SuperHyperGirth on SuperHyperGraph and Neutrosophic SuperHyperGraph With SuperHyperModeling of Cancer's Recognitions

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Abstract

The research is on the SuperHyperGirth and the neutrosophic SuperHyperGirth. A SuperHyperGraph has SuperHyperGirth where it's the longest SuperHyperCycle. To get structural examples and instances, I'm going to introduce the next SuperHyperClass of SuperHyperGraph based on SuperHyperGirth. It's the main. It'll be disciplinary to have the foundation of previous definition in the kind of SuperHyperClass. This SuperHyperClass is officially called "SuperHyperFlower". If there's a need to have all SuperHyperCycles until the SuperHyperGirth, then it's officially called "SuperHyperOrder" but otherwise, it isn't SuperHyperOrder. There are two instances about the clarifications for the main definition titled "SuperHyperGirth". These two examples get more scrutiny and discernment since there are characterized in the disciplinary ways of the SuperHyperClass based on SuperHyperGirth and they're called "SuperHyperFlower." A SuperHyperGraph has "neutrosophic SuperHyperGirth" where it's the strongest [the maximum value from all SuperHyperCycles amid the minimum value amid all SuperHyperEdges from a SuperHyperCycle.] SuperHyperCycle. In "Cancer's Recognitions", the aim is to find either the longest SuperHyperCycle or the strongest SuperHyperCycle in those neutrosophic SuperHyperModels. For the longest SuperHyperCycle, called SuperHyperGirth, and the strongest SuperHyperCycle, called neutrosophic SuperHyperGirth, some general results are introduced. Beyond that in SuperHyperStar, all possible SuperHyperPaths have only two SuperHyperEdges but it's not enough since it's essential to have at least three SuperHyperEdges to form any style of a SuperHyperCycle. There isn't any formation of any SuperHyperCycle but literarily, it's the deformation of any SuperHyperCycle. It, literarily, deforms and it doesn't form. A basic familiarity with SuperHyperGraph theory and neutrosophic SuperHyperGraph theory are proposed.

Keywords: (Neutrosophic) SuperHyperGraph; (Neutrosophic) SuperHyperGirth; Cancer's Treatments

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

1 Background

Look at [1–7, 9–15] for some researches.

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Table 1. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", Mentioned in the Example (2.3)

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

2 SuperHyperGirth

Definition 2.1. A SuperHyperGraph has **SuperHyperGirth** where it's the longest SuperHyperCycle.

To get structural examples and instances, I'm going to introduce the next SuperHyperClass of SuperHyperGraph based on SuperHyperGirth. It's the main. It'll be disciplinary to have the foundation of previous definition in the kind of SuperHyperClass. This SuperHyperClass is officially called "SuperHyperFlower". If there's a need to have all SuperHyperCycles until the SuperHyperGirth, then it's officially called "SuperHyperOrder" but otherwise, it isn't SuperHyperOrder.

Definition 2.2. A graph is called **SuperHyperFlower** if it's SuperHyperGraph and there are too many SuperHyperCycles having only one SuperHyperVertex in common and beyond that, there are only some components, namely some SuperHyperCycle, for this disconnected SuperHyperGraph. If there are all SuperHyperCycles until the SuperHyperGirth, then it's officially called "**SuperHyperOrder**" but otherwise, it **isn't SuperHyperOrder**.

In the upcoming section, there are two instances about the clarifications for the main definition titled "SuperHyperGirth". These two examples get more scrutiny and discernment since there are characterized in the disciplinary ways of the SuperHyperClass based on SuperHyperGirth and they're called "SuperHyperFlower."

The first instance is to clarify by applying the SuperHyperProper of the SuperHyperFlower.

Example 2.3. A SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (1). The characterization of SuperHyperGirth is as follows. There are all SuperHyperCycles until the SuperHyperGirth, six, then it's officially called "**SuperHyperOrder**". The SuperHyperCycles from any SuperHyperLength aren't unique. If there's an acceptance on neglecting the SuperHyperCycle from any SuperHyperLength four, then the SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (1), is SuperHyperOrder.

$$
\begin{aligned}
&SuperHyperCycleSHC_1 : V_{11}, U_5, V_2, V_{11}\\
&SuperHyperCycleSHC_2 : V_{11}, V_3, V_4, H_7, R_9, V_{11}\\
&SuperHyperCycleSHC_3 : V_{11}, V_6, V_7, V_8, C_9, S_9, V_{11}\\
&SuperHyperCycleSHC_4 : V_{11}, K_9, Q_4, P_4, R_4, T_4, S_4, V_{11}
\end{aligned}
$$

By using the Figure (1), and the Table (1), the neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", is obtained and the computations are straightforward to make sense about what's figured out on determinacy, indeterminacy and neutrality.

The second example is to elicit where the SuperHyperFlower isn't SuperHyperProper.

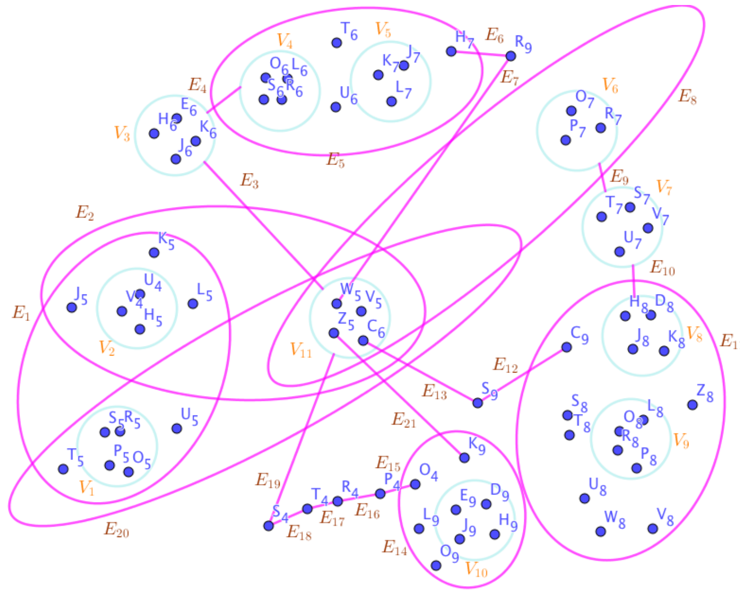

Figure 1. A SuperHyperGraph, is called "SuperHyperFlower", Associated to the Notions of SuperHyperGirth in the Example (2.3)

Table 2. The Values of Vertices, SuperVertices, Edges, HyperEdges, and Super-HyperEdges Belong to The Neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", Mentioned in the Example (2.4)

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

Example 2.4. A SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (2). The characterization of SuperHyperGirth is as follows. There are all SuperHyperCycles until the SuperHyperGirth, six, then it's officially called "**SuperHyperOrder**". The SuperHyperCycles from any SuperHyperLength aren't unique. The SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (2), isn't SuperHyperOrder since the SuperHyperCycle from the SuperHyperLength four isn't existed.

$$SuperHyperCycleSHC_1 : V_{11}, U_5, V_2, V_{11}$$
$$SuperHyperCycleSHC_2 : V_{11}, V_3, V_4, H_7, R_9, V_{11}$$
$$SuperHyperCycleSHC_3 : V_{11}, V_6, V_7, V_8, C_9, S_9, V_{11}$$
$$SuperHyperCycleSHC_4 : V_{11}, K_9, Q_4, P_4, R_4, T_4, S_4, V_{11}$$

By using the Figure (2), and the Table (2), the neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", is obtained and the computations are straightforward to make sense about what's figured out on determinacy, indeterminacy and neutrality.

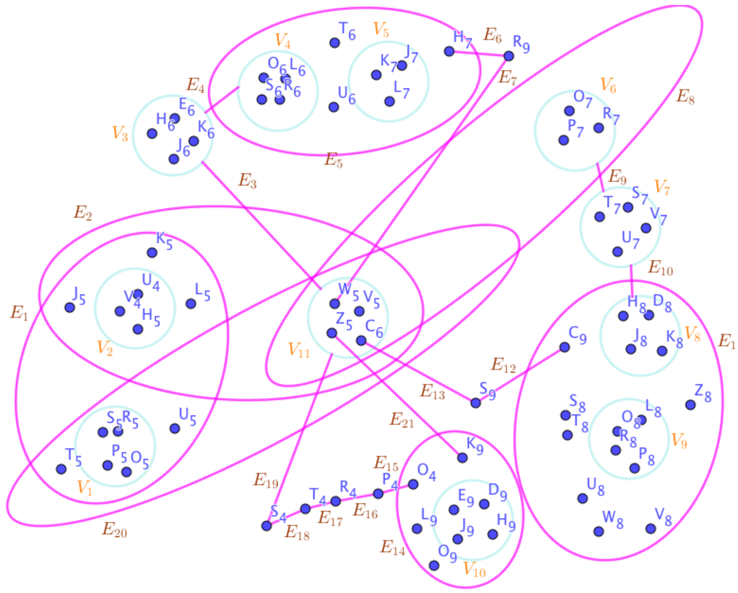

Figure 2. A SuperHyperGraph, is called "SuperHyperFlower", Associated to the Notions of SuperHyperGirth in the Example (2.4)

3 Neutrosophic SuperHyperGirth

Definition 3.1. A SuperHyperGraph has **neutrosophic SuperHyperGirth** where it's the strongest [the maximum value from all SuperHyperCycles amid the minimum value amid all SuperHyperEdges from a SuperHyperCycle.] SuperHyperCycle.

