Non-Euclidean, AntiGeometry, and NeutroGeometry Characterization

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Abstract: Recently, a problem is addressed about dealing the difference among Non-Euclidean, AntiGeometry and NeutroGeoemtry data sets. The problem arises while partial negation of Euclidean Geometry, full negation of Euclidean or Hybrid mode. In case of undefined geometry also many researchers raised the questions. To tackle this issue, the current paper provides some examples for Non-Euclidean, AntiGeometry, and Neutrogemoetry for better understanding.

Keywords: AntiGeometry; Euclidean geometry; Graph Analytics; Knowledge representation; NeutroGeometry, Non-Euclidean geometry; Turiyam; Unknown graph.

1. INTRODUCTION

The Euclid given a way to deal with any data sets and its representation based on its five postulates [1]. The problem arises with data representation when any of the postulates fails. One of the famous examples is failure of parallel postulates as shown in Figure 1.

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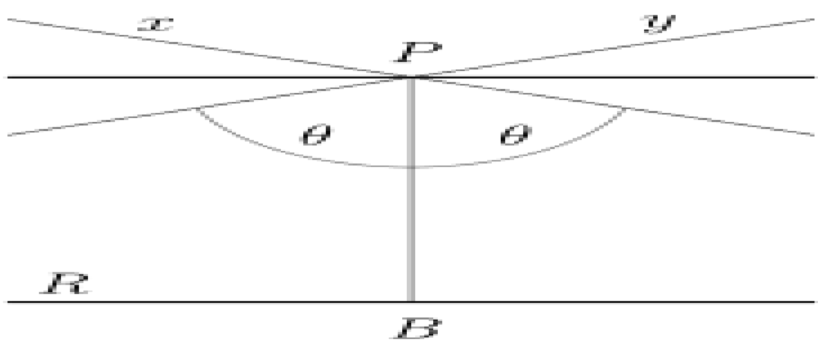

Figure 1: The negation of parallel postulates exists in Euclidean Geometry.

It is Lobachevsky who provided one of the negation of Euclidean geometry (i.e. Parallel Postulates) [2]. The Riemann provided (i.e. Elliptic geometry) a Non-Euclidean geometry where fifth and second postulates fail [3-4][1]. It is considered as both Non-Euclidean and AntiGeometry. It given a new way to deal the cases when each of the Euclid postulates fails or may be hybrid or hetero postulates exists in the data set [5-7]. In case any of the fifth postulate fails or may all postulates fails can be considered as AntiGeometry. The problem arises when the data sets contains Euclidean + Non-Euclidean (as in Hybrid Smarandache Geometries [5,6,7]), AntiGeometry + Euclidean or other data sets. The characterization of these types of data sets and thier algebraic properties is one of the crucial tasks for the research communities [8-10]. The reason is this type of data may contain Euclidean+Non-Euclidean, Euclidean+Hyperbolic, Euclicean+AntiGeometry. NeutroGeometry means at least one axiom is partially true, partially indeterminate, and partially false (and no axiom is totally denied) as shown in Figure 2[11-12]. It shows several lines parallel to CE passing through point *N* (i.e. Hyperbolic) but not with the point D (i.e. Elliptical), where as from point M only one line is parallel to CE. This is Hybrid Smarandache case which contain Euclid+Non-Euclid geometry [5].

