Air Quality Index Analysis Using Single-Valued Neutrosophic Plithogenic Graph for Multi-Decision Process

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Abstract

Recently, Plithogenic set and its graphical structure visualization is stuide for dealing with multi-attribute data set. In this pocess a problem arises while characterization of uncertainty in tue, false and uncertain regions, independently. One of the suitable examples is Air Quality Index and its impact on human health contains multi-valued attributes. In this case the conflict may arise among two experts about acceptation, rejection and uncertain impact of AQI for human health. To resolve this issue a single-valued neutrosophic Plithogenic set and its graphical strcutue visualization is discussed in this paper with an illustrative example.

Keywords: Knowledge representation; Graph Analytics; Neutrosophic set; Plithogenic set; Plithogenic graph.

1.Introduction

Recent time dealing uncertainty in data sets and its precise representation is considered as one of the major concern for the data science researchers [1]. The problem arises while precise measurement of uncertainty in true, false and uncertain regions, independently [2]. To achieve this goal, algebra of neutrosophic set is introduced by Smarandache [3]. The neutrosophic graph and its visualization given a well established way for data analysis and processing tasks [4]. In this case, a problem is addressed while dealing the multi-attribute data sets like Air Quality Index (AQI) and its impact measurement on human health [5]. In this case, a problem arises while representation of AQI data sets and its impact human health may create contradiction among two experts. One experts may agreed that the given AQI and its impact is nomal on human whereas another may say it is hazardous. To deal with these types of Plithogenic data sets can be considered as one of the effective set for precise representation of multi-attribute data [6-8]. The problem arises when the expert wants to characterize the uncertainty in Plithogenic attribute based on iation based

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on acceptation, rejection and uncertain regions, independelty. To achieve this goal, the theory of single-valued neutrosophic Plithogenic set and its graphical structure visualization is introduced in this paper.

Recently, some of the researchers tried to pay the attention for data analysis and processing tasks [9-11]. Singh [12] tried to introduced the Plithogenic graph and its visualization for precise analysis of data with multi-attribute [13] and its approximation [14] in single-valued fuzzy space. One of the reasons is that the graph provides a compact and simple way to understand the hidden pattern in the given data sets. This motivated to introduce neutrosophic Plithogenic graph and its application in this paper. The objective is to deal with contradiction arises among two experts and its characterization of uncertainty in true, false and uncertain, regions. To achieve this goal following methods are proposed in this paper:

(i) A method is proposed for precise representation of AQI data sets and its contradiction using Single-valued Neutrosophic Plithogenic set,

(ii) The compact visualization of AQI data sets in Neutrosophic Plithogenic graph is shown for multi-decision process.

(iii) The comparison of the proposed method with recently available approaches [14] is also discussed.

Remaining paper is structured as follows : Section 2 contains preliminaries about single-valued Plithogenic set and its algebra. Section 3 contains the proposed method for single-valued neutrosophic Plithogenic graph visualization with its illustration at Section 4. Section 5 provides conclusions followed by acknowledgement and references.

2. Data With Plithogenic Attribute

This section provides some basic definitions and example for understaindg the neutrosophic Plithogenic graph as given below :

Definition 1: Neutrosophic Set [3]: The neutrosophic set consist three independent functions called as truth, indeterminacy and false, (T, I, F) to represent the uncertainty in attributes. The range of these three independent functions varies between 0 and 1 and mutually exclusive under the conditions $0 \leq T + I + F \leq 3$. The Neutrosophic value 0 represents the universal false cases and 3 represent the universal truth cases i.e. $N = \{\langle x : T, I, F \rangle : x \in \xi\}$. It means this set contains triplet having a true, a false and indeterminacy membership values which can be characterized independently, T_N, F_N , I_N, independently in [0,1] as shown in Figure 1 which can be visualized using Single-valued neutrosophic graph [4]. It can be abbreviate as follows: $N = \{<k; T_N(k), I_N(k), F_N(k)>: k \in \xi; T_N(k), I_N(k), F_N(k) \in \xi\ ]^{-}0, 1^{+}[\}$ ..... ……………(1)

