



Turiyam a Co-ordinate Free Geometry and its exploration

Prem Kumar Singh^{1,*}

¹Department of Computer Science and Engineering, Gandhi Institute of Technology and Management-Visakhapatnam, Andhra Pradesh 530045, India

Email: premsingh.csjm@gmail.com

Abstract

Recent time data representation and visualization is considered as one of the major issues. It become more crucial when the data sets exists beyond the non-euclidean geometry and its hybridization also. There are several examples given by non-euclidean geometry by Lobachevsky, Bolyai, Riemannian which contains failure of Euclid postulates V and II, respectively. The problem arises when none of the Euclid Postulates exists. It might possible that the data sets contains unknown or co-ordinate free geometry. In this case the data can be explored based on a defined vector space rather than available co-ordinate geometry. It require human Turiyam consciousness to explore these types of unknown, undefined, co-ordinate free data. To understand this problem current paper explores the Turiyam geometry and its basic for exploring the unknown or undefined data with an example.

Keywords: Concept Lattice; Graph Analytics; Knowledge representation; Non-Euclidean; Turiyam Geometry; Unknown Graph

1. Introduction

The precise representation of data and its graphical visualization is considered as one of the major problem among the research communities [1-4]. The basic problem arises while exploration of data sets and its precise representation [5-8]. The Euclid or Thales somehow tried to represent them via defined postulates or Theorem [9]. The Descarte introduced Cartesian co-ordinate for precise representation and visualization of two dimensional data as XOY where O represents origin. It is indded requirement to understand the mathematical character of land, space, solid or universal elements. The Euclid tried to represent them based on the five postulates using a primitive notion point as follows:

- (i) A straight line can be drawn from any given two points,
- (ii) A finite length straight line can be drawn continuously in a straight line,
- (iii) A circle can be drawn from a given point using any radius,
- (iv) Each of right angles in the given plane is equal to each others,
- (v) The last one is parallel postulates which says that, one and only one parallel line can be drawn from a point not lie on the straight line [2].

It gives a way to analyze the conic section and its properties based on quadratic equation $Ax^2+Bxy+ Cy^2+ Dx+Ey+F=0$ discussed by Hypatia shown in Figure 1.

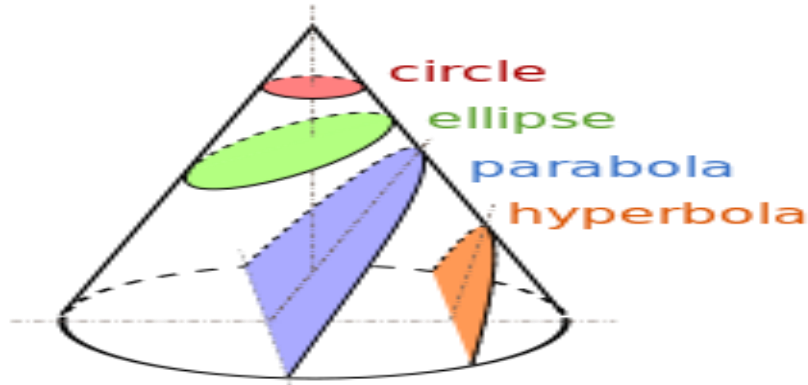


Figure 1. The conic section based on Euclidean geometry

The problem arises when any of the data sets does not follow the given postulates as discussed by Lobachevsky and Bolyai [10]. They gave an example where fifth postulates fails shown in Figure 2 called as Hyperbolic Geometry [11]. The Riemann gave an example for negation of second postulates fails as shown in Figure 3 [12].