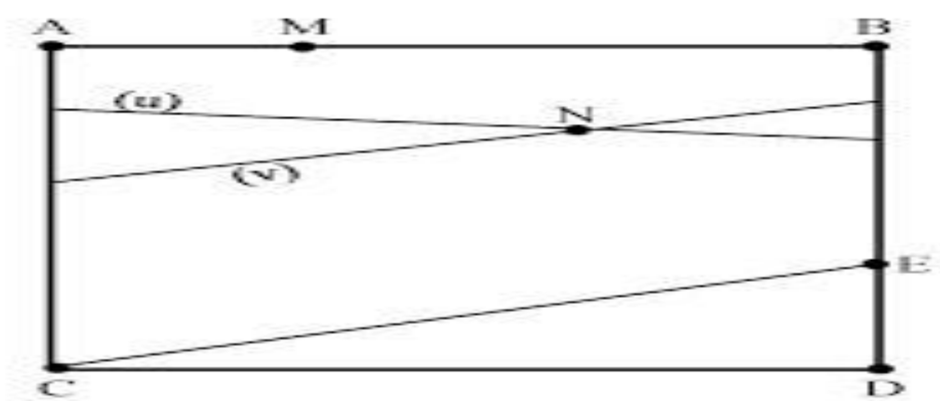

Figure 2: The NeutroGeometry example as a Hybrid Smarandache Geometry [11]

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It exists in fractals, Anisotropy, or Heteroclinic data sets where one or more types of zero, negative and positive curvature exists. It leads to fourth dimensional that nothing is known, unknown or undefined data sets and its charcterization [13-17]. The problem become more difficult when the undefined or unknown data exists [18-21] which is totally focused on awareness of an expert in the given area can be called as Turiyam [13-17]. One of the reason is these types of data sets and its orientations changes based on time and distance [23-24]. In this case acceptation and rejection of parallel postulates is one of the crucial tasks [25]. This paper provides some glimpses on characterizing the Non-Euclidean, AntiGeometry and NeutroGeometry data for knowledge processing tasks.

Other parts are structured as follows: Section 2 provides preliminaries about Euclidean and Non-Euclidean geometry. Section 3 provides some steps to characterize the AntiGeoemtry and NeutroGeometry data with its illustrative examples in Section 4. Section 5 contains conclusions followed acknowledgement and references.

2. PRELIMINARIES

This section provides some examples to understand the Euclidean and Non-Euclidean data sets for better understanding of its negation as given below:

Definition 1. (Euclidean Geometry): The Euclidean geometry is based on five postulates defined by Euclid as given below:

(a) Two points can be connected via a straight line.

(b) A straight line can be prolonged continuously to finite length.

(c) A circle can be drawn around a point considering it as a centre via a defined radius.

(d) All the right angles are equal.

(e) There is one and only one straight line can be drawn parallel to the straight line outside from the given point.

The problem arises when any of the Euclidean postulates or all postulates or may be hybrid postulates fails. Already the negation of parallel postulates shown in Figure 1. In this case the precise representation and exploration of the data set is major tasks beyond the time and space trade-off [21-24]. To deal with this issue a method is proposed in the next section. .

3. A PROPOSED METHOD

It is well known that the negation of parallel postulates is easier to find the Non-Euclidean data sets. However the negation for any the five postulates exists in the given data sets can be characterized as Non-Euclidean. To get the AntiGeometry data the negation of at least one of the postulates should exists in the given data sets. It means the AntiGeometry data can be found via full negation on Euclidean geometrical data. The problem arises when the data sets contain Hybridization of these Geometry. It means the data contains uncertainty or indeterminacy about the Euclidean, Non-Euclidean, AntiGeometry,

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NeutroGeometry, Hybrid Smarandache Geometry or Heteroclinic like Algae image [20], medical data [21], unkown data [22], organic data structure [23] or multi-attributes data sets [24]. These types of data sets and their characterization is one of crucial tasks for data science researchers. The first problem arises with its exploration rather than space time tradeoff complexity. In this section some steps given to characterize those data sets in Non-Euclidean, AntiGeometry and NeutroGeometry space as given below:

The Hybrid Geometry, AntiGeometry and NeutroGeometry were proposed by Smarandache starting since 1969 and continued in 2019-2021.

The AntiGeometry results from the total negation of any axiom or even of more axioms from any geometric axiomatic system (Euclid's, Hilbert's, etc.) and from any type of geometry such as (Euclidean, Projective, Finite, Affine, Differential, Algebraic, Complex, Discrete, Computational, Molecular, Convex, etc.) Geometry, and the NeutroGeometry results from the partial negation of one or more axioms [and no total negation of no axiom] from any geometric axiomatic system and from any type of geometry. [11]

Generally, instead of a classical geometric Axiom, one may take any classical geometric Theorem from any axiomatic system and from any type of geometry, and transform it by NeutroSophication or AntiSophication into a NeutroTheorem or AntiTheorem respectively in order to construct a NeutroGeometry or AntiGeometry. [11]

Therefore, the AntiGeometry is a generalization of the Non-Euclidean Geometries, while NeutroGeometry is an alternative of the Non-Euclidean Geometries. [11]

Step 1: Let us suppose, the given data sets having *n*-number of elements (*X*).

