Research Article

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New Ideas In Recognition of Cancer and Neutrosophic Super Hypergraph as Hyper Tool on Super Toot

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Abstract
In this scientific research, new setting is introduced to study dominating, resolving, Coloring, Eulerian (Hamiltonian) neutrosophic path, n-Eulerian (Hamiltonian) Neutrosophic path, zero forcing number, zero forcing neutrosophic-number, independent Number, independent neutrosophic-number, clique number, clique neutrosophic-number, Matching number, matching neutrosophic-number, girth, neutrosophic girth, 1-zero-forcing number, 1-zero-forcing neutrosophic-number, failed 1-zero-forcing number, failed 1-zero-forcing neutrosophic-number, global-offensive alliance, t-offensive alliance, t-defensive alliance, t-powerful alliance, and global-powerful alliance in SuperHyperGraph and Neutrosophic Super Hypergraph. Some Classes of SuperHyperGraph and Neutrosophic SuperHyperGraph are cases of study. Some results are applied in family of SuperHyperGraph and Neutrosophic SuperHyperGraph. A basic familiarity with Super Hypergraphs theory, and Neutrosophic SuperHyperGraph theory are proposed.

Keywords: SuperHyperGraph, Neutrosophic SuperHyperGraph, Classes, Families, Cancer's Recognition.

AMS Subject Classification: 05C17, 05C22, 05E45

Neutrosophic Preliminaries of This Scientific Research on the Redeemed Ways: In this section, the basic material in this scientific research, is referred to [Single Valued Neutrosophic Set] (Ref. [23], Definition 2.2, p.2), [Neutrosophic Set] (Ref. [23] , Definition 2.1, p.1), [Neutrosophic SuperHyperGraph (NSHG)] (Ref. [23], Definition 2.5, p.2), [Characterization of the Neutrosophic SuperHyperGraph (NSHG)] (Ref. [23], Definition 292.7, p.3), [t-norm] (Ref. [23], Definition 2.7, p.3), and [Characterization of the 30Neutrosophic SuperHyperGraph (NSHG)] (Ref. [23], Definition 2.7, p.3), [Neutrosophic 31Strength of the Neutrosophic SuperHyperPaths] (Ref. [23], Definition 5.3, p.7), and [Different Neutrosophic Types of Neutrosophic SuperHyperEdges (NSHE)] (Ref. [23], Definition 5.4, p.7). Also, the new ideas and their clarifications are addressed to Ref. [23]. In this subsection, the basic material which is used in this scientific research, is presented. Also, the new ideas and their clarifications are elicited.

Definition 2.1: (Neutrosophic Set). (Ref. [23], Definition 2.1, p.1). Let X be a Eulerian-Path-Cut of points (objects) with generic elements in X denoted by x; then the **Neutrosophic set** A (NS A) is an object having the form

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

where the functions $T, I, F : X \to]^-0,1^+[$ define respectively the a **truth-membership function, an indeterminacy-membership function, and a falsity-membership function** of the element $x \in X$ to the set A with the condition

$$^-0 \leq T_A(x) + I_A(x) + F_A(x) \leq 3^+.$$

The functions $T_A(x)$, $IA(x)$ and $F_A(x)$ are real standard or nonstandard subsets of$]^-0, 1^+[$.

Definition 2.2: (Single Valued Neutrosophic Set). (Ref. [23], Definition 2.2, p.2). Let X be an Eulerian-Path-Cut of points (objects) with generic elements in X denoted by x. A **single valued** Neutrosophic set A (SVNS A) is characterized by truth-membership function $T_A(x)$, an indeterminacy-membership function $I_A(x)$, and a falsity-membership function $F_A(x)$. For each point x in X, $T_A(x), I_A(x), F_A(x) \in [0, 1]$.
A SVNS A can be written as

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

Definition 2.3: The **degree of truth-membership, indeterminacy-membership** and **falsity-membership of the subset** $X \subset A$ of the single valued Neutrosophic set
$A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$:

$$T_A(X) = \min[T_A(v_i), T_A(v_j)]_{v_i,v_j \in X},$$

$$I_A(X) = \min[I_A(v_i), I_A(v_j)]_{v_i,v_j \in X},$$

$$\text{and } F_A(X) = \min[F_A(v_i), F_A(v_j)]_{v_i,v_j \in X}.$$

Definition 2.4: The support of $X \subset A$ of the single valued Neutrosophic set $A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$:

$$supp(X) = \{x \in X : \; T_A(x), I_A(x), F_A(x) > 0\}.$$

Definition 2.5: (Neutrosophic SuperHyperGraph (NSHG)). (**Ref**. [23], Definition 2.5, p.2). Assume V^0 is a given set. A **Neutrosophic SuperHyperGraph** (NSHG) S is a pair $S = (V, E)$, where

(i) $V = \{V_1, V_2, ..., V_n\}$ a finite set of finite single valued Neutrosophic subsets of V^0;

(ii) $V = \{(V_i, T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i)) : \; T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i) \geq 0\}, \; (i = 1, 2, \ldots, n)$;

(iii) $E = \{E_1, E_2, ..., E_n0\}$ a finite set of finite single valued Neutrosophic subsets of V;

(iv) $E = \{(E_{i'}, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'})) : \; T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}) \geq 0\}, \; (i' = 1, 2, \ldots, n')$;

(v) $V_i \neq \emptyset, \; (i = 1, 2, \ldots, n)$;

(vi) $E_{i'} \neq \emptyset, \; (i' = 1, 2, \ldots, n')$;

(vii) $\sum_i supp(V_i) = V, \; (i = 1, 2, \ldots, n)$;

(viii) $\sum_{i'} supp(E_{i'}) = V, \; (i' = 1, 2, \ldots, n')$;

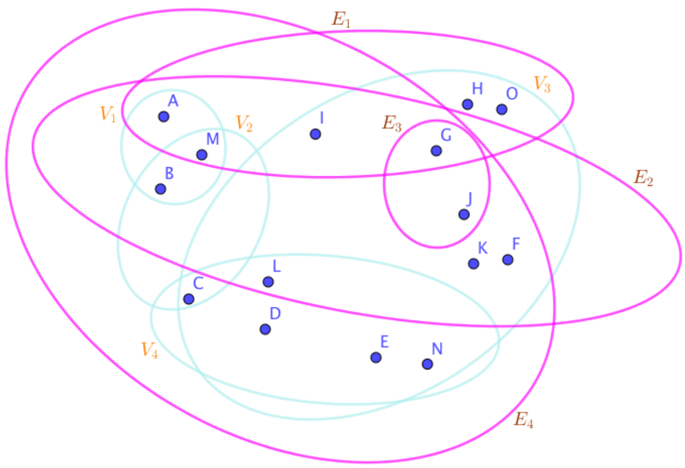

Figure 1: The Neutrosophic Super Hypergraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

And the following conditions hold:
TV0 (Ei0) ≤ min [TV 0(VI), TV 0(VJ)] VI, Vj□Ei0,
IV0 (Ei0) ≤ min[IV 0(Vi),IV 0(Vj)]Vi,Vj∈Ei0, and where i0 = 1,2,...,n0. Here the Neutrosophic SuperHyperEdges (NSHE) Ej0 and the Neutrosophic SuperHyperVertices (NSHV) VJ are single valued Neutrosophic sets. TV 0(Vi), IV 0(Vi), and FV 0(Vi) denote the degree of truth-membership, the degree of indeterminacy-membership and the degree of falsity-membership the Neutrosophic SuperHyperVertex (NSHV) Vi to the Neutrosophic SuperHyperVertex (NSHV) V., and) denote the degree of truth membership, the degree of indeterminacy-membership and the degree of falsity-membership of the Neutrosophic SuperHyperEdge (NSHE) Ei0 to the Neutrosophic SuperHyperEdge (NSHE) E. Thus, the ii0th element of the incidence matrix of Neutrosophic SuperHyperGraph (NSHG) are of the form (VI, TV0 (Ei0), IV0 (Ei0), FV0 (Ei0)), the sets V and E are crisp sets.

Example 2.6. : Assume a Neutrosophic Super Hypergraph (NSHG) S is a pair S = (V, E) in the mentioned Neutrosophic Figures in every Neutrosophic items.

On the Figure (1), the Neutrosophic SuperHyperNotion, namely, Neutrosophic notion, is up. The Neutrosophic Algorithm is Neutrosophicly straightforward. And E3 are some empty Neutrosophic SuperHyperEdges but E2 is a loop Neutrosophic SuperHyperEdge and E4 is a Neutrosophic SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely, E4. The Neutrosophic SuperHyperVertex, V3 is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint.

On the Figure (2), the Neutrosophic SuperHyperNotion, namely, Neutrosophic Notion, is up. The Neutrosophic Algorithm is Neutrosophicly straightforward. E1, E2 and E3 are some empty Neutrosophic SuperHyperEdges but E4 is a

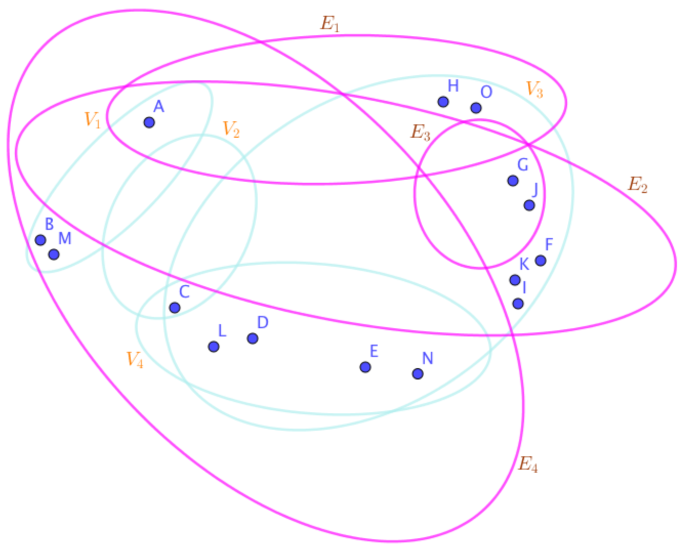

Figure 2: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

Neutrosophic SuperHyperEdge. Thus in the terms of Neutrosophic SuperHyperNeighbor, there's only one Neutrosophic SuperHyperEdge, namely, E4. The Neutrosophic SuperHyperVertex, V3 is Neutrosophic isolated means that there's no Neutrosophic SuperHyperEdge has it as a Neutrosophic endpoint.

- On the Figure (3), the SuperHyperNotion, namely, SuperHyperGirth, is up. E1, E2 and E3 are some empty SuperHyperEdges but E4 is a SuperHyperEdge. Thus in the terms of SuperHyperNeighbor, there's only one SuperHyperEdge, namely, E4.

• On the Figure (4), there's no empty SuperHyperEdge but E3 are a loop SuperHyperEdge on {F} and there are some SuperHyperEdges, namely, E1 on {H,V1,V3}, alongside E2 on {O,H,V4,V3} and E4,E5 on {N,V1,V2,V3,F}.

• On the Figure (5), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
• On the Figure (6), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
• On the Figure (7), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
• On the Figure (8), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
• On the Figure (9), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
• On the Figure (10), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
• On the Figure (11), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.

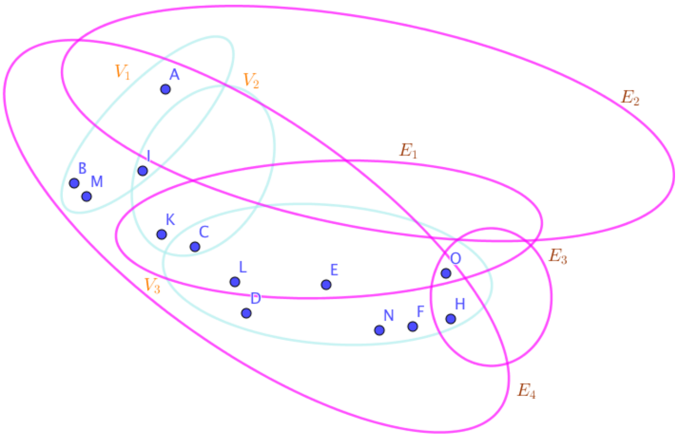

Figure 3: The Neutrosophic Super Hypergraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

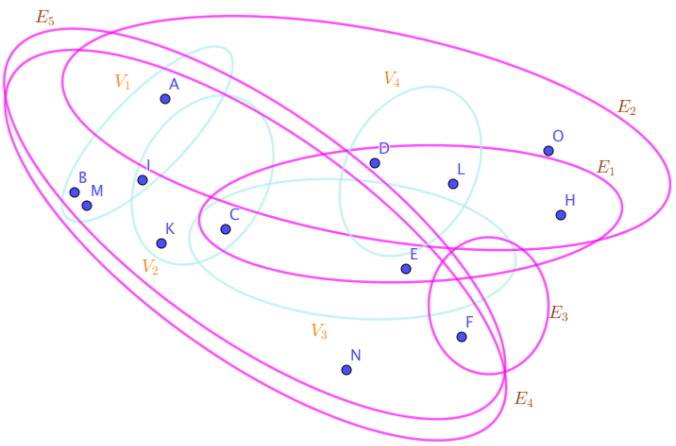

Figure 4: The Neutrosophic Super Hypergraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