To get structural examples and instances, I've introduced the next SuperHyperClass of SuperHyperGraph based on SuperHyperGirth. It's the main. It'll be disciplinary to have the foundation of that definition in the kind of SuperHyperClass. This SuperHyperClass is officially called "SuperHyperFlower". If there's a need to have all SuperHyperCycles until the SuperHyperGirth, then it's officially called "SuperHyperOrder" but otherwise, it isn't SuperHyperOrder.

In the upcoming section, there are two instances about the clarifications for the main definition titled "neutrosophic SuperHyperGirth". These two examples get more scrutiny and discernment since there are characterized in the disciplinary ways of the SuperHyperClass based on SuperHyperGirth and they're called "SuperHyperFlower."

The first instance is to clarify by applying the SuperHyperProper of the SuperHyperFlower.

Example 3.2. A SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (3). The characterization of SuperHyperGirth is as follows. There are all SuperHyperCycles until the SuperHyperGirth, six, then it's officially called "**SuperHyperOrder**". The SuperHyperCycles from any SuperHyperLength aren't unique. If there's an acceptance on neglecting the SuperHyperCycle from any SuperHyperLength four, then the SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (3), is SuperHyperOrder. The neutrosophic SuperHyperGirth from the component are illustrated as follows. It's interesting to mention that the last neutrosophic SuperHyperGirth from the maximum length is the neutrosophic SuperHyperGirth for the SuperHyperFlower. It's completely different from the Example

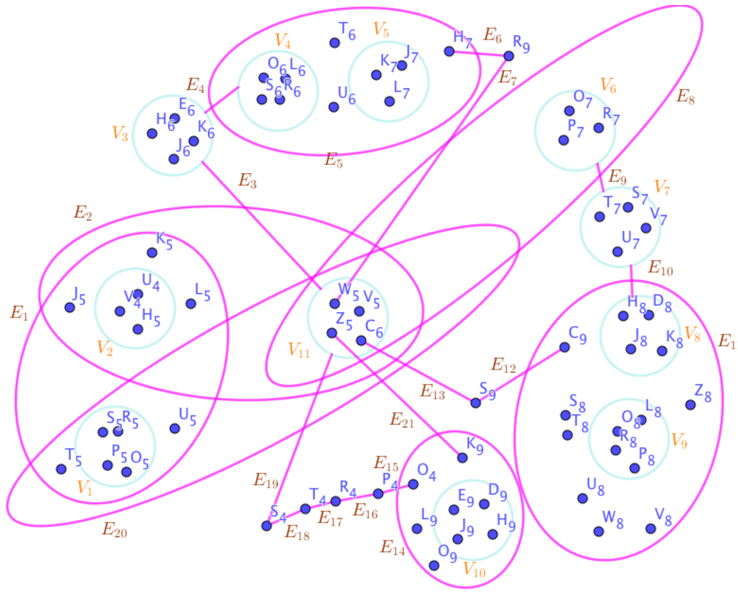

Figure 3. A SuperHyperGraph, is called "SuperHyperFlower", Associated to the Notions of SuperHyperGirth in the Example (3.2)

Table 3. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", Mentioned in the Example (3.2)

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

(2.3). It's beyond the Example (2.3), and faraway from the Example (2.3).

$$neutrosophic\ SuperHyperGirth\ SHC_1 : V_{11}, V_1, V_2, V_{11}$$
$$SuperHyperGirth\ SHC_1 : V_{11}, U_5, V_2, V_{11}$$
$$neutrosophic\ SuperHyperGirth\ SHC_2 : V_{11}, V_3, V_4, H_7, R_9, V_{11}$$
$$SuperHyperGirth\ SHC_2 : V_{11}, V_3, V_4, H_7, R_9, V_{11}$$
$$neutrosophic\ SuperHyperGirth\ SHC_3 : V_{11}, V_6, V_7, V_8, C_9, S_9, V_{11}$$
$$SuperHyperGirth\ SHC_3 : V_{11}, V_6, V_7, V_8, C_9, S_9, V_{11}$$
$$neutrosophic\ SuperHyperGirth\ SHC_4 : V_{11}, K_9, Q_4, P_4, R_4, T_4, S_4, V_{11}$$
$$SuperHyperGirth\ SHC_4 : V_{11}, K_9, Q_4, P_4, R_4, T_4, S_4, V_{11}$$

By using the Figure (3), and the Table (3), the neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", is obtained and the computations are straightforward to make sense about what's figured out on determinacy, indeterminacy and neutrality.

The second example is to elicit where the SuperHyperFlower isn't SuperHyperProper.

Example 3.3. A SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (4). The characterization of SuperHyperGirth is as follows. There are all

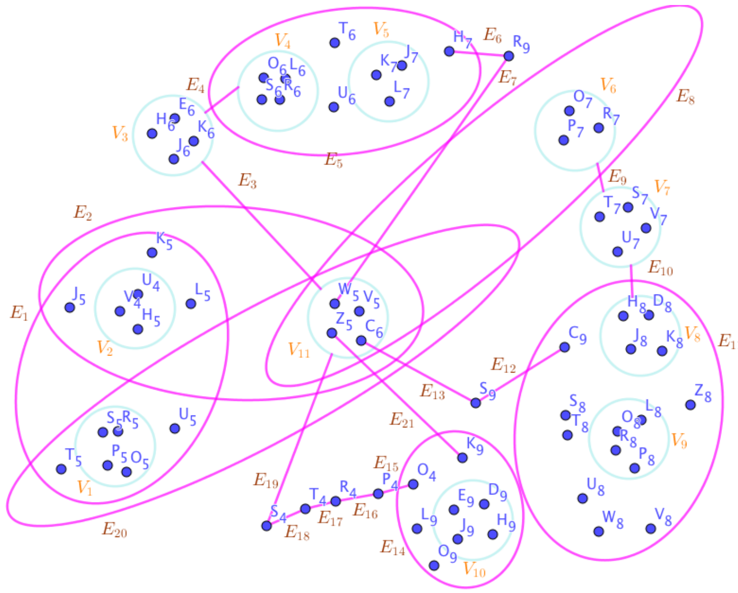

Figure 4. A SuperHyperGraph, is called "SuperHyperFlower", Associated to the Notions of SuperHyperGirth in the Example (3.3)

SuperHyperCycles until the SuperHyperGirth, six, then it's officially called "**SuperHyperOrder**". The SuperHyperCycles from any SuperHyperLength aren't unique. If there's an acceptance on neglecting the SuperHyperCycle from any SuperHyperLength four, then the SuperHyperGraph, is called "SuperHyperFlower", is depicted in the Figure (4), is SuperHyperOrder. The neutrosophic SuperHyperGirth from the component are illustrated as follows. It's interesting to mention that the last neutrosophic SuperHyperGirth from the maximum length is the neutrosophic SuperHyperGirth for the SuperHyperFlower. It's completely different from the Example (2.4). It's beyond the Example (2.4), and faraway from the Example (2.4).

$$neutrosophic\ SuperHyperGirth\ SHC_1 : V_{11}, V_1, V_2, V_{11}$$
$$SuperHyperGirth\ SHC_1 : V_{11}, U_5, V_2, V_{11}$$
$$neutrosophic\ SuperHyperGirth\ SHC_2 : V_{11}, V_3, V_4, H_7, R_9, V_{11}$$
$$SuperHyperGirth\ SHC_2 : V_{11}, V_3, V_4, H_7, R_9, V_{11}$$
$$neutrosophic\ SuperHyperGirth\ SHC_3 : V_{11}, V_6, V_7, V_8, C_9, S_9, V_{11}$$
$$SuperHyperGirth\ SHC_3 : V_{11}, V_6, V_7, V_8, C_9, S_9, V_{11}$$
$$neutrosophic\ SuperHyperGirth\ SHC_4 : V_{11}, K_9, Q_4, P_4, R_4, T_4, S_4, V_{11}$$
$$SuperHyperGirth\ SHC_4 : V_{11}, K_9, Q_4, P_4, R_4, T_4, S_4, V_{11}$$

By using the Figure (4), and the Table (4), the neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", is obtained and the computations are straightforward to make sense about what's figured out on determinacy, indeterminacy and neutrality.