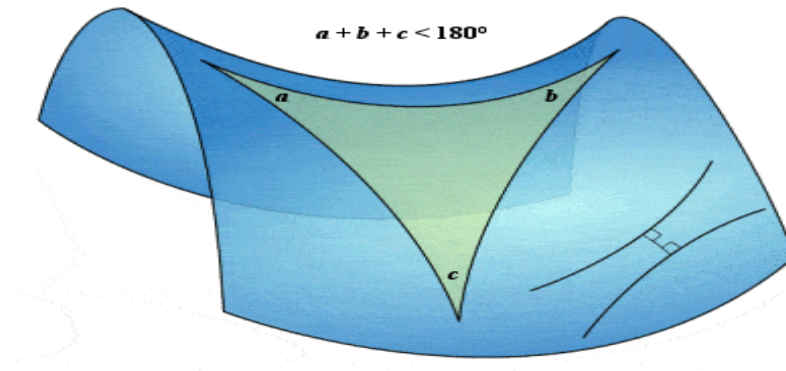


Figure 2. The Hyperbolic Geometry where fifth Postualtes fails

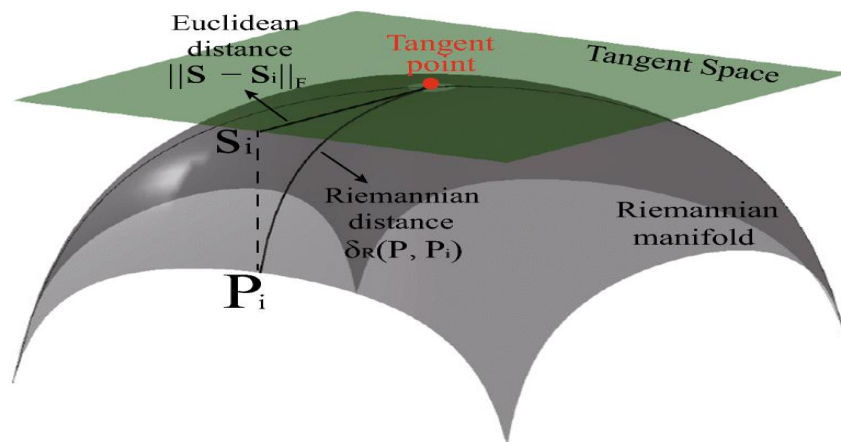


Figure 3. The Riemmanian Geometry where Second Postulates fails

The third case arises when the geometrical data contain both properties of Euclidean and Non-Euclidean as Hybrid called as NeuroGeometry as shown in Figure 4 [1-4, 13].

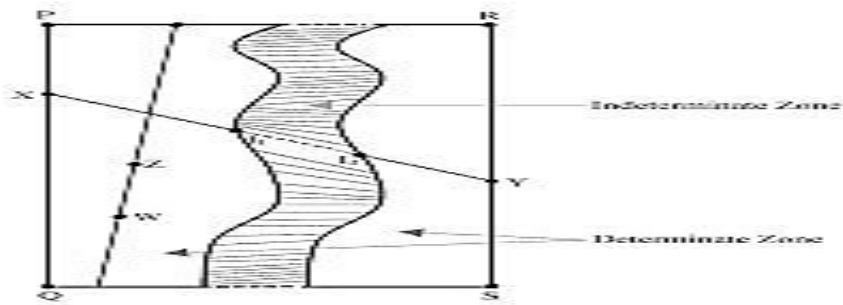


Figure 4. The NeuroGeometry data characterization

The final is co-ordinate free geometry [14], empty geometry or unknown geometry [15-16] like Borromean ring shown in Figure 5. It requires human quantum cognition to explore the data and its visualization in the space [17-18]. The chimera is another example of unknown or impossible objects [19]. The distance measurement of any city is totally based on Turiyam consciousness. The local person who is aware of the city provides distance measurement more precisely when compared to other unknown persons. The new person needs to explore the city based on his/her consciousness to define near or far based on the distance or time. Belnap logic [20-21] somehow able to provide basic computation about unknown data which motivated to investigate unknown of four-dimensional data. Recently several authors have paid attention towards this direction [22-30]. One of the suitable examples is exploration of robot path requires Turiyam geometry [31-32]. There are other data sets also contain unknown geometry due to involvement of human consciousness like religion conflict analysis, political conflict among two countries, brain drain analysis, citation and cricket data analysis. In this paper, the author tried to explore this unknown or co-ordinate free geometry.

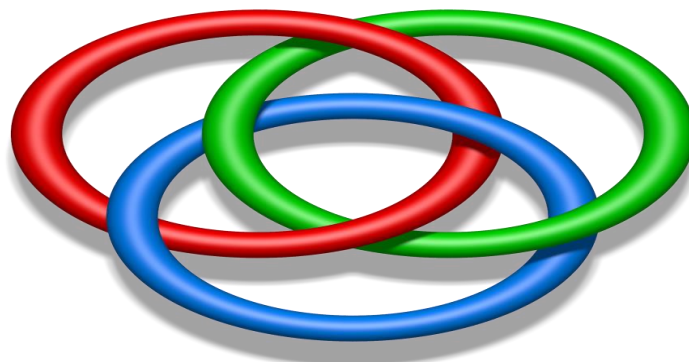


Figure 5. The Borromean Rings



Figure 6. An impossible or unknown object like Chimera

Table 1: Some of the possible Conditions for characterization of Geometrical data