Step 2: The data sets does not follow the parallel postulates as discusses in Section 2 can be considered as Non-Euclidean data sets.

Step 3: The obtained Non-Euclidean data contain several several parallel as failure of parallel postulates as. In this case it can be characterized as Hyperbolic otherwise Elliptical Geometry (zero parallel lines) as shown in Figure 3.

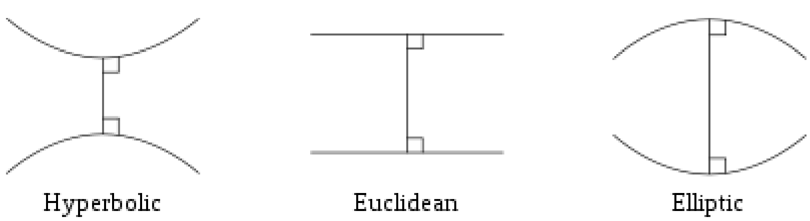

Figure 3: The difference between Hyberbolic and Elliptic Geometry

Step 4: The problem arises when any one of the postulates fails in the given data sets or may be all postulates fails can be considered as AntiGeometry like Anistropy, heteroclinic network, fractal, and chemical structure etc. One of the suitable examples is while dealing Anisotropy or heteroclinic data sets in which none of co-ordinate is perpendular to each other as shown in Figure 4. These types of data sets can be characterized as AntiGeometry.

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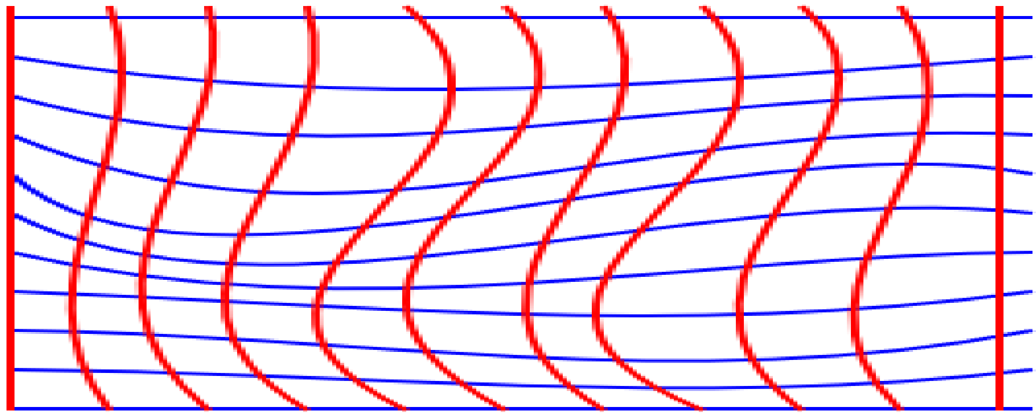

Figure 4: The Anti-Geometery data where none of Co-ordinate is perpendualr to each other

Step 5. The problem arises when the element (X) contains data in both Geometry as Euclidean and non-Euclidean, Euclidean+AntiGeometry, Hyperbolic+Euclidean, Euclidean+Elliptical where one of Euclid Postluates is true, and one of the postulates is partially false or indeterminate means no axiom is totally denied. This type of data can be characterize via NeutroGeometry as shown in Figure 2.

Step 6. The data having Non-Euclidean can be considered as True (t), Not Non-Euclidean (f) and indeterminant (i) or Hybrid. The charcterization of these types of data sets in determinant and indeterminant zone is one of the major tasks as shown in Figure 5.

