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MAGNIFIED TRANSFORMATIONS OF BIPOLAR VALUED MULTI FUZZY SUBNEAR-RING OF A NEAR-RING

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Abstract In this paper, some magnified translations of bipolar valued multi fuzzy subnear-ring of a near-ring are introduced and using these translations, some theorems are stated and proved.

1 Introduction

In 1965, Zadeh [9] introduced the notion of a fuzzy subset of a set, fuzzy sets are a kind of useful mathematical structure to represent a collection of objects whose boundary is vague. Since then it has become a vigorous area of research in different domains, there have been a number of generalizations of this fundamental concept such as intuitionistic fuzzy sets, interval-valued fuzzy sets, vague sets, soft sets etc. W.R.Zhang [10, 11] introduced an extension of fuzzy sets named bipolar valued fuzzy sets in 1994 and bipolar valued fuzzy set was developed by Lee [2, 3]. Bipolar valued fuzzy sets are an extension of fuzzy sets whose membership degree range is enlarged from the interval $[0, 1]$ to $[-1, 1]$. In a bipolar valued fuzzy set, the membership degree 0 means that elements are irrelevant to the corresponding property, the membership degree $(0, 1]$ indicates that elements somewhat satisfy the property and the membership degree $[-1, 0)$ indicates that elements somewhat satisfy the implicit counter property. Bipolar valued fuzzy sets and intuitionistic fuzzy sets look similar each other. However, they are different each other [3]. Vasantha kandasamy.W.B[7] introduced the basic idea about the fuzzy group and fuzzy bigroup. M.S.Anitha et.al [1] introduced the bipolar valued fuzzy subgroup. Sheena. K. P and K.Uma Devi [6] have introduced the bipolar valued fuzzy subbigroup of a bigroup. Shanthi.V.K and G.Shyamala[5, 13] have introduced the bipolar valued multi fuzzy subgroups of a group. Yasodara.S, KE. Sathappan [8] defined the bipolar valued multi fuzzy subsemirings of a semiring. Bipolar valued multi fuzzy subnearring of a nearing has been introduced by S.Muthukumaran and B.Anandh [4, 12]. In this paper, the concept of translations of bipolar valued multi fuzzy subnearring of a nearing is introduced and established some results.

2 Preliminaries

Definition 2.1. ([11]) A bipolar valued fuzzy set (BVFS) B in X is defined as an object of the form $B = \{\langle x, B^+(u), B^-(u)\rangle / x \in X\}$, where $B^+ : X \to [0, 1]$ and $B^- : X \to [-1, 0]$. The positive membership degree $B^+(u)$ denotes the satisfaction degree of an element x to the property corresponding to a bipolar valued fuzzy set B and the negative membership degree $B^-(u)$ denotes the satisfaction degree of an element x to some implicit counter-property corresponding to a bipolar valued fuzzy set B.

Definition 2.2. [8] A bipolar valued multi fuzzy set (BVMFS) A in X is defined as an object of the form $B = \langle x, B_1^+(u), B_2^+(u), \cdots, B_n^+(u), B_1^-(u), B_2^-(u), \cdots, B_n^-(u)\rangle / x \in X$, where $B_i^+ : X \to [0, 1]$ and $B_i^- : X \to [-1, 0]$, for all i. The positive membership degrees $B_i^+(u)$ denote the satisfaction degree of an element x to the property corresponding to a bipolar valued multi fuzzy set B and the negative membership degrees $B_i^-(u)$ denote the satisfaction degree of an element x to some implicit counter-property corresponding to a bipolar valued multi fuzzy set B.

Definition 2.3. [4] Let $(N, +, -)$ be a nearring. A BVMFS B of N is said to be a bipolar valued multi fuzzy subnearring of N (BVMFSNR) if the following conditions are satisfied, for all i,

(i) $B_i^+(u-v) \geq min\{B_i^+(u), B_i^+(v)\}$

(ii) $B_i^+(uv) \geq min\{B_i^+(u), B_i^+(v)\}$

(iii) $B_i^-(u-v) \leq max\{B_i^-(u), B_i^-(v)\}$

(iv) $B_i^-(uv) \leq max\{B_i^-(u), B_i^-(v)\}, \forall u, v \in N$.

Definition 2.4. [8] Let $A = \langle A_1^+, A_2^+, \dots, A_n^+, A_1^-, A_2^-, \dots, A_n^- \rangle$ and $B = \langle B_1^+, B_2^+, \dots, B_n^+, B_1^-, B_2^-, \dots, B_n^- \rangle$ be two bipolar valued multi fuzzy subsets with degree n of a set X. We define the following relations and operations:

(i) $A \subset B$ if and only if for all i, $A_i^+(u) \leq B_i^+(u)$ and $A_i^-(u) \geq B_i^-(u), \forall u \in X$.

