Neutrosophic Borda method

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Abstract

In this paper we introduce and then study the general concept of neutrosophic Borda method. The idea is to combine Borda count (in one of its most typical versions) with neutrosophic sets (which allow us to deal with uncertainty in a very broad sense). We show the whole algorithm which is then illustrated with some numerical examples. Finally, we discuss several possible extensions of the proposed method. For example, we present neutrosophic approach to the problem of weights.

Keywords: Neutrosophic Borda; Neutrosophic Set; Uncertainty

1 Introduction

Many methods of *multi-criteria decision making* (MCDM) have been already interpreted in the context of uncertainty. This means that there is plenty of papers about fuzzy (and intuitionistic fuzzy, soft, grey, rough or neutrosophic) implementations of numerous MCDM methods. As for the particular case of neutrosophic approach, there have already been developed neutrosophic versions of ARAS, MOORA, PROMETHEE, TOPSIS, VIKOR and other methods. Thus, it is possible to use those algorithms when our data are marked with this kind of vagueness that can be modelled by means of neutrosophic sets.

Recall that in this theory we have three logical values: *truth* (T), *ignorance* (I) and *falsity* (F). They are all fuzzy which means that each of them takes its values from the interval $[0,1]$. Moreover, they can sum up to any number from the interval $[0,3]$[1]. Hence, there is some room for *incomplete* information (when $T(x)+I(x)+F(x)<1$) and *paraconsistent* information (when $T(x)+I(x)+F(x)>1$). In each case some non-zero hesitation margin is allowed. Of course, it is also possible that all three values sum up exactly to 1. This means that our knowledge is *complete*.

As we can see, neutrosophic sets are far reaching generalization of fuzzy sets introduced by Zadeh in[14] and intuitionistic fuzzy sets of Atanassov (see[1]).

In the present paper we would like to discuss neutrosophic variant of Borda method. The proposed method can be easily limited to the intuitionistic fuzzy (that is, *vague*) approach.

In general, Borda count may be considered as a family of decision rules. We shall use only one of them. Everything relies here on the fact that all the criteria evaluations are given by neutrosophic sets. For each pair *(scenario, criterion)* we calculate three *Borda subranks* (one for each neutrosophic logical value). The

[1]In fact, this description refers only to so-called single valued neutrosophic sets. This will be briefly discussed in the next chapter of our paper.

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details of this calculation depend on if the criterion is a *cost* or a *benefit* one. Then we sum up those ranks to obtain *Borda rank* for the pair in question. We calculate such ranks for all the criteria (assuming that the scenario is fixed). Then we add them together and the result is *Borda number* for this particular scenario. Then we compare all the scenarios on the ground of their Borda numbers. We put them in descending order. The biggest results are the best.

As for the criteria, they may be weighted. The researcher may establish his own (even very arbitrary) system of weights. However, he can use more sophisticated methods. For example, we propose the following solution. For each criterion we calculate three *subweights* (one for each neutrosophic logical value). From the technical point of view, they are based on the concept of *coefficient of variation*. Then we procure the final weight as an arithmetic or geometric mean of these subweights. Of course we may think about other measures of central tendency too.

2 General presentation

In this chapter of our paper we will develop neutrosophic Borda method in its most basic form (that is, without weights).

2.1 Neutrosophic sets

We would like to start this chapter from the very definition of neutrosophic sets.

Definition 2.1. Let X be a non-empty universe. A *neutrosophic set* on X can be defined as follows:

$A = \{(x, T_A(x), I_A(x), F_A(x)) : x \in X\}$.

We assume that $T_A(x), I_A(x), F_A(x) : X \to [0, 1]$ and $0 \leq T_A(x) + I_A(x) + F_A(x) \leq 3$.

We say that $T_A(x)$, $I_A(x)$ and $F_A(x)$ are degrees of (respectively) *truth*, *ignorance* and *falsity* (of x with respect to A)[2].

As we have already pointed out in the footnote to the Introduction, the definition above is *not* the most general one. The initial definition proposed by Smarandache (e.g. in[10]) was based on some notions taken from the area of Robinson's *non-standard analysis*. Hence, this exposition was far more general and more complicated than the one which will be used in our paper. For example, it involved hyperreals and infinitesimals.