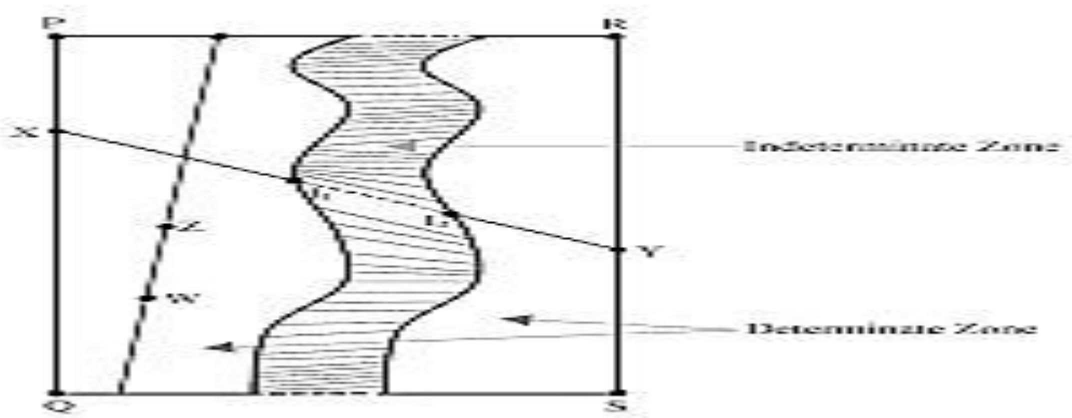

Figure 5: The NeutroGeometery data and its Characterization

Step 7. It means the NeutroGeometry data can be characterize via a defined Neutro operator as $\circ : X \times X \rightarrow P^n(X)$ where $(T, I, F) \notin \{(1,0,0),(0,0,1)\}$.

Step 8. The representation of data can be done as given below :

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(i) Let us suppose, $x_1, x_2 \in X$ be two element of non-Euclidean geometry then $x_1 \circ x_2 \subseteq X$ provides a new element in Non-Euclidean space i.e. true (1, 0, 0).

(ii) Let us suppose, $x_1, x_2 \in X$ be two element of non-Euclidean geometry then $x_1 \circ x_2 \nsubseteq X$ provides a new element which does not exists in the Non-Euclidean geometry i.e. false region (0, 0, 1).

(iii) Let us suppose, $x_1, x_2 \in X$ be two element of non-Euclidean geometry provides a new element $x_1 \circ x_2$ which is uncertain that Euclidean or Non-Euclidean, AntiGeometry. This type of saddle space can be defined as indeterminacy (t, i, f) region of NeutroGeometry.

Step 9: The indeterminant element and its position can be analyzed via NeutroAlgebra for defined Neutrosophic numebrs.

Step 10. It can be visualized using the defined NeutroGraph (V, E) where V represents elements in NeutroGeometry and Edges (E) represented by Hyperedges.

Complexity: The time complexity to characterize the NeutroGeometrical data having n-number of elements can take O(n^3) time complexity for true, false and uncertain regions.

The next section provides some of the real life examples for the Non-Euclidean, AntiGeometry and NeutroGeometry data for better understanding.

4. Examples of Data sets Beyond the Non-Euclidean Geometry

Recently, the characterization of Non-Euclidean and Not Non-Euclidean data is considered as one of the most crucial tasks [3-4]. One of the examples is AntiGeometry and NeutroGeometry data [11-12]. In this section some examples will be given which is not Non-Euclidean need to be characterized based on acceptation, rejection and uncertain part of NeutroGeometry [3, 11]. In case of undefined, unknown, not existence of human thought and its cognition Turiyam set [13-14] and its space is also [15-16]. In this section some of the examples beyond Non-Euclidean will be discussed as given below**:**

Example 1**:** The first example is difference between Euclidean and Non-Euclidean data sets which can be characterized via Figure 6. The Non-Euclidean data sets where one of the Euclid Postulates does not exist and can be represented by Elliptic or Hyperbolic Geometry as shown in Figure 7. It is used to used for representing twisted filament bundle and its packing as shown in Figure 8. The problem arises when the given data sets exists beyond the Non-Euclidean and unable to represent via Non-Euclidean Geoemtry.