4 Results on SuperHyperClasses

Proposition 4.1. *Assume a SuperHyperPath. Then SuperHyperGirth isn't well-defined.*

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Table 4. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperGraph, is called "Neutrosophic SuperHyperFlower", Mentioned in the Example (3.3)

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

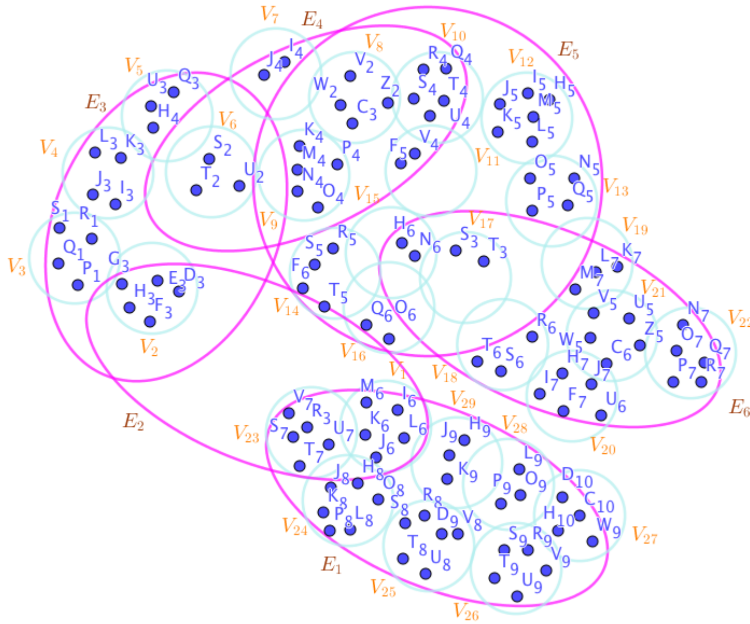

Figure 5. A SuperHyperPath Associated to the Notions of SuperHyperGirth in the Example (4.2)

Proof. Assume a SuperHyperPath. There's a sequence of the SuperHyperVertices and the SuperHyperEdges but this consecutive sequence, even with having all the SuperHyperVertices and the SuperHyperEdges, doesn't find any SuperHyperEdge more to back to a SuperHyperVertex. Thus there's only an unique SuperHyperPath but there's no SuperHyperCycle implies there's no longest SuperHyperCycle induces there's no SuperHyperGirth. Assume the SuperHyperPath has t the SuperHyperEdges. Then all the longest SuperHyperPaths are below.

$$I_{E_1}, E_1, E_{E_1 \cap E_2}, E_2, E_{E_2 \cap E_3}, \ldots, E_{t-2}, E_{E_{t-2} \cap E_{t-1}}, E_{t-1}, E_{E_{t-1} \cap E_t}, E_t.$$

where I_{E_i} is one of the interior SuperHyperVertex from the SuperHyperEdges E_i and E_{E_i} is one of the exterior SuperHyperVertex from the SuperHyperEdges E_i. All SuperHyperEdges are used but there's no repetition of any SuperHyperVertices. Then SuperHyperGirth isn't well-defined. □

Example 4.2. In the Figure (5), the SuperHyperPath is highlighted and featured. The consecutive sequence,

$$V_{25}, E_1, V_1, E_2, V_2, E_3, V_6, E_4, V_{10}, E_5, V_{17}, E_6, V_{22},$$

is a SuperHyperPath but there's no more distinct SuperHyperEdge to be back to any of the SuperHyperVertices in the mentioned consecutive sequence. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperPath in the Figure (5). Let us gather all the longest SuperHyperPaths but not SuperHyperGirths as follows.

$$(-/V_1/V_{24}/V_{26}/V_{23}/V_{29}/V_{28}/V_{27})V_{25},$$
$$E_1,(-/V_{23})V_1,E_2,V_2,E_3,V_6,E_4,(-/V_8/V_9/V_{15})V_{10},$$
$$E_5,(-/V_{15})V_{17},E_6,(-/V_{15}/V_{17}/V_{19}/V_{18}/V_{21}/V_{20})V_{22}.$$

It's some interesting to note that it's fantasized to have one SuperHyperCycle when we're talking about the SuperHyperCycle. It's happened.

Proposition 4.3. *Assume a SuperHyperCycle. Then SuperHyperGirth is counted the number of exterior SuperHyperVertices, and its SuperHyperLength is the SuperHyperOrder.*

Proof. Assume a SuperHyperCycle. There's only the number of exterior SuperHyperVertices sequences of the SuperHyperVertices and the SuperHyperEdges and these consecutive sequences, even with having all the SuperHyperVertices and the SuperHyperEdges, find only one SuperHyperEdge and not more to back to an initial SuperHyperVertex. Thus there are only the number of exterior SuperHyperVertices SuperHyperCycles and there's no SuperHyperCycle more that that imply there are only the number of exterior SuperHyperVertices longest SuperHyperCycles induce there are only the number of exterior SuperHyperVertices SuperHyperGirths. Assume the SuperHyperCycle has t the SuperHyperEdges. Then all the longest SuperHyperCycles and all the SuperHyperGirths are below.

$$E_{E_{i-1}\cap E_i},E_i,E_{E_i\cap E_{i+1}},E_{i+1},E_{E_{i+1}\cap E_{i+2}},\ldots,E_{i+t},E_{E_{i+t}\cap E_{i+t}},E_t,E_{E_{i-1}\cap E_i}$$

where E_{E_i} is one of the exterior SuperHyperVertex from the SuperHyperEdges E_i. All SuperHyperEdges are used but there's only one repetition of any SuperHyperVertices in the initial position and the last position. Then SuperHyperGirth is counted the number of exterior SuperHyperVertices, and its SuperHyperLength is the SuperHyperOrder. □

Example 4.4. In the Figure (6), the SuperHyperCycle is highlighted and featured. The consecutive sequence,

$$V_{25},E_1,V_1,E_2,V_2,E_3,V_6,E_4,V_{10},E_5,V_{17},E_6,V_{22},$$

is a SuperHyperCycle but there's only one distinct SuperHyperEdge to be back to any of the SuperHyperVertices in the mentioned consecutive sequence in the form of initial SuperHyperVertex. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperCycle in the Figure (6). All SuperHyperEdges are used but there's only one repetition of any SuperHyperVertices in the initial position and the last position. Let us gather all the longest SuperHyperCycles and the SuperHyperGirths as it's illustrated in the Figure (6) where the consecutive sequences are clear.

Proposition 4.5. *Assume a SuperHyperStar. Then SuperHyperGirth isn't well-defined.*

Proof. Assume a SuperHyperStar. There's only SuperHyperOrder minus one sequences of the SuperHyperVertices and the SuperHyperEdges and these consecutive sequences, even with having not all the SuperHyperVertices and the SuperHyperEdges, doesn't find any SuperHyperEdge to back to an initial SuperHyperVertex. Thus there are only SuperHyperOrder minus one SuperHyperPaths and there's no SuperHyperPaths more that that imply there's not any longest SuperHyperCycle induces there's no

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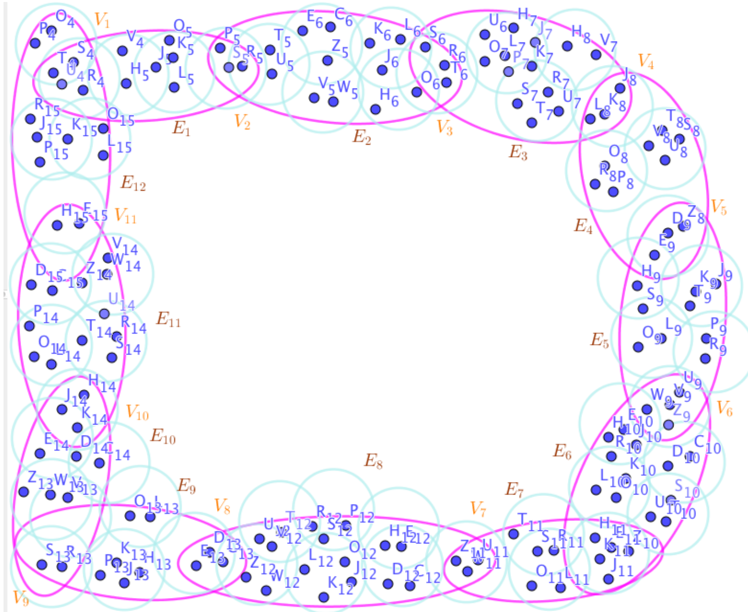