Imamura critized some aspects of Smarandache's approach in.[4] In his opinion, some parts of Smarandache's exposition were imprecise or unclear. His aim was to "describe a rigorous definition of neutrosophic logic and correct all the errors in the original definition". Smarandache answered Imamura in.[11] He admitted that some corrections were necessary but he pointed out that "the nonstandard neutrosophic logic was never used in practical applications".

Indeed, it seems that the overhelming majority of researchers limit their interest only to *single valued neutrosophic sets* which were introduced in a formal way by Wang et al. in.[13] Hence, for brevity, in the remainder of the present paper, we shall identify neutrosophic sets with their single valued instance[3] (in fact, this is the one presented in Definition 2.1).

One can define many algebraic operations on neutrosophic sets. Among them are various forms of intersection, union and complement. However, in this paper we shall not use them. We shall treat neutrosophic sets just as a convenient tool to discuss the idea of three intermediate logical values.

[2]Alternatively, we may speak about about belonging, indeterminacy and not belonging. Other interpretations are possible too.

[3]One could recall the fact that some authors use *interval valued* neutrosophic sets. However, this approach also does not require non-standard analysis. The same can be said about (single or interval valued) quadri-, penta- and heptapartitioned neutrosophic sets.

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2.2 Borda algorithm

Assume that we have m scenarios (options, alternatives, objects) that are rated on n criteria (parameters). We denote scenarios by x_1, x_2, ..., x_m and criteria by e_1, e_2, ..., e_n. Thus, we obtain our initial decision matrix $[x_{ij}]_{m\times n}$ where each x_{ij} is a neutrosophic evaluation of x_i with respect to the criterion e_j. Hence, it is of the form $(T_{e_j}(x_i), I_{e_j}(x_i), F_{e_j}(x_i))$. In fact, the whole structure may be considered as a *neutrosophic soft set* (see[5] and[7]) although we do not need to use this terminology here.

Clearly, for any $i \in \{1,...,m\}$, $j \in \{1,...,n\}$ we have $T_{e_j}(x_i), I_{e_j}(x_i), F_{e_j}(x_i) \in [0,1]$ and $T_{e_j}(x_i) + I_{e_j}(x_i) + F_{e_j}(x_i) \leq 3$. As for the criteria, we assume that some of them are beneficial and some are cost. This difference will be taken into account later.

Thus, we may depict this structures as follows:

Scenario / criterion	e_1	e_2	...	e_n
x_1	x_{11}	x_{12}	...	x_{1n}
x_2	x_{21}	x_{22}	...	x_{2n}
...	...	...	...	...
x_m	x_{m1}	x_{m2}	...	x_{mn}

For any $i \in \{1,...,m\}$ and $j \in \{1,...,n\}$ we have $x_{ij} = (T_{e_j}(x_i), I_{e_j}(x_i), F_{e_j}(x_i))$.

We are interested in the final ranking that will allow us to point out the best and the worst solutions. The method used comes from the 18th century mathematician Jean-Charles de Borda. Our basic approach does not involve weights. These are the steps of the algorithm in question.

1. For each criterion e_j, where $j \in \{1,...,n\}$:
   (a) If e_j is a benefit criterion, then:
      i. Arrange the values of $T_{e_j}(x_i)$ (for all $i \in \{1,...,m\}$) in descending order.
      ii. Arrange the values of $I_{e_j}(x_i)$ (for all $i \in \{1,...,m\}$) in ascending order.
      iii. Arrange the values of $F_{e_j}(x_i)$ (for all $i \in \{1,...,m\}$) in ascending order.
   (b) If e_j is a cost criterion, then:
      i. Arrange the values of $T_{e_j}(x_i)$ (for all $i \in \{1,...,m\}$) in ascending order.
      ii. Arrange the values of $I_{e_j}(x_i)$ (for all $i \in \{1,...,m\}$) in ascending order.
      iii. Arrange the values of $F_{e_j}(x_i)$ (for all $i \in \{1,...,m\}$) in descending order.