(ii) $A \cap B = \{\langle u, min(A_1^+(u), B_1^+(u)), min(A_2^+(u), B_2^+(u)), \dots, min(A_n^+(u), B_n^+(u)), max(A_1^-(u), B_1^-(u)), max(A_2^-(u), B_2^-(u)), \dots, max(A_n^-(u), B_n^-(u))\rangle / u \in X\}$.

Definition 2.5. Let $C = \langle C_1^+, C_2^+, \cdots, C_n^+, C_1^-, C_2^-, \cdots, C_n^- \rangle$ be a bipolar valued multi fuzzy subnearring of a nearring R and $s \in R$. Then the pseudo bipolar valued multi fuzzy coset $(sC)^p = \langle (sC_1^+)^{p_1^+}, (sC_2^+)^{p_2^+}, \cdots, (sC_n^+)^{p_n^+}, (sC_1^-)^{p_1^-}, (sC_2^-)^{p_2^-}, \cdots, (sC_n^-)^{p_n^-} \rangle$is defined by $(sC_i^+)^{p_i^+}_{(a)} = p_i^+(s)C_i^+(a)$ and $(sC_i^-)^{p_i^-}(a) = -p_i^-(s)C_i^-(a)$, for all i and every $a \in R$ and $p \in P$, where P is a collection of bipolar valued multi fuzzy subsets of R.

Definition 2.6. [8]
Let $A = \langle A_1^+, A_2^+, \cdots, A_n^+, A_1^-, A_2^-, \cdots, A_n^- \rangle$ be a bipolar valued multi fuzzy subset of X. Then the height $H(A) = \langle H(A_1^+), H(A_2^+), \cdots, H(A_n^+), H(A_1^-), H(A_2^-), \cdots, H(A_n^-) \rangle$ is defined for all i as $H(A_i^+) = supA_i^+(x)$ for all $x \in X$ and $H(A_i^-) = infA_i^-(x)$ for all $x \in X$.

Definition 2.7. [6] Let $A = \langle A_1^+, A_2^+, \cdots, A_i^+, A_1^-, A_2^-, \cdots, A_i^- \rangle$ be a bipolar valued multi fuzzy subset of X. Then $OA = \langle OA_1^+, OA_2^+, \cdots, OA_n^+, OA_1^-, OA_2^-, \cdots, OA_n^- \rangle$ is defined for all i as $OA_i^+(x) = A_i^+(x)H(A_i^+)$ for all $x \in X$ and $OA_i^-(x) = -A_i^-(x)H(A_i^-)$ for all $x \in X$.

Definition 2.8. [6] Let $A = \langle A_1^+, A_2^+, \cdots, A_n^+, A_1^-, A_2^-, \cdots, A_n^- \rangle$ be a bipolar valued multi fuzzy subset of X. Then ${}^{\Delta}A = \langle {}^{\Delta}A_1^+, {}^{\Delta}A_2^+, \cdots, {}^{\Delta}A_n^+, {}^{\Delta}A_1^-, {}^{\Delta}A_2^-, \cdots, {}^{\Delta}A_n^- \rangle$ is defined for all i as ${}^{\Delta}A_i^+(x) = A_i^+(x)/H(A_i^+)$ for all $x \in X$ and ${}^{\Delta}A_i^-(x) = -A_i^-(x)/H(A_i^-)$ for all $x \in X$.