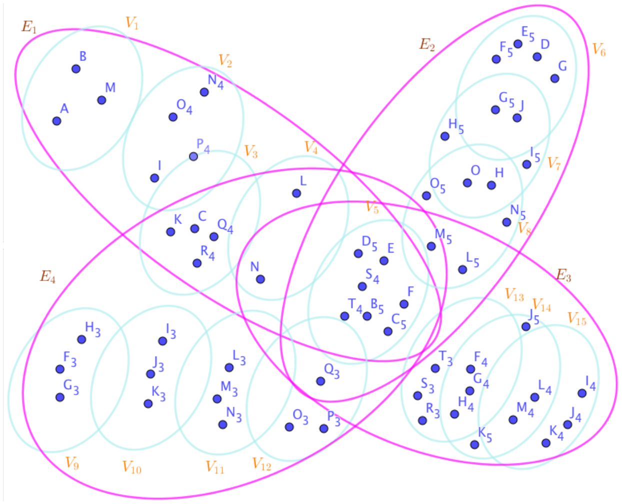

Figure 5: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

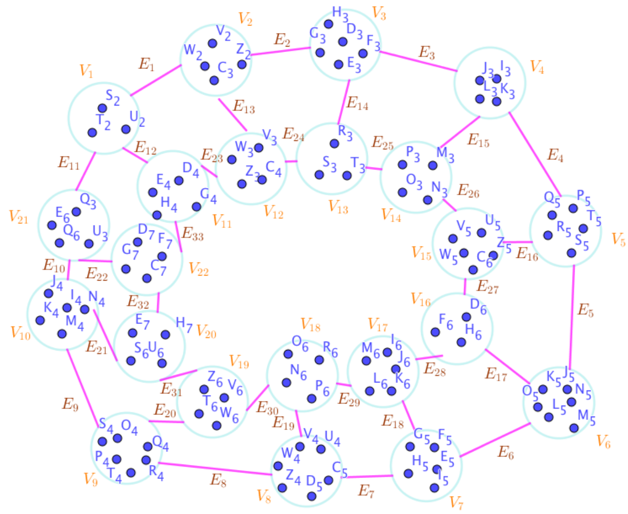

Figure 6: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

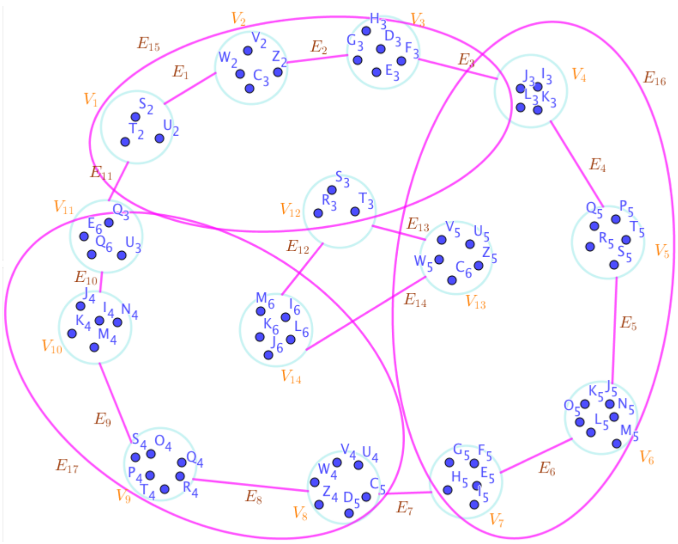

Figure 7: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

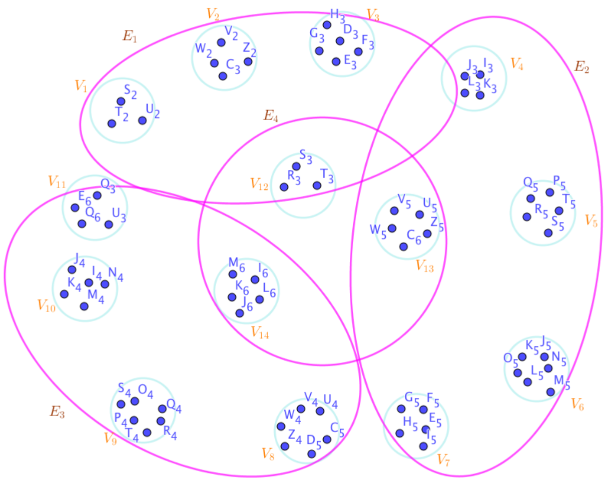

Figure 8: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

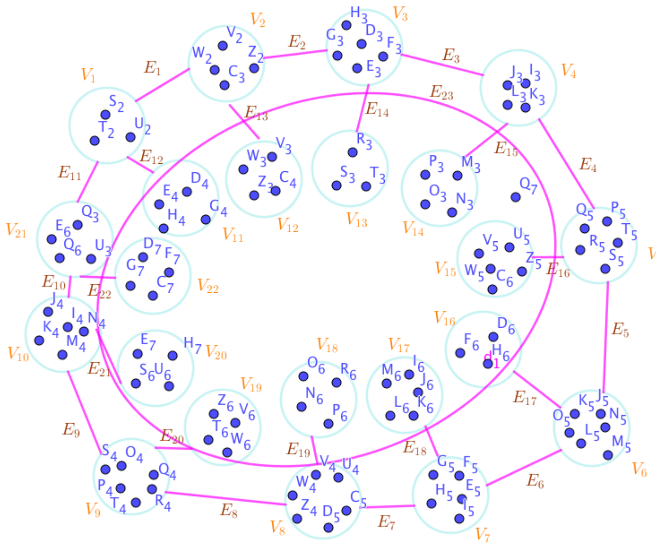

Figure 9: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

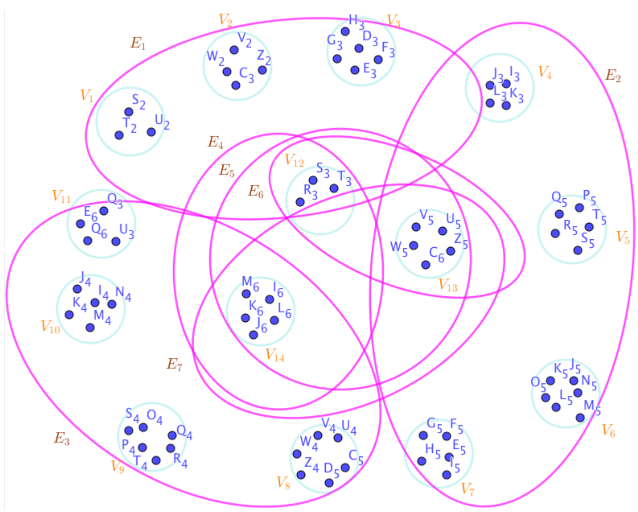

Figure 10: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

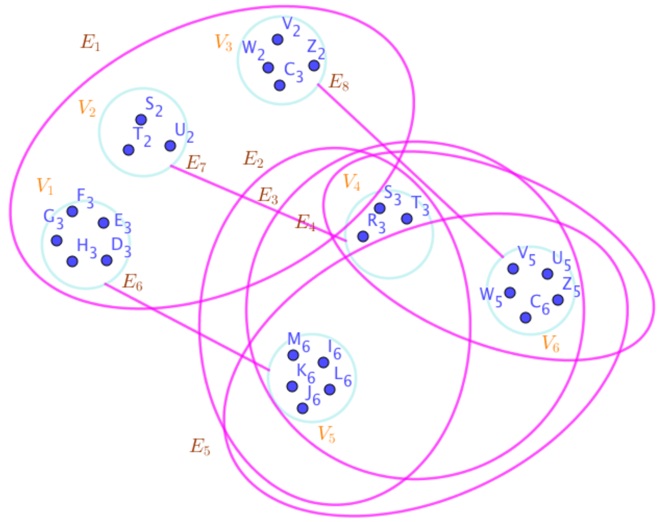

Figure 11: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

- On the Figure (12), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (13), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (14), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (15), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (16), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (17), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (18), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (19), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (20), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (21), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.
- On the Figure (22), there's neither empty SuperHyperEdge nor loop SuperHyperEdge.