Figure 6. A SuperHyperCycle Associated to the Notions of SuperHyperGirth in the Example (4.4)

SuperHyperGirth. All the longest SuperHyperPaths and not any SuperHyperGirths are below.

$$E_{E_i}, E_i, CHV, E_j, E_{E_j}$$

where E_{E_i} is one of the Non-SuperHyperCenter from the SuperHyperEdges E_i and CHV is the SuperHyperCenter. All SuperHyperEdges aren't used but there's not any repetitions of any SuperHyperVertices in the initial position and the last position. Then SuperHyperGirth is counted zero, and it has no SuperHyperLength. Beyond that, all possible SuperHyperPaths have only two SuperHyperEdges but it's not enough since it's essential to have at least three SuperHyperEdges to form any style of a SuperHyperCycle. There isn't any formation of any SuperHyperCycle but Literarily, it's the deformation of any SuperHyperCycle. It, literarily, deforms and it doesn't form. Then SuperHyperGirth isn't well-defined. □

Example 4.6. In the Figure (7), the SuperHyperStar is highlighted and featured. The consecutive sequence,

$$\{P_2, S_2, R_2, T_2, O_2\}, E_1, V_1, E_2, \{Z_4, W_4, V_4, E_5, C_5, D_5\},$$

is a SuperHyperPath but there's no distinct SuperHyperEdge to be back to the SuperHyperVertex $\{P_2, S_2, R_2, T_2, O_2\}$. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperStar in the Figure (7). All SuperHyperEdges aren't used but there's no repetition of any SuperHyperVertices in the initial position and the last position. Let us gather all the longest SuperHyperPath but not the SuperHyperGirths as it's illustrated in the Figure (7) where the consecutive sequences are clear by the naming the SuperHyperCenter, V_1, and two distinct SuperHyperVertices are chosen from the distinct SuperHyperEdges. All possible SuperHyperPaths have only two SuperHyperEdges but it's not enough since it's essential to have at least three SuperHyperEdges to form any style of a SuperHyperCycle. There isn't any formation of any SuperHyperCycle but Literarily, it's the deformation of any SuperHyperCycle. It, literarily, deforms and it doesn't form. Then SuperHyperGirth isn't well-defined.

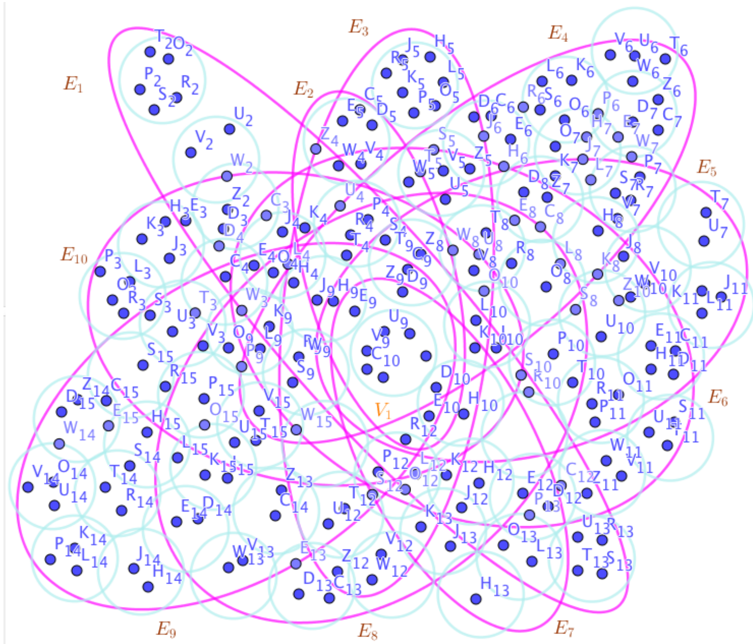

Figure 7. A SuperHyperStar Associated to the Notions of SuperHyperGirth in the Example (4.6)

Proposition 4.7. *Assume a SuperHyperBipartite. Then SuperHyperGirth has all the consecutive exterior SuperHyperVertices from different parts. Thus the SuperHyperGirth's SuperHyperLength is the minimum cardinality amid parts of SuperHyperVertices.*

Proof. Assume a SuperHyperBipartite. The longest SuperHyperCycles and the SuperHyperGirths are $V_1, E_1, V_2, E_2, \ldots, V_{\min\{|P_1|,|P_2|\}}, E_r, V_1$ where the even indexes indicate the same part and with analogous to that, the odd indexes demonstrate the same part. Then SuperHyperGirth has all the consecutive exterior SuperHyperVertices from different parts. Thus the SuperHyperGirth's SuperHyperLength is the minimum cardinality amid parts of SuperHyperVertices. □

Example 4.8. In the Figure (8), the SuperHyperBipartite is highlighted and featured. The set of the SuperHyperParts is

$$\{\{V_1, V_2\}, \{V_3, V_4, V_5\}\}.$$

The two consecutive sequences,

$$V_1(-/V_2), E_2(-/E_1), V_3, E_1(-/E_2), V_2(-/V_1), E_3(-/E_4), V_4, E_4(-/E_3), V_1(-/V_2),$$

are the longest SuperHyperCycles and SuperHyperGirths and there's only one distinct SuperHyperEdge to be back to the SuperHyperVertex $V_1(-/V_2)$. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperBipartite in the Figure (8). All SuperHyperEdges aren't used but there's only one repetition of the SuperHyperVertex in the initial position and the last position. Let us gather all the longest SuperHyperCycles and the SuperHyperGirths as it's illustrated in the Figure (8) where the consecutive sequences are clear by the naming the SuperHyperVertex, V_i, and the SuperHyperVertex is chosen from the distinct parts. All possible the longest SuperHyperCycles have only four SuperHyperEdges and it's

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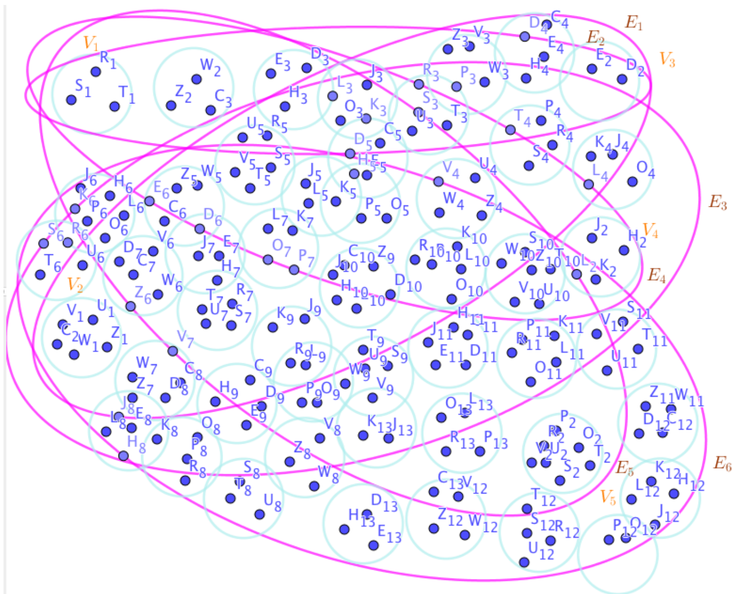

Figure 8. A SuperHyperBipartite Associated to the Notions of SuperHyperGirth in the Example (4.8)

enough since it's essential to have at least three SuperHyperEdges to form any style of a SuperHyperCycle. There's any formation of any the longest SuperHyperCycle. Thus SuperHyperGirth is well-defined.