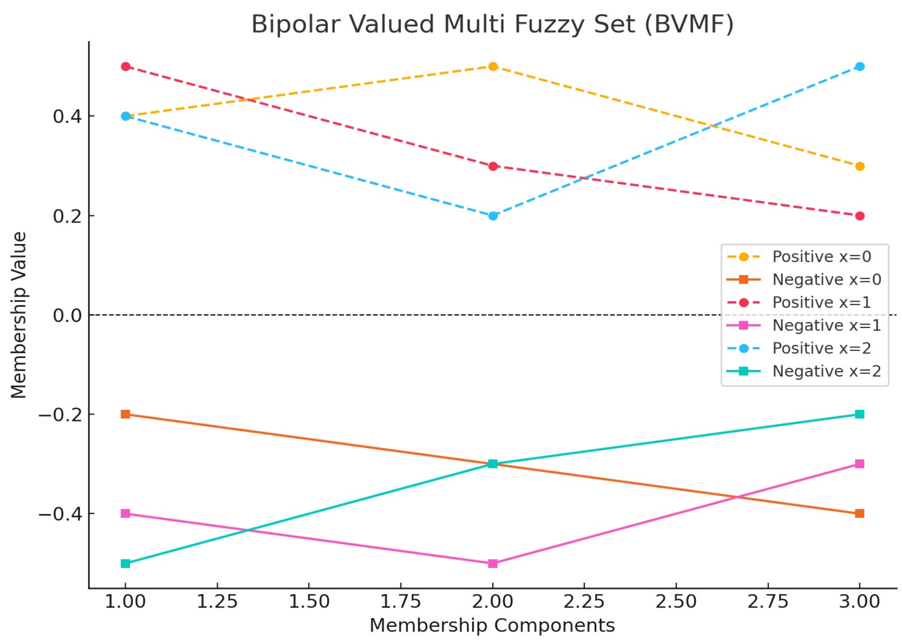
Definition 2.9. [6] Let $A = \langle A_1^+, A_2^+, \cdots, A_n^+, A_1^-, A_2^-, \cdots, A_n^- \rangle$ be a bipolar valued multi fuzzy subset of X. Then ${}^{\oplus}A = \langle {}^{\oplus}A_1^+, {}^{\oplus}A_2^+, \cdots, {}^{\oplus}A_n^+, {}^{\oplus}A_1^-, {}^{\oplus}A_2^-, \cdots, {}^{\oplus}A_n^- \rangle$ is defined for all i as $A_i^+(x) = A_i^+(x) + 1 - H(A_i^+)$ for all $x \in X$ and $A_i^-(x) = A_i^-(x) - 1 - H(A_i^-)$ for all $x \in X$.

Definition 2.10. [6] Let $A = \langle A_1^+, A_2^+, \cdots, A_n^+, A_1^-, A_2^-, \cdots, A_n^- \rangle$ be a bipolar valued multi fuzzy subset of X. Then A is called bipolar valued normal multi fuzzy subset of X if $H(A_i^+) = 1$ and $H(A_i^-) = -1$ for all I.

Definition 2.11. Let $\mathfrak{P} = \langle \mathfrak{P}_1^+, \mathfrak{P}_2^+, \cdots, \mathfrak{P}_n^+, \mathfrak{P}_1^-, \mathfrak{P}_2^-, \cdots, \mathfrak{P}_n^- \rangle$ be a $\mathbb{BVMFS}$ of the near-ring $\mathbb{N}_1$ and $\varpi_i \in \left[0,\ 1 - \sup\left\{\mathfrak{P}_i^+(\varsigma) : \varsigma \in \mathbb{N}_1\right\}\right], \rho_i \in [0, 1], \tau_i \in \left[-1 - \inf\left\{\mathfrak{P}_i^-(\varsigma) : \varsigma \in \mathbb{N}_1\right\}, 0\right]$ and $\varrho_i \in [-1,\ 0]$. Let $\varpi = (\varpi_1, \varpi_2, \dots, \varpi_n), \rho = (\rho_1, \rho_2, \dots, \rho_n), \tau = (\tau_1, \tau_2, \dots, \tau_n)$ and $\varrho = (\varrho_1, \varrho_2, \dots, \varrho_n)$. Then the $\mathbb{BVMF}$ magnified transformation $\mathfrak{P}^{\mathcal{T}}_{(\varpi\rho, \tau\varrho)}$ of $\mathfrak{P}$ in $\mathbb{N}_1$ is defined as ${\mathfrak{P}_i^+}^{\mathcal{T}}_{(\varpi\rho, \tau\varrho)}(\mathfrak{z}) = \rho_i \mathfrak{P}_i^+(\mathfrak{z}) + \varpi_i$ and ${\mathfrak{P}_i^-}^{\mathcal{T}}_{(\varpi\rho, \tau\varrho)}(\mathfrak{z}) = -\varrho_i \mathfrak{P}_i^-(\mathfrak{z}) + \tau_i$ for all $\mathfrak{z} \in \mathbb{N}_1$. It is a $\mathbb{BVMF}$ of $\mathbb{N}_1$.

Remark 2.12. If $\rho_i = 1$ and $\varrho_i = -1$, then $\mathfrak{P}^{\mathcal{T}}_{(\varpi, \tau)}$ is called a $\mathbb{BVMF}$ transformation of $\mathfrak{P}$. Also if $\varpi_i = 0$ and $\tau_i = 0$, then $\mathfrak{P}^{\mathcal{M}}_{(\rho, \varrho)}$ is called a $\mathbb{BVMF}$ multiplication of $\mathfrak{P}$.