Conditions	Object (X)	Object (Y)	Relation (R)	Geometry
(a)	Known	Known	Five Postulates	Euclid
(b)	Known	Known	Does not follow any of the five Postulates	Non-Euclidean
(c)	Known	Known (or Uncertain)	Hybrid i.e. Euclid+Non-Euclidean	NeutroGeometry
(d)	Known	Known	Follow each four postulates except fifth	Neutral Geometry
(e)	Known	Known	Does not follow any of the Euclid Postulates	Anti-Geometry
(f)	Known (or Unknown)	Unknown (or Known)	Liberal Relation or Co-ordinate free geometry	Human Consciouenss require for exploration i.e. Tuiryam Geometry.
(g)	Unknown (or Known)	Unknown (or Known)	Liberal Relation or Unknown Geometry	Human Consciouenss require for exploration i.e. Tuiryam Geometry.

The motive of this paper is try to characterize any of the given data sets in form of Table 1 for its precise exploration in four ways as given below:

- (i) The data can be represented via Euclidean Geometry i.e (EG),
- (ii) The data can be represented via Non-Euclidean Geometry i.e (NE),
- (iii) The data can be represented via partial i.e. Euclidean+Non-Euclidean called as NeutroGeometry(NG),
- (iv) The data cannot be represented by any other ways. It is nothing. It is unknown. It is undefined. It is co-ordinate free geometry. It is empty geometry. It is missing or unknown geometry which requires human consciouenss to explore it. The co-ordinate free geometry in one of the example.

The objective is to underatnd the hidden pattern in unknown or co-ordinate free geometry based on Human Turiyam consciouenss rather than defined a closed geometry. It can be observed that the proposed paper is distinct from any of the papers published by the author.

Other parts are structured as follows: Section 2 provides some data with Non-Euclidean geometry and its visualization. Section 3 proposed a method for characterization of Non-Euclidean data sets and its complement for validation of four way characterization. Section 4 provides some of examples for Knowledge processing tasks. Section 5 provides conclusions followed acknowledgement and references.

2. Data Representation with Defined Geometry

In this section, some distinct geometry and its visualization is shown for understanding the Non-Euclidean data:

Definition 1. (Euclid Geometry) [9]: The data set which follows the Euclid five postulates is considered as Euclid geometry. The most interesting is parallel postulates. It says that one and only one parallel can be drawn from a point outside the given straight line as shown in Figure 7. There are several cases where parallel postulates fails as discussed by Lobachevsky and Bolyai. It leads a new way called as Non-Euclidean geometry.

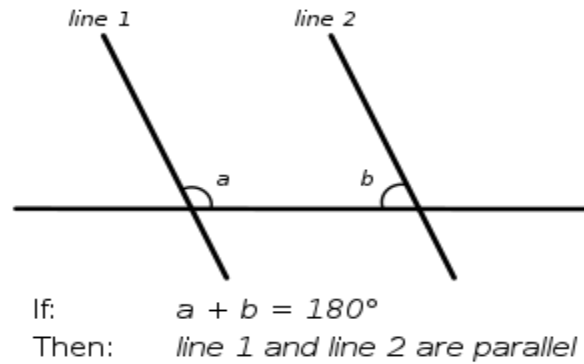


Figure 7. The famous parallel Postulates of Euclid Geometry

Definition 2. (Non-Euclid Geometry) [10]: It represents those data sets which contain negation of parallel postulates that many lines can be drawn from a point outside the given line as discussed by Lobachevsky and Bolyai. In this geometry parallel postulates fails where more than one line can be drawn from a given point outside the line as shown in Figure 8. Riemmanian is another case of Euclidean geometry where second postulates also fails. The problem arises when the data sets contains both Euclid and Non-Euclidean. To deal with these types of data sets NeutroGeometry is another way to characterize them