   For any criterion the rank of x_i in the first order[4] will be named *Borda truth-subrank* of (x_{ij}) and denoted by $r_T(x_{ij})$. The rank of x_i in the second order will be named *Borda ignorance-subrank* of (x_{ij}) and denoted by $r_I(x_{ij})$. The rank of x_i in the third order will be named *Borda falsity-subrank* of (x_{ij}) and denoted by $r_F(x_{ij})$.
2. For each scenario x_i, $i \in \{1,...,m\}$ and each criterion e_j, $j \in \{1,...,n\}$ (that is, for each element x_{ij}), calculate its *Borda rank*: $BR(x_{ij}) = r_T(x_{ij}) + r_I(x_{ij}) + r_F(x_{ij})$.
3. For each scenario x_i (where $i \in \{1,...,m\}$) sum up complements of all its Borda ranks to $3m$ to obtain its *Borda number*: $B(x_i) = \sum_{j=1}^{n}(3m - BR(x_{ij}))$.
4. Organize obtained Borda numbers in descending order. The biggest numbers refer to the best scenarios.

[4] We identify the rank of scenario with the rank of its logical value T. The same for I and F.

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Let us discuss briefly the idea of this algorithm. Assume that our criterion is a benefit one. For example, it can be *richness* or *beauty* [5]. As we already know, we have three logical values, that is truth (T), ignorance (I) and falsity (F). They may be considered as neutrosophic probabilities (see the longer discussion of this issue in[2]).

We think that is natural to assume that in case of benefit criteria we should reward high truth values and penalize high falsity values. If we think that it is good when our scenario is, say, beautiful, then we should look for such scenarios that our conviction about their beauty is strong.

Contrary to this, in case of cost criteria we reward high falsity values and penalize high truth values. If we think that that it is good when our scenario is *not* polluted then we should look for such scenarios that our belief that they are *highly* polluted is weak.

As for the ignorance (indeterminacy) in both cases we prefer those scenarios which have low degrees of this parameter. This is because high levels of I refer to the situation in which we are not able to say anything precise about the objects in question.

As we can see, the idea is that the lowest Borda subranks (and then the lowest Borda ranks) represent the best scenarios. However, in the end we would like to identify the best scenarios with the biggest Borda numbers. Hence, we do not sum up Borda ranks as such, but their complements to $3m$. This is based on the most classical approach. The best scenarios are (in some average sense) *far* from the *last* place. Note that we use $3m$, not m itself (as it would be in classical case). This is because our hypothetical worst possible Borda rank is $m + m + m$ (three times, one for each logical value).

Example 2.2. Assume that there are four houses x_1, x_2, x_3, x_4 and three parameters, namely: e_1 is *beauty*, e_2 is *good technical condition* and e_3 is *high energy consumption*. We may assume that e_1 and e_2 are benefit criteria and e_3 is a cost criterion.

Suppose that our evaluations have been formulated in the following table:

Scenario / criterion	e_1	e_2	e_3
x_1	$(0.70, 0.10, 0.20)$	$(0.40, 0.60, 0.15)$	$(0.35, 0.05, 0.60)$
x_2	$(0.20, 0.15, 0.65)$	$(0.75, 0.10, 0.05)$	$(0.50, 0.30, 0.45)$
x_3	$(0.80, 0.05, 0.15)$	$(0.90, 0.20, 0.10)$	$(0.70, 0.20, 0.15)$
x_4	$(0.20, 0.30, 0.50)$	$(0.95, 0.20, 0.30)$	$(0.15, 0.10, 0.80)$

We do not investigate here how these evaluations have been produced. It is possible that decision maker used his general intuition. However, he could use more formal, mathematical and sophisticated methods. For example, it is possible that these evaluations are (averaged in some way) results of survey conducted among some credible experts [6].

We wanted to express some already mentioned properties and potentialities of neutrosophic sets. For example, in case of criterion e_1 each evaluation represents complete information (all the logical values sum up to 1). However, in case of e_2 and e_3 there are some examples of incomplete (e.g. (x_2, e_2)) or inconsistent (e.g. (x_3, e_3)) information.

Let us execute our algorithm. We shall use the following shortcut: $T(x_{ij}) = T_{e_j}(x_i)$ and the same for I and F.

1. Take e_1. This is benefit criterion, hence we have the following arrangements [7]:

   $1.T(x_{31}) = 0.80, 2.T(x_{11}) = 0.70, 3.T(x_{21}) = T(x_{41}) = 0.20.$

[5] Of course it is not always clear if some criterion is benefit or cost. For example, one can prefer the biggest or the smallest possible houses. However, in many cases it is intuitive. In general, we prefer beauty over ugliness, high salaries over low salaries (at least if we are employees and not employers). On the other hand we prefer low taxes over high taxes or low pollution levels over high levels.