Example 2.13. Consider the set $\mathbb{N}_1$= {0, 1, 2}. Let $\mathfrak{P}$ = { (0, 0.4, 0.5, 0.3, -0.2, -0.3, -0.4), (1, 0.5, 0.3, 0.2, -0.4, -0.5, -0.3), (2, 0.4, 0.2, 0.5, -0.5, -0.3, -0.2)} be a ($\mathbb{BVMFS}$) of ($\mathbb{N}_1$ and $(\rho_i = 1)$ and $(\varrho_i = -1), (\varpi_1) = 0.1, (\varpi_2) = 0.1, (\varpi_3) = 0.1, (\tau_1) = 0.1, (\tau_2) = 0.1, (\tau_3) = 0.1$. Then the $\mathbb{BVMF}$ magnified transformation $(\mathfrak{P}^{\mathcal{T}}_{(\varpi\rho, \tau\varrho)})$ of $(\mathfrak{P})$ in $(\mathbb{N}_1)$is $(\mathfrak{P}^{\mathcal{T}}_{(\varpi\rho, \tau\varrho)})$=$\{(0, 0.5, 0.6, 0.4, -0.3, -0.4, -0$



3 Properties

Theorem 3.1. *Let $\mathfrak{P} = \langle \mathfrak{P}_1^+, \mathfrak{P}_2^+, \ldots, \mathfrak{P}_n^+, \mathfrak{P}_1^-, \mathfrak{P}_2^-, \ldots, \mathfrak{P}_n^- \rangle$ be a $\mathbb{BVMFS}$ of the near-rings $\mathbb{N}_1$. Then the $\mathbb{BVMF}$ magnified transformation $\mathfrak{P}^{\mathcal{T}}_{(\varpi\rho,\tau\varrho)}$ of $\mathfrak{P}$ in $\mathbb{N}_1$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$ if and only if $\mathfrak{P}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$.*

Proof. Let ξ and ς in $\mathbb{N}_1$. For all $i = 1, 2, \ldots, n$,

$$\begin{aligned}
\mathfrak{P}_i^{+\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\xi - \varsigma) &= \rho_i \mathfrak{P}_i^+(\xi - \varsigma) + \varpi_i \\
&\geq \rho_i \min\left\{\mathfrak{P}_i^+(\xi), \mathfrak{P}_i^+(\varsigma)\right\} + \varpi_i \\
&= \min\left\{\rho_i \mathfrak{P}_i^+(\xi), \rho_i \mathfrak{P}_i^+(\varsigma)\right\} + \varpi_i \\
&= \min\left\{\rho_i \mathfrak{P}_i^+(\xi) + \varpi_i, \rho_i \mathfrak{P}_i^+(\varsigma) + \varpi_i\right\} \\
&= \min\left\{\mathfrak{P}_i^{+\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\xi), \mathfrak{P}_i^{+\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\varsigma)\right\}, \quad \text{for all } \xi, \varsigma \in \mathbb{N}_1.
\end{aligned}$$

$$\begin{aligned}
\text{And } \mathfrak{P}_i^{+\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\xi\varsigma) &= \rho_i \mathfrak{P}_i^+(\xi\varsigma) + \varpi_i \\
&\geq \rho_i \min\left\{\mathfrak{P}_i^+(\xi), \mathfrak{P}_i^+(\varsigma)\right\} + \varpi_i \\
&= \min\left\{\rho_i \mathfrak{P}_i^+(\xi), \rho_i \mathfrak{P}_i^+(\varsigma)\right\} + \varpi_i \\
&= \min\left\{\rho_i \mathfrak{P}_i^+(\xi) + \varpi_i, \rho_i \mathfrak{P}_i^+(\varsigma) + \varpi_i\right\} \\
&= \min\left\{\mathfrak{P}_i^{+\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\xi), \mathfrak{P}_i^{+\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\varsigma)\right\}, \quad \text{for all } \xi, \varsigma \in \mathbb{N}_1.
\end{aligned}$$

$$\begin{aligned}
\text{Also } \mathfrak{P}_i^{-\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\xi - \varsigma) &= (-\varrho_i)\mathfrak{P}_i^-(\xi - \varsigma) + \tau_i \\
&\leq (-\varrho_i) \max\left\{\mathfrak{P}_i^-(\xi), \mathfrak{P}_i^-(\varsigma)\right\} + \tau_i \\
&= \max\left\{(-\varrho_i)\mathfrak{P}_i^-(\xi), (-\varrho_i)\mathfrak{P}_i^-(\varsigma)\right\} + \tau_i \\
&= \max\left\{(-\varrho_i)\mathfrak{P}_i^-(\xi) + \tau_i, (-\varrho_i)\mathfrak{P}_i^-(\varsigma) + \tau_i\right\} \\
&= \max\left\{\mathfrak{P}_i^{-\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\xi), \mathfrak{P}_i^{-\mathcal{T}}{}_{(\varpi\rho,\tau\varrho)}(\varsigma)\right\}, \quad \text{for all } \xi, \varsigma \in \mathbb{N}.
\end{aligned}$$