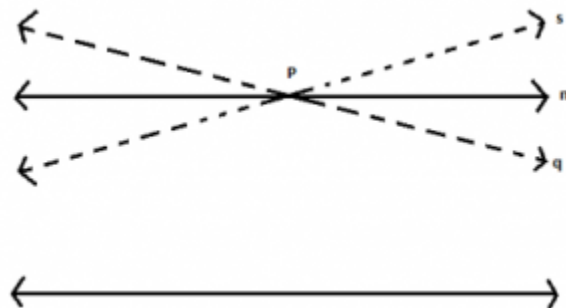


Figure 8. An example of Non-Euclidean geometry arises by negation of fifth postulates

Definition 4. (NeutroGeometry) [1-4] : NeutroGeometry means at least one of the Euclid postulates is partially true, partially indeterminate, and partially false (and no axiom is totally denied) as shown in Figure 5. It shows several lines parallel to CE passing through point N (i.e. Hyperbolic) but not with the point D (i.e. Elliptical), whereas from point M only one line is parallel to CE. This is hybrid case which contain Euclid+Non-Euclid geometry.

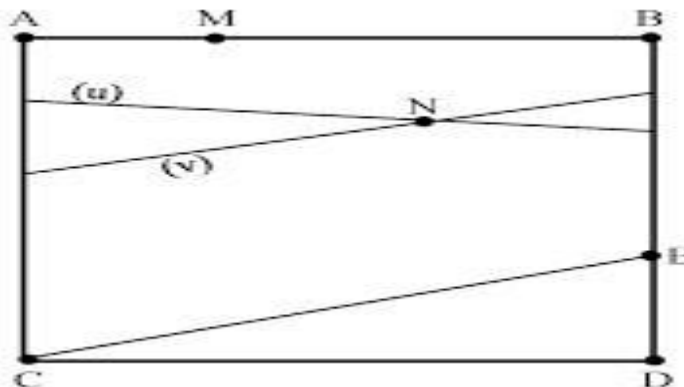


Figure 9. An example for Euclidean+Non-Euclidean i.e. NeutroGeometry

The problem arises when the data set is unknown, undefined, ungeometry, empty geometry, missing geometry, coordinate free geometry [14-17]. These types of data sets can be explored based on Human Turiyam Consciousness [18-19]. It can be called as Turiyam Geometry. In this case, every expert can have their own data representation and its interpretation. To deal with that a new method is proposed in this paper for dealing the unknown geometry.

3. A Proposed Method for Exploring the Unknown Data or Unknown Geometry

In this section, a method is proposed to for characterization of Non-Euclidean data in Euclidean, Non-Euclidean, Hybrid or NeutroGeometry and last Unknown Geometry i.e. Turiyam Geometry(TG). Coordinate-free geometry liberates geometric concepts from the constraints of specific coordinate systems. Focusing on intrinsic properties enables a more abstract and general understanding of geometric structures that transcends the limitations of any particular coordinate system.

Step 1. Let us consider any unknown data sets (or Robot path) to explore as $F(X)=(t, i, f, l)$.

Step 2. The operator provides a new element in Four Dimensional Turiyam space as $: X \times X \rightarrow P^4(X)$.

Step 3. It will give an object representation in vector space $\Sigma i^4 \hat{\alpha}^4$ where $\hat{\alpha}$ is finite length measurement in any coordinate.

Step 4. It will provide a point representation in four dimensional which is Euclidean or not Euclidean as $(\hat{\alpha}^1, \hat{\alpha}^2, \hat{\alpha}^3, \hat{\alpha}^4)$.

Step 5. The notations i^1, i^2, i^3, i^4 can be considered as mutually perpendicular vector i.e. $i^m \cdot i^n = 0$ and $i^m \cdot i^m = 1$.

Step 6. The i^1 -axis can be drawn 30 degree below the horizontal line, i^2 -axis 90 degree right to this, i^3 -axis 60 degree above this on right horizontal half line, i^4 -axis 90 from this and vertical.

Step 7. The point will represent an object and its attribute in Hyperspace.

Step 8. Hence Turiyam geometry deals mostly with cognitive space rather than taxi cab geometrical data representation XOY format.

Time Complexity: It can be observed that the proposed method takes four way characterization of Non-Euclidean data sets having n -elements. In this way it can take maximum $O(n^4)$ time complexity. However the problem arises in case of dealing the Not Non-Euclidean and last Unknown Geometry. To understand this in better way the complement operator is used in the next section as validation.