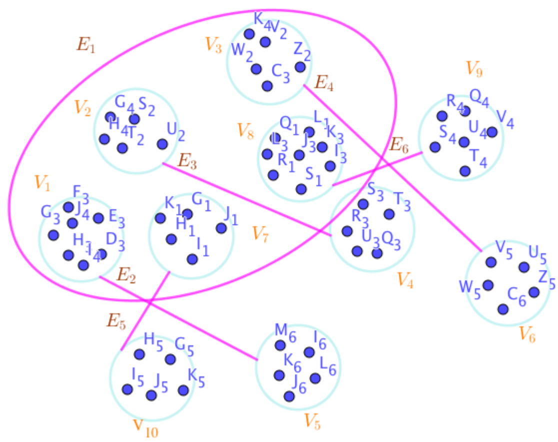

Figure 12: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

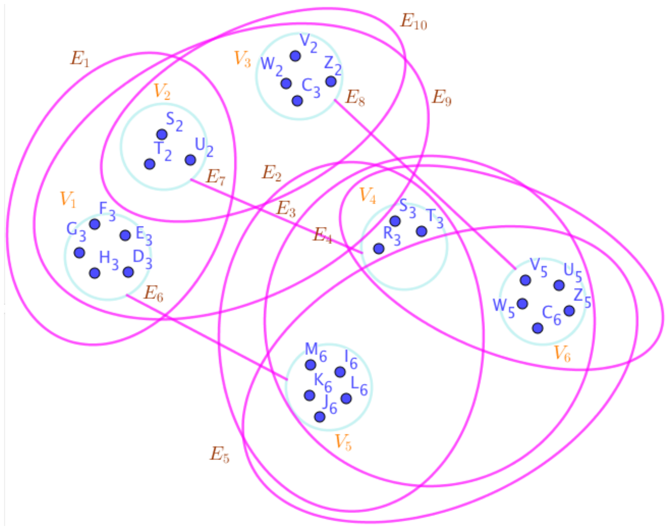

Figure 13: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

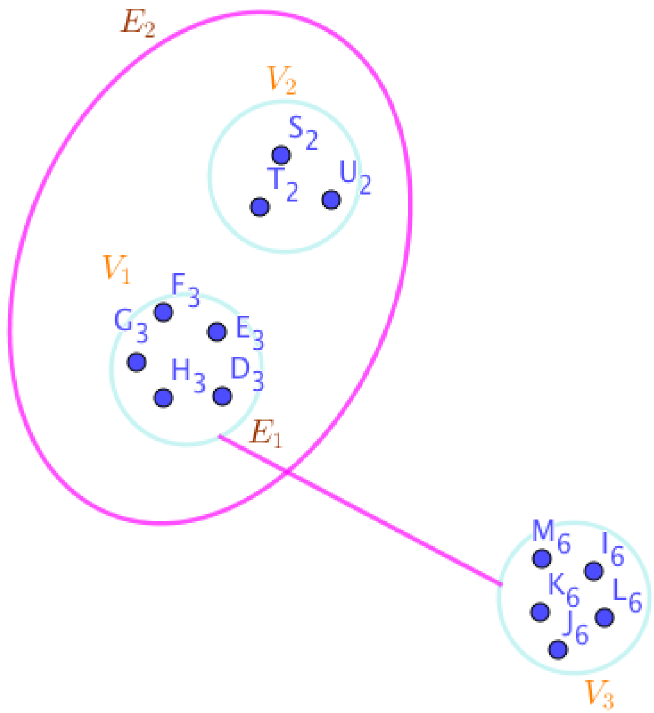

Figure 14: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

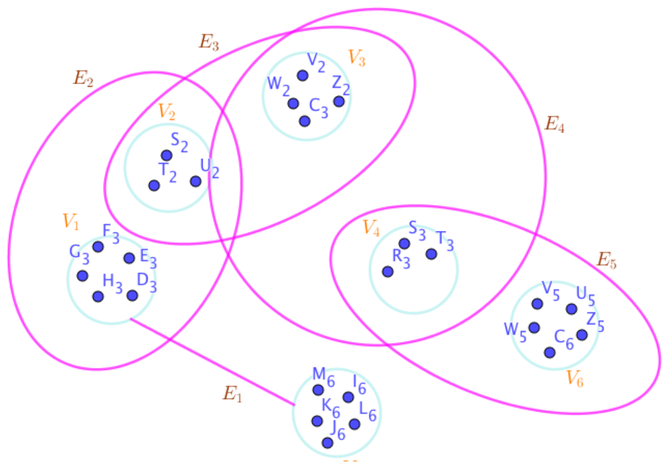

Figure 15: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

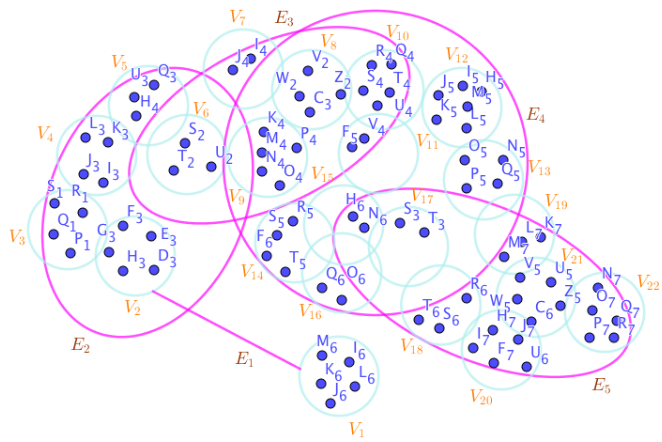

Figure 16: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

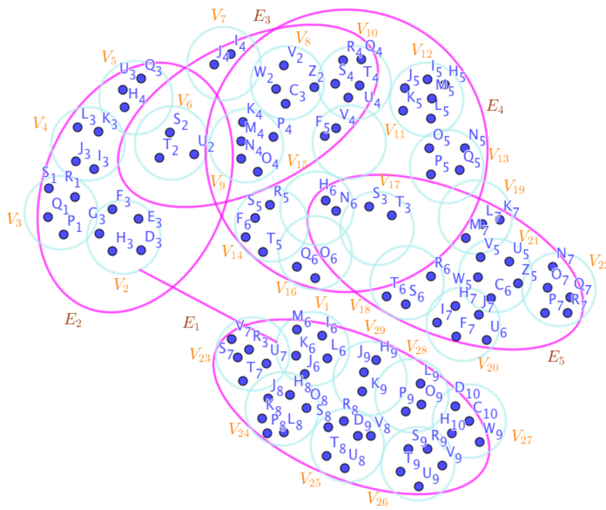

Figure 17: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

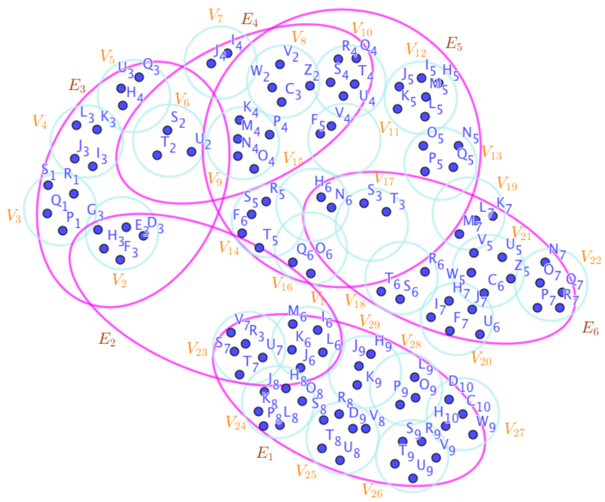

Figure 18: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

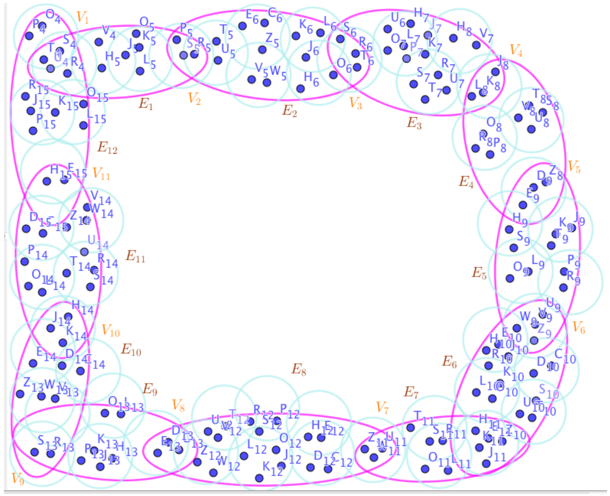

Figure 19: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

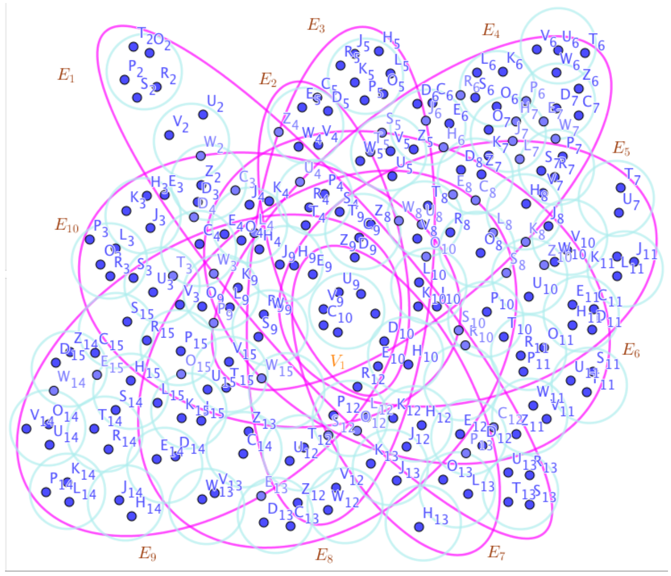

Figure 20: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

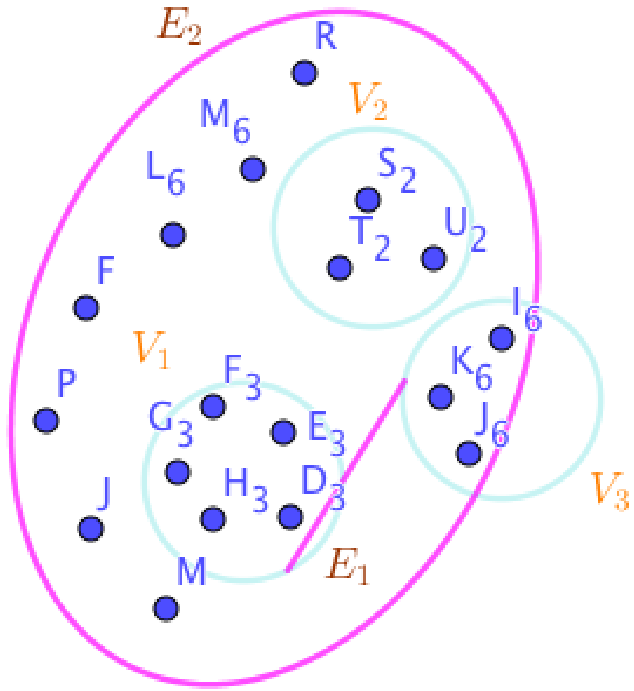

Figure 21: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

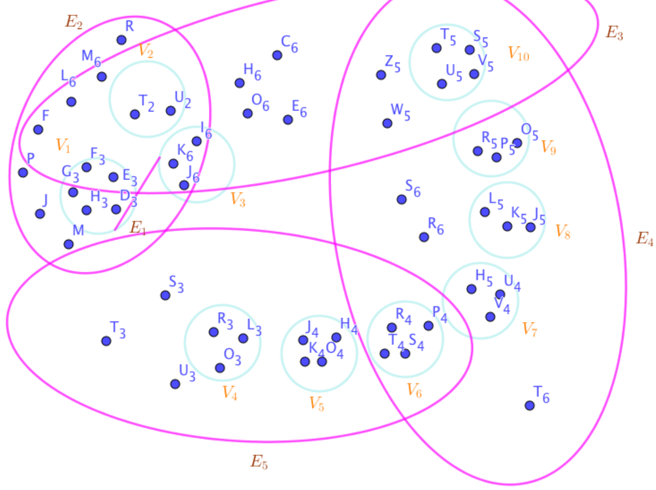

Figure 22: The Neutrosophic SuperHyperGraphs Associated to the Neutrosophic Notions in the Neutrosophic Example (2.6)

Definition 2.7: (Characterization of the Neutrosophic SuperHyperGraph (NSHG)). (**Ref**. [23], Definition 2.7, p.3). Assume a Neutrosophic SuperHyperGraph (NSHG) S is a pair *S = (V, E)*. The Neutrosophic SuperHyperEdges (NSHE) Ei0 and the Neutrosophic Super hyper vertices (NSHV) Vi of Neutrosophic SuperHyperGraph (NSHG) S = (V, E) could be characterized as follow-up items. If |Vi| = 1, then Vi is called vertex; if |Vi| ≥ 1, then Vi is called SuperVertex; if for all Vis are incident in Ei0, |Vi| = 1, and |Ei0| = 2, then Ei0 is called edge; if for all Vis are incident in Ei0, |Vi| = 1, and |Ei0| ≥ 2, then Ei0 is called Hyper Edge; if there's a Vi is incident in Ei0 such

that |Vi| ≥ 1, and |Ei0| = 2, then Ei0 is called Super Edge;
if there's a Vi is incident in Ei0 such that |Vi| ≥ 1, and |Ei0| ≥ 2, then Ei0 is called SuperHyperEdge. If we choose different types of binary operations, then we could get hugely diverse 143 types of general forms of Neutrosophic Super Hyper graph (NSHG).

Definition 2.8: (t-norm). (Ref. [23], Definition 2.7, p.3). A binary operation ⊗ : [0,1] × [0,1] → [0,1] is a ***t*-norm** if it satisfies the following for *x,y,z,w* ∈ [0,1]:

(i) 1 ⊗ *x* = *x*;
(ii) *x* ⊗ *y* = *y* ⊗ *x;*
(iii) *X* ⊗ *(y* ⊗ *z)* = *(x* ⊗ *y)* ⊗ *z;* (IV) If *w* ≤ *x* and *y* ≤ *z* then *w* ⊗ *y* ≤ *x* ⊗ *z.*

Definition 2.9.: The ***degree of truth-membership, indeterminacy-membership and falsity-membership of the subset*** $X \subset A$ of the single valued Neutrosophic set $A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$ (with respect to t-norm T_{norm}):

$$T_A(X) = T_{norm}[T_A(v_i), T_A(v_j)]_{v_i,v_j \in X},$$

$$I_A(X) = T_{norm}[I_A(v_i), I_A(v_j)]_{v_i,v_j \in X},$$

and $F_A(X) = T_{norm}[F_A(v_i), F_A(v_j)]_{v_i,v_j \in X}.$

Definition 2.10.: The support of $X \subset A$ of the single valued Neutrosophic set $A = \{< x : T_A(x), I_A(x), F_A(x) >, x \in X\}$:

$$supp(X) = \{x \in X : \ T_A(x), I_A(x), F_A(x) > 0\}.$$

Definition 2.11.: (General Forms of Neutrosophic SuperHyperGraph (NSHG)). Assume V^0 is a given set. A Neutrosophic SuperHyperGraph (NSHG) S is a 153 pair *S = (V, E*), where

(i) $V = \{V_1, V_2, ..., V_n\}$ a finite set of finite single valued Neutrosophic subsets of V^0;
(ii) $V = \{(V_i, T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i)) : \ T_{V'}(V_i), I_{V'}(V_i), F_{V'}(V_i) \geq 0\}, \ (i = 1, 2, \ldots, n);$
(iii) $E = \{E_1, E_2, ..., E_n 0\}$ a finite set of finite single valued Neutrosophic subsets of V;
(iv) $E = \{(E_{i'}, T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'})) : \ T'_V(E_{i'}), I'_V(E_{i'}), F'_V(E_{i'}) \geq 0\}, \ (i' = 1, 2, \ldots, n');$
(v) V_i 6= ∅, (*i* = 1,2,...,*n*);
(vi) $E_i 0$ 6= ∅, (i^0 = 1,2,...,n^0);
(vii) $\sum_i supp(V_i) = V, \ (i = 1, 2, \ldots, n);$
$\sum_{i'} supp(E_{i'}) = V, \ (i' = 1, 2, \ldots, n').$

Here the Neutrosophic SuperHyperEdges (NSHE) Ej0 and the Neutrosophic SuperHyperVertices (NSHV) VJ are single valued Neutrosophic sets. TV 0(Vi), IV 0(Vi), and FV 0(Vi) denote the degree of truth-membership, the degree of indeterminacy-membership and the degree of falsity-membership the Neutrosophic SuperHyperVertex (NSHV) Vi to the Neutrosophic SuperHyperVertex (NSHV) V., an) denote the degree of truth-membership, the degree of indeterminacy-membership and the degree of falsity-membership of the Neutrosophic SuperHyperEdge (NSHE) Ei0 to the Neutrosophic SuperHyperEdge (NSHE) E. Thus, the ii0th element of the incidence matrix of Neutrosophic SuperHyperGraph (NSHG) are of the form, the sets V and E are crisp sets.

Definition 2.12: (Characterization of the Neutrosophic SuperHyperGraph (NSHG)). (Ref. [23], Definition 2.7, p.3). Assume a Neutrosophic SuperHyperGraph (NSHG) S is a pair S = (V, E). The Neutrosophic SuperHyperEdges (NSHE) Ei0 and the Neutrosophic SuperHyperVertices (NSHV) Vi of Neutrosophic SuperHyperGraph (NSHG) S = (V, E) could be characterized as follow-up items.

(i) If |Vi| = 1, then Vi is called vertex;
(ii) if |Vi| ≥ 1, then Vi is called SuperVertex;
(iii) if for all Vis are incident in Ei0, |Vi| = 1, and |Ei0| = 2, then Ei0 is called edge;
(iv) if for all Vis are incident in Ei0, |Vi| = 1, and |Ei0| ≥ 2, then Ei0 is called HyperEdge;
(v) if there's a Vi is incident in Ei0 such that |Vi| ≥ 1, and |Ei0| = 2, then Ei0 is called SuperEdge;
(vi) If there's a VI is incident in Ei0 such that |Vi| ≥ 1, and |Ei0| ≥ 2, then Ei0 is called SuperHyperEdge.

This SuperHyperModel is too messy and too dense. Thus there's a need to have some restrictions and conditions on SuperHyperGraph. The special case of this SuperHyperGraph makes the patterns and
Regularities.

Definition 2.13.: A graph is **SuperHyperUniform** if it's SuperHyperGraph and the number of elements of SuperHyperEdges are the same. To get more visions on SuperHyperUniform, the some SuperHyperClasses are introduced. It makes to have SuperHyperUniform more understandable.

Definition 2.14: Assume a Neutrosophic SuperHyperGraph. There are some SuperHyperClasses as

Follows.
(i) its Neutrosophic SuperHyperPath if it's only one SuperVertex as intersection amid two given SuperHyperEdges with two exceptions;
(ii) it's SuperHyperCycle if it's only one SuperVertex as intersection amid two given SuperHyperEdges;
(iii) it's SuperHyperStar it's only one SuperVertex as intersection amid all SuperHyperEdges;
(iv) it's SuperHyperBipartite it's only one SuperVertex as intersection amid two given SuperHyperEdges and these SuperVertices, forming two separate sets, has no SuperHyperEdge in common;
(v) it's SuperHyperMultiPartite it's only one SuperVertex as intersection amid two given SuperHyperEdges and these Super Vertices, forming multi separate sets, has no SuperHyperEdge in common;
(vi) it's SuperHyperWheel if it's only one SuperVertex as intersection amid two given SuperHyperEdges and one SuperVertex has one SuperHyperEdge with any common SuperVertex

Example 2.15: In the Figure (23), the connected Neutrosophic SuperHyperPath ESHP: (V, E), is highlighted and featured. The Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (23), is the notion.

Example 2.16: In the Figure (24), the connected Neutrosophic SuperHyperCycle 218 NSHC: (V, E), is highlighted and featured. The obtained Neutrosophic SuperHyperSet, in the Neutrosophic SuperHyperModel (24), is up.

Example 2.17: In the Figure (25), the connected Neutrosophic SuperHyperStar 221 ESHS: (*V, E*), is Highlighted and featured. The obtained Neutrosophic SuperHyperSet, 222 by the Algorithm in previous Neutrosophic result, of the Neutrosophic 223 SuperHyperVertices of the connected Neutrosophic SuperHyperStar ESHS : (V,E), in 224 the Neutrosophic SuperHyperModel (25), is up.

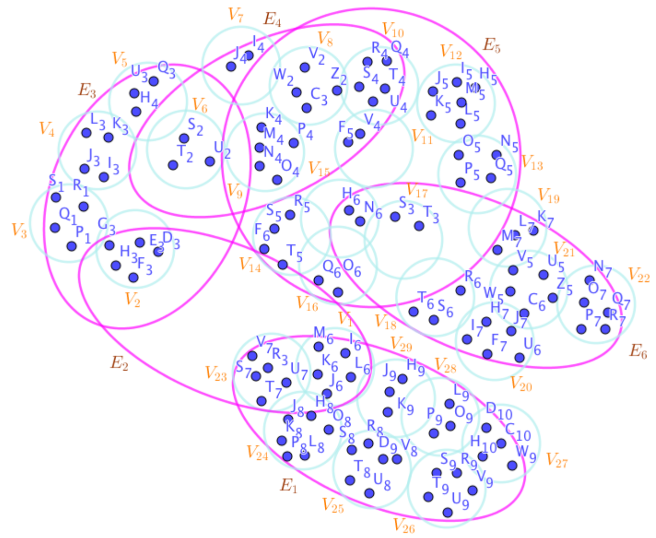

Figure 23: A Neutrosophic SuperHyperPath Associated to the Notions in the Example (2.15)

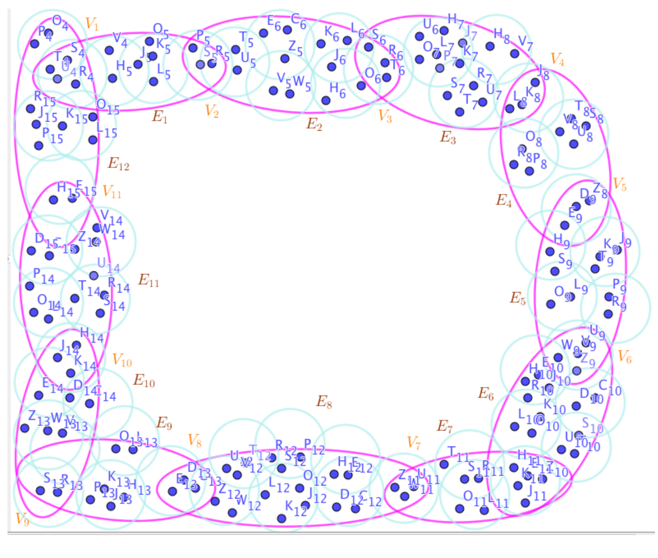

Figure 24: A Neutrosophic SuperHyperCycle Associated to the Neutrosophic Notions in the Neutrosophic Example (2.16)

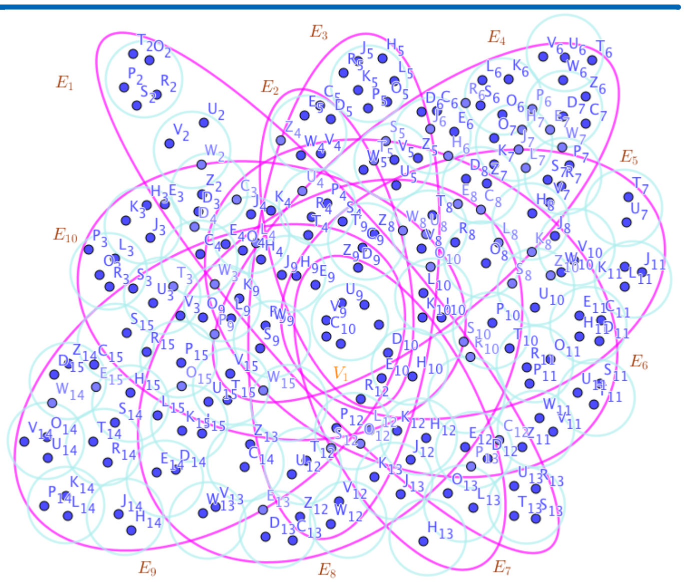

Figure 25: A Neutrosophic SuperHyperStar Associated to the Neutrosophic Notions in the Neutrosophic Example (2.17)