Whereas $0^{-} \leq T_N(k) + I_N(k) + F_N(k) \leq 3^{+}$. ……….…………….....(2)

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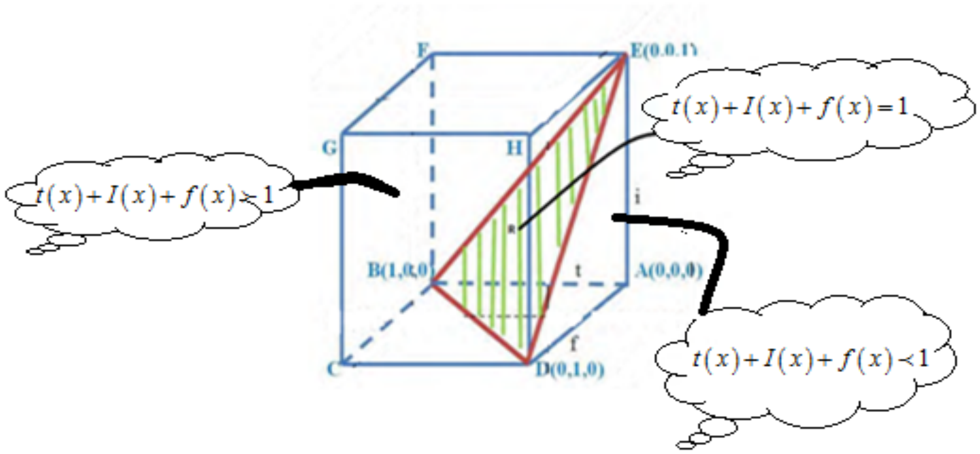

Figure1. The graphical visualization of neutrosophic environment

Example 1: Let us suppose that, an expert wants to analyze the AQI index and its impact on human health via mathematical model [5]. In this casethe data can be collected from CPCB website as shown in Table 1[1]. Let us suppose the expert wants to characterize the AQI for the given place in India based on its acceptation, rejection and indeterminant parts, independnelty for the helath regions. To deal with this issue, the expert can write the AQI is 50 percent accepted for the health, 30 percent harmful for the health and 30 percent is uncertain which changes based on environment or other issues. This case can be written via neutrosophic set as (0.5, 0.3, 0.3). The problem arises when the experts wants to analyze the AQI data more precise using the multi-attribute PM_{10} ,$PM_{2.5}$, NO_2 and its impact on human health like effect on lung and heart. This type of data sets can be analyzed using Plithogenic set as explained below.

Table 1: The AQI Level in India based on Multi-attributes and its values till oct 2021[1].

AQI Category (Range)	PM_{10} (24hr)	$PM_{2.5}$ (24hr)	NO_2 (24hr)	O_3 (8hr)	CO (8hr)	SO_2 (24hr)	NH_3 (24hr)	Pb (24hr)
Good (0–50)	0–50	0–30	0–40	0–50	0–1.0	0–40	0–200	0–0.5
Satisfactory (51–100)	51–100	31–60	41–80	51–100	1.1–2.0	41–80	201–400	0.5–1.0
Moderately polluted (101–200)	101–250	61–90	81–180	101–168	2.1–10	81–380	401–800	1.1–2.0

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Poor (201–300)	251–350	91–120	181–280	169–208	10–17	381–800	801–1200	2.1–3.0
Very poor (301–400)	351–430	121–250	281–400	209–748	17–34	801–1600	1200–1800	3.1–3.5
Severe (401–500)	430+	250+	400+	748+	34+	1600+	1800+	3.5+