$$\begin{aligned}
\mathfrak{P}^{\mathcal{T}-}_{i,(\varpi\rho,\tau\varrho)}(\xi\varsigma) &= -\varrho_i\,\mathfrak{P}^{-}_{i}(\xi\varsigma)+\tau_i \\
&\leq -\varrho_i \max\left\{\mathfrak{P}^{-}_{i}(\xi),\, \mathfrak{P}^{-}_{i}(\varsigma)\right\}+\tau_i \\
&= \max\left\{-\varrho_i\mathfrak{P}^{-}_{i}(\xi),\, -\varrho_i\mathfrak{P}^{-}_{i}(\varsigma)\right\}+\tau_i \\
&= \max\left\{-\varrho_i\mathfrak{P}^{-}_{i}(\xi)+\tau_i,\, -\varrho_i\mathfrak{P}^{-}_{i}(\varsigma)+\tau_i\right\} \\
&= \max\left\{\mathfrak{P}^{\mathcal{T}-}_{i,(\varpi\rho,\tau\varrho)}(\xi),\, \mathfrak{P}^{\mathcal{T}-}_{i,(\varpi\rho,\tau\varrho)}(\varsigma)\right\}, \quad \text{for all } \xi,\varsigma\in\mathbb{N}_1.
\end{aligned}$$

Hence, the $\mathbb{BVMF}$ magnified transformation $\mathfrak{P}^{\mathcal{T}}_{(\varpi\rho,\tau\varrho)}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$. Conversely, assume that the $\mathbb{BVMF}$ magnified transformation $\mathfrak{P}^{\mathcal{T}}_{(\varpi\rho,\tau\varrho)}$ of $\mathfrak{P}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$.
For all $i=1,2,\ldots,n$,

$$\begin{aligned}
\rho_i\mathfrak{P}^{+}_{i}(\xi-\varsigma)+\varpi_i &= \mathfrak{P}^{+\mathcal{T}}_{i,(\varpi\rho,\tau\varrho)}(\xi-\varsigma) \\
&\geq \min\left\{\mathfrak{P}^{+\mathcal{T}}_{i,(\varpi\rho,\tau\varrho)}(\xi),\, \mathfrak{P}^{+\mathcal{T}}_{i,(\varpi\rho,\tau\varrho)}(\varsigma)\right\} \\
&= \min\left\{\rho_i\mathfrak{P}^{+}_{i}(\xi)+\varpi_i,\, \rho_i\mathfrak{P}^{+}_{i}(\varsigma)+\varpi_i\right\} \\
&= \min\left\{\rho_i\mathfrak{P}^{+}_{i}(\xi),\, \rho_i\mathfrak{P}^{+}_{i}(\varsigma)\right\}+\varpi_i \\
&= \rho_i\min\left\{\mathfrak{P}^{+}_{i}(\xi),\, \mathfrak{P}^{+}_{i}(\varsigma)\right\}+\varpi_i
\end{aligned}$$

implies that $\quad \mathfrak{P}^{+}_{i}(\xi-\varsigma)\geq\min\left\{\mathfrak{P}^{+}_{i}(\xi),\, \mathfrak{P}^{+}_{i}(\varsigma)\right\}, \quad$ for all $\xi,\varsigma\in\mathbb{N}_1$.

And
$$\begin{aligned}
\rho_i\mathfrak{P}^{+}_{i}(\xi\varsigma)+\varpi_i &= \mathfrak{P}^{+\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\xi\varsigma) \\
&\geq \min\left\{\mathfrak{P}^{+\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\xi),\, \mathfrak{P}^{+\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\varsigma)\right\} \\
&= \min\left\{\rho_i\mathfrak{P}^{+}_{i}(\xi)+\varpi_i,\, \rho_i\mathfrak{P}^{+}_{i}(\varsigma)+\varpi_i\right\} \\
&= \min\left\{\rho_i\mathfrak{P}^{+}_{i}(\xi),\, \rho_i\mathfrak{P}^{+}_{i}(\varsigma)\right\}+\varpi_i \\
&= \rho_i\min\left\{\mathfrak{P}^{+}_{i}(\xi),\, \mathfrak{P}^{+}_{i}(\varsigma)\right\}+\varpi_i
\end{aligned}$$

implies that $\quad \mathfrak{P}^{+}_{i}(\xi\varsigma)\geq\min\left\{\mathfrak{P}^{+}_{i}(\xi),\, \mathfrak{P}^{+}_{i}(\varsigma)\right\}, \quad$ for all $\xi,\varsigma\in\mathbb{N}_1$.