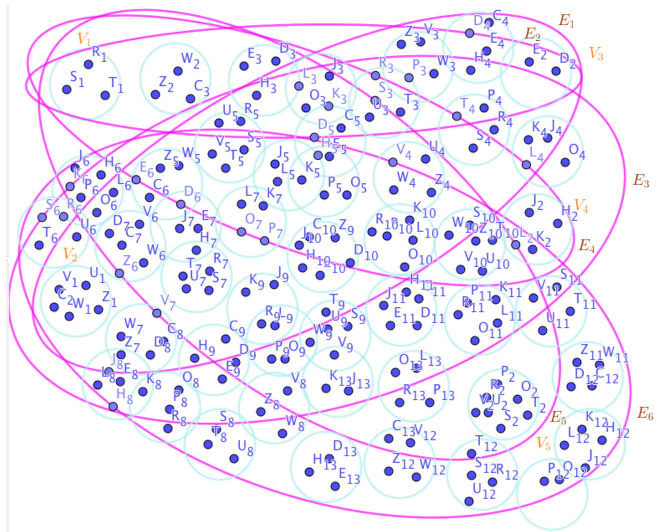

Figure 26: Neutrosophic SuperHyperBipartite Neutrosophic Associated to the Neutrosophic Notions in the Example (2.18)

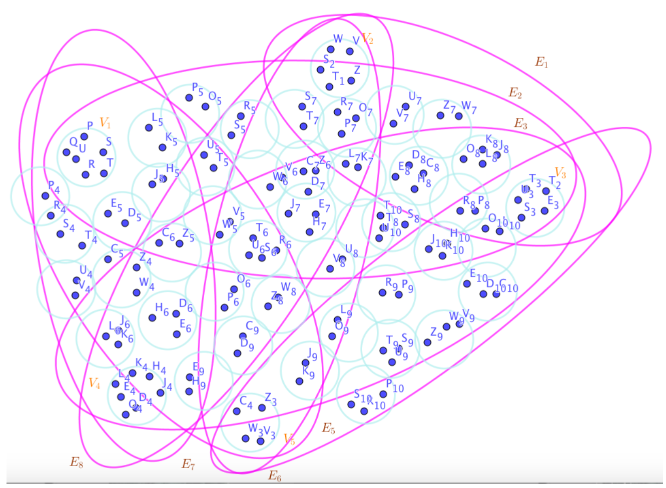

Figure 27: A Neutrosophic SuperHyperMultipartite Associated to the Notions in the Example (2.19)

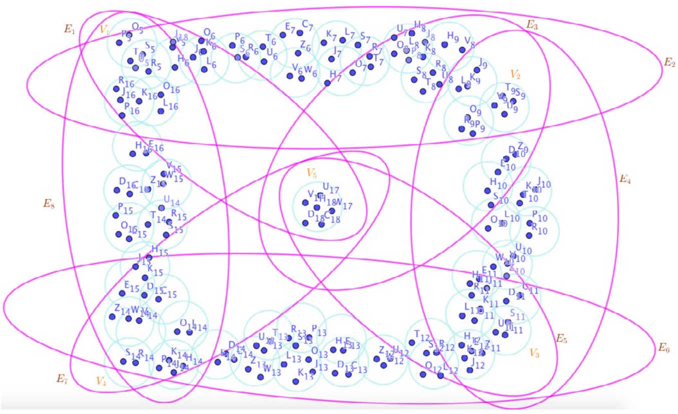

Figure 28: A Neutrosophic SuperHyperWheel Neutrosophic Associated to the Neutrosophic Notions in the Neutrosophic Example (2.20)

(ii) There's a vertex VI ∈ VI such that VI, VI+1 ∈ Ei0;
(iii) There's a SuperVertex Vi0 ∈ VI such that Vi0, VI+1 ∈ Ei0;
(iv) There's a vertex VI+1 ∈ VI+1 such that VI, VI+1 ∈ Ei0;
(v) There's a SuperVertex   such that
(vi) There are a vertex VI ∈ VI and a vertex VI+1 ∈ VI+1 such that VI, VI+1 ∈ Ei0;
(vii) There are a vertex VI ∈ VI and a SuperVertex such that
(viii) There are a SuperVertex Vi0 ∈ VI and a vertex VI+1 ∈ VI+1 such that Vi0, VI+1 ∈ Ei0;
(ix) There are a SuperVertex Vi0 ∈ VI and a SuperVertex such that

Definition 2.22: (Characterization of the Neutrosophic SuperHyperPaths). Assume a Neutrosophic SuperHyperGraph (NSHG) S is a pair S = (*V, E*). A Neutrosophic SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV) V_1 to Neutrosophic SuperHyperVertex (NSHV) V_s is sequence of Neutrosophic SuperHyperVertices (NSHV) and Neutrosophic SuperHyperEdges (NSHE)

$$V_1, E_1, V_2, E_2, V_3 ... V_{s-1}, E_{s-1}, V_s,$$

could be characterized as follow-up items.
(i) If for all V_i, E_{j0}, $|V_i| = 1$, $|E_{j0}| = 2$, then NSHP is called path;
(ii) if for all E_{j0}, $|E_{j0}| = 2$, and there's V_i, $|V_i| \geq 1$, then NSHP is called SuperPath;
(iii) if for all V_i, E_{j0}, $|V_i| = 1$, $|E_{j0}| \geq 2$, then NSHP is called HyperPath;
(iv) If there are V_i, E_{j0}, $|V_i| \geq 1$, $|E_{j0}| \geq 2$, then NSHP is called **neutrosophi super hyper path**.

Definition 2.23: (Neutrosophic Strength of the Neutrosophic SuperHyperPaths). (Ref. [23], Definition 5.3, p.7).

Assume a Neutrosophic SuperHyperGraph (NSHG) S is a pair *S = (V, E)*. A Neutrosophic SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

Table 1. The values of vertices, super vertices, edges, hyper edges, and super hyper edges belong to the neutrosophic super hyper graph mentioned in the definition

V_1 to neutrosophic super hyper vertex (NSHV) *Vs* is sequence of neutrosophic super hyper vertices (NSHV) and neutrosophic super hyper edges (NSHE)

(i) Neutrosophic t-strength ; $(\min\{T(V_i)\}, m, n)^s_{i=1};$

(ii) Neutrosophic I-strength ; $(m, \min\{I(V_i)\}, n)^s_{i=1};$

(iii) Neutrosophic f-strength ; $(m, n, \min\{F(V_i)\})^s_{i=1};$

(iv) Neutrosophic strength. $(\min\{T(V_i)\}, \min\{I(V_i)\}, \min\{F(V_i)\})^s_{i=}$

Definition 2.24: (Different Neutrosophic Types of Neutrosophic SuperHyperEdges (NSHE)). (Ref. [23], Definition 5.4, p.7). Assume a Neutrosophic SuperHyperGraph (NSHG) S is a pair S = (V, E). Consider
I. ***Neutrosophic t-connective:*** if *T (E)* ≥ maximum number of Neutrosophic t-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV) V_i to Neutrosophic SuperHyperVertex (NSHV) V_j where $1 \leq i,j \leq s;$
II. ***Neutrosophic i-connective:*** if *I (E)* ≥ maximum number of Neutrosophic i-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV) V_i to Neutrosophic SuperHyperVertex (NSHV) V^j where $1 \leq i, j \leq s;$
III. ***Neutrosophic f-connective:*** if *F (E)* ≥ maximum number of Neutrosophic f-strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV) V_i to Neutrosophic SuperHyperVertex (NSHV) V_j where $1 \leq i, j \leq s;$
IV. ***Neutrosophic connective:*** if *(T (E), I (E), F (E))* ≥ maximum number of Neutrosophic strength of SuperHyperPath (NSHP) from Neutrosophic SuperHyperVertex (NSHV) V_i to Neutrosophic SuperHyperVertex (NSHV) V_jWhere $1 \leq i, j \leq s$.

For the sake of having a Neutrosophic notion, there's a need to "redefine" thNotion of "Neutrosophic SuperHyperGraph". The SuperHyperVertices and the SuperHyperEdges are assigned by the labels from the letters of the alphabets. In this Procedure, there's the usage of the position of labels to assign to the values.

Definition 2.25: Assume a Neutrosophic SuperHyperGraph (NSHG) *S* is a pair *S = (V, E)*. It's redefined Neutrosophic SuperHyperGraph if the Table (1) holds.

It's useful to define a "Neutrosophic" version of SuperHyperClasses. Since there's more ways to get Neutrosophic type-results to make a Neutrosophic more understandable.

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

Table 2: The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to the Neutrosophic SuperHyperGraph, Mentioned in the Definition (2.26)

The Values of The Vertices	The Number of Position in Alphabet
The Values of The SuperVertices	The maximum Values of Its Vertices
The Values of The Edges x	The maximum Values of Its Vertices
The Values of The HyperEdges	The maximum Values of Its Vertices
The Values of The SuperHyperEdges	The maximum Values of Its Endpoints

Table 3. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to the Neutrosophic SuperHyperGraph Mentioned in the Definition (2.27)

Is called **optimal-SuperHyper-dominating number and X is called optimal-SuperHyper-dominating set.**

(B): Super Hyper-resolving set and number are defined as follows.
(i): A Super Vertex *x* SuperHyper-resolves SuperVertices *y, w* if

$$d(x,y) \neq d(x,w).$$

(ii): A set *S* is called SuperHyper-resolving set if for every $Y_n \in G_n \setminus S,$ There's at least one SuperVertex X_n which SuperHyper-resolves SuperVertices Y_n, W_n.
(iii): If *S* is set of all sets of SuperHyper-resolving sets, then

$$|X| = \min_{S \in \mathcal{S}} |\{\cup X_n | X_n \in S\}|$$

Is called **optimal-Super Hyper-resolving number** and *X* is called **optimal-SuperHyper-resolving set.**

(C): SuperHyper-coloring set and number are defined as follows.
(i): A SuperVertex X_n **SuperHyper-colors** a SuperVertex Yn differently with itself if there's at least one SuperHyperEdge which is incident to them.
(ii): A set S_n is called **SuperHyper-coloring** set if for every $Y_n \in G_n \setminus S_n,$ there's at least one SuperVertex X_n which SuperHyper-colors SuperVertex Y_n.
(iii): If S_n is set of all sets of SuperHyper-coloring sets, then

$$|X| = \min_{S_n \in \mathcal{S}_n} |\{\cup X_n | X_n \in S_n\}|$$

is called **optimal-SuperHyper-coloring number** and *X* is called **optimal-SuperHyper-coloring set.**

Proposition 3.2: Assume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. *S* is maximum set of SuperVertices which form a SuperHyperEdge. Then optimal-SuperHyper-coloring set has as cardinality as *S* has.

Proposition 3.3: aaAssume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. If optimal-SuperHyper-coloring number is $|V|$, then for every SuperVertex there's at least one SuperHyperEdge which contains has all members of *V*.

Proposition 3.4: Assume SuperHyperGraph SHG = (*G ⊆ P (V)*, *E ⊆ P (V)*). If there's at least one SuperHyperEdge which has all members of *V*, then optimal-SuperHyper-coloring number is $|V|$.

Proposition 3.5: Assume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. If optimal-SuperHyper-dominating number is $|V|$, then there's one member of *V*, is contained in, at least one SuperVertex which doesn't have incident to any SuperHyperEdge.

Proposition 3.6: Assume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. Then optimal-SuperHyper-dominating number is < $|V|$.

Proposition 3.7: Assume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. If optimal-SuperHyper-resolving number is |V |, then every given SuperVertex doesn't have incident to any super hyper edge.

Proposition 3.8: Assume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. Then optimal-SuperHyper-resolving number is < $|V|$.

Proposition 3.9: Assume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. If optimal-SuperHyper-coloring number is $|V|$, then all SuperVertices which have incident to at least one SuperHyperEdge.

Proposition 3.10: Assume SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))*. Then optimal-SuperHyper-coloring number isn't < $|V|$.

Proposition 3.11: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$. Then optimal-SuperHyper-dominating set has cardinality which is greater than $n - 1$ where n is the cardinality of the set V.

Proposition 3.12: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$. S is maximum set of SuperVertices which form a SuperHyperEdge. Then S is optimal-SuperHyper-coloring set and $|\{\cup Xn \mid Xn \in S\}|$ is optimal-SuperHyper-coloring number.

Proposition 3.13: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$. If S is SuperHyper-dominating set, then D contains S is SuperHyper-dominating set.

Proposition 3.14: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$. If S is SuperHyper-resolving set, then D contains S is SuperHyper-resolving set.

Proposition 3.15: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$. If S is SuperHyper-coloring set, then D contains S is SuperHyper-coloring set.

Proposition 3.16: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$. Then G_n is SuperHyper-dominating set.

Proposition 3.17: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$.Then G_n is SuperHyper-resolving set.

Proposition 3.18: Assume SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$. Then G_n is SuperHyper-coloring set.

Proposition 3.19: Assume G is a family of SuperHyperGraph. Then G_n is SuperHyper-dominating set for all members of G, simultaneously.

Proposition 3.20: Assume G is a family of SuperHyperGraph. Then G_n is SuperHyper-resolving set for all members of G, simultaneously.

Proposition 3.21: Assume G is a family of SuperHyperGraph. Then G_n is SuperHyper-coloring set for all members of G, simultaneously.

Proposition 3.22: Assume G is a family of SuperHyperGraph. Then $G_n \setminus \{X_n\}$ is SuperHyper-dominating set for all members of G, simultaneously.

Proposition 3.23: Assume G is a family of SuperHyperGraph. Then $G_n \setminus \{X_n\}$ is SuperHyper-resolving set for all members of G, simultaneously.

Proposition 3.24: Assume G is a family of SuperHyperGraph. Then $G_n \setminus \{X_n\}$ isn't SuperHyper-coloring set for all members of G, simultaneously.

Proposition 3.25: Assume G is a family of SuperHyperGraph. Then union of SuperHyper-dominating sets from each member of G is SuperHyper-dominating set for all members of G, simultaneously.

Proposition 3.26: Assume G is a family of SuperHyperGraph. Then union of SuperHyper-resolving sets from each member of G is SuperHyper-resolving set for all members of G, simultaneously.

Proposition 3.27: Assume G is a family of SuperHyperGraph. Then union of SuperHyper-coloring sets from each member of G is SuperHyper-coloring set for all members of G, simultaneously.

Proposition 3.28: Assume G is a family of SuperHyperGraph. For every given SuperVertex, there's one SuperHyperGraph such that the SuperVertex has another SuperVertex which are incident to a SuperHyperEdge. If for given SuperVertex, all SuperVertices have a common SuperHyperEdge in this way, then $G_n \setminus \{X_n\}$ is optimal-SuperHyper-dominating set for all members of G, simultaneously.