Proposition 4.9. *Assume a SuperHyperMultipartite. Then SuperHyperGirth has all the consecutive exterior SuperHyperVertices from different parts. The SuperHyperGirth's SuperHyperLength is obtained from the sequence.*

Proof. Assume a SuperHyperMultipartite. The longest SuperHyperCycles and the SuperHyperGirths are $V_1, E_1, V_2, E_2, \ldots, V_s, E_r, V_1$ where the even indexes indicate the same part and with analogous to that, the odd indexes demonstrate the same part. Then SuperHyperGirth has all the consecutive exterior SuperHyperVertices from different parts. The SuperHyperGirth's SuperHyperLength is obtained from the sequence. □

Example 4.10. In the Figure (9), the SuperHyperMultipartite is highlighted and featured. The set of the SuperHyperParts is

$$\{\{V_1, V_2\}, \{V_3\}, \{V_4, V_5\}\}.$$

The two consecutive sequences,

$$V_1(-/V_2), E_7(-/E_8), V_4, E_3, V_3, E_4, V_5, E_5(-/E_6), V_1(-/V_2),$$

are SuperHyperCycles and SuperHyperGirths and there's only one distinct SuperHyperEdge to be back to the SuperHyperVertex $V_1(-/V_2)$. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperBipartite in the Figure (9). All SuperHyperEdges aren't used but there's only one repetition of the SuperHyperVertex in the initial position and the last position. Let us gather all the longest SuperHyperCycles and the SuperHyperGirths as it's illustrated in the Figure (9) where the consecutive sequences are clear by the naming the SuperHyperVertex, V_i, and the SuperHyperVertex is chosen from the distinct parts.

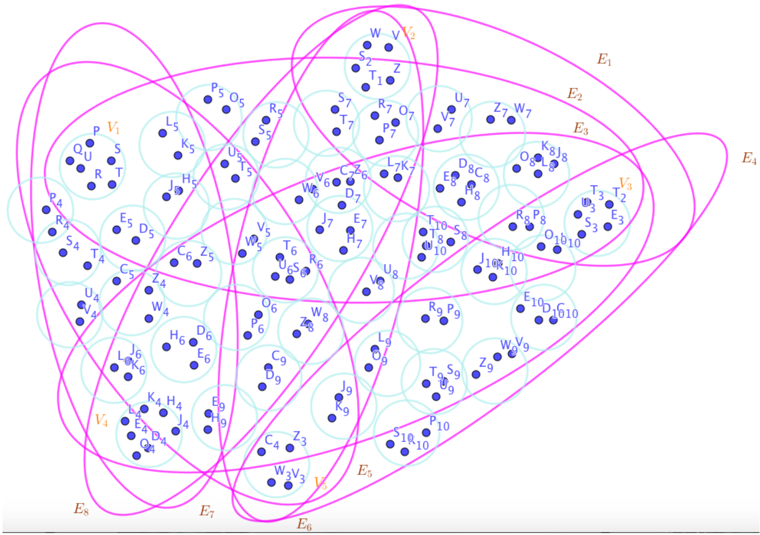

Figure 9. A SuperHyperMultipartite Associated to the Notions of SuperHyperGirth in the Example (4.10)

All possible the longest SuperHyperCycles have only five SuperHyperEdges and it's enough since it's essential to have at least three SuperHyperEdges to form any style of a SuperHyperCycle. There's any formation of any the longest SuperHyperCycle. Thus SuperHyperGirth is well-defined.

Proposition 4.11. *Assume a SuperHyperWheel. Then SuperHyperGirth is the all SuperHyperVertices from same SuperHyperNeighborhood. The SuperHyperGirth's SuperHyperLength is the number of categories of exterior SuperHyperVertices.*

Proof. Assume a SuperHyperWheel. The longest SuperHyperCycles and the SuperHyperGirths are $V_1, E_1, V_2, E_2, \ldots, V_s, E_r, V_1$ where the indexes indicate either the SuperHyperCenter or the SuperHyperNeighbors from the SuperHyperCycle of the SuperHyperWheel. Then SuperHyperGirth is the all SuperHyperVertices from same SuperHyperNeighborhood. The SuperHyperGirth's SuperHyperLength is the number of categories of exterior SuperHyperVertices. □

Example 4.12. In the Figure (10), the SuperHyperWheel is highlighted and featured. The consecutive sequence,

$$V_1, E_2, V_2, E_4, V_3, E_6, V_4, E_8, V_1,$$

is a SuperHyperCycle but there's only one distinct SuperHyperEdge to be back to any of the SuperHyperVertices in the mentioned consecutive sequence in the form of initial SuperHyperVertex. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperCycle in the Figure (10). All SuperHyperEdges aren't used but there's only one repetition of any SuperHyperVertices in the initial position and the last position. Let us gather all the longest SuperHyperCycles and the SuperHyperGirths as it's illustrated in the Figure (10) where the consecutive sequences are clear in the form of exterior SuperHyperVertices since the usage of interior SuperHyperVertices imply the repetition of SuperHyperEdges induce the consecutive sequence isn't SuperHyperCycle, isn't SuperHyperGirth and SuperHyperGirth isn't well-defined.

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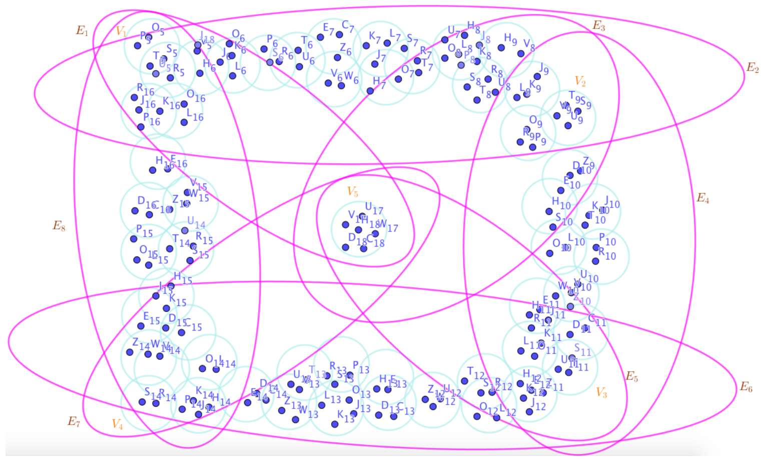

Figure 10. A SuperHyperWheel Associated to the Notions of SuperHyperGirth in the Example (4.12)

Table 5. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperPath Mentioned in the Example (5.2)

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

5 Results on Neutrosophic SuperHyperClasses

Proposition 5.1. *Assume a neutrosophic SuperHyperPath. Then neutrosophic SuperHyperGirth isn't well-defined.*

Example 5.2. In the Figure (11), the SuperHyperPath is highlighted and featured. By using the Figure (11) and the Table (5), the neutrosophic SuperHyperPath is obtained.

There's no SuperHyperCycle. Thus there's no strongest SuperHyperCycle. It implies there isn't any neutrosophic SuperHyperGirth.

Proposition 5.3. *Assume a neutrosophic SuperHyperCycle. Then*

$$
\begin{aligned}
&Neutrosophic\ SuperHyperGirth = \\
&\{V_1, E_1, V_2, E_2, V_3, E_3, \ldots, E_{The\ number\ of\ the\ SuperHyperEdges-1}, \\
&V_{The\ number\ of\ the\ SuperHyperEdges}, E_{The\ number\ of\ the\ SuperHyperEdges}, V_1 \mid \\
&V_1, E_1, V_2, E_2, V_3, E_3, \ldots, E_{The\ number\ of\ the\ SuperHyperEdges-1}, \\
&V_{The\ number\ of\ the\ SuperHyperEdges}, E_{The\ number\ of\ the\ SuperHyperEdges}, \\
&V_1,\ is\ a\ SuperHyperGirth,\ it's\ named\ to\ A\ and \\
&\sum_{i=1}^{3} \sum_{V_j\ is\ used\ on\ a\ SuperHyperGirth,\ A} \\
&\sigma_i(V_j) = \max_{S\ is\ a\ SuperHyperGirth.} \sum_{i=1}^{3} \sum_{V_j\ is\ used\ on\ a\ SuperHyperGirth,\ S} \\
&\sigma_i(V_j)\}.
\end{aligned}
$$

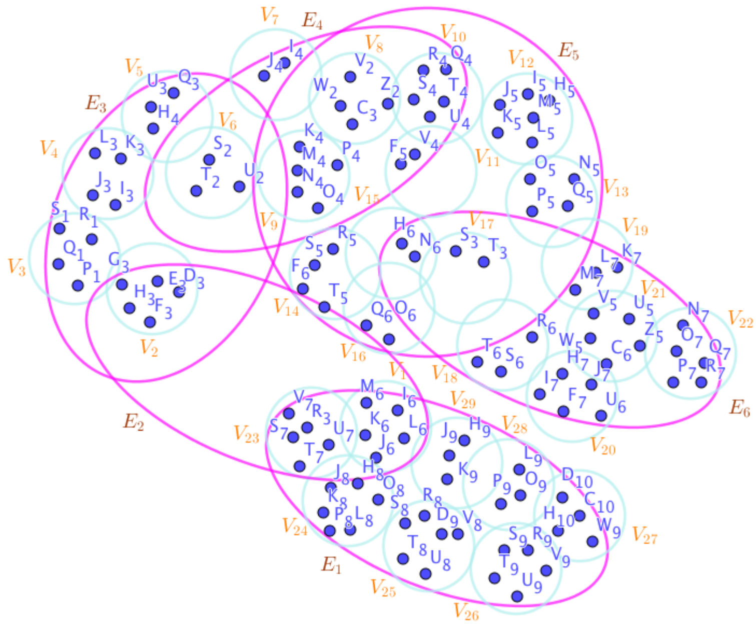

Figure 11. A Neutrosophic SuperHyperPath Associated to the Notions of SuperHyperGirth in the Example (5.2)

Table 6. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperCycle Mentioned in the Example (5.4)

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

Where σ_i is the unary operation on the SuperHyperVertices of the SuperHyperGraph to assign the determinacy, the indeterminacy and the neutrality, for $i = 1, 2, 3$, respectively.