Definition 2.PlithogenicSet [6]: This set contains five parts to represents the multi-valued attributes of the given data sets. Let us suppose,ξbe a universe of discourse, P be a subset of this universe of discourse, "*a*" a multi-valued attribute, V is the range of the multi-valued attribute, "*d*" be the known (fuzzy, intuitionistic fuzzy, or neutrosophic) degree of appurtenance with regard to some generic of element *x*'s attribute value to the set **P**, and *c* is the (fuzzy, intuitionistic fuzzy, neutrosophic) degree of contradiction (dissimilarity) among the attribute values as (<*A*, Neutral *A*, Anti *A*>; <*B*, Neutral *B*, Anti *B*>; <*C*, Neutral *C*, Anti *C*>). It can be represented as a set (P, a, V, d, c)which named as a Plithogenic Set (**P**). The Plithogenic set is a set **P**(P, a, V, d, c) in which each element $x \in P$ is characterized by all attribute's (a) values in $V = \{v_1, v_2, \ldots, v_n\}$, for $n \geq 1$ for the degree of appurtenance (d). The contradiction degree function (c) distinct the Plithogenic set from all of the above set. It represents attribute values in form of fuzzy t-norm and fuzzy t-conorm as:

(*i*)$c: V \times V \rightarrow [0, 1]$represents the contradiction degree function among v_1 and v_2.

It used be noted as $c(v_1, v_2)$, and satisfies the following axioms:

(ii) $c(v_1, v_1) = 0$ *i.e.* the contradiction among $v_1$and $v_2$is zero.

(iii) $c(v_1, v_2) = c(v_2, v_1)$,the contradiction among $v_1$and v_2 or v_2 and v_1 used to be considered as per the commutatively properties. In this paper author focuses on single-valued fuzzy membership to handle the Plithogenic set. It can be studied exensively also.[2]

Example 2: Let us suppose, the affect of AQI on human health like Lung and Heart is analyzed by expert for precise analysis. To deal with a data sets can be collected from more than two Hospital to validate the analysis. The collected data sets can be written using the Plithogenic set as shown in Table 2. The data collected from hospital (y_1) and (y_2) allocated in the given region (x_1)as shown in Table 1. The hospital (y_1) says that level of PM_{10} in the given area (x_1) is 60 percent suitable for human health where hospital (y_2) says 70 percent suitable without any contradiction. In this case, the expert consider second parameter $PM_{2.5}$ for their opinion. The hospital (y_1) says that that, the level of $PM_{2.5}$ is 20 percent suitable for human healthwhere as hospital (y_2) says 40 percent suitability which creats30 percent contradiction among them. In this case the expert considers the third parameter NO_2 for the analysis. The hospital (y_1) says that, and the level of $NO_2$is 70 percent suitable for the human health whereas the

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hospital (y_2) says 60 percent suitability which creates 66 percent contradiction. In this case, the expert wanted to verify the lung and heart disease patient for the given AQI. The hospital (y_1) contains more than 80 percent Lung patient due to AQI whereas the hospital (y_2) contains more than 60 percent lung patient due to the given AQI. Same time the hospital (y_1) contain 50 percent heart patient where as hospital (y_2) contains 40 percent heart patient which creats 50 percent contradiction. In this way the AQI and its impact for the chosen multi-attribute for the Table 1 can be written in form of Table 2 using the Plithoegnic set.

Table 2: The Hospital (y_1) and Hospital (y_2) data for AQI In the given area (x_1)

Contradiction degree	0	0.33	0.66	0	0.5
Multi-attributes	PM_{10}	$PM_{2.5}$	No_2	*Lung*	*Heart Disease*
y_1	0.6	0.2	0.7	0.8	0.5
y_2	0.7	0.4	0.6	0.6	0.4

Definition 3. Union and Intersection of Plithogenic Set [6-7]: Let us suppose two Plithogenic set (P_1, P_2) then the intersection can be computed as follows:

$$d_{p_1}(a_p, v_p) \wedge d_{p_2}(a_p, v_p) = (1 - c_p') \times (d_{p_1}(a_p, v_p) \wedge_f d_{p_2}(a_p, v_p)) + c_p'(d_{p_1}(a_p, v_p) \vee_f d_{p_2}(a_p, v_p)) \text{..(iii)}$$

then the union can be computed as follows:

$$d_{p_1}(a_p, v_p) \vee d_{p_2}(a_p, v_p) = (1 - c_p') \times (d_{p_1}(a_p, v_p) \vee_f d_{p_2}(a_p, v_p)) + c_p'\left(d_{p_1}(a_p, v_p) \wedge_f d_{p_2}(a_p, v_p)\right) \text{.......(iv)}$$

where *dp* represents degree of appurtenance, $c_p$represents contradiction degrees for the multi-valued attributes a_p. Others are fuzzy t-conorm to define the intersection.