Proposition 3.29: Assume G is a family of SuperHyperGraph. For every given SuperVertex, there's one SuperHyperGraph such that the SuperVertex has another SuperVertex which are incident to a SuperHyperEdge. If for given SuperVertex, all SuperVertices have a common SuperHyperEdge in this way, then $G_n \setminus \{X_n\}$ is optimal-SuperHyper-resolving set for all members of G, simultaneously.

Proposition 3.30: Assume G is a family of SuperHyperGraph. For every given SuperVertex, there's one SuperHyperGraph such that the SuperVertex has another SuperVertex which are incident to a SuperHyperEdge. If for given SuperVertex, all SuperVertices have a common SuperHyperEdge in this way, then G_n is optimal-SuperHyper-coloring set for all members of G, simultaneously.

Proposition 3.31: Let SHG be a SuperHyperGraph. An $(k - 1)$-set from a k-set of twin SuperVertices is subset of a SuperHyper-resolving set.

Corollary 3.32: Let SHG be a SuperHyperGraph. The number of twin SuperVertices is $n - 1$. Then SuperHyper-resolving number is $n - 2$.

Corollary 3.33: Let SHG be SuperHyperGraph. The number of twin SuperVertices is $n - 1$. Then SuperHyper-resolving number is $n - 2$. Every $(n - 2)$-set including twin SuperVertices is SuperHyper-resolving set.

Proposition 3.34: Let SHG be SuperHyperGraph such that it's complete. Then SuperHyper-resolving number is $n - 1$. Every $(n - 1)$-set is SuperHyper-resolving set.

Proposition 3.35: Let G be a family of Super Hypergraphs with common super vertex set G_n. Then simultaneously SuperHyper-resolving number of G is $|V| - 1$

Proposition 3.36: Let G be a family of SuperHyperGraphs with common SuperVertex set G_n. Then simultaneously SuperHyper-resolving number of G is greater than the maximum SuperHyper-resolving number of $n\text{-}SHG \in G$.

Proposition 3.37: Let G be a family of SuperHyperGraphs with common SuperVertex set G_n. Then simultaneously SuperHyper-resolving number of G is greater than simultaneously SuperHyper-resolving number of $H \subseteq G$.

Theorem 3.38: Twin SuperVertices aren't SuperHyper-resolved in any given SuperHyperGraph.

Proposition 3.39: Let $SHG = (G \subseteq P(V), E \subseteq P(V))$ be a SuperHyperGraph. If SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$ is complete, then every couple of SuperVertices are twin SuperVertices.

Theorem 3.40: Let G be a family of SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ with SuperVertex set Gn and $n\text{-}SHG \in G$ is complete. Then simultaneously SuperHyper-resolving number is $|V| - 1$. Every $(n - 1)$-set is simultaneously SuperHyper-resolving set for G.

Corollary 3.41; Let G be a family of SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ with SuperVertex set G_n and $n\text{-}SHG$? G is complete. Then simultaneously SuperHyper-resolving number is $|V| - 1$. Every $(|V| - 1)$-set is simultaneously Super Hyper-resolving set for G.

Theorem 3.42; Let G be a family of Super Hypergraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ with Super Vertex set G_n and for every given couple of Super Vertices, there's an $n\text{-}SHG \in G$ such that in that, they're twin SuperVertices. Then simultaneously SuperHyper-resolving number is $|V| - 1$. Every $(|V| - 1)$-set is Simultaneously SuperHyper-resolving set for G.

Theorem 3.43: Let G be a family of SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ with SuperVertex set G_n. If G contains three 455 SuperHyper-stars with different SuperHyper-centers, then simultaneously SuperHyper-resolving number is $|V| - 2$. Every $(|V| - 2)$-set is simultaneously SuperHyper-resolving set for G.

Corollary 3.44; Let G be a family of SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ with SuperVertex set G_n. If G contains three SuperHyper-stars with different SuperHyper-centers, then simultaneously SuperHyper-resolving number is $|V| - 2$. Every $(|V| - 2)$-set is simultaneously SuperHyper-resolving set for G.

Proposition 3.45: Consider two antipodal SuperVertices X_n and Y_n in any given even SuperHyper-cycle. Let U_n and V_n be given SuperVertices. Then $d(X_n,U_n)$ 6= $d(X_n,V_n)$ if and only if $d(Y_n,U_n)$ 6= $d(Y_n,V_n)$.

Proposition 3.46; Consider two antipodal SuperVertices X_n and Y_n in any given even cycle. Let U_n and V_n be given SuperVertices. Then $d(X_n,U_n) = d(X_n,V_n)$ if and only if $d(Y_n,U_n) = d(Y_n,V_n)$.

Proposition 3.47; the set contains two antipodal SuperVertices, isn't SuperHyper-resolving set in any given even SuperHyper-cycle.

Proposition 3.48; Consider two antipodal SuperVertices X_n and Y_n in any given even SuperHyper-cycle. X_n SuperHyper-resolves a given couple of SuperVertices, Z_n and Z_n^0, if and only if Yn does.

Proposition 3.49: there are two antipodal SuperVertices aren't SuperHyper-resolved by other two antipodal SuperVertices in any given even SuperHyper-cycle.

Proposition 3.50: For any two antipodal SuperVertices in any given even SuperHyper-cycle, there are only two antipodal SuperVertices don't SuperHyper-resolve them.

Proposition 3.51: In any given even SuperHyper-cycle, for any SuperVertex, there's only one SuperVertex such that they're antipodal SuperVertices.

Proposition 3.52: Let SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ be an even SuperHyper-cycle. Then every couple of SuperVertices are SuperHyper-resolving set if and only if they aren't antipodal SuperVertices.

Corollary 3.53: Let SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ be an even SuperHyper-cycle. Then SuperHyper-resolving number is two.

Corollary 3.54: Let SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ be an even SuperHyper-cycle. Then SuperHyper-resolving set contains couple of SuperVertices such that they aren't antipodal SuperVertices.

Corollary 3.55: Let $\mathcal{G}$ be a family SuperHyperGraphs $SHG = (G \subseteq P(V), E \subseteq P(V))$ be an odd SuperHyper-cycle with common SuperVertex set G_n. Then simultaneously super hyper-resolving set contains couple of SuperVertices such that they aren't antipodal SuperVertices and SuperHyper-resolving number is two.

Proposition 3.56: In any given Super Hypergraph $SHG = (G \subseteq P(V), E \subseteq P(V))$ which is odd SuperHyper-cycle, for any SuperVertex, there's no SuperVertex such that they're antipodal super vertices.

Proposition 3.57; Let Super Hypergraph $SHG = (G \subseteq P(V), E \subseteq P(V))$ be an odd SuperHyper-cycle. Then every couple of SuperVertices are SuperHyper-resolving set.

Proposition 3.58: Let SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$ be an odd Cycle. Then SuperHyper-resolving number is two.

Corollary 3.59: Let SuperHyperGraph $SHG = (G \subseteq P(V), E \subseteq P(V))$ be an odd cycle. Then SuperHyper-resolving set contains couple of SuperVertices.

Corollary 3.60: Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* which are odd SuperHyper-cycles with common SuperVertex set G_n. Then simultaneously SuperHyper-resolving set contains couple of SuperVertices and SuperHyper-resolving number is two.

Proposition 3.61: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-path. Then every SuperHyper-leaf forms SuperHyper-resolving set.

Proposition 3.62: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-path. Then a set including every couple of SuperVertices is SuperHyper-resolving set.

Proposition 3.63: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-path. Then a 1-set contains leaf is SuperHyper-resolving set and SuperHyper-resolving number is one.

Corollary 3.64; Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* are SuperHyper-paths with common SuperVertex set G_n such that they've a common SuperHyper-leaf. Then simultaneously SuperHyper-resolving number is 1, 1-set contains common leaf, is simultaneously SuperHyper-resolving set for G.

Proposition 3.65: Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* are SuperHyper-paths with common SuperVertex sent such that for every SuperHyper-leaf Ln from *n-SHG*, there's another *n-SHG* ∈ G such n that Ln isn't SuperHyper-leaf. Then a 2-set contains every couple of SuperVertices, is SuperHyper-resolving set. A_n 2-set contains every couple of SuperVertices, is optimal-SuperHyper-resolving set. Optimal-SuperHyper-resolving number is two.

Corollary 3.66: Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* are SuperHyper-paths with common SuperVertex set Gn such that they've no common SuperHyper-leaf. Then an 2-set is simultaneously optimal-SuperHyper-resolving set and simultaneously optimal-SuperHyper-resolving number is 2.

Proposition 3.67: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-t-partite. Then every set excluding couple of SuperVertices in different parts whose cardinalities of them are strictly greater than one, is optimal-SuperHyper-resolving set.

Corollary 3.68: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-t-partite. Let $|V| \geq 3$. Then every $(|V| - 2)$-set excludes two SuperVertices 536 from different parts whose cardinalities of them are strictly greater than one, is optimal-SuperHyper-resolving set and optimal-SuperHyper-resolving number is.

Corollary 3.69: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-bipartite. Let $|V| \geq 3$. Then every $(|V| - 2)$-set excludes two SuperVertices from different parts, is optimal-SuperHyper-resolving set and optimal-SuperHyper-resolving number is $|V| - 2$.

Corollary 3.70: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-star. Then every $(|V| - 2)$-set excludes SuperHyper-center and a given SuperVertex, is optimal-SuperHyper-resolving set and optimal-SuperHyper-resolving number is $(|V| - 2)$.

Corollary 3.71: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-wheel. Let $|V| \geq 3$. Then every $(|V| - 2)$-set excludes SuperHyper-center and a given SuperVertex, is optimal-SuperHyper-resolving set and optimal-SuperHyper-resolving number is $|V| - 2$.

Corollary 3.72: Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* which are SuperHyper-t-partite with common SuperVertex set Gn. Let $|V| \geq 3$. Then simultaneously optimal SuperHyper-resolving number is $|V| - 2$ and every $(|V| - 2)$-set excludes two SuperVertices from different parts, is simultaneously optimal-SuperHyper-resolving set for G.

Corollary 3.73: Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* which are SuperHyper-bipartite with common SuperVertex set G_n. Let $|V| \geq 3$. Then simultaneously optimal-SuperHyper-resolving number is $|V| - 2$ and every $(|V| - 2)$-set excludes two SuperVertices from different parts, is simultaneously optimal-SuperHyper-resolving set for G.

Corollary 3.74: Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* which are SuperHyper-star with common SuperVertex set G_n. Let $|V| \geq 3$. Then simultaneously optimal-SuperHyper-resolving number is $|V| - 2$ and every $(|V| - 2)$-set excludes SuperHyper-center and a given SuperVertex, is simultaneously optimal-SuperHyper-resolving set for G.

Corollary 3.75: Let G be a family of SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* which are SuperHyper-wheel with common SuperVertex set G_n. Let $|V| \geq 3$. Then simultaneously optimal-SuperHyper-resolving number is $|V| - 2$ and every $(|V| - 2)$-set excludes SuperHyper-center and a given SuperVertex, is simultaneously optimal-SuperHyper-resolving set for G.

Proposition 3.76: Let SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-complete. Then optimal-SuperHyper-coloring number is $|V|$.

Proposition 3.77: Let SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-path. Then optimal-SuperHyper-coloring number is two.

Proposition 3.78: Let SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* be an even SuperHyper-cycle. Then optimal-SuperHyper-coloring number is two.

Proposition 3.79: Let SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* be an odd SuperHyper-cycle. Then optimal-SuperHyper-coloring number is three.

Proposition 3.80: Let SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-star. Then optimal-SuperHyper-coloring number is two.

Proposition 3.81: Let SuperHyperGraphs *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-wheel such that it has even SuperHyper-cycle. Then optimal-SuperHyper-coloring number is Three.

Proposition 3.82: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-wheel such that it has odd SuperHyper-cycle. Then optimal-SuperHyper-coloring number is four.

Proposition 3.83: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-complete and SuperHyper-bipartite. Then optimal-SuperHyper-coloring number is two.

Proposition 3.84: Let SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* be a SuperHyper-complete and SuperHyper-t-partite. Then optimal-SuperHyper-coloring number is t.

Proposition 3.85: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be SuperHyperGraph. Then optimal-SuperHyper-coloring number is 1 if and only if *SHG = (G ⊆ P (V), E* □ *P (V))* is SuperHyper-empty.

Proposition 3.86: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be SuperHyperGraph. Then optimal-SuperHyper-coloring number is 2 if and only if *SHG = (G ⊆ P (V), E ⊆ P (V)* is both SuperHyper-complete and SuperHyper-bipartite.

Proposition 3.87: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be SuperHyperGraph. Then optimal-SuperHyper-coloring number is $|V|$ if and only if *SHG = (G ⊆ P (V), E ⊆ P (V))* is SuperHyper-complete.

Proposition 3.88: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be SuperHyperGraph. Then optimal-SuperHyper-coloring number is obtained from the number of SuperVertices which is $|G_n|$ and optimal-SuperHypercoloring number is at most $|V|$.

Proposition 3.89: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be SuperHyperGraph. Then optimal-SuperHyper-coloring number is at most $\Delta + 1$ and at least 2.

Proposition 3.90: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be SuperHyperGraph and SuperHyper-r-regular. Then optimal-SuperHyper-coloring number is at most $r + 1$.

Definition 3.91: (Eulerian (Hamiltonian) Neutrosophic Path). Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then.

(i) **Eulerian(Hamiltonian) neutrosophic path** $M_e(SHG)$ $(M_h(SHG))$ for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P(V),E ⊆ P(V))* is a sequence of consecutive edges(vertices) $x_1,x_2,\cdots,x_S(SHG)(x_1,x_2,\cdots,x_O(SHG))$ which is neutrosophic path;

(ii) n-Eulerian(Hamiltonian) neutrosophic path $N_e(SHG)$ $(N_h(SHG))$ for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P(V),E ⊆ P(V))* is the number of sequences of consecutive edges(vertices) $x_1,x_2,\cdots,x_S(SHG)(x_1,x_2,\cdots,x_O(SHG))$ which is neutrosophic path.

