 & 0.10 & 0.08 & 0.13 & 0.07 & 0.13 \\ 0.36 & 0.28 & 0.41 & 0.16 & 0.06 & 0.11 & 0.05 & 0.12 \end{bmatrix} \end{array}$$

The fourth step is to determine the matrix of the border approximate area (G). The calculation is performed by using the expression (8).

$$G = \begin{array}{c} \begin{array}{cccccccc} C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8 \end{array} \\ \begin{bmatrix} 0.25 & 0.39 & 0.26 & 0.15 & 0.08 & 0.10 & 0.06 & 0.11 \end{bmatrix} \end{array}$$

The fifth step is the calculation of distance matrix elements of alternatives from the border approximate area (Q). The calculation is performed by using the expression (11).

$$Q = \begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ A_4 \\ A_5 \end{array} \begin{array}{c} \begin{array}{cccccccc} C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8 \end{array} \\ \begin{bmatrix} -0.07 & -0.08 & +0.04 & +0.05 & -0.02 & -0.04 & 0.000 & +0.02 \\ +0.02 & +0.04 & -0.06 & +0.01 & +0.02 & 0.000 & -0.02 & +0.01 \\ -0.03 & +0.18 & -0.05 & +0.01 & +0.04 & +0.01 & +0.03 & -0.04 \\ +0.01 & +0.03 & -0.04 & -0.05 & 0.000 & +0.03 & +0.01 & +0.02 \\ +0.11 & -0.10 & +0.15 & +0.01 & -0.02 & +0.01 & -0.01 & +0.01 \end{bmatrix} \end{array}$$

The last step is the ranking of alternatives by using the expression (14). The final results and the ranks of alternatives are presented in the Table 2**.**

Table 2. Rank of alternatives

Alternative	S_i	Rank
A_1	-0.092	5.
A_2	0.021	3.
A_3	0.136	2.
A_4	-0.001	4.
A_5	0.154	1.

The results from the Table 2 indicate that the alternative A_5 is ranked as the first one, and the alternative A_1 as the last one and the least favorable.

4.3. Sensitivity analysis of output results

A sensitivity analysis of output results is usually recommended as a means for checking the stability of the results [17]. The sensitivity analysis is performed by changing the initial weight coefficients of criteria.

Table 3. Situations of changes in weight coefficients

Crite rion	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9
C_1	0.125	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1
C_2	0.125	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1
C_3	0.125	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1
C_4	0.125	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1
C_5	0.125	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1
C_6	0.125	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1
C_7	0.125	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.1
C_8	0.125	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3

In the Table 3 are provided situations of changes in weight coefficients (nine situations), based on which is performed the ranking of already shown alternatives.

The rank of alternatives after the application of the situations is provided in the Table 4.

Table 4. Ranks of alternatives upon applying different situations

Alter na- tive	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9
A_1	5.	5.	5.	3.	3.	5.	5.	4.	4.
A_2	4.	4.	3.	5.	4.	2.	4.	5.	3.
A_3	1.	2.	1.	2.	1.	1.	1.	1.	5.
A_4	3.	3.	2.	4	5.	3.	3.	2.	2.
A_5	2.	1.	4.	1.	2.	4.	2.	3.	1.

In the Table 4 are shaded the ranks of alternatives that match with the ranks obtained by the application of real weights of criteria. Analyzing the obtained results, it can be concluded that there is a significant stability of output results in most situations.

This is supported with the fact that the alternatives A_3 and A_4 are mostly ranked as the first and the second, as expected for a stable system, bearing in mind that when using real criteria weights the difference obtained in the final values of criteria functions is very small (0.018). In addition, A_1 in larger number of situations is ranked as the fifth, respectively, the third or fourth, and in no case is presented as a proposal for solving the problem.

5. CONCLUSION

The output results obtained by applying the MABAC method show that the method can be used as a support in making a decision on using forces in a defensive operation of Land Forces and formulation of a decision strategy. Furthermore, this study appears as a continuation of research from which are used the criteria and their weight coefficients.

In addition to the practical contribution of the paper, from theoretical side it is shown the setting of a new method - MABAC, and its successful implementation in practice. The steps of the method are simple and explained in detail and provide the possibility of its application and further research in terms of its improvement, and also its verification through the comparison with other methods for multicriteria decision-making. With the new method it is enriched the theoretic background of the decision-making theory.

REMARK

This paper is translation in English of the paper published in the Magazine „Tehnika“, year LXXI, 2016. No 1.

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REZIME

PRIMENE METODE MABAC U PODRŠCI ODLUČIVANJU UPOTREBE SNAGA U ODBRAMBENOJ OPERACIJI

U radu je prikazana primena nove metode višekriterijumske komparacije graničnih aproksimativnih oblasti - MABAC. Osnovna postavka metode ogleda se u definisanju udaljenosti kriterijumske funkcije svake posmatrane alternative od granične aproksimativne oblasti.

Granična aproksimativna oblast definiše se posebnim postupkom za svaki kriterijum i zavisi od vrednosti svih alternativa po posmatranom kriterijumu. Metoda je prikazana kroz šest jednostavnih koraka u podršci odlučivanja upotrebe snaga u odbrambenoj operaciji. Za definisanje kriterijuma i njihovih težinskih koeficijenata iskorišćena su ranija istraživanja.

Ključne reči: *MABAC (Multi-Attributive Border Approximation area Comparison), odlučivanje, varijanta upotrebe, odbrambena operacija*