Example 3: Let us extend the example 2 and find the union and intersection of data collected from hospital (y_1) and hospital (y_2) for further analysis as shown in Table 3.

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Table 3: Intersection and union of both hospital data (y_1) and (y_2) for data analysis

Contradiction degree	0	0.33	0.66	0	0.5
Multi-attributes	PM10	PM2.5	NO_2	*Lung*	*Heart Disease*
$y_1 \wedge_{x_1} y_2$	0.42	0.23	0.73	0.48	0.45
$y_1 \vee_{x_1} y_2$	0.88	0.37	0.57	0.92	0.45

The problem arises when the expert wants to characterize the AQI impact beyond acceptation part like non-acceptation and rejection part [5]. The multi-valued attribute $V = \{v_1, v_2, \ldots, v_n\}$, for $n \geq 1$ and its degree of appurtenance (d) should be written using the neutrosophic set. Same time the contradiction degree (c) may contains at least a single-valued neutrosophic membership-value. In this case, the precise analysis of AQI like Acceptable AQI (1, 0, 0), Harmful AQI (0, 0, 1) or Neutr-AQI(t, i, f) and its impact is major issues. Same time the graphical representation of these types of Neutrosophic Plithogenic data sets is another concern [12-14]. To achieve this goal and precise analysis of AQI data and its impact the single-valued neutrosophic Plithogenic set and its graphical structure visualization is proposed in the next section.

3. A Proposed method for Single-valued Neutrosophic Plithogenic data visualization

In this section, the steps to deal with AQI data using single-valued neutrosophic Plithogenic set is proposed as follows:

Step 1. Let us consider, the AQI data sets as shown in Table 1. The Plithogenic attributes can be chosen based on expert requirement for analyzing the impact of AQI in the given area.

Step 2. The multi-valued attribute like PM_{10}, $PM_{2.5}$ or NO_2 can be written using Single-valued Neutrosophic Plithogenic attributes as(P, a, V, d, c), where each element $x \in P$ is characterized by all attribute's (a) values in $V = \{v_1, v_2, \ldots, v_n\}$, for $n \geq 1$ for the single-valued neutrosophic degree of appurtenance (d). The contradiction degree (c) also contains at least a single-valued neutrosophic membership-value as shown in Table 4. It represents the AQI data set in contextual format where mutliattribute and its contradiction degree represented in coloumn. The expert opinion written in row for precise analysis of AQI and its impact.

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Table 4: Data with Single-valued Neutrosophic Plithogenic set

Contradiction degree	c_1	c_2		c_3		c_{k+1}		c_m
Mutli-attribute values	a_1	a_2		a_3		a_{k+1}		a_m
a_1	$d_{1,1}(t,i,f)$	$d_{1,2}(t,i,f)$		$d_{1,k}(t,i,f)$		$d_{1,k+1}(t,i,f)$		$d_{1,m}(t,i,f)$
a_2	$d_{2,1}(t,i,f)$	$d_{2,2}(t,i,f)$		$d_{2,k}(t,i,f)$		$d_{2,k+1}(t,i,f)$		$d_{2,m}(t,i,f)$
. . .	. . .	. . .		. . .		. . .		. . .
a_n	$d_{n,1}(t,i,f)$	$d_{n,2}(t,i,f)$		$d_{n,k}(t,i,f)$		$d_{n,k+1}(t,i,f)$		$d_{n,m}(t,i,f)$

Step 3. The single-valued neutrosophic Plithogenic set representation of AQI and its impact on Lung and Heart can be considered as vertex of a Plithogenic graph (*G*) contains five tuples $(V_p, E_p, a_p, d_p, c_p)$.