Proposition 3.92: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-neutrosophic super hyper graph with two weakest edges. Then

$$\mathcal{M}_e(CMT_\sigma) : \textit{Not Existed;}$$

$$\mathcal{M}_h(CMT_\sigma) : v_{\tau(1)}, v_{\tau(2)}, \cdots, v_{\tau(\mathcal{O}(CMT_\sigma)-1)}, v_{\tau(\mathcal{O}(CMT_\sigma))}$$

Where τ is a permutation on $O\ (CMT_\sigma)$.

$$\mathcal{N}_e(CMT_\sigma) = 0;$$

$$\mathcal{N}_h(CMT_\sigma) = \mathcal{O}(CMT_\sigma)!.$$

Proposition 3.93: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a path-neutrosophic Super hyper graph. Then

$$\mathcal{M}_e(PTH) : v_1, v_2, \cdots, v_{\mathcal{S}(PTH)};$$

$$\mathcal{M}_h(PTH) : v_1, v_2, \cdots, v_{\mathcal{O}(PTH)}.$$

$$\mathcal{N}_e(PTH) = 1;$$

$$\mathcal{N}_h(PTH) = 1.$$

Proposition 3.94: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a cycle-neutrosophic SuperHyperGraph where $O\ (CYC) \geq 3$. Then

$$\mathcal{M}_e(CYC) : \textit{Not Existed};$$

$$\mathcal{M}_h(CYC) : x_i, x_{i+1}, \cdots, x_{\mathcal{O}(CYC)-1}, x_{\mathcal{O}(CYC)}, \cdots, x_{i-1}.$$

$$\mathcal{N}_e(CYC) = 0;$$

$$\mathcal{N}_h(CYC) = \mathcal{O}(CYC).$$

Proposition 3.95: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a star-neutrosophic SuperHyperGraph with center c. Then

$$\mathcal{M}_e(STR_{1,\sigma_2}) : v_1, v_2$$

$$\mathcal{M}_h(STR_{1,\sigma_2}) : v_1, c, v_2$$

$$\textit{where } \mathcal{O}(STR_{1,\sigma_2}) \leq 2;$$

$$\mathcal{M}_e(STR_{1,\sigma_2}) : \textit{Not Existed}$$

$$\mathcal{M}_h(STR_{1,\sigma_2}) : \textit{Not Existed}$$

$$\textit{where } \mathcal{O}(STR_{1,\sigma_2}) \geq 3.$$

$$\mathcal{N}_e(STR_{1,\sigma_2}) = 2$$

$$\mathcal{N}_h(STR_{1,\sigma_2}) = 3$$

$$\textit{where } \mathcal{O}(STR_{1,\sigma_2}) \leq 2;$$

$$\mathcal{N}_e(STR_{1,\sigma_2}) = 0$$

$$\mathcal{N}_h(STR_{1,\sigma_2}) = 0$$

$$\textit{where } \mathcal{O}(STR_{1,\sigma_2}) \geq 3.$$

Proposition 3.96: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be acomplete-bipartite-neutrosophic SuperHyperGraph. Then

$$\mathcal{M}_e(CMC_{\sigma_1,\sigma_2}) : Not\ Existed$$

$$\mathcal{M}_h(CMC_{\sigma_1,\sigma_2}) : v_1, v_2, \cdots, v_{\mathcal{O}(CMC_{\sigma_1,\sigma_2})-1}, v_{\mathcal{O}(CMC_{\sigma_1,\sigma_2})}$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2}) \geq 3,\ |V_1| = |V_2|,\ v_{2i+1} \in V_1,\ v_{2i} \in V_2;$

$$\mathcal{M}_e(CMC_{\sigma_1,\sigma_2}) : v_1v_2$$

$$\mathcal{M}_h(CMC_{\sigma_1,\sigma_2}) : v_1, v_2$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2}) = 2;$

$$\mathcal{M}_e(CMC_{\sigma_1,\sigma_2}) : -$$

$$\mathcal{M}_h(CMC_{\sigma_1,\sigma_2}) : v_1$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2}) = 1.$

$$\mathcal{N}_e(CMC_{\sigma_1,\sigma_2}) = 0$$

$$\mathcal{N}_h(CMC_{\sigma_1,\sigma_2}) = c$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2}) \geq 3,\ |V_1| = |V_2|,\ v_{2i+1} \in V_1,\ v_{2i} \in V_2;$

$$\mathcal{N}_e(CMC_{\sigma_1,\sigma_2}) = 2$$

$$\mathcal{N}_h(CMC_{\sigma_1,\sigma_2}) = 2$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2}) = 2;$

$$\mathcal{N}_e(CMC_{\sigma_1,\sigma_2}) = -$$

$$\mathcal{N}_h(CMC_{\sigma_1,\sigma_2}) = 1$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2}) = 1.$

Proposition 3.97: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-t-partite-neutrosophic SuperHyperGraph. Then

$$\mathcal{M}_e(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) : Not\ Existed$$

$$\mathcal{M}_h(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) : v_1, v_2, \cdots, v_{\mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t})-1}, v_{\mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t})}$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) \geq 3,\ |V_i| = |V_j|,\ v_{2i+1} \in V_i,\ v_{2i} \in V_j;$

$$\mathcal{M}_e(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) : v_1v_2$$

$$\mathcal{M}_h(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) : v_1, v_2$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 2;$

$$\mathcal{M}_e(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) : -$$

$$\mathcal{M}_h(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) : v_1$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 1.$

$$\mathcal{N}_e(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 0$$

$$\mathcal{N}_h(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = c$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) \geq 3,\ |V_i| = |V_j|,\ v_{2i+1} \in V_i,\ v_{2i} \in V_j;$

$$\mathcal{N}_e(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 2$$

$$\mathcal{N}_h(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 2$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 2;$

$$\mathcal{N}_e(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = -$$

$$\mathcal{N}_h(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 1$$

$where\ \mathcal{O}(CMC_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = 1.$

Proposition 3.98: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a wheel-neutrosophic SuperHyperGraph. Then

$$\mathcal{M}_h(WHL_{1,\sigma_2}) : x_i, x_{i+1}, \cdots, x_{\mathcal{O}(WHL_{1,\sigma_2})-1}, x_{\mathcal{O}(WHL_{1,\sigma_2})}, x_{i-1}.$$

$$\mathcal{M}_e(WHL_{1,\sigma_2}) : v_1, v_2, v_3$$

$where\ \mathcal{S}(WHL_{1,\sigma_2}) = 3.$

$$\mathcal{M}_h(WHL_{1,\sigma_2}) : x_i, x_{i+1}, \cdots, x_{\mathcal{O}(WHL_{1,\sigma_2})-1}, x_{\mathcal{O}(WHL_{1,\sigma_2})}, x_{i-1}.$$

$$\mathcal{M}_e(WHL_{1,\sigma_2}) : Not\ Existed$$

$where\ \mathcal{S}(WHL_{1,\sigma_2}) > 3.$

$$\mathcal{N}_h(WHL_{1,\sigma_2}) = \mathcal{O}(WHL_{1,\sigma_2});$$

$$\mathcal{N}_e(WHL_{1,\sigma_2}) = 3;$$

$where\ \mathcal{S}(WHL_{1,\sigma_2}) = 3.$

$$\mathcal{N}_h(WHL_{1,\sigma_2}) = \mathcal{O}(WHL_{1,\sigma_2});$$

$$\mathcal{N}_e(WHL_{1,\sigma_2}) = 0;$$

$where\ \mathcal{S}(WHL_{1,\sigma_2}) > 3.$

Neutrosophic Super Hypergraph

Definition 4.1: (Zero Forcing Number). 628 Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) zero forcing number *Z(SHG)* for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P(V),E ⊆ P(V))* is minimum cardinality of a set *S* of black vertices (whereas vertices in *V (G) \ S* are colored white) such that *V (G)* is turned black after finitely many applications of “the color-change rule”: a white vertex is converted to a black vertex if it is the only white neighbor of a black vertex;

(ii) zero forcing neutrosophic-number Z_n (*SHG*) for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is minimum neutrosophic cardinality of a set S of black vertices (whereas vertices in *V (G) \ S* are colored white) such that *V (G)* is turned black after finitely many applications of “the color-change rule”: a white vertex is converted to a black vertex if it is the only white neighbor of a black vertex.

Definition 4.2: (Independent Number). Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) Independent number *I (SHG)* for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is maximum cardinality of a set *S* of vertices Such that every two vertices of S aren’t endpoints for an edge, simultaneously;

(ii) Independent neutrosophic-number In (*SHG*) for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is maximum neutrosophic cardinality of a set *S* of vertices such that every two vertices of *S* aren’t endpoints for an edge, simultaneously.

Definition 4.3: (Clique Number). Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) Clique number *C* (*SHG*) for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is maximum cardinality of a set *S* of vertices such that every two vertices of *S* are endpoints for

an edge, simultaneously;
(ii) Clique neutrosophic-number C_n *SHG)* for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is maximum neutrosophic cardinality of a set S of vertices such that every two vertices of S are endpoints for an edge, simultaneously.

Definition 4.4: (Matching Number). Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) matching number *M(SHG)* for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P(V),E ⊆ P(V))* is maximum cardinality of a set *S* of edges such that every two edges of *S* don't have any vertex in common;
(ii) Matching neutrosophic-number M_n *(SHG)* for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is maximum neutrosophic cardinality of a set *S* of edges such that every two edges of *S* don't have any vertex in common.

Definition 4.5: (Girth and Neutrosophic Girth). Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) Girth *G (SHG)* for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is minimum crisp cardinality of vertices forming shortest cycle. If there isn't, then girth is ∞;
(ii) Neutrosophic girth G_n (*SHG*) for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is minimum neutrosophic cardinality of vertices forming shortest cycle. If there isn't, then girth is ∞.
(iii) Neutrosophic girth G_n (*SHG*) for a neutrosophic Super Hypergraph *SHG = (G ⊆ P (V), E ⊆ P (V))* is minimum neutrosophic cardinality of vertices forming shortest cycle. If there isn't, then girth is ∞.

Proposition 4.6: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-neutrosophic SuperHyperGraph. Then

1. $\mathcal{Z}(CMT_\sigma) = \mathcal{O}(CMT_\sigma) - 1.$
2. $\mathcal{I}(SHG) = 1.$
3. $\mathcal{C}(SHG) = \mathcal{O}(SHG).$
4. $\mathcal{M}(SHG) = \lfloor \frac{n}{2} \rfloor.$
5. $\mathcal{G}(SHG) = 3.$

Proposition 4.7: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a path-neutrosophic SuperHyperGraph. Then

1. $\mathcal{Z}(PTH_n) = 1.$
2. $\mathcal{I}(SHG) = \lceil \frac{\mathcal{O}(SHG)}{2} \rceil.$
3. $\mathcal{C}(SHG) = 2.$
4. $\mathcal{M}(SHG) = \lfloor \frac{n}{2} \rfloor.$
5. $\mathcal{G}(SHG) = \infty.$

Proposition 4.8: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a cycle-neutrosophic SuperHyperGraph where *O (CY C)* ≥ 3. Then

1. $\mathcal{Z}(CYC_n) = 2.$
2. $\mathcal{I}(SHG) = \lfloor \frac{\mathcal{O}(SHG)}{2} \rfloor.$
3. $\mathcal{C}(SHG) = 2.$
4. $\mathcal{M}(SHG) = \lfloor \frac{n}{2} \rfloor.$
5. $\mathcal{G}(SHG) = \mathcal{O}(SHG).$

Proposition 4.9: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a star-neutrosophic SuperHyperGraph with center c. Then

1. $\mathcal{Z}(STR_{1,\sigma_2}) = \mathcal{O}(STR_{1,\sigma_2}) - 2.$
2. $\mathcal{I}(SHG) = \mathcal{O}(SHG) - 1.$
3. $\mathcal{C}(SHG) = 2.$
4. $\mathcal{M}(SHG) = 1.$
5. $\mathcal{G}(SHG) = \infty.$

Proposition 4.10: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-bipartite-neutrosophic SuperHyperGraph. Then 684

1. $\mathcal{Z}(CMT_{\sigma_1,\sigma_2}) = \mathcal{O}(CMT_{\sigma_1,\sigma_2}) - 2.$
2. $\mathcal{I}(SHG) = \max\{|V_1|, |V_2|\}.$
3. $\mathcal{C}(SHG) = 2.$
4. $\mathcal{M}(SHG) = \min\{|V_1|, |V_2|\}.$
5. $\mathcal{G}(SHG) = 4$

where $\mathcal{O}(SHG) \geq 4$. *And*

$$\mathcal{G}(SHG) = \infty$$

where $\mathcal{O}(SHG) \leq 3$.

Proposition 4.11: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-t-partite-neutrosophic SuperHyperGraph. Then 687

1. $\mathcal{Z}(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = \mathcal{O}(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) - 1.$

2. $$\mathcal{I}(SHG) = \max\{|V_1|, |V_2|, \cdots, |V_t|\}.$$

3. $$\mathcal{C}(SHG) = t.$$

4. $$\mathcal{M}(SHG) = \min |V_i|_{i=1}^{t}.$$

5. $$\mathcal{G}(SHG) = 3$$

where $t \geq 3$.
$$\mathcal{G}(SHG) = 4$$
where $t \leq 2$. And
$$\mathcal{G}(SHG) = \infty$$
where $\mathcal{O}(SHG) \leq 2$.

Proposition 4.12: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-neutrosophic 690 SuperHyperGraph. Then

1. $\mathcal{Z}_n(CMT_\sigma) = \mathcal{O}_n(CMT_\sigma) - \max\{\Sigma_{i=1}^{3}\sigma_i(x)\}_{x\in V}.$

2. $$\mathcal{I}_n(SHG) = \max\{\sum_{i=1}^{3}\sigma_i(x)\}_{x\in V}.$$

3. $$\mathcal{C}_n(SHG) = \mathcal{O}_n(SHG).$$

4. $$\mathcal{M}_n(SHG) = \max\{\sum_{i=1}^{3}\mu_i(x_0x_1) + \sum_{i=1}^{3}\mu_i(x_1x_2) + \cdots + \sum_{i=1}^{3}\mu_i(x_{j-1}x_j)\}_{j=\lfloor\frac{n}{2}\rfloor}.$$

5. $\mathcal{G}_n(SHG) = \min\{\Sigma_{i=1}^{3}(\sigma_i(x) + \sigma_i(y) + \sigma_i(z))\}.$

Proposition 4.13: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a path-neutrosophic 692 SuperHyperGraph. Then

1. $$\mathcal{Z}_n(PTH_n) = \min\{\Sigma_{i=1}^{3}\sigma_i(x)\}_{x \text{ is a leaf}}.$$

2. $$\mathcal{I}_n(SHG) = \max\{\sum_{i=1}^{3}(\sigma_i(x_1) + \sigma_i(x_3) + \cdots + \sigma_i(x_t)), \sum_{i=1}^{3}\sigma_i(x_2) + \sigma_i(x_4) + \cdots + \sigma_i(x_t'))\}_{x_ix_{i+1}\in E}.$$

3. $$\mathcal{C}_n(SHG) = \max\{\sum_{i=1}^{3}(\sigma_i(x_j) + \sigma_i(x_{j+1}))\}_{x_jx_{j+1}\in E}.$$

4. $$\mathcal{M}_n(SHG) = \max\{\sum_{i=1}^{3}\mu_i(x_0x_1) + \sum_{i=1}^{3}\mu_i(x_2x_3) + \cdots + \sum_{i=1}^{3}\mu_i(x_{j-1}x_j)\}_{|S|=\lfloor\frac{n}{2}\rfloor}.$$

5. $$\mathcal{G}_n(SHG) = \infty.$$

Proposition 4.14: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a cycle-neutrosophic 694 SuperHyperGraph where *O (CY C)* ≥ 3. Then

1. $$\mathcal{Z}_n(CYC_n) = \min\{\Sigma_{i=1}^{3}\sigma_i(x) + \Sigma_{i=1}^{3}\sigma_i(y)\}_{xy\in E.}.$$

2. $$\mathcal{I}_n(SHG) = \max\{\sum_{i=1}^{3}(\sigma_i(x_1) + \sigma_i(x_3) + \cdots + \sigma_i(x_t)) \sum_{i=1}^{3}\sigma_i(x_2) + \sigma_i(x_4) + \cdots + \sigma_i(x_t'))\}_{x_ix_{i+1}\in E}.$$