4. Applications

Recently, several researchers paid attention towards four dimensional data representation and its mathematics [17-30]. The belnap logic gave a way to deal the four valued data sets [20-22]. However this logic also based on unconsciousness. It is difficult to measure the dark or unknown data sets where human Turiyam consciousness involved. Some time error is created using Human Turiyam consciousness. It is difficult to measure these types of issues and its visualization. It requires expert Turiyam cognition for exploration without geometry. In this paper a method is proposed to deal with these types of data sets using Turiyam Geometry. Hence the Turiyam geometry and its exploration will be distinct from expert to expert. In this section some of the example of impossible, unknown, undefined and unknown objects is discussed:

Example 1. (Differential Geometry) : It provides a Coordinate-free geometry for drawing the curvature, tangent spaces, or connections. It defines them intrinsically without reference of any specific coordinates like XoY where o is origin.

Example 2. (Algebraic Geometry) : It also provides a coordinate-free techniques to study the geometric objects and its shapes via polynomial equations. It need more attention of researchers to understand the intrinsic properties of geometrical objects and its pattern analysis.

Example 3. (Robotics and Computer Graphics) [31-32]: It is a new research field of Turiyam geometry. The robot learns new or unknown things based on defined algorithms. It requires coordinate-free geometry rather than XoY geometry.

Example 4. (Quantum Mechanics) [6, 8]: It is another coordinate-free geometry area where new mathematical formalism required for understanding the quantum systems.

Example 5. (Friendship Network) [28-29]: The virtual network where the chatting, calling or connection is totally unknown some time. Sometime the other side person and its identification is unknown. We used to explore them via chatting, calling, checking on other social media account. The liberal or unknown friend exploration on any app like Tinder/facebook or other social media.

Example 6. (Soil Pollution and its geometrical exploration): The Soil pollution and its measurement is another issue which can be characterized based on four ways as follows:

- (i) Pollution: The expert is aware that soil is polluted $(1, 0, 0, 1)$,
- (ii) Anti-Pollution: The expert is aware that soil is not Polluted $(0, 0, 1, 1)$,
- (iii) Neutro-Pollution: The expert is unaware that soil is polluted or not polluted $(0, 1, 0, 0)$,
- (iv) Unknown or nothing: The last is nothing, it is desert, it is snow area no soil nothing unknown like other planet. The last one is based on expert awareness or consciousness to explore the soil pollution as (t, i, f, u) .

Example 7: (A Child Citizenship Analysis): The citizenship analysis for any country is one of the most crucial tasks. It become hot topic for the democratic country like Bharat (i.e. India) when Citizen Amendment Act is passed in 2019. One of the crucial tasks about dealing the unknown citizen, immigrants, refugee or enemy country citizenship analysis. It can be explored via Turiyam Geometry as follows:

- (i) True Citizen $(t, 0, 0, l)$: These type of people having mother and father from Bharat. They used to marry with Indian citizen in consciousness which can be represented as $(t, 0, 0, l)$. In case they married with Indian citizens in unconsciousness way then can be represented as $(t, 0, 0, 0)$. The membership value for t and l can be computed based on the time spend in Bharat or family tree.
- (ii) False Citizen $(0, 0, f, l)$: These type of people having mother and father from enemy or other country. They used to marry with anyone who is enemy of the Bharat. They do this act in consciousness which can be represented as $(0, 0, f, l)$. In case they do this act in unconsciousness way then can be represented as $(0, 0, f, 0)$. The membership value for f and l can be computed based on the time and its activity as threat for the Bharat.
- (iii) Uncertain Citizen $(0, i, 0, l)$: These types of people having at least one parents from Bharat. Sometime the enemy country citizen purposefully married to Indian citizen. The motive is to spoil Bharat or pass the confidential message to enemy country. It is matter of exploration for the government agencies which can be written as $(0, i, 0, l)$. In case they do this act in unconsciousness way then can be represented as $(0, 0, i, l)$. The membership value for i and l can be computed based on the activity done in bharat while living. It is will provide an idea that how much membership the concern person is loyal or unloyal with Bharat.
- (iv) Liberal or Turiyam Citizen (t, i, f, l) : The last problem arises with the family which family tree or any information does not exists. They came to Bharat in refugee format, immigrant format or injected by enemy country. They donot have any passport or visa. They are living without approval. The child who lost their parents. The orphan child citizenship analysis is totally based on awareness of Governemnt agencies. It will decise the goverenemtn is in favor of saving bharat, supporting enemy country, liberal or working in pressure of any country. Same time the person having passport or Visa also considered as liberal citizen. They came to enjoy the Bharat or complete some of the tasks. They are not true citizen, false citizen or uncertain citizen. They came to Bharat based on their consciousness. It need exploration for government agencies to give them visa, citizenship or not requires Turiyam cognition as (t, i, f, l) .