Step 4. The single-valued neutrosophic Plithogenic set of AQI data can be represented as vertex: $\frac{\{a_{p_4},(t_{d_{p_4}}, i_{d_{p_4}}, f_{d_{p_4}}),(t_{c_{p_4}}, i_{c_{p_4}}, f_{c_{p_4}})\}}{v_{p_4}}$ where (a_p) represents multi-attributes attributes, (dp) represents single-valued neutrosophic degree of appurtenance, and (c_p) represents contradiction degrees defines for the vertex (Vp).

Step 5. The corresponding relationship among the AQI data sets and its impact can be found via edges (E_{pq}) as $V_p \times V_p - E_{p_c q_c}$ where $E_{p_c q_c}$ represents those edges having zero contradiction degrees (c_{pq}) due to its commutative properties $c(v_1, v_2) = c(v_2, v_1)$ for degree of appurtenance (d_{pq}).

Step 6. The relationship can be computed as Intersection of the Neutrosophic Plithogenic set as follows:

$$d_{p_1}(a_p, v_p) \wedge d_{p_2}(a_p, v_p) = (1 - c_p) \times (d_{p_1}(a_p, v_p) \wedge_f d_{p_2}(a_p, v_p)) + c_p(d_{p_1}(a_p, v_p) \vee_f d_{p_2}(a_p, v_p))$$

…………...(v)

Otherwise the relation can be as follows:

$$d_{p_1}(a_p, v_p) \wedge d_{p_2}(a_p, v_p) \geq (1 - c_p) \times (d_{p_1}(a_p, v_p) \wedge_f d_{p_2}(a_p, v_p)) + c_p^s(d_{p_1}(a_p, v_p) \vee_f d_{p_2}(a_p, v_p))$$

………..(vi)

Step 7. The Union can computed as follows:

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$$d_{p_1}(a_p, v_p) \vee d_{p_2}(a_p, v_p) = (1 - c_{\,p}) \times (d_{p_1}(a_p, v_p) \vee_f d_{p_2}(a_p, v_p)) + c_{\,p}(d_{p_1}(a_p, v_p) \wedge_f d_{p_2}(a_p, v_p))$$
…..(vii)

Step 8. The degree of appurtenance for single-valued neutrosophic set can be computed as follows:

$$(i)\ V_1 \wedge_p V_2 = \left(t_{dp_1} \wedge_p t_{dp_2}, i_{dp_1} \vee_p i_{dp_2}, f_{dp_1} \vee_p f_{dp_2}\right)$$
$$(ii)\ V_1 \vee_p V_2 = \left(t_{dp_1} \vee_p t_{dp_2}, i_{dp_1} \wedge_p i_{dp_2}, f_{dp_1} \wedge_p f_{dp_2}\right)$$

Step 9. The obtained single-valued neutrosophic Plithogenic relation among edges can be visualized in graph as shown in Figure 2.