Also
$$\begin{aligned}
(-\varrho_i)\mathfrak{P}^{-}_{i}(\xi-\varsigma)+\tau_i &= \mathfrak{P}^{-\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\xi-\varsigma) \\
&\leq\ max\{\mathfrak{P}^{-\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\xi),\mathfrak{P}^{-\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\varsigma)\} \\
&= max\{(-\varrho_i)\mathfrak{P}^{-}_{i}(\xi)+\tau_i,\ (-\varrho_i)\mathfrak{P}^{-}_{i}(\varsigma)+\tau_i\} \\
&= max\{(-\varrho_i)\mathfrak{P}^{-}_{i}(\xi),\ (-\varrho_i)\mathfrak{P}^{-}_{i}(\varsigma)\}+\tau_i \\
&= (-\varrho_i)max\{\mathfrak{P}^{-}_{i}(\xi),\ \mathfrak{P}^{-}_{i}(\varsigma)\}+\tau_i
\end{aligned}$$

implies that $\mathfrak{P}^{-}_{i}(\xi-\varsigma)\ \leq\ max\{\mathfrak{P}^{-}_{i}(\xi),\ \mathfrak{P}^{-}_{i}(\varsigma)\}$for all $\xi,\ \varsigma\in\mathbb{N}_1$.

And
$$\begin{aligned}
(-\varrho_i)\mathfrak{P}^{-}_{i}(\xi\varsigma)+\tau_i &= \mathfrak{P}^{-\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\xi\varsigma) \\
&\leq\ max\{\mathfrak{P}^{-\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\xi),\mathfrak{P}^{-\mathcal{T}}_{i\ (\varpi\rho,\tau\varrho)}(\varsigma)\} \\
&= max\{(-\varrho_i)\mathfrak{P}^{-}_{i}(\xi)+\tau_i,\ (-\varrho_i)\mathfrak{P}^{-}_{i}(\varsigma)+\tau_i\} \\
&= max\{(-\varrho_i)\mathfrak{P}^{-}_{i}(\xi),\ (-\varrho_i)\mathfrak{P}^{-}_{i}(\varsigma)\}+\tau_i \\
&= (-\varrho_i)max\{\mathfrak{P}^{-}_{i}(\xi),\ \mathfrak{P}^{-}_{i}(\varsigma)\}+\tau_i
\end{aligned}$$

implies that $\mathfrak{P}^{-}_{i}(\xi\varsigma)\ \leq\ max\{\mathfrak{P}^{-}_{i}(\xi),\ \mathfrak{P}^{-}_{i}(\varsigma)\}$, for all $\xi,\varsigma\in\mathbb{N}_1$.

Hence $\mathfrak{P}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$.

□

Corollary 3.2. *Let* $\mathfrak{P} = \langle \mathfrak{P}_1^+, \mathfrak{P}_2^+, \ldots, \mathfrak{P}_n^+, \mathfrak{P}_1^-, \mathfrak{P}_2^-, \ldots, \mathfrak{P}_n^- \rangle$ *be a* $\mathbb{BVMFS}$ *of the near-rings* $\mathbb{N}_1$. *Then the* $\mathbb{BVMF}$ *transformation* $\mathfrak{P}^{\mathcal{T}}_{(\varpi,\tau)}$ *of* $\mathfrak{P}$ *in* $\mathbb{N}_1$ *is a* $\mathbb{BVMFSNR}$ *of* $\mathbb{N}_1$ *if and only if* $\mathfrak{P}$ *is a* $\mathbb{BVMFSNR}$ *of* $\mathbb{N}_1$.

Proof. For all $i = 1, 2, \ldots, n$, put $\rho_i = 1$ and $\varrho_i = -1$ in Theorem 3.1, then $\mathbb{BVMF}$ transformation $\mathfrak{P}^{\mathcal{T}}_{(\varpi,\tau)}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$ if and only if $\mathfrak{P}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$. □

Corollary 3.3. *Let* $\mathfrak{P} = \langle \mathfrak{P}_1^+, \mathfrak{P}_2^+, \ldots, \mathfrak{P}_n^+, \mathfrak{P}_1^-, \mathfrak{P}_2^-, \ldots, \mathfrak{P}_n^- \rangle$ *be a* $\mathbb{BVMFS}$ *of the near-rings* $\mathbb{N}_1$. *Then the* $\mathbb{BVMF}$ *multiplication* $\mathfrak{P}^{\mathcal{M}}_{(\rho,\varrho)}$ *of* $\mathfrak{P}$ *in* $\mathbb{N}_1$ *is a* $\mathbb{BVMFSNR}$ *of* $\mathbb{N}_1$ *if and only if* $\mathfrak{P}$ *is a* $\mathbb{BVMFSNR}$ *of* $\mathbb{N}_1$.