Example 5.4. In the Figure (12), the SuperHyperCycle is highlighted and featured. By using the Figure (12) and the Table (6), the neutrosophic SuperHyperCycle is obtained.

There's only one SuperHyperCycle. Thus this SuperHyperCycle is the longest SuperHyperCycle. So it's SuperHyperGirth. Also, it's the strongest SuperHyperCycle by the uniqueness of SuperHyperCycles. Hence it's neutrosophic SuperHyperGirth. The consecutive sequence,

$$V_{25}, E_1, V_1, E_2, V_2, E_3, V_6, E_4, V_{10}, E_5, V_{17}, E_6, V_{22},$$

is a SuperHyperCycle, a strongest SuperHyperCycle and a neutrosophic SuperHyperGirth.

Proposition 5.5. *Assume a neutrosophic SuperHyperStar. Then neutrosophic SuperHyperGirth isn't well-defined.*

Example 5.6. In the Figure (13), the SuperHyperStar is highlighted and featured. By using the Figure (13) and the Table (7), the neutrosophic SuperHyperStar is obtained.

There's no SuperHyperCycle. Thus there's no strongest SuperHyperCycle. It implies there isn't any neutrosophic SuperHyperGirth.

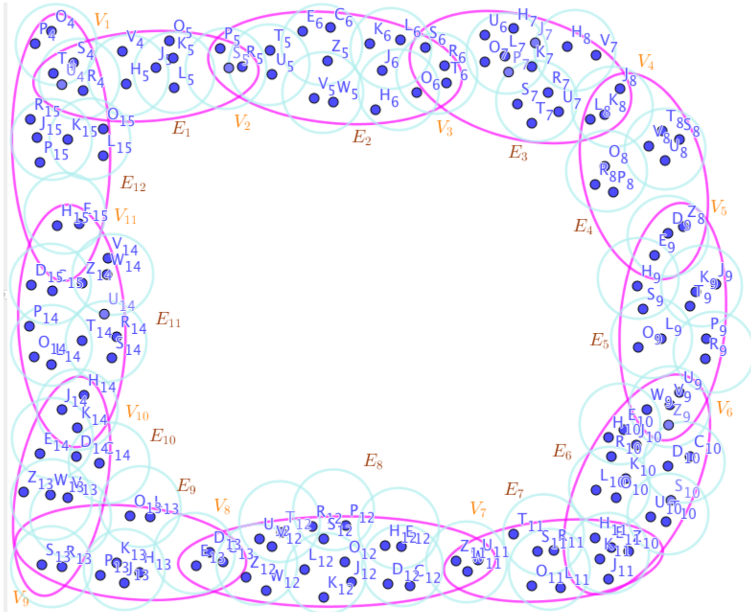

Figure 12. A Neutrosophic SuperHyperCycle Associated to the Notions of SuperHyperGirth in the Example (5.4)

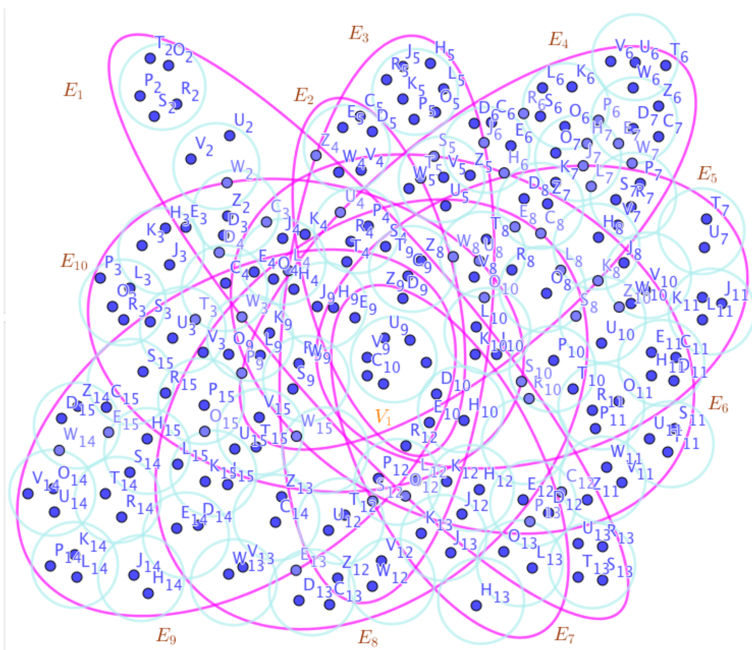

Figure 13. A Neutrosophic SuperHyperStar Associated to the Notions of SuperHyperGirth in the Example (5.6)

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Table 7. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperStar Mentioned in the Example (5.6)

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

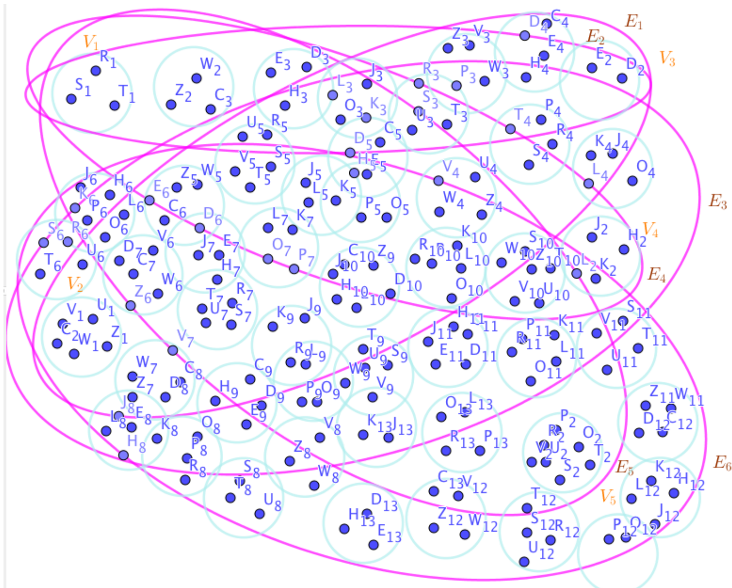

Figure 14. A Neutrosophic SuperHyperBipartite Associated to the Notions of SuperHyperGirth in the Example (5.8)

Proposition 5.7. *Assume a neutrosophic SuperHyperBipartite. Then neutrosophic SuperHyperGirth is*

$$
\begin{aligned}
&Neutrosophic\ SuperHyperGirth = \\
&\{V_1, E_1, V_2, E_2, V_3, E_3, \ldots E_{n-1}, V_n, E_n, V_1 \mid \\
&V_1, E_1, V_2, E_2, V_3, E_3, \ldots E_{n-1}, V_n, E_n, V_1 \text{ is a SuperHyperGirth and} \\
&\sum_{i=1}^{3} \ \sum_{V_j \text{ is used on a SuperHyperGirth, } V_1,E_1,V_2,E_2,V_3,E_3,\ldots E_{n-1},V_n,E_n,V_1} \\
&\sigma_i(V_j) = \max_{S \text{ is a SuperHyperGirth.}} \sum_{i=1}^{3} \ \sum_{V_j \text{ is used on a SuperHyperGirth, } S} \\
&\sigma_i(V_j)\}.
\end{aligned}
$$

Where σ_i is the unary operation on the SuperHyperVertices of the SuperHyperGraph to assign the determinacy, the indeterminacy and the neutrality, for $i = 1, 2, 3$, respectively.

Example 5.8. In Figure (14), the SuperHyperBipartite is highlighted and featured. By using the Figure (14) and the Table (8), the neutrosophic SuperHyperBipartite is obtained.