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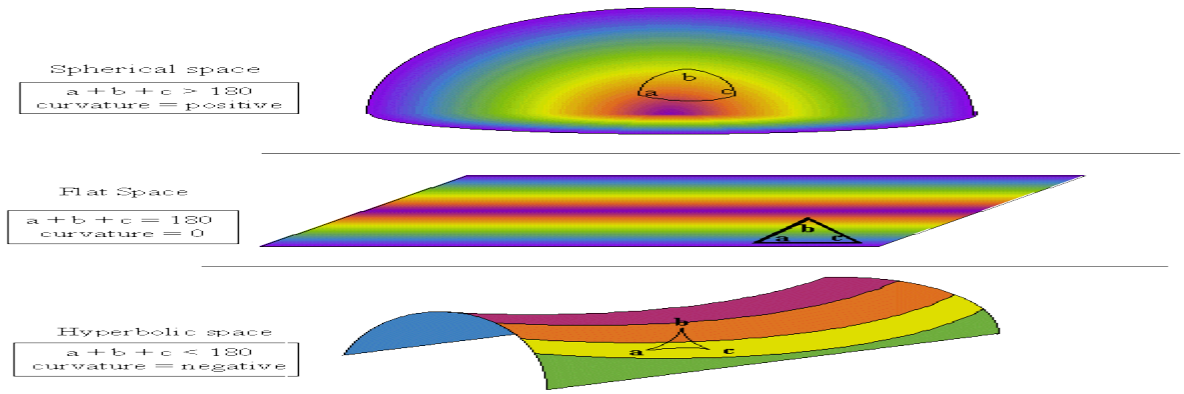

Figure 6: The difference between Euclidean and Non-Euclidean data sets and its representation

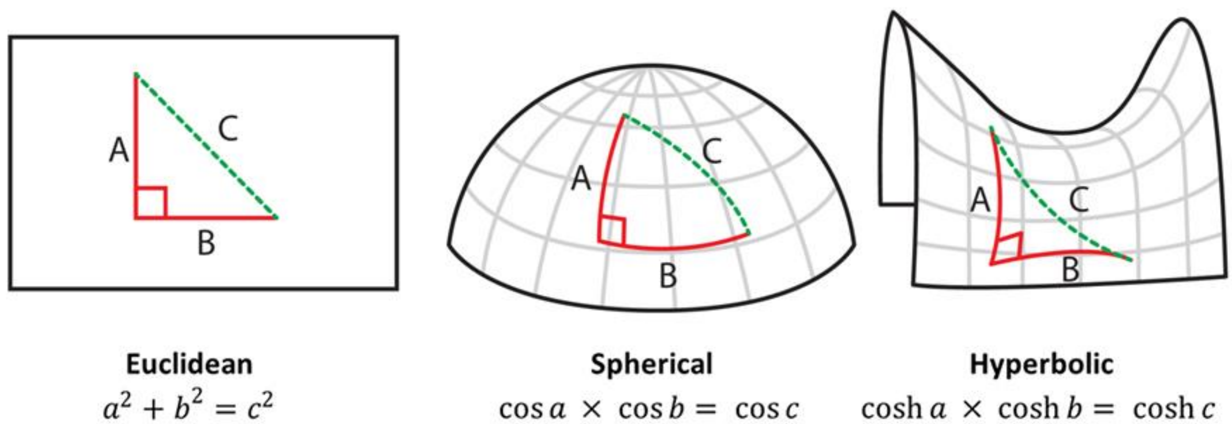

Figure 7: The difference between Euclidean and Non-Euclidean data sets and its representation