Proof. For all $i = 1, 2, \ldots, n$, put $\varpi_i = 0$ and $\tau_i = 0$ in Theorem 3.1, then $\mathbb{BVMF}$ multiplication $\mathfrak{P}^{\mathcal{M}}_{(\rho,\varrho)}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$ if and only if $\mathfrak{P}$ is a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$. □

Theorem 3.4. *If* $\mathfrak{P} = \langle \mathfrak{P}_1^+, \mathfrak{P}_2^+, \ldots, \mathfrak{P}_n^+, \mathfrak{P}_1^-, \mathfrak{P}_2^-, \ldots, \mathfrak{P}_n^- \rangle$ *is a* $\mathbb{BVMFSNR}$ *of the near-rings* $\mathbb{N}_1$, *then the collection of all* $\mathbb{BVMF}$ *magnified transformations* $\mathfrak{C}$ *of* $\mathfrak{P}$ *in* $\mathbb{N}_1$ *is also a* $\mathbb{BVMFSNR}$ *of* $\mathbb{N}_1$.

Proof. By Theorem 3.1, it is a negligible concern. □

Corollary 3.5. *If* $\mathfrak{P} = \langle \mathfrak{P}_1^+, \mathfrak{P}_2^+, \ldots, \mathfrak{P}_n^+, \mathfrak{P}_1^-, \mathfrak{P}_2^-, \ldots, \mathfrak{P}_n^- \rangle$ *is a* $\mathbb{BVMFSNR}$ *of the near-rings* $\mathbb{N}_1$, *then the collection of all* $\mathbb{BVMF}$ *transformations* $\mathfrak{C}$ *of* $\mathfrak{P}$ *in* $\mathbb{N}_1$ *is also a* $\mathbb{BVMFSNR}$ *of* $\mathbb{N}_1$.

Proof. By Corollary 3.2, it is insignificant. □

Corollary 3.6. *If* $\mathfrak{P} = \langle \mathfrak{P}_1^+, \mathfrak{P}_2^+, \ldots, \mathfrak{P}_n^+, \mathfrak{P}_1^-, \mathfrak{P}_2^-, \ldots, \mathfrak{P}_n^- \rangle$ *is a* $\mathbb{BVMFSNR}$ *of the near-rings* $\mathbb{N}_1$, *then the collection of all* $\mathbb{BVMF}$ *multiplications* $\mathfrak{C}$ *of* $\mathfrak{P}$ *in* $\mathbb{N}_1$ *is also a* $\mathbb{BVMFSNR}$ *of* $\mathbb{N}_1$.

Proof. By Corollary 3.3, it is inconsequential. □

Theorem 3.7. *Intersection of the two* $\mathbb{BVMF}$ *magnified transformations of* $\mathbb{BVMFNSNR}$ *of the near-ring* $\mathbb{N}_1$ *is also a* $\mathbb{BVMFNSNR}$ *of* $\mathbb{N}_1$.

Proof. By Theorem 3.1, the two $\mathbb{BVMF}$ magnified transformations of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ are also $\mathbb{BVMFNSNR}s$ of $\mathbb{N}_1$.
If $\mathfrak{K} = \langle \mathfrak{K}_1^+, \mathfrak{K}_2^+, \ldots, \mathfrak{K}_n^+, \mathfrak{K}_1^-, \mathfrak{K}_2^-, \ldots, \mathfrak{K}_n^- \rangle$ and $\mathfrak{W} = \langle \mathfrak{W}_1^+, \mathfrak{W}_2^+, \ldots, \mathfrak{W}_n^+, \mathfrak{W}_1^-, \mathfrak{W}_2^-, \ldots, \mathfrak{W}_n^- \rangle$ are two $\mathbb{BVMFNSNR}s$ of the near-ring $\mathbb{N}_1$, then their intersection $\mathfrak{K} \cap \mathfrak{W}$ is also a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$.