3. $$\mathcal{C}_n(SHG) = \max\{\sum_{i=1}^{3}(\sigma_i(x_j) + \sigma_i(x_{j+1}))\}_{x_jx_{j+1}\in E}.$$

4. $$\mathcal{M}_n(SHG) = \max\{\sum_{i=1}^{3}\mu_i(x_0x_1) + \sum_{i=1}^{3}\mu_i(x_2x_3) + \cdots + \sum_{i=1}^{3}\mu_i(x_{j-1}x_j)\}_{|S|=\lfloor\frac{n}{2}\rfloor}.$$

5. $$\mathcal{G}_n(SHG) = \mathcal{O}_n(SHG).$$

Proposition 4.15: Let *SHG = (G ⊆ P(V);E ⊆ P(V))* be a star-neutrosophic 696 SuperHyperGraph with center *c*: Then

1. $\mathcal{Z}_n(STR_{1,\sigma_2}) = \mathcal{O}_n(STR_{1,\sigma_2}) - \max\{\Sigma_{i=1}^{3}\sigma_i(c) + \Sigma_{i=1}^{3}\sigma_i(x)\}_{x\in V}.$

2. $$\mathcal{I}_n(SHG) = \mathcal{O}_n(SHG) - \sigma(c) = \sum_{i=1}^{3}\sum_{x_j\neq c}\sigma_i(x_j).$$

3. $$\mathcal{C}_n(SHG) = \sum_{i=1}^{3}\sigma_i(c) + \max\{\sum_{i=1}^{3}\sigma_i(x_j)\}.$$

4. $$\mathcal{M}_n(SHG) = \max\{\sum_{i=1}^{3}\mu_i(x_{j-1}x_j)\}_{x_{j-1}x_j\in E}.$$

5. $$\mathcal{G}_n(SHG) = \infty.$$

Proposition 4.16: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-bipartite-neutrosophic SuperHyperGraph. The

1.
$$\mathcal{Z}_n(CMT_{\sigma_1,\sigma_2}) = \mathcal{O}_n(CMT_{\sigma_1,\sigma_2}) - \max\{\Sigma_{i=1}^3 \sigma_i(x) + \Sigma_{i=1}^3 \sigma_i(x')\}_{x,x' \in V}.$$

2.
$$\mathcal{I}_n(SHG) = \max\{(\sum_{i=1}^3 \sum_{x_j \in V_1} \sigma_i(x_j)), (\sum_{i=1}^3 \sum_{x_j \in V_2} \sigma_i(x_j))\}.$$

3.
$$\mathcal{C}_n(SHG) = \max\{\sum_{i=1}^3 (\sigma_i(x_j) + \sigma_i(x_{j'}))\}_{x_j \in V_1,\ x_{j'} \in V_2}.$$

4.
$$\mathcal{M}_n(SHG) = \max\{\sum_{i=1}^3 \mu_i(x_0x_1) + \sum_{i=1}^3 \mu_i(x_2x_3) + \cdots + \sum_{i=1}^3 \mu_i(x_{j-1}x_j)\}_{|S|=\min\{|V_1|,|V_2|\}}.$$

5.
$$\mathcal{G}_n(SHG) = \min\{\Sigma_{i=1}^3 (\sigma_i(x) + \sigma_i(y) + \sigma_i(z) + \sigma_i(w))\}_{x,y \in V_1,\ z,w \in V_2}.$$

where $\mathcal{O}(SHG) \geq 4$ *and* $\min\{|V_1|, |V_2|\} \geq 2$. *Also,*

$$\mathcal{G}_n(SHG) = \infty$$

where $\mathcal{O}(SHG) \leq 3$.

Proposition 4.17: Be a complete-t-partite-neutrosophic SuperHyperGraph. Then

1.
$$\mathcal{Z}_n(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = \mathcal{O}_n(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) - \max\{\Sigma_{i=1}^3 \sigma_i(x)\}_{x \in V}.$$

2.
$$\mathcal{I}_n(SHG) = \max\{(\sum_{i=1}^3 \sum_{x_j \in V_1} \sigma_i(x_j)), (\sum_{i=1}^3 \sum_{x_j \in V_2} \sigma_i(x_j)), \cdots,$$
$$(\sum_{i=1}^3 \sum_{x_j \in V_t} \sigma_i(x_j))\}.$$

3.
$$\mathcal{C}_n(SHG) = \max\{\sum_{i=1}^3 (\sigma_i(x_{j_1}) + \sigma_i(x_{j_2}) + \cdots + \sigma_i(x_{j_t}))\}_{x_{j_1} \in V_1, x_{j_2} \in V_2, \cdots,\ x_{j_t} \in V_t}.$$

4.
$$\mathcal{M}_n(SHG) = \max\{\sum_{i=1}^3 \mu_i(x_0x_1) + \sum_{i=1}^3 \mu_i(x_2x_3) + \cdots + \sum_{i=1}^3 \mu_i(x_{j-1}x_j)\}_{|S|=\min |V_i|_{i=1}^t\}}.$$

5.
$$\mathcal{G}_n(SHG) = \min\{\Sigma_{i=1}^3 (\sigma_i(x) + \sigma_i(y) + \sigma_i(z))\}_{x \in V_1,\ y \in V_2,\ z \in V_3}.$$

where $t \geq 3$.

$$\mathcal{G}_n(SHG) = \min\{\Sigma_{i=1}^3 (\sigma_i(x) + \sigma_i(y) + \sigma_i(z) + \sigma_i(w))\}_{x,y \in V_1,\ z,w \in V_2}.$$

where $t \leq 2$. *And*

$$\mathcal{G}_n(SHG) = \infty$$

where $\mathcal{O}(SHG) \leq 2$.

Definition 4.18: (1-Zero-Forcing Number). Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) 1-zero-forcing number *Z(SHG)* for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P(V),E ⊆ P(V))* is minimum cardinality of a set *S* of black vertices (whereas vertices in *V (G) \ S* are colored white) such that *V (G)* is turned black after finitely many applications of "the color-change rule": a white vertex is converted to a black vertex if it is the only white neighbor of a black vertex. The last condition is as follows. For one time, black can change any vertex from white to black.
(ii) 1-zero-forcing neutrosophic-number $Z_n(SHG)$ for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P(V),E ⊆ P(V))* is minimum neutrosophic cardinality of a set *S* of black vertices (whereas vertices in *V (G) \ S* are colored white) such that *V* (*G*) is turned black after finitely many applications of "the color-change rule": a white vertex is converted to a black vertex if it is the only white neighbor of a black vertex. The last condition is as follows. For one time, black can change any vertex from white to black.

Definition 4.19: (Failed 1-Zero-Forcing Number). Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) ***Failed 1-zero-forcing number*** Z^0 (SHG) for a neutrosophic SuperHyperGraph *SHG = (G □ P (V), E □ P (V))* is maximum cardinality of a set S of black Vertices (whereas vertices in *V (G)* \ S are colored white) such that V (G) isn't Turned black after finitely many applications of "the color-change rule": a white. Vertex is converted to a black vertex if it is the only white neighbor of a black Vertex. The last condition is as follows. For one time, Black can change any vertex from white to black. The last condition is as follows. For one time, black can Change any vertex from white to black;
(Ii) failed 1-zero-forcing neutrosophic-number) for a neutrosophic SuperHyperGraph *SHG = (G ⊆ P (V),E ⊆ P(V))* is maximum neutrosophic Cardinality of a set S of black vertices (whereas vertices in *V (G)* \ S are colored White) such that V (G) isn't turned black after finitely many applications of "the color-change rule": a white vertex is converted to a black vertex if it is the only white neighbor of a black vertex. The last condition is as follows. For one time, Black can change any vertex from white to black. The last condition is as follows. For one time, black can change any vertex from white to black.

Proposition 4.20: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}(CMT_{\sigma}) = \mathcal{O}(CMT_{\sigma}) - 2.$$

Proposition 4.21: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a path-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}(PTH_n) = 1.$$

Proposition 4.22: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a cycle-neutrosophic SuperHyperGraph where *O (CY C)* ≥ 3. Then

$$\mathcal{Z}(CYC_n) = 1.$$

Proposition 4.23: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a star-neutrosophic SuperHyperGraph with center c. Then

$$\mathcal{Z}(STR_{1,\sigma_2}) = \mathcal{O}(STR_{1,\sigma_2}) - 3.$$

Proposition 4.24: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-bipartite-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}(CMT_{\sigma_1,\sigma_2}) = \mathcal{O}(CMT_{\sigma_1,\sigma_2}) - 3.$$

Proposition 4.25: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-t-partite-neutrosophic SuperHyperGraph. Then

$$MT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = \mathcal{O}(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) - 2.$$

Setting of 1-Zero-Forcing Neutrosophic-Number

Proposition 4.26: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-neutrosophic SuperHyperGraph. Then.

$$\mathcal{Z}_n(CMT_{\sigma}) = \mathcal{O}_n(CMT_{\sigma}) - \max\{\Sigma_{i=1}^{3}\sigma_i(x) + \Sigma_{i=1}^{3}\sigma_i(y)\}_{x,y\in V}.$$

Proposition 4.27: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a path-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}_n(PTH_n) = \min\{\Sigma_{i=1}^{3}\sigma_i(x)\}_{x \text{ is a vertex}}.$$

Proposition 4.28: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a cycle-neutrosophic SuperHyperGraph where *O (CY C)* ≥ 3. Then

$$\mathcal{Z}_n(CYC_n) = \min\{\Sigma_{i=1}^{3}\sigma_i(x)\}_{x \text{ is a vertex}}.$$

Proposition 4.29: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a star-neutrosophic SuperHyperGraph with center c. Then

$$\mathcal{Z}_n(STR_{1,\sigma_2}) = \mathcal{O}_n(STR_{1,\sigma_2}) - \max\{\Sigma_{i=1}^{3}\sigma_i(c) + \Sigma_{i=1}^{3}\sigma_i(x) + \Sigma_{i=1}^{3}\sigma_i(y)\}_{x,y\in V}.$$

Proposition 4.30: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a Complete-bipartite-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}_n(CMT_{\sigma_1,\sigma_2}) = \mathcal{O}_n(CMT_{\sigma_1,\sigma_2}) - \max\{\Sigma_{i=1}^{3}\sigma_i(x) + \Sigma_{i=1}^{3}\sigma_i(x') + \Sigma_{i=1}^{3}\sigma_i(x'')\}_{x,x',x''\in V}.$$

Proposition 4.31: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a Complete-t-partite-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}_n(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = \mathcal{O}_n(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) - \max\{\Sigma_{i=1}^{3}\sigma_i(x) + \Sigma_{i=1}^{3}\sigma_i(x')\}_{x,x'\in V}.$$

Setting of Neutrosophic Failed 1-Zero-Forcing Number

Proposition 4.32: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}'(CMT_{\sigma}) = \mathcal{O}(CMT_{\sigma}) - 3.$$

Proposition 4.33: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a path-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}'(PTH_n) = 0.$$

Proposition 4.34: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a cycle-neutrosophic SuperHyperGraph where *O (CY C)* ≥ 3.

$$\mathcal{Z}'(CYC_n) = 0.$$

Proposition 4.35: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a star-neutrosophic SuperHyperGraph with center c. Then

$$\mathcal{Z}'(STR_{1,\sigma_2}) = \mathcal{O}(STR_{1,\sigma_2}) - 4.$$

Proposition 4.36: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-bipartite-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}'(CMT_{\sigma_1,\sigma_2}) = \mathcal{O}(CMT_{\sigma_1,\sigma_2}) - 4.$$

Proposition 4.37: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-t-partite-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}'(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = \mathcal{O}(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) - 3.$$

Setting of Failed 1-Zero-Forcing Neutrosophic-Number

Proposition 4.38: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}'_n(CMT_\sigma) = \mathcal{O}_n(CMT_\sigma) - \min\{\Sigma_{i=1}^3\sigma_i(x) + \Sigma_{i=1}^3\sigma_i(y) + \Sigma_{i=1}^3\sigma_i(z)\}_{x,y,z\in V}.$$

Proposition 4.39: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a path-neutrosophic SuperHyperGraph. Then.

$$\mathcal{Z}'_n(PTH_n) = 0.$$

Proposition 4.40: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a cycle-neutrosophic SuperHyperGraph where *O (CY C)* ≥ 3. Then

$$\mathcal{Z}'_n(CYC_n) = 0$$

Proposition 4.41: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a star-neutrosophic SuperHyperGraph with center *c*. Then

$$\mathcal{Z}'_n(STR_{1,\sigma_2}) = \mathcal{O}_n(STR_{1,\sigma_2}) - \min\{\Sigma_{i=1}^3\sigma_i(c) + \Sigma_{i=1}^3\sigma_i(x) + \Sigma_{i=1}^3\sigma_i(y) + \Sigma_{i=1}^3\sigma_i(z)\}_{x,y,z\in V}.$$

Proposition 4.42: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-bipartite-neutrosophic SuperHyperGraph. Then

$$\mathcal{Z}'_n(CMT_{\sigma_1,\sigma_2}) = \mathcal{O}_n(CMT_{\sigma_1,\sigma_2}) - \min\{\Sigma_{i=1}^3\sigma_i(x) + \Sigma_{i=1}^3\sigma_i(x') + \Sigma_{i=1}^3\sigma_i(x'') + \Sigma_{i=1}^3\sigma_i(x''')\}_{x,x',x'',x'''\in V}.$$

Proposition 4.43: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a complete-t-partite-neutrosophic Super Hypergraph.Then

$$\mathcal{Z}'_n(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) = \mathcal{O}_n(CMT_{\sigma_1,\sigma_2,\cdots,\sigma_t}) - \min\{\Sigma_{i=1}^3\sigma_i(x) + \Sigma_{i=1}^3\sigma_i(x') + \Sigma_{i=1}^3\sigma_i(x'')\}_{x,x'\in V}.$$

Global Offensive Alliance

Definition 4.44: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic SuperHyperGraph. Then

(i) a set *S* is called global-offensive alliance if

$$\forall a \in V \setminus S,\ |N_s(a) \cap S| > |N_s(a) \cap (V \setminus S)|;$$

(ii) ∀S^0 ⊆ *S, S* is global offensive alliance but S^0 isn't global offensive alliance. Then *S* is called minimal-global-offensive alliance;

(iii) Minimal-global-offensive-alliance number of *SHG* is

$$\bigwedge_{S \text{ is a minimal-global-offensive alliance.}} |S|$$

and it's denoted by Γ;

(iv) Minimal-global-offensive-alliance-neutrosophic number of *SHG* is

$$\bigwedge_{S \text{ is a minimal-global-offensive alliance.}} \Sigma_{s\in S}\Sigma_{i=1}^3\sigma_i(s)$$

and it's denoted by Γ_s.

Proposition 4.45: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* Be a strong neutrosophic SuperHyperGraph. If S is global-offensive alliance, then ∀*v* ∈ V \ *S*, ∃*x* ∈ *S* such that

(i) *V* ∈ *Ns(x);*
(ii) *Vx* ∈ *E.*

Definition 4.46: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a strong neutrosophic SuperHyperGraph. Suppose S is a set of vertices. Then

(i) *S* is called dominating set if ∀*v* ∈ *V* \ *S*, ∃*s* ∈ *S* such that either *v* ∈ *Ns(s) or vs* ∈ *E*;
(ii) |S| is called chromatic number if ∀*v* ∈ *V*, ∃*s* ∈ *S* such that either *v* ∈ *Ns(s) or vs* ∈ *E* implies *s* and *v* have different colors.