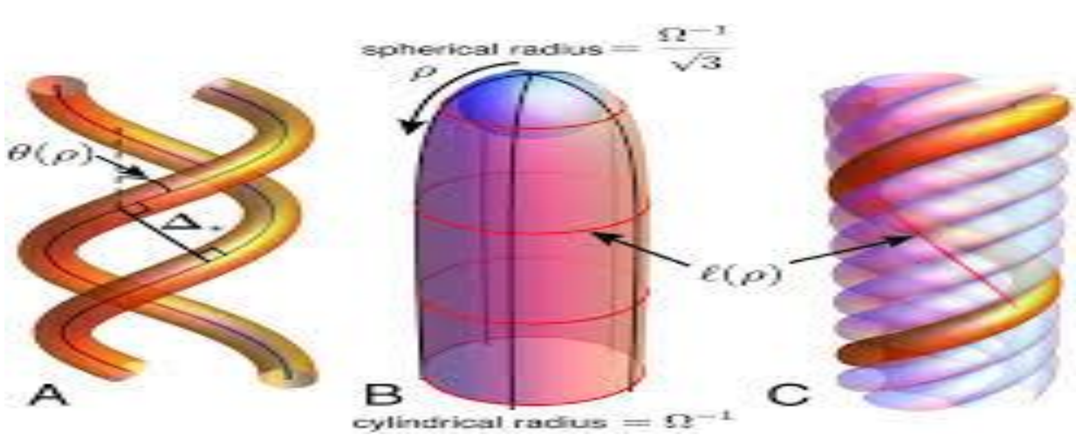

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Figure 8: One of the applications of Non-Euclidean Geometry i.e. Twisted bundles

Example 2. (Saccheri quadrilateral) [25]: This type of quadrilateral includes both type of Geometry as Hyperbolic and Elliptic geometry as shown in Figure 9. The summit angles in this type of quadrilateral become right angles in case of Euclidean, acute in case of hyperbolic and obtuse angles in case of elliptic geometry. These types of geometry can be characterized via NeutroGeoemtry at the same time based on given space.

Figure 9: A Saccheri quadrilateral and its representation

Example 2. (Ackermann steering geometry) [2]**:** This arrange the among steering of a car (or other vehicle) to solve the problem of wheels and its turning from inside or outside. It trace out by the circles of different radii to avoid the slip of tires at a given curvature as shown in Figure 10. This type of data can be analyzed via NeutroGeometry as Hybrid of AntiGeometry+Euclidean.

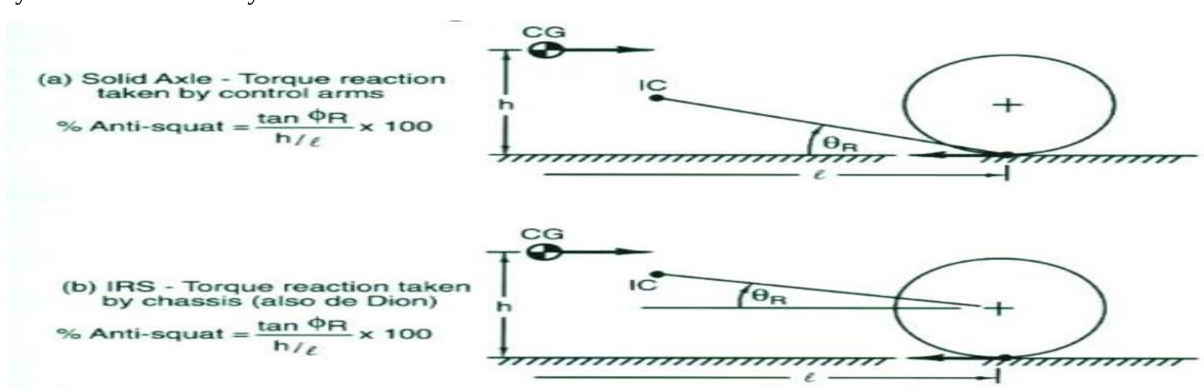

Figure 10: The Anti-Squad Geometry and its characterization

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Example 4. (Anti-Periplanar)[3]: The organic chemical structure and its representation cannot be done via Non-Euclidean space. The reason is these type of structure belongs beyond the Spherical, Elliptical and AntiGeometry. In this case the structure can be characterized based on acceptation, rejection and uncertain regions based on user requirement [23]. It can be understood while representing the A–B–C–D bond angle of a given molecule shown in Figure 11 using the anti-periplanar (or antiperiplanar).