[6] Clearly, in this case we could ask how the experts in question formulated their opinions.

[7] It is possible that some scenarios occupy the same place, i.e. have the same subrank, rank or even the final number. Clearly, in the last case we must say that these scenarios are identically good. Of course it can lead us to the further analysis by means of other methods.

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$1.I(x_{31}) = 0.05, 2.T(x_{11}) = 0.10, 3.I(x_{21}) = 0.15, 4.I(x_{41}) = 0.30.$

$1.F(x_{31}) = 0.15, 2.F(x_{11}) = 0.20, 3.F(x_{41}) = 0.50, 4.F(x_{21}) = 0.65.$

Thus we have the following Borda ranks:

$BR(x_{11}) = 2 + 2 + 2 = 6$, $BR(x_{21}) = 3 + 3 + 4 = 10$, $BR(x_{31}) = 1 + 1 + 1 = 3$, $BR(x_{41}) = 3 + 4 + 3 = 11$.

2. Take e_2. Again, this is benefit criterion. Our arrangements are:

   $1.T(x_{42}) = 0.95, 2.T(x_{32}) = 0.90, 3.T(x_{22}) = 0.75, 4.T(x_{12}) = 0.40.$

   $1.I(x_{22}) = 0.10, 2.I(x_{32}) = I(x_{42}) = 0.20, 3.I(x_{12}) = 0.60.$

   $1.F(x_{22}) = 0.05, 2.F(x_{32}) = 0.10, 3.F(x_{12}) = 0.15, 4.F(x_{42}) = 0.30.$

   Thus we have the following Borda ranks:

   $BR(x_{12}) = 4 + 3 + 3 = 10$, $BR(x_{22}) = 3 + 1 + 1 = 5$, $BR(x_{32}) = 2 + 2 + 2 = 6$, $BR(x_{42}) = 1 + 2 + 4 = 7$.

3. Take e_3. This is cost criterion. Hence, our arrangements are:

   $1.T(x_{43}) = 0.15, 2.T(x_{13}) = 0.35, 3.T(x_{23}) = 0.50, 4.T(x_{33}) = 0.70.$

   $1.I(x_{13}) = 0.05, 2.I(x_{43}) = 0.10, 3.I(x_{33}) = 0.20, 4.I(x_{23}) = 0.30.$

   $1.F(x_{43}) = 0.80, 2.F(x_{13}) = 0.60, 3.F(x_{23}) = 0.45, 4.F(x_{33}) = 0.15.$

   Thus we have the following Borda ranks:

   $BR(x_{13}) = 2 + 1 + 2 = 5$, $BR(x_{23}) = 3 + 3 + 3 = 9$, $BR(x_{33}) = 4 + 3 + 4 = 11$, $BR(x_{43}) = 1 + 2 + 1 = 4$.

4. Calculate Borda numbers:

   $B(x_1) = (12 - 6) + (12 - 10) + (12 - 5) = 6 + 2 + 7 = 15.$

   $B(x_2) = (12 - 10) + (12 - 5) + (12 - 10) = 2 + 7 + 2 = 11.$

   $B(x_3) = (12 - 3) + (12 - 6) + (12 - 11) = 9 + 6 + 1 = 16.$

   $B(x_4) = (12 - 11) + (12 - 7) + (12 - 4) = 1 + 5 + 8 = 14.$

Now let us organize Borda numbers in descending order:

$B(x_3) = 16, B(x_1) = 15, B(x_4) = 14, B(x_2) = 11.$

The best scenario is x_3 and the worst is x_2. In general, we have $x_3 \succ x_1 \succ x_4 \succ x_2$ where the symbol $\succ$ describes the obtained order of preference.

3 System of weights

In the previous sections we assumed tacitly that all the parameters (criteria) are equally important. However, in many applications it is more natural to assume that some of them are more important and some less. This importance can be measured by means of *weights*.

It is easy to reformulate our final formula for neutrosophic Borda number in a way that takes weights into account:

$B(x_i) = \sum_{j=1}^{n} w_j(3m - BR(x_{ij}))$.

Clearly, w_j is a weight of criterion e_j. It is natural to assume that $\sum_{j=1}^{n} w_j = 1$ and for any $j \in \{1, ..., n\}$ we have $w_j \geq 0$.