Proposition 4.47: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a strong neutrosophic SuperHyperGraph. If S is global-offensive alliance, then

(i) *S* is dominating set;
(ii) There's *S* ⊆ S^0 such that |S^0| is chromatic number.

Proposition 4.48: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a strong neutrosophic SuperHyperGraph. Then

(i) $\Gamma \leq O$;
(ii) $\Gamma_s \leq O_n$.

Proposition 4.49: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a strong neutrosophic SuperHyperGraph which is connected. Then

(i) $\Gamma \leq \mathcal{O} - 1$;
(ii) $\Gamma_s \leq \mathcal{O}_n - \Sigma_{i=1}^3\sigma_i(x)$.

Proposition 4.50: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an odd path. Then

(i) The set *S* = {v_2, v_4, ⋯, v_{n-1}} is minimal-global-offensive alliance;

(ii) $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$ *and corresponded set is* $S = \{v_2, v_4, \cdots, v_{n-1}\}$;

(iii) $\Gamma_s = \min\{\Sigma_{s\in S=\{v_2,v_4,\cdots,v_{n-1}\}}\Sigma_{i=1}^3\sigma_i(s), \Sigma_{s\in S=\{v_1,v_3,\cdots,v_{n-1}\}}\Sigma_{i=1}^3\sigma_i(s)\}$;

(iv) The sets $S_1 = \{v_2, v_4, \cdots, v_{n-1}\}$ *and* $S_2 = \{v_1, v_3, \cdots, v_{n-1}\}$ are only Minimal-global-offensive alliances.

Proposition 4.51: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an even path. Then

(i) The set $S = \{v_2, v_4, \cdots .v_n\}$ is minimal-global-offensive alliance;

(ii) $\Gamma = \lfloor \frac{n}{2} \rfloor$ and corresponded sets are $\{v_2, v_4, \cdots .v_n\}$and $\{v_1, v_3, \cdots .v_{n-1}\}$;

(iii) $\Gamma_s = \min\ \{\Sigma_{s \in S=\{v_2,v_4,\cdots,v_n\}} \Sigma_{i=1}^{3}\sigma_i(s), \Sigma_{s\in S=\{v_1,v_3,\cdots .v_{n-1}\}} \Sigma_{i=1}^{3}\sigma_i(s)\}$;

(iv) The sets $S_1 = \{v_2, v_4, \cdots .v_n\}$ and $S_2 = \{v_1, v_3, \cdots .v_{n-1}\}$ are only minimal-global-offensive alliances.

Proposition 4.52: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an even cycle. Then

(i) The set $S = \{v_2, v_4, \cdot\cdot, v_n\}$ is minimal-global-offensive alliance; and corresponded sets are $\{v_2, v_4, \cdots, v_n\}$ and $\{v_1, v_3, \cdots, v_{n-1}\}$;

(ii) $\Gamma = \lfloor \frac{n}{2} \rfloor$ and corresponded sets are $\{v_2, v_4, \cdots, v_n\}$ and $\{v_1, v_3, \cdots, v_{n-1}\}$;

(iii) $\Gamma_s = \min\{\Sigma_{s\in S=\{v_2,v_4,\cdots,v_n\}}\sigma(s), \Sigma_{s\in S=\{v_1,v_3,\cdots,v_{n-1}\}}\sigma(s)\}$;

(iv) The sets $S_1 = \{v_2, v_4, \cdots, v_n\}$ and $S_2 = \{v_1, v_3, \cdots, v_{n-1}\}$ are only minimal-global-offensive alliances.

Proposition 4.53: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an odd cycle. Then

(i) The set $S = \{v_2, v_4, \cdots, v_{n-1}\}$ is minimal-global-offensive alliance; and corresponded set is $S = \{v_2, v_4, \cdots, v_{n-1}\}$;

(iii) $\Gamma_s = \min\{\Sigma_{s\in S=\{v_2,v_4,\cdots .v_{n-1}\}}\Sigma_{i=1}^{3}\sigma_i(s),$
$\Sigma_{s\in S=\{v_1,v_3,\cdots .v_{n-1}\}}\Sigma_{i=1}^{3}\sigma_i(s)\}$;

(iv) The sets $S_1 = \{v_2, v_4, \cdots .v_{n-1}\}$ and $S_2 = \{v_1, v_3, \cdots .vn-1\}$ are only minimal-global-offensive alliances.

Proposition 4.54: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be star. Then

(i) The set *S = {c}* is minimal-global-offensive alliance;
(ii) Γ = 1;
(iii) $\Gamma_s = \Sigma_{i=1}^{3}\sigma_i(c)$;

(iii) The sets *S = {c}* and $S \subseteq S^0$ are only global-offensive alliances.

Proposition 4.55: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be wheel. Then

(i) The set is minimal-global-offensive alliance;

(ii) $\Gamma = |\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1)\leq n}|$;

(iii) $\Gamma_s = \Sigma_{\{v_1,v_3\}\cup\{v_6,v_9\cdots,v_{i+6},\cdots,v_n\}_{i=1}^{6+3(i-1)\leq n}} \Sigma_{i=1}^{3}\sigma_i(s)$;

(iv) The set $\{v_1, v_3\} \cup \{v_6, v_9 \cdots, v_{i+6}, \cdots, v_n\}_{i=1}^{6+3(i-1)\leq n}$ is only Minimal-global-offensive alliance.

Proposition 4.56: Let *SHG = (G ⊆ P(V);E ⊆ P(V))* be an odd complete. Then 809

(i) *the set* $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor+1}$ *is minimal-global-offensive alliance;*

(ii) $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$;

(iii) $\Gamma_s = \min\{\Sigma_{s\in S}\Sigma_{i=1}^{3}\sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor+1}}$;

(iv) *the set* $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor+1}$ *is only minimal-global-offensive alliances.*

Proposition 4.57: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an even complete. Then

(i) The set $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$ is minimal-global-offensive alliance;

(ii) $\Gamma = \lfloor \frac{n}{2} \rfloor$;

(iii) $\Gamma_s = \min\{\Sigma_{s\in S}\Sigma_{i=1}^{3}\sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}}$;

(iv) The set $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$ is only minimal-global-offensive alliances.

Proposition 4.58: *G* be an m-family of neutrosophic stars with common neutrosophic vertex set. Then

(i) The set $S = \{c_1, c_2, \cdots, c_m\}$ is minimal-global-offensive alliance for *G*;

(ii) Γ = *m* for *G*;

(iii) $\Gamma_s = \Sigma_{i=1}^{m}\Sigma_{j=1}^{3}\sigma_j(c_i)$ *for* $\mathcal{G}$;

(iv) The sets $S = \{c_1, c_2, \cdots, c_m\}$ and $S \subset S^0$ are only minimal-global-offensive alliances for *G*.

Proposition 4.59: Let *G* be an m-family of odd complete graphs with common neutrosophic vertex set. Then

(i) The set $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor+1}$ is minimal-global-offensive alliance For *G*;

(ii) $\Gamma = \lfloor \frac{n}{2} \rfloor + 1$ *for* $\mathcal{G}$;

(iii) $\Gamma_s = \min\{\Sigma_{s\in S}\Sigma_{i=1}^{3}\sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor+1}}$ *for* $\mathcal{G}$;

(iv) The sets $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor+1}$ are only minimal-global-offensive alliances for *G*.

Proposition 4.60: Let G be an m-family of even complete graphs with common Neutrosophic vertex set. Then

(i) The set $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$ is minimal-global-offensive alliance for G;

(ii) $\Gamma = \lfloor \frac{n}{2} \rfloor$ *for* $\mathcal{G}$;

(iii) $\Gamma_s = \min\{\Sigma_{s \in S}\Sigma_{i=1}^{3}\sigma_i(s)\}_{S=\{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}}$ *for* $\mathcal{G}$;

(iv) The sets $S = \{v_i\}_{i=1}^{\lfloor \frac{n}{2} \rfloor}$ are only minimal-global-offensive alliances for G.

Global Powerful Alliance

Definition 4.61: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a neutrosophic Super Hypergraph. Then

(i) a set S of vertices is called t-offensive alliance if

$$\forall a \in V \setminus S,\ |N_s(a) \cap S| - |N_s(a) \cap (V \setminus S)| > t;$$

(ii) a t-offensive alliance is called global-offensive alliance if $t = 0$;
(iii) a set S of vertices is called t-defensive alliance if

$$\forall a \in S,\ |N_s(a) \cap S| - |N_s(a) \cap (V \setminus S)| < t;$$

(iv) a t-defensive alliance is called global-defensive alliance if $t = 0$;
(v) a set S of vertices is called t-powerful alliance if it's both t-offensive alliance and (t-2)-defensive alliance;

(vi) A t-powerful alliance is called global-powerful alliance if t = 0;
(vii) $\forall S^0 \subseteq S$, S is global-powerful alliance but S^0 isn't global-powerful alliance. Then S is called Minimal-global-powerful alliance;
(viii) minimal-global-powerful-alliance number of *SHG* is

$$\bigwedge_{S \text{ is a minimal-global-powerful alliance.}} |S|$$

and it's denoted by Γ;

(ix) minimal-global-powerful-alliance-neutrosophic number of *SHG* is

$$\bigwedge_{S \text{ is a minimal-global-offensive alliance.}} \Sigma_{s \in S}\Sigma_{i=1}^{3}\sigma_i(s)$$

and it's denoted by Γ_s.

Proposition 4.62: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a strong neutrosophic Super Hypergraph. Then following statements hold;

(i) If $s \geq t$ and a set S of vertices is t-defensive alliance, then S is s-defensive alliance;
(ii) If $s \leq t$ and a set S of vertices is t-offensive alliance, then S is s-offensive alliance.

Proposition 4.63: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a strong neutrosophic SuperHyperGraph. Then following statements hold;

(i) If $s \geq t + 2$ and a set S of vertices is t-defensive alliance, then S is s-powerful alliance;
(ii) If $s \leq t$ and a set S of vertices is t-offensive alliance, then S is t-powerful alliance.

Proposition 4.64: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be a r-regular-strong-neutrosophic Super Hypergraph. Then following statements hold;

(i) *if* $\forall a \in S,\ |N_s(a) \cap S| < \lfloor \frac{r}{2} \rfloor + 1$, then *SHG* = (G ⊆ P (V), E ⊆ P (V)) is 2-defensive alliance;

(ii) *if* $\forall a \in V \setminus S,\ |N_s(a) \cap S| > \lfloor \frac{r}{2} \rfloor + 1$, then *SHG = (G ⊆ P (V), E ⊆ P (V))* is 2-offensive alliance;

(iii) If $\forall_a \in_S$, $|Ns\ (a) \cap V \setminus S| = 0$, then *SHG = (G ⊆ P (V), E ⊆ P (V))* is r-defensive alliance;

(iv) If $\forall_a \in V \setminus S$, $|N_s\ (a) \cap V \setminus S| = 0$, then *SHG = (G ⊆ P (V), E ⊆ P (V))* is r-offensive alliance.

Proposition 4.65: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an r-regular-strong-neutrosophic Super Hypergraph. Then following statements hold;

(i) $\forall a \in S,\ |N_s(a) \cap S| < \lfloor \frac{r}{2} \rfloor + 1$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ Is 2-defensive alliance?
(ii) $\forall a \in V \setminus S,\ |N_s(a) \cap S| > \lfloor \frac{r}{2} \rfloor + 1$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ Is 2-offensive alliance?
(iii) $\forall a \in S,\ |N_s(a) \cap V \setminus S| = 0$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ is r-defensive alliance;
(iv) $\forall a \in V \setminus S,\ |N_s(a) \cap V \setminus S| = 0$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ is r-offensive alliance.

Proposition 4.66: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an r-regular-strong-neutrosophic SuperHyperGraph which is complete. Then following statements hold;

(i) $\forall a \in S,\ |N_s(a) \cap S| < \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-defensive alliance;
(ii) $\forall a \in V \setminus S,\ |N_s(a) \cap S| > \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-offensive alliance;
(iii) $\forall a \in S,\ |N_s(a) \cap V \setminus S| = 0$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ *is* $(\mathcal{O} - 1)$-defensive alliance;
(iv) $\forall a \in V \setminus S,\ |N_s(a) \cap V \setminus S| = 0$ *if* $SHG = (G \subseteq P(V), E \subseteq P(V))$ is $(O - 1)$-offensive alliance.

Proposition 4.67: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an r-regular-strong-neutrosophic SuperHyperGraph which is complete. Then following statements hold;

(i) If $\forall a \in S,\ |N_s(a) \cap S| < \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$, then *SHG = (G ⊆ P (V), E ⊆ P (V))* is 2-defensive alliance;
(ii) If $\forall a \in V \setminus S,\ |N_s(a) \cap S| > \lfloor \frac{\mathcal{O}-1}{2} \rfloor + 1$, then *SHG = (G ⊆ P (V), E ⊆ P (V))* is 2-offensive alliance;
(iii) If $\forall a \in S,\ |N_s(a) \cap V \setminus S| = 0$, then *SHG = (G ⊆ P (V), E ⊆ P (V))* is $(O - 1)$-defensive alliance;
(iv) If $\forall a \in V \setminus S,\ |N_s(a) \cap V \setminus S| = 0$, then *SHG = (G ⊆ P (V), E ⊆ P (V))* is $(O - 1)$-offensive alliance.

Proposition 4.68: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an r-regular-strong-neutrosophic SuperHyperGraph which is cycle. Then following statements hold;

(i) $\forall a \in S,\ |N_s(a) \cap S| < 2\ if\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-defensive alliance;
(ii) $\forall a \in V \setminus S,\ |N_s(a) \cap S| > 2\ if\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-offensive alliance;
(iii) $\forall a \in S,\ |N_s(a) \cap V \setminus S| = 0\ if\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-defensive alliance;
(iv) $\forall a \in V \setminus S,\ |N_s(a) \cap V \setminus S| = 0\ if\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-offensivealliance.

Proposition 4.69: Let *SHG = (G ⊆ P (V), E ⊆ P (V))* be an r-regular-strong-neutrosophic SuperHyperGraph which is cycle. Then following statements hold;
(i) If $\forall a \in S,\ |N_s(a) \cap S| < 2,\ then\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-defensive alliance;
(ii) If $\forall a \in V \setminus S,\ |N_s(a) \cap S| > 2,\ then\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-offensive alliance;
(iii) If $\forall a \in S,\ |N_s(a) \cap V \setminus S| = 0,\ then\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-defensive alliance;
(iv) If $\forall a \in V \setminus S,\ |N_s(a) \cap V \setminus S| = 0,\ then\ SHG = (G \subseteq P(V), E \subseteq P(V))$ is 2-offensive alliance.

Background

See the seminal scientific researches [1–3]. The formalization of the notions on the framework of notions in SuperHyperGraphs, Neutrosophic notions in SuperHyperGraphs theory, and (Neutrosophic) SuperHyperGraphs theory at [5–23]. Two popular scientific research books in Scribd in the terms of high readers, 4216 and respectively, on neutrosophic science is on [24, 25].

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