Let ϱ, υ be in $\mathbb{N}_1$. Let $\mathfrak{K} \cap \mathfrak{W} = \mathfrak{U}$ and for all $i = 1, 2, \ldots, n$. By a known theorem, $\mathfrak{K} \cap \mathfrak{W}$ is also a $\mathbb{BVMFSNR}$ of $\mathbb{N}_1$. Then

$$\begin{aligned}\mathfrak{U}_i^+(\varrho + \upsilon) &= min\{\mathfrak{K}_i^+(\varrho + \upsilon), \mathfrak{W}_i^+(\varrho + \upsilon)\} \\ &= min\{\mathfrak{K}_i^+(\upsilon + \varrho), \mathfrak{W}_i^+(\upsilon + \varrho)\} = \mathfrak{U}_i^+(\upsilon + \varrho), \text{for all } \varrho \text{ and } \upsilon \text{ in } \mathbb{N}_1.\end{aligned}$$

$$\begin{aligned}\text{And } \mathfrak{U}_i^+(\varrho\upsilon) &= min\{\mathfrak{K}_i^+(\varrho\upsilon), \mathfrak{W}_i^+(\varrho\upsilon)\} \\ &= min\{\mathfrak{K}_i^+(\upsilon\varrho), \mathfrak{W}_i^+(\upsilon\varrho)\} = \mathfrak{U}_i^+(\upsilon\varrho), \text{for all } \varrho \text{ and } \upsilon \text{ in } \mathbb{N}_1.\end{aligned}$$

$$\begin{aligned}\text{Also } \mathfrak{U}_i^-(\varrho + \upsilon) &= max\{\mathfrak{K}_i^-(\varrho + \upsilon), \mathfrak{W}_i^-(\varrho + \upsilon)\} \\ &= max\{\mathfrak{K}_i^-(\upsilon + \varrho), \mathfrak{W}_i^-(\upsilon + \varrho)\} = \mathfrak{U}_i^-(\upsilon + \varrho), \text{for all } \varrho \text{ and } \upsilon \text{ in } \mathbb{N}_1.\end{aligned}$$

$$\begin{aligned}\text{And } \mathfrak{U}_i^-(\varrho\upsilon) &= max\{\mathfrak{K}_i^-(\varrho\upsilon), \mathfrak{W}_i^-(\varrho\upsilon)\} \\ &= max\{\mathfrak{K}_i^-(\upsilon\varrho), \mathfrak{W}_i^-(\upsilon\varrho)\} = \mathfrak{U}_i^-(\upsilon\varrho), \text{for all } \varrho \text{ and } \upsilon \text{ in } \mathbb{N}_1.\end{aligned}$$

Hence $\mathfrak{K} \cap \mathfrak{W} = \mathfrak{U}$ is also a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$. By the above Theorem, the intersection of these two $\mathbb{BVMF}$ magnified transformations of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ is a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$. □

Theorem 3.8. *Intersection of the two* $\mathbb{BVMF}$ *transformations of* $\mathbb{BVMFNSNR}$ *of the near-ring* $\mathbb{N}_1$ *is also a* $\mathbb{BVMFNSNR}$ *of* $\mathbb{N}_1$.

Proof. By Theorem 3.2, the two $\mathbb{BVMF}$ transformations of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ are also $\mathbb{BVMFNSNR}s$ of $\mathbb{N}_1$.
Again by Theorem 3.7, the intersection of these two $\mathbb{BVMF}$ transformations of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ is a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$. □

Theorem 3.9. *Intersection of the two $\mathbb{BVMF}$ multiplications of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ is also a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$.*

Proof. By Theorem 3.3, the two $\mathbb{BVMF}$ multiplications of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ are also $\mathbb{BVMFNSNR}s$ of $\mathbb{N}_1$.
Again by Theorem 3.7, the intersection of these two $\mathbb{BVMF}$ multiplications of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ is a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$. □

Theorem 3.10. *Intersection of the collection of all $\mathbb{BVMF}$ magnified transformations of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ is also a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$.*

Proof. By Theorem 3.4, the collection of all $\mathbb{BVMF}$ magnified transformations of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ are also $\mathbb{BVMFNSNR}s$ of $\mathbb{N}_1$.
Again by Theorem 3.7, the intersection of these collection of all $\mathbb{BVMF}$ magnified transformations of $\mathbb{BVMFNSNR}$ of the near-ring $\mathbb{N}_1$ is a $\mathbb{BVMFNSNR}$ of $\mathbb{N}_1$. □

4 Conclusion remarks

The paper you're referring to sounds like it explores the application of magnified translations within the context of bipolar-valued multi-fuzzy subnear-rings of near-rings. These translations likely serve as a tool for studying properties and relationships within these algebraic structures. By introducing and employing these translations, the paper likely establishes various theorems, which are statements that can be proved within the framework of these structures. These theorems could cover a range of topics, such as characterizing certain properties of the subnear-rings, establishing relationships between different elements or subsets, or providing conditions under which specific operations or properties hold. Furthermore, the paper suggests that the concepts and techniques introduced can be generalized and applied to other algebraic systems beyond near-rings. This speaks to the versatility and applicability of the methods developed in the paper, suggesting that similar approaches may yield insights in various other mathematical contexts.

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