Example 8: (Langauge Characterization): The country Like Bharat where multi-langauge exists. It is difficult to analyze them based on true, false, uncertain or other regions. It requires four dimensional space:

- (i) True-Langauge $(t, 0, 0, l)$.: The lanaguge which contains the same words from the lanaguge generated in Bharat like Sanskrit or Tamil. In this case the membership values can be computed based on percentage of words taken from these lanaguge.
- (ii) False-Lanaguge $(0, 0, f, l)$: The lanaguge which is not based on concept of Panini grammar i.e. Sanskrit. They can be considered as false lanaguge in context of Bharat like Latin, Hebrew, English Chinese, Russians, Persian or others. The percentage of words used from those lanaguge can be represented as false membership

whereas people use them in consciousness can be considered as Turiyam membership. It can be represented as $(0, 0, f, 1)$ In case some people use those words in Bharat unconsciousness way without knowing the subject. It can be represented as $(0, 0, f, 0)$.

- (iii) Uncertain Language $(0, i, 0, 1)$: The language which is mixup of two or more languages. Telugu is one of the example which is based on Sanskrit+Tamil+Kanada language. The telugu citizen speaks this language unconsciously. Anyone from this region can speak this language unconsciously which can be written as $(0, i, 0, 0)$. However others need Turiyam awareness of Sanskrit+Tamil+Kannada which can be written as $(0, i, 0, 1)$. These types of person may understand or speak Telugu partially which need exploration.
- (iv) Unknown Language $(t, i, f, 1)$: The language which contains many words from unknown language. Any new language created in India by anyone using any of the language of the world. The language which includes any words from any foreign language also. It need more exploration to use or find based on Human Turiyam consciousness. One of the suitable example is Hindi which is based on four types of words as Tatsam+Tadbhav+Deshaj+Videshaj. Tatsam means direct Sanskrit words. Tadbhav means derived from Sanskrit words. Deshaj means words taken directly from any Indian Languages and Final is words from any foreign languages. The uses of these words is totally based on Human Turiyam consciousness otherwise conflict arises. Hence exploration of Hindi is totally based on Human Turiyam consciousness as (t, i, f, u) .

Example 9. (Author Analysis) : The characterization of citation and its visualization is another crucial task. It become more crucial in case of intellectual measurement as the citations contains large number of data. It can be done as follows:

- (i) True Author $(1, 0, 0, 0)$: A paper is cited due to its related keyword, title, methodology, or similar topic can be considered as true citation $(1, 0, 0, 0)$. In this case two or more authors working in same area cite each other paper.
- (ii) False Author $(0, 0, 1, 0)$: A paper is cited in irrelevant way without matching keyword, title, similar topic or any relevancy. The retracted paper is citation, the paper is not cited due to conflict of interest, same departmental citations beyond the relevant of topic, host conference citation without relevancy, forced citation, random citation can be considered as Anti-Citation $(0, 0, 1, 0)$.
- (iii) Uncertain Author : A paper is cited with interdisciplinary, collaboration, self-citations, influenced citations, honours citations, editorial citation, same journal citations, the diverse indexed citation, the author is uncertain about founding paper, time based citation, plagiarism citation, etc. can be considered as Neutro-citation $(0, 1, 0, 0)$.
- (iv) Unknown or Nothing: The author does not aware about the given topic. He/she need to explore the topic based on his/her consciousness. The author cited current research just to increase the impact factor of the given journal rather than linguistic diversity. There are many papers written in other language rather than English. The author unaware about those works and consider the work from some defined indexing. It may happen that some good idea also exists outside the Scopus. The author unknown about those potential work and did not cited. These types of citation can be characterized based on awareness of expert which comes after hard work. It can be characterized based on fourth dimension as (t, i, f, u) .