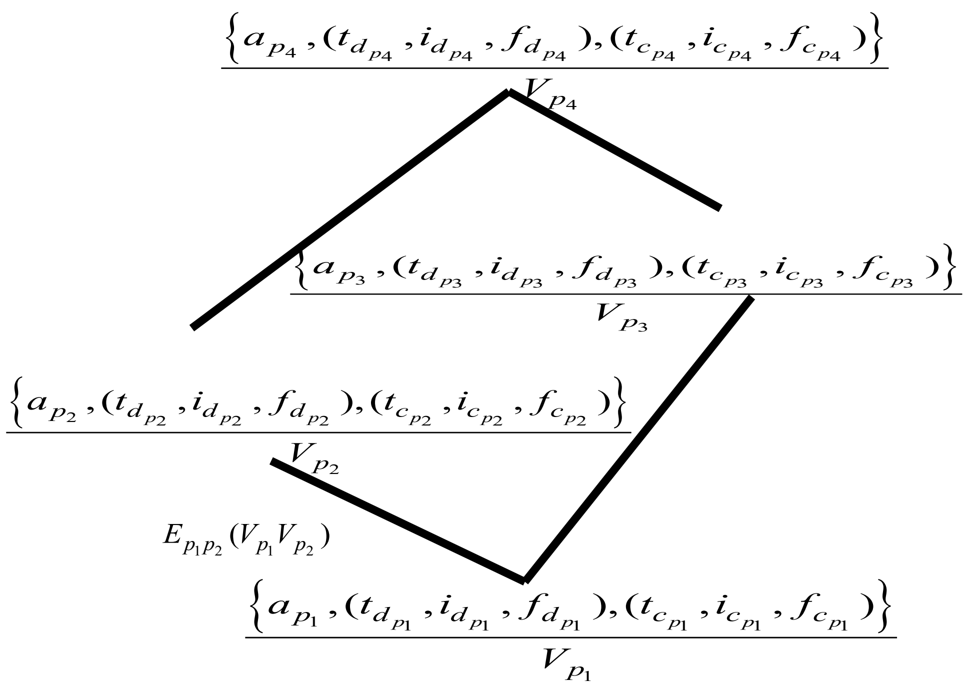

Figure 2. The Single-valued Neutrosophic Plithogenic graph for four vertex

Step 10. The knowledge can be discovered for AQI index and its impact as follows:

(i) Non Harmful AQI level (1, 0, 0): In case any vertex degree of Appurtenance contains (1, 0, 0) – membership-values. It means the AQI is not harmful in that reagion as per the Figure 2.

(ii) Harmful AQI level (0, 0, 1): In case any vertex degree of Appurtenance contains (0, 0, 1) – membership-values. It means the AQI is harmful in that reagion as per Figure 2.

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(iii) Neutro-AQI level (0, 0, 1): In case any vertex degree of Appurtenance contains (t, i, f) –membership-values. It means the AQI contain uncertainty that changes many times based on the environement and other parameters as per Figure 2.

In this way, the proposed method provides an alternative way to deal with Plithogenic data sets and its visualization for multi-decision process. In similar way the proposed method can be applied for dealing other plithoegnic data sets.

Time complexity: Let us suppose, $n$number of neutrosophic Plithogenic attributes with$m$-number of multi-attributes. This may take O($n.m$) for drawing the edges and its truth, falsity, indeterminacy membership-values computation can take maximum O ($m.n^3$) or ($n.m^3$) time complexity.

4. AQI Data Analysis Using Single-valued Neutrosophic Plithogenioc Graph

Data with Plithogenic set and its uncertainty measurement is considered as one of the major issues as reported recently[6-12]. The reasons is that the, Plithogenic data set contains multi-valued attributes and it's opposite, non-opposite or neutral sides [6-7]. The precise representation of data with Plithogenic data sets and its graphical visualization is considered as adequate way to find some pattern [8, 12]. The problem arises when the expert wants to characterize the uncertainty based on truth, falsity and uncertain regions [2]. One of the example is AQI data sets [5] which impact based on several attributes as shown in Section 2. To achieve this goal, the current paper introduced single-valued neutrosophic Plithogenic graph in this paper in Section 3. The proposed method is illustrated in this section with an illustrative example.

Example 4: Let us extend the Example 2 and 3 for precise analysis of AQI and its impact on human health based on acceptation, rejection and uncertain regions for multi-decision process [5]. In this case, the data collected from hospitals (y_1) and (y_2) can be written in precise way for acceptance, rejection and indeterminacy of PM_{10}, $PM_{2.5}$, NO_2 and its impact on Lung and Heart disease in the given area (x_1) as shown in Table 5. The problem is to analyze the hospital data for multi-decision process. To achieve this goal, a method is proposed in Section 3.

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Table 5: The Hospital (y_1) and Hospital (y_2)data for AQI In the given area (x_1)

Contradiction degree	(0, 0.5, 1)	0.33	0.66	0	0.5
Multi-attributes	PM10	PM2.5	No_2	*Lung*	*Heart Disease*
Single-valued neutrosophic degree (y_1)	(0.4, 0.1, 0.5)	(0.3, 0.6, 0.2)	(0.2, 0.1, 0.4)	(0.8, 0.3, 0.1)	(0.6, 0.2, 0.3)
Single-valued neutrosophic degree (y_2)	(0.5, 0.2, 0.4)	(0.4, 0.1, 0.3)	(0.3, 0.4, 0.2)	(0.7, 0.1, 0.6)	(0.5, 0.1, 0.3)

Let us suppose the first entry of Table 5 to compute the union among $(0.4,0.1,0.5) \vee_{x} (0.5,0.2,0.4)$ with internal contradiction (0, 0.5, 1). It can be computed as follows:

$$=(0.4 + 0.5 - 0.4 \times 0.5, 0.5(0.1 \times 0.2 + 0.1 + 0.2 - 0.1 \times 0.2), 0.5 \times 0.4)$$

$$=(0.70, 0.15, 0.20)$$

It is reflected as first entry of Table 6. Similarly, the union among other entries can be computed as reflected in Table 6.