Some exterior SuperHyperVertices are pointed out in the Figure (14). Thus the

Table 8. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperBipartite Mentioned in the Example (5.8)

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

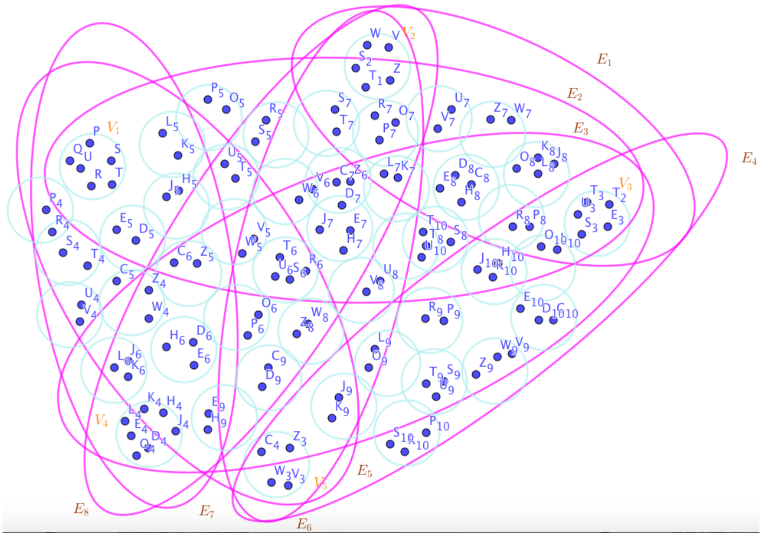

Figure 15. A Neutrosophic SuperHyperMultipartite Associated to the Notions of SuperHyperGirth in the Example (5.10)

positions of the exterior SuperHyperVertices are determined. The latter is straightforward to get neutrosophic SuperHyperGirth.

Proposition 5.9. *Assume a neutrosophic SuperHyperMultipartite. Then neutrosophic SuperHyperGirth is*

$$\begin{aligned}
&Neutrosophic\ SuperHyperGirth = \\
&\{V_1, E_1, V_2, E_2, V_3, E_3, \ldots E_{n-1}, V_n, E_n, V_1 \mid \\
&V_1, E_1, V_2, E_2, V_3, E_3, \ldots E_{n-1}, V_n, E_n, V_1 \text{ is a SuperHyperGirth and} \\
&\sum_{i=1}^{3} \sum_{V_j \text{ is used on a SuperHyperGirth, } V_1,E_1,V_2,E_2,V_3,E_3,\ldots E_{n-1},V_n,E_n,V_1} \\
&\sigma_i(V_j) = \max_{S \text{ is a SuperHyperGirth.}} \sum_{i=1}^{3} \sum_{V_j \text{ is used on a SuperHyperGirth, } S} \\
&\sigma_i(V_j)\}.
\end{aligned}$$

Where σ_i is the unary operation on the SuperHyperVertices of the SuperHyperGraph to assign the determinacy, the indeterminacy and the neutrality, for $i = 1, 2, 3$, respectively.

Example 5.10. In Figure (15), the SuperHyperMultipartite is highlighted and featured. By using the Figure (15) and the Table (9), the neutrosophic SuperHyperMultipartite is obtained.

Table 9. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperMultipartite Mentioned in the Example (5.10)

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

Table 10. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperWheel Mentioned in the Example (5.12)

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

Some exterior SuperHyperVertices are pointed out in the Figure (15). Thus the positions of the exterior SuperHyperVertices are determined. The latter is straightforward to get neutrosophic SuperHyperGirth.

Proposition 5.11. *Assume a neutrosophic SuperHyperWheel. Then neutrosophic SuperHyperGirth is*

$$\begin{aligned}
&Neutrosophic\ SuperHyperGirth = \\
&\{V_1, E_1, V_2, E_2, V_3, E_3, \ldots, E_{The\ half\ number\ of\ the\ SuperHyperEdges-1}, \\
&V_{The\ half\ number\ of\ the\ SuperHyperEdges}, E_{The\ half\ number\ of\ the\ SuperHyperEdges}, V_1 \mid \\
&V_1, E_1, V_2, E_2, V_3, E_3, \ldots, E_{The\ half\ number\ of\ the\ SuperHyperEdges-1}, \\
&V_{The\ half\ number\ of\ the\ SuperHyperEdges}, E_{The\ half\ number\ of\ the\ SuperHyperEdges}, \\
&V_1,\ is\ a\ SuperHyperGirth,\ it's\ named\ to\ A\ and \\
&\sum_{i=1}^{3} \sum_{V_j\ is\ used\ on\ a\ SuperHyperGirth,\ A} \\
&\sigma_i(V_j) = \max_{S\ is\ a\ SuperHyperGirth.} \sum_{i=1}^{3} \sum_{V_j\ is\ used\ on\ a\ SuperHyperGirth,\ S} \\
&\sigma_i(V_j)\}.
\end{aligned}$$

Where σ_i is the unary operation on the SuperHyperVertices of the SuperHyperGraph to assign the determinacy, the indeterminacy and the neutrality, for $i = 1, 2, 3$, respectively.

Example 5.12. In the Figure (16), the SuperHyperWheel is highlighted and featured. By using the Figure (16) and the Table (10), the neutrosophic SuperHyperWheel is obtained.

Some exterior SuperHyperVertices are pointed out in the Figure (16). Thus the positions of the exterior SuperHyperVertices are determined. The latter is straightforward to get neutrosophic SuperHyperGirth.

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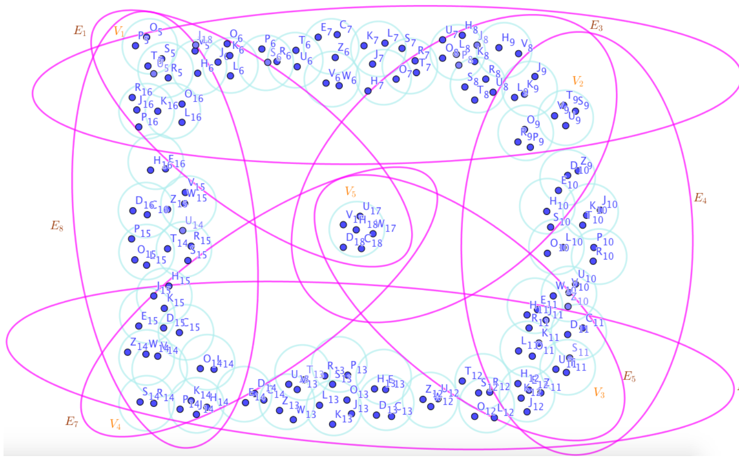

Figure 16. A Neutrosophic SuperHyperWheel Associated to the Notions of SuperHyperGirth in the Example (5.12)

6 General Results

For the longest SuperHyperCycle, called SuperHyperGirth, and the strongest SuperHyperCycle, called neutrosophic SuperHyperGirth, some general results are introduced.

Remark 6.1. Let remind that the neutrosophic SuperHyperGraph is redefined on the positions of the alphabets.

Corollary 6.2. *Assume a neutrosophic SuperHyperGraph. Then*

$$\begin{aligned}
&Neutrosophic\ SuperHyperGirth = \\
&\{V_1, E_1, V_2, E_2, V_3, E_3, \ldots E_{n-1}, V_n, E_n, V_1 \mid \\
&V_1, E_1, V_2, E_2, V_3, E_3, \ldots E_{n-1}, V_n, E_n, V_1 \text{ is a SuperHyperGirth and} \\
&\sum_{i=1}^{3} {}_{V_j \text{ is used on a SuperHyperGirth},}\ \sum_{V_1,E_1,V_2,E_2,V_3,E_3,\ldots E_{n-1},V_n,E_n,V_1} \\
&\sigma_i(V_j) = \max_{S \text{ is a SuperHyperGirth.}} \sum_{i=1}^{3} {}_{V_j \text{ is used on a SuperHyperGirth},}\ \sum_{S} \\
&\sigma_i(V_j)\}\}.
\end{aligned}$$

Where σ_i is the unary operation on the SuperHyperVertices of the SuperHyperGraph to assign the determinacy, the indeterminacy and the neutrality, for $i = 1, 2, 3$, respectively.