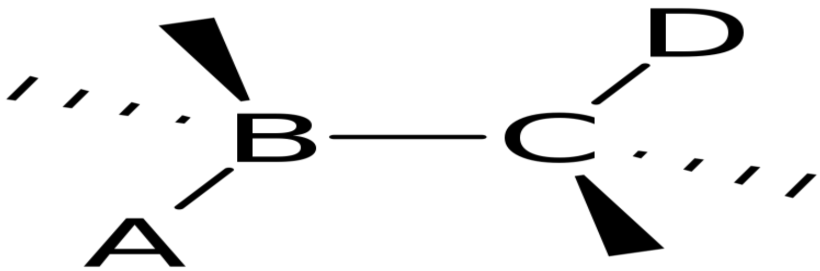

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Figure 11: The representation of chemical structure with A-B-C-D bond angles.

Example 5. (Neutro Social Network)**:** The virtual network where the chatting is uncertain. Sometime the other side person and its identification is uncertain. This type of data and its analysis is difficult for knowledge processing tasks. It can be characterized using NeutroGeometry as given below:

(i) True Social Network (1, 0, 0): The particular person chatting on the given Social media, whatsapp or telegram, facebook or other netwrok then it can be characterized as true chat or Networking.

(ii) Anti-Social Network(0, 0, 1): The concerned person is not chatting on the Social Network at given Whatsapp, Telegram or other network then it can be characterized as Anti-Social Network.

(iii) Neutro Social Network (t, i, f): The concerned or wrong person chatting on the given network and its identity is uncertain.

The problem arises while exploration of NeutroGeometry data sets and its visualization in one frame as per Euclidean and Non-Euclidean Geometry. It can be done via tree or other methods for exploring the NeutroGeometry data sets shown in Figure 12. The second problem arises when the data sets is unknown, undefined or not sure about existence as per current time. This type of data sets one of the examples is Chimera[4]. It is observed while characterization of plant or algae as shown in Figure 13. It can be arises new dimension can be called as undefined, Unknown or liberated data can be characterized by Turiyam Space [13-14] which will be future scope of the paper.

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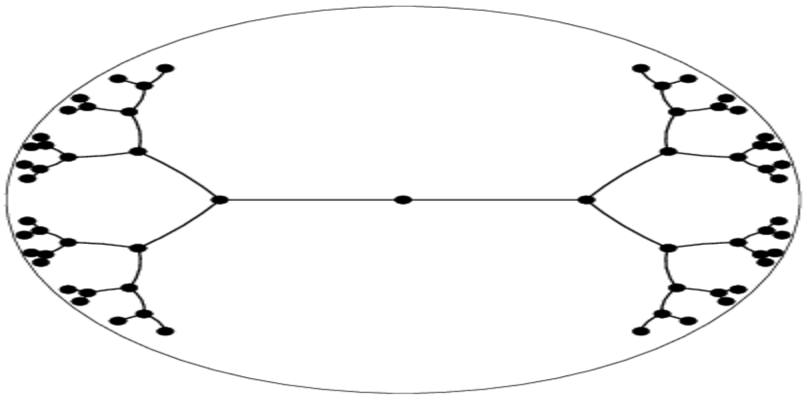

Figure 12: The chacterization of Citation and its graphical visualization in one frame

Figure 13: A Chimerism of Ficus with chlorophyll-deficient cell zones

5. CONCLUSIONS

This paper explores the difference among Euclidean, Non-Euclidean, AntiGeometry and NeutroGeoemetry data sets with an illustrative examples. In near future, the author will focus on graphical visualization of NeutroGeometry data sets with its extensive properties.

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Footnotes:

1. https://www.britannica.com/science/Riemannian-geometry

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2. https://en.wikipedia.org/wiki/Ackermann_steering_geometry
3. https://en.wikipedia.org/wiki/Anti-periplanar
4. https://en.wikipedia.org/wiki/Chimera_(genetics)

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