The intersection among (0.4, 0.1, 0.5) and (0.5, 0.2. 0.4) with internal contradiction (0, 0.5, 1) shown in Table 5can be computed as follows: $(0.4,0.1,0.5) \wedge_{x} (0.5,0.2,0.4)$

$$=(\{1-0\}.[0.4 \wedge_x 0.5] + \{0\}[0.4 \vee_x 0.5], 0.5.[0.1 \wedge_x 0.2] + 0.5[0.1 \vee_x 0.2], \{1-0\}.[0.4 \vee_x 0.5] + \{0\}[0.4 \wedge_x 0.5])$$

$$=(1.[0.4.0.5] + 0.[0.4 \vee_x 0.5], 0.5.[0.1 \wedge_x 0.2] + 0.5[0.1 \vee_x 0.2], 1.[0.4 \vee_x 0.5] + 0.[0.4 \wedge_x 0.5])$$

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$=(0.2,0.5.[0.1 \times 0.2]+0.5[0.1+0.2-0.1 \times 0.2],1.[0.4+0.5-0.4 \times 0.5])$

$=(0.2,0.15,0.7)$

It is represented as first entry of Table 6. Similarly, intersection among other neutrosophic Plithogenic attributes can be computed as reflected in Table 6. The problem is how to analyze or extract some useful information from Table 5 and 6. One of the reason is its mathematical representation is computationally expensive tasks. To achieve this goal, these data can be visualizaed using Single-valued Neutrosophic Plithogenic graph as shown in Figure 3. It provides a compact representation of Table 5 and 6 which will be useful in knowledge processing tasks.

Table 6: The Union and Intersection of Hospital data (y_1)and (y_2)

Contradiction degree	(0, 0.5, 1)	0.33	0.66	0	0.5
Multi-attributes	PM10	PM2.5	No_2	*Lung*	*Heart Disease*
$y_1 \vee_{x_1} y_2$	(0.7, 0.15, 0.2)	(0.43, 0.35, 0.19)	(0.19, 0.25, 0.37)	(0.94, 0.2, 0.06)	(0.55, 0.15, 0.3)
$y_1 \wedge_{x1} y_2$	(0.2, 0.15, 0.7)	(0.27, 0.35, 0.31)	(0.31, 0.25, 0.23)	(0.56, 0.2, 0.64)	(0.55, 0.15, 0.3)