Corollary 6.3. *Assume a neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then the notion of neutrosophic SuperHyperGirth and SuperHyperGirth coincide.*

Corollary 6.4. *Assume a neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then a consecutive sequence of the SuperHyperVertices and the SuperHyperEdges is a neutrosophic SuperHyperGirth if and only if it's a SuperHyperGirth.*

Corollary 6.5. *Assume a neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then a consecutive sequence of the SuperHyperVertices and the SuperHyperEdges is a strongest SuperHyperCycle if and only if it's a longest SuperHyperCycle.*

Corollary 6.6. *Assume SuperHyperClasses of a neutrosophic SuperHyperGraph on the same identical letter of the alphabet. Then its neutrosophic SuperHyperGirth is its SuperHyperGirth and reversely.*

Corollary 6.7. *Assume a neutrosophic SuperHyperPath(-/SuperHyperCycle, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel) on the same identical letter of the alphabet. Then its neutrosophic SuperHyperGirth is its SuperHyperGirth and reversely.*

Corollary 6.8. *Assume a neutrosophic SuperHyperGraph. Then its neutrosophic SuperHyperGirth isn't well-defined if and only if its SuperHyperGirth isn't well-defined.*

Corollary 6.9. *Assume SuperHyperClasses of a neutrosophic SuperHyperGraph. Then its neutrosophic SuperHyperGirth isn't well-defined if and only if its SuperHyperGirth isn't well-defined.*

Corollary 6.10. *Assume a neutrosophic SuperHyperPath(-/SuperHyperCycle, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). Then its neutrosophic SuperHyperGirth isn't well-defined if and only if its SuperHyperGirth isn't well-defined.*

Corollary 6.11. *Assume a neutrosophic SuperHyperGraph. Then its neutrosophic SuperHyperGirth is well-defined if and only if its SuperHyperGirth is well-defined.*

Corollary 6.12. *Assume SuperHyperClasses of a neutrosophic SuperHyperGraph. Then its neutrosophic SuperHyperGirth is well-defined if and only if its SuperHyperGirth is well-defined.*

Corollary 6.13. *Assume a neutrosophic SuperHyperPath(-/SuperHyperCycle, SuperHyperStar, SuperHyperBipartite, SuperHyperMultipartite, SuperHyperWheel). Then its neutrosophic SuperHyperGirth is well-defined if and only if its SuperHyperGirth is well-defined.*

7 Applications in Cancer's Recognitions

7.1 Case 1: The Initial Steps Toward SuperHyperBipartite as SuperHyperModel

In the Figure (17), the SuperHyperBipartite is highlighted and featured. The set of the SuperHyperParts is

$$\{\{V_1, V_2\}, \{V_3, V_4, V_5\}\}.$$

The two consecutive sequences,

$$V_1(-/V_2), E_2(-/E_1), V_3, E_1(-/E_2), V_2(-/V_1), E_3(-/E_4), V_4, E_4(-/E_3), V_1(-/V_2),$$

are the longest SuperHyperCycles and SuperHyperGirths and there's only one distinct SuperHyperEdge to be back to the SuperHyperVertex $V_1(-/V_2)$. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperBipartite in the Figure (17). All SuperHyperEdges aren't used but there's only one repetition of the SuperHyperVertex in the initial position and the last position. Let us gather all the longest SuperHyperCycles and the SuperHyperGirths as it's illustrated in the Figure (17) where the consecutive sequences are clear by the naming the SuperHyperVertex, V_i, and the SuperHyperVertex is chosen from the distinct parts. All possible the longest SuperHyperCycles have only four SuperHyperEdges and it's enough since it's essential to have at least three SuperHyperEdges to form any style of a

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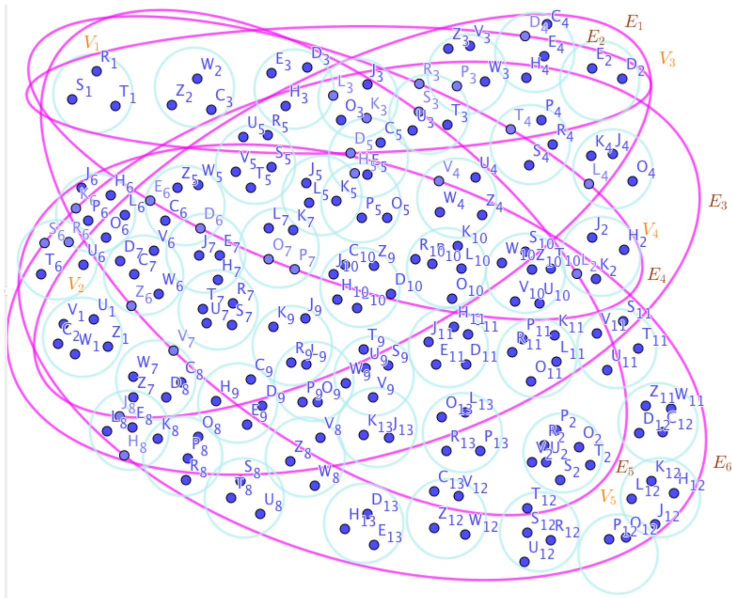

Figure 17. A SuperHyperBipartite Associated to the Notions of SuperHyperGirth

Table 11. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperBipartite

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

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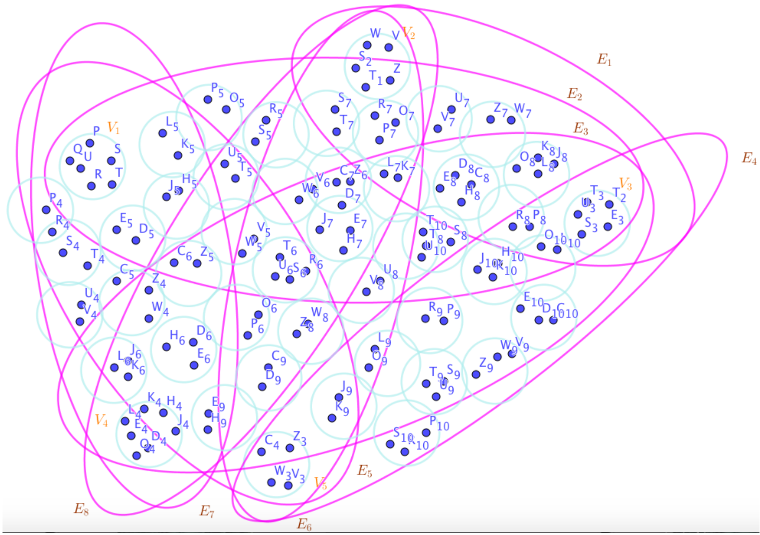

Figure 18. A SuperHyperMultipartite Associated to the Notions of SuperHyperGirth

SuperHyperCycle. There's any formation of any the longest SuperHyperCycle. Thus SuperHyperGirth is well-defined. By using the Figure (17) and the Table (11), the neutrosophic SuperHyperBipartite is obtained.

Some exterior SuperHyperVertices are pointed out in the Figure (17). Thus the positions of the exterior SuperHyperVertices are determined. The latter is straightforward to get neutrosophic SuperHyperGirth.

7.2 Case 2: The Increasing Steps Toward SuperHyperMultipartite as SuperHyperModel

In the Figure (18), the SuperHyperMultipartite is highlighted and featured. The set of the SuperHyperParts is

$$\{\{V_1, V_2\}, \{V_3\}, \{V_4, V_5\}\}.$$

The two consecutive sequences,

$$V_1(-/V_2), E_7(-/E_8), V_4, E_3, V_3, E_4, V_5, E_5(-/E_6), V_1(-/V_2),$$

are SuperHyperCycles and SuperHyperGirths and there's only one distinct SuperHyperEdge to be back to the SuperHyperVertex $V_1(-/V_2)$. This event could be happened to any of arbitrary consecutive sequence which is chosen from the intended SuperHyperBipartite in the Figure (18). All SuperHyperEdges aren't used but there's only one repetition of the SuperHyperVertex in the initial position and the last position. Let us gather all the longest SuperHyperCycles and the SuperHyperGirths as it's illustrated in the Figure (18) where the consecutive sequences are clear by the naming the SuperHyperVertex, V_i, and the SuperHyperVertex is chosen from the distinct parts. All possible the longest SuperHyperCycles have only five SuperHyperEdges and it's enough since it's essential to have at least three SuperHyperEdges to form any style of a SuperHyperCycle. There's any formation of any the longest SuperHyperCycle. Thus SuperHyperGirth is well-defined. By using the Figure (18) and the Table (12), the neutrosophic SuperHyperMultipartite is obtained.

Some exterior SuperHyperVertices are pointed out in the Figure (18). Thus the positions of the exterior SuperHyperVertices are determined. The latter is straightforward to get neutrosophic SuperHyperGirth.

Table 12. The Values of Vertices, SuperVertices, Edges, HyperEdges, and SuperHyperEdges Belong to The Neutrosophic SuperHyperMultipartite

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

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