The most interesting question is how to determine those weights. Of course, we can do it in somewhat arbitrary manner (using our intuitive presumptions). However, this is not the best solution. We should look for more formal method. We propose the following algorithm which involves *mean deviation coefficient of variation*:

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1. For each criterion e_j, $j \in \{1, ..., n\}$:
   (a) Calculate the arithmetic mean of truth values, that is: $\overline{X}_j^T = \frac{1}{m}\sum_{i=1}^m T(x_{ij})$. Then calculate mean deviation of truth values: $d_j^T = \frac{1}{m}\sum_{i=1}^m |T(x_{ij}) - \overline{X}_j^T|$. Finally, calculate *mean deviation coefficient of variation for truth value*: $V_{d_j}^T = \frac{d_j^T}{\overline{X}_j^T}$.
   (b) In an analogous manner, calculate $V_{d_j}^I$ and $V_{d_j}^F$.
2. Again, for each criterion e_j, $j \in \{1, ..., n\}$:
   (a) Calculate its *truth weight*: $w_j^T = \frac{V_{d_j}^T}{\sum_{k=1}^n V_{d_k}^T}$.
   (b) Calculate w_j^I and w_j^F (that is, *ignorance* and *falsity* weights) in an analogous manner.
   (c) Calculate the *final weight*: $w_j = \frac{w_j^T + w_j^I + w_j^F}{3}$.

We shall use the reasoning above in the next example.

Example 3.1. Let us go back to the table from Example 2.2.

1. Take e_1. In this case we have the following arithmetic mean of truth values: $\overline{X}_1^T = \frac{0.70+0.20+0.80+0.20}{4} = 0.475$. As for the mean deviation, it is $d_1^T = 0.275$. Hence, we get $V_{d_1}^T = \frac{0.275}{0.475} \approx 0.579$.
   Analogously, we may calculate $V_{d_1}^I = 0.500$ and $V_{d_1}^F \approx 0.533$.
2. Take e_2. In this case we have $V_{d_2}^T \approx 0.233$, $V_{d_2}^I \approx 0.591$ and $V_{d_2}^F = 0.500$.
3. Take e_3. Here we obtain $V_{d_3}^T \approx 0.412$, $V_{d_3}^I \approx 0.538$ and $V_{d_3}^F = 0.400$.
4. Now we calculate truth, ignorance and falsity weights for each criterion:
   (a) Take e_1. We have:
   $w_1^T = \frac{0.579}{0.579+0.233+0.412} = \frac{0.579}{1.224} \approx 0.473$.
   $w_1^I = \frac{0.500}{0.500+0.591+0.538} = \frac{0.500}{1.629} \approx 0.307$.
   $w_1^F = \frac{0.533}{0.533+0.500+0.400} = \frac{0.533}{1.433} \approx 0.372$.
   (b) Take e_2. We have: $w_2^T \approx 0.190$, $w_2^I \approx 0.363$ and $w_2^F \approx 0.349$.
   (c) Take e_3. We have: $w_3^T \approx 0.337$, $w_3^I \approx 0.330$ and $w_3^F \approx 0.279$.
5. Calculate final weights:
   $w_1 = \frac{0.473+0.307+0.372}{3} = 0.384$.
   $w_2 \approx 0.301$.
   $w_3 \approx 0.315$.

After these calculations we may find neutrosophic Borda numbers again, this time using weights. We get:

$B(x_1) = 0.384 \cdot 6 + 0.301 \cdot 2 + 0.315 \cdot 7 = 2.304 + 0.602 + 2.205 = 5.111.$

$B(x_2) = 0.384 \cdot 2 + 0.301 \cdot 7 + 0.315 \cdot 2 = 0.768 + 2.107 + 0.630 = 3.505.$

$B(x_3) = 0.384 \cdot 9 + 0.301 \cdot 6 + 0.315 \cdot 1 = 3.456 + 1.806 + 0.315 = 5.577.$

$B(x_4) = 0.384 \cdot 1 + 0.301 \cdot 5 + 0.315 \cdot 8 = 0.384 + 1.505 + 2.520 = 4.409.$

Now the final descending order is $x_3 \succ x_1 \succ x_4 \succ x_2$. In this case, it does not differ from the original one. However, there are some differences in proportions. For example, the original score of x_2 was just like 0.6875 of the score obtained by x_3 (calculate $\frac{11}{16}$). Now it is $\frac{3.505}{5.577} \approx 0.628$.