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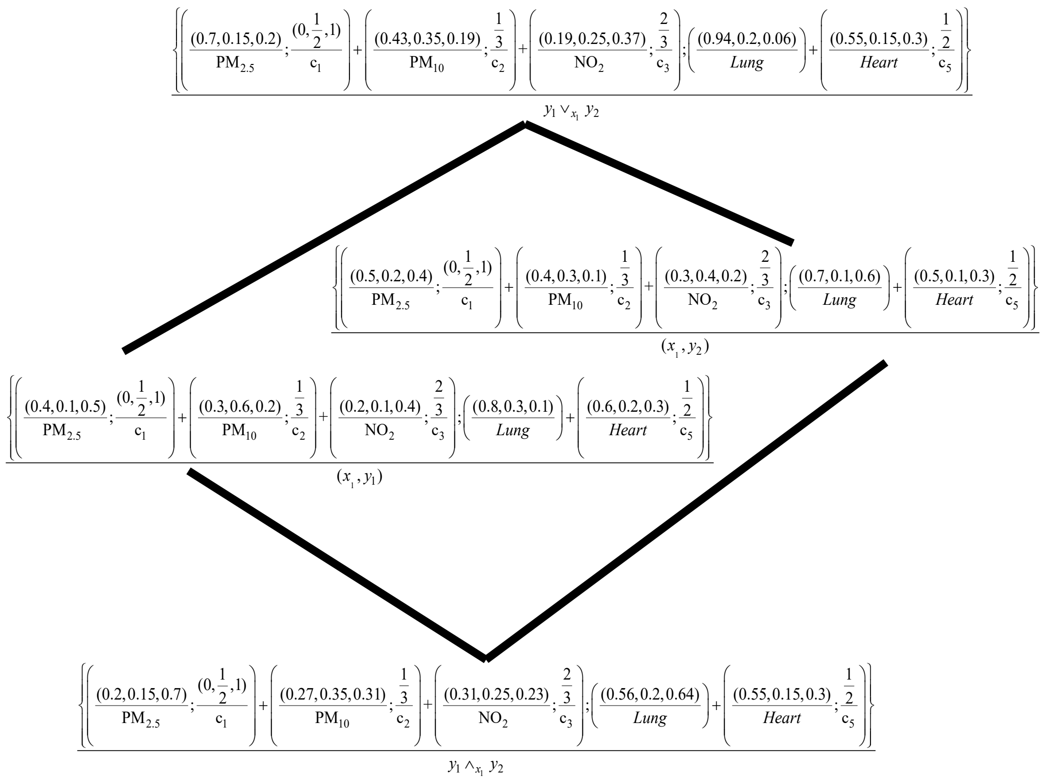

Figure 3.The Single-valued Neutrosophic Plithogenic graph of Tables 5 and 6

It can be observed that, the Figure 3 does not contain any vertex with (1, 0, 0) membership-values. It means the AQI in particular area is harmful and neutro-AQI level. It provides an information that both Hospitals agreed about affect of AQI in the given area more than 50 percent to Lung and Heart patients. It means the area (x_1)is not suitable for Lung patient specially without any conflict whereas Heart Patient is 50 percent effected. The analysis data says that the government need to reallocate the people from the given area or find some alternative solutions to control the AQI. Otherwise the patient of Lung and heart Diesease may increase in future which will drastic change the citizens life and medical crisis. In this case the government may take decision to control AQI or rehabilition of population for future plans. However the proposed method does not provide any analysis about changes in AQI based on given phase of time or its micro or macro level analysis on health. To resolve this issue, author will focus on some different applications of Plithogenic set and its decomposition. Table 7 shows the comparison of the proposed method with recently available methods on Plithogenic set and its graphical visualization. It can be observed that the proposed method is distinct from any of the available approach on various ways.

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Table 7. The comparison of the proposed method with recent studies on Plithogenic Graph

	Plithogenic set [8]	Plithogenic graph [12]	Proposed methods
Plithogenic attributes	Yes	Yes	Yes
Neutrosophic Attributes	No	No	Yes
Decision making	Yes	Yes	Yes
Graph	No	Yes	Yes
AQI analysis	No	Yes	Yes
Data set	Yes	Yes	Yes
Time complexity	Not given	O($m.n^2$) or ($n.m^2$)	O($m.n^2$) or ($n.m^2$)

In near future author will focus on zoom in and zoom out of neutrosophic Plithogenic set at user defined granulation [14] and other data sets [15].

5. Conclusion

This paper focused on introducing new graph for dealing the data with single-valued neutrosophic Plithogenic attributes. To achieve this goal, Plithogenic graph is extended in this paper for characterization of uncertainty in neutrosophic attributes based on true, false and uncertain regions, independnelty as shown in Section 3. The proposed method is illustrated using AQI data sets and its contradiction level as shown in Section4. Table 7 represents that, the proposed method is distinct from any of the available approaches in Plithogenic set [8] and its visualization [14]. In future, author will focus on zoom in and zoom out of neutrosophic Plithogenic set at use defined Plithogenic granulation for knowledge processing tasks.

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Footnotes:

1. https://en.wikipedia.org/wiki/Air_quality_index
2. http://fs.unm.edu/a/paradoxism.htm

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