Besides, in the next subsection we shall show an example in which introduction of weights changes the final order.

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3.1 Questions and extensions

One could point out that we used mean absolute deviation instead of *standard deviation*. In fact, there was no any special reason expect maybe the fact that the former is easier in calculation. However, we are aware that standard deviation is more typical. The vast majority of important theorems in probability calculus and statistics refers to this concept. This is because it is connected with variance (beings its square root).

Hence, we may easily replace mean deviation with standard deviation in our calculations. We solved the following example using this approach [8].

Example 3.2. Assume that there is a company which wants to hire at least one personal advisor. There are five candidates: a, b, c, d, e. Their skills are rated on three benefit criteria, namely e_1 = *wisdom*, e_2 =*elegance* and e_3 = *competences*. HR experts provided neutrosophic evaluations of these criteria. They are shown in the table below:

Candidate / criterion	e_1	e_2	e_3
a	$(0.526, 0.999, 0.950)$	$(0.120, 0.060, 0.429)$	$(0.855, 0.676, 0.805)$
b	$(0.901, 0.768, 0.938)$	$(0.808, 0.646, 0.658)$	$(0.132, 0.500, 0.819)$
c	$(0.474, 0.194, 0.816)$	$(0.822, 0.783, 0.948)$	$(0.536, 0.408, 0.623)$
d	$(0.846, 0.899, 0.731)$	$(0.249, 0.131, 0.107)$	$(0.301, 0.190, 0.411)$
e	$(0.568, 0.258, 0.463)$	$(0.699, 0.565, 0.965)$	$(0.132, 0.928, 0.155)$

First, we applied neutrosophic Borda method without weights to these data. We obtained the following Borda numbers:

$B(a) = 14$, $B(b) = 15$, $B(c) = 19$, $B(d) = 24$, $B(e) = 18$.

Hence the ordering from the best to the worst options is: $d \succ c \succ e \succ b \succ a$.

Second, we used standard deviation to formulate coefficients of variation and then the weights of criteria. We got the following weighted Borda numbers:

$B(a) = 5.253$, $B(b) = 5.113$, $B(c) = 6.345$, $B(d) = 8.143$, $B(e) = 5.518$.

Hence, the final ordering is: $d \succ c \succ e \succ a \succ b$. As we can see, the first three positions are the same. However, the last two are different. Candidate b is now the worst while a is on the penultimate place.

For the whole time we used arithmetic mean to calculate the final weight of each criterion. However, sometimes arithmetic mean is not the best tool. One can replace it with alternative measures, e.g. *geometric mean*.

Let us recalculate weights in Example 3.1 using geometric mean. The reader can check that we get $w_1 = 0.378$, $w_2 = 0.289$ and $w_3 = 0.314$. As we can see, they are only slightly different from the original weights. The final Borda numbers are $B(x_1) = 5.044$, $B(x_2) = 3.407$, $B(x_3) = 5.450$ and $B(x_4) = 4.335$. The ultimate ordering of scenarios is the same.

Another interesting observation is that we can weight not only criteria but also logical values. We mean that the final weight of criterion e_j may be calculated as a *weighted* mean of w_j^T, w_j^I and w_j^F. Of course we should have some reason for it and some method to find those weights. In general, we can imagine that some decision maker thinks that (for example) truth weights are more important than ignorance and falsity weights. Clearly, any further discussion of this issue lies beyond the scope of the present research.

One can easily reformulate our method by replacing neutrosophic sets with other sets, e.g. intuitionistic fuzzy sets or interval-valued neutrosophic (or intuitionistic fuzzy) sets. Another option is to increase the number of logical values and to use quadri- (,[93]), penta- ([6]), hepta- ([8]) or even n-partitioned neutrosophic sets (the last case was analyzed in[12]). It seems that some of these changes would not be very complicated from the purely mathematical point of view. However, they can be important in practical applications.

[8] We omit details of calculation here. They were performed in MS Excel.

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4 Conclusion

In this paper we have introduced and analyzed neutrosophic version of multi-criteria Borda algorithm. At first, we proposed its basic version (without weights). Then we have shown that it is possible to establish weight system in a systematic manner. Finally, we have discussed several additional issues. Among them, there were possible extensions of the method in question.

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