Example 10. (Brain Drain Analysis): The brain drain analysis is one of the most crucial data which is not Euclidean. In this case the precise measurement and visualization of data is major issues for data science researchers. It can be characterized in four way as follows:

- (i) Brain Drain $(1, 0, 0, 0)$: The Professor of given expert area left the organization due to salary, promotion or other issues can be characterized as Brain Drain $(1, 0, 0, 0)$. It can be easily verified by the paper published by the author in the given research domain, its citation and influenced. It used to observed in undeveloped country where many researchers left the organization to developed country.
- (ii) Anti-Brain Drain $(0, 0, 1, 0)$: The Professor having no papers, Posthumous authors papers, No citation or no knowledge about given research area left the organization. The Professor who does not contribute anything to the organization and left the organization. It can be considered as Anti-brain drain $(0, 0, 1, 0)$. It used to observe when a Professor from developed country live the organization and join some other undeveloped country.

- (iii) Neutro Brain Drain (0, 1, 0, 1): This problem arises when author publishes different papers in various areas as collaboration, multiple co-authors exists in the given paper, author is having less corresponding author paper, or author work is retracted, plagiarism work is totally uncertain. It can be characterized as Neutro Brain Drain where uncertainty arises about author work as (0, 1, 0, 0). It can be observed at many places where people write paper as collaboration. In this case totally uncertain that who is more expert of the given area.
- (iv) Nothing or Unknown: It exists when the expert write papers in different language than English, non-indexed papers, the expert have less resources but still do his/her best. Same time the Professor may resign due to family pressure, unethical work of organization, do not want to work, want retirement, died, killed by some agency, forced to leave the organization, the author understood that his is business leave it and start something new. This type of data needs exploration for better understanding. The reason is this type of awareness is based on human cognition rather than simple mathematics. It can be characterized as (t, i, f, u) .

Example 11. (Conflict Analysis) : The precise analysis of conflict or cold war among USA and Russia (or USA-China, Israel-Philistine, India-Pakistan) is totally beyond the win, draw or loss of the given issue. It is totally based on the conduit metaphor or digital diplomacy of USA and Russia (or USA-China, Israel-Philistine, India-Pakistan) can be characterized in following ways:

- (i) True graph (V_r, E_r) : A set of countries that support Russia (S_r) can be characterized as true regions. These countries (V) and their relationships (E) are known to everyone. These countries and their graph can be explored in precise way for better understanding.
- (ii) False or Misleading graph (V_w, E_w) : A set of countries supporting the USA can be characterized as false regions (S_w). These countries always and their relationship with the USA can be easily drawn. However they just mislead Russia to show the affection.
- (iii) Neutro-graph (V_i, E_i) : A set of countries supports Russia or USA based on their metaphor. These types of countries and their vote is uncertain can be characterized as $(2^k - S_r)$. These countries and their relationship with Russia or USA can be defined based on membership values rather than known or misleading graph. They can change their support any time based on their conduit metaphor.
- (iv) Unknown graph (t, i, f, l) : The fourth case is some countries like India or China choose nothing as per their interest to fulfill their hidden agenda. It is not uncertain vote. It is totally based on digital diplomacy. It is unknown that where these countries support to USA or Russia. Everyone knows that due to choosing nothing or Absent India, China or UAE supported Russia. However no one can define the conduit metaphor behind it. This type of unknown data can be explored based on human awareness or expert consciousness as (t, i, f, u) .

Example 11. (Retraction Analysis) : The retraction became one of the major issue now a days. It happens when some of the researchers did scientific misconduct which is basically unknown to editor before publication. It is explored by editor using his/her Turiyam awareness. It can be characterized as follows:

- (i) True Answer (1, 0, 0, 0): The author gave true answer, true data and its review comment. It means the author has did the work and taken responsibility for answering the questions.,
- (ii) False Answer (0, 0, 1, 0): The author unable to answer the question, the author wrote any author mail ID as wrong, the author unable to reply the proper question. Author unable to take responsibility. These types of false answer can lead to consider something flaw towards retraction,
- (iii) Neutro Answer (0, 1, 0, 0): The author answer something uncertain about the paper. In case any answers are partially wrong or only partially correct. Same time the time line of paper and its submission mismatch. These types of Neutro-answer given by the author can keep in the paper under screening,
- (iv) Turiyam Answer (t, i, f, l) : The author knows each question, each things about the paper from zero to till acceptance. The author knows self consciousness that the paper is done by him or others. The self consciousness answer of author reflects the truth about paper. Same time the truth about editor also knows the fact about the paper. The self consciousness and self awareness by corresponding author or editor extend the paper for the self retraction can be considered as Turiyam answer.

It can be observed that the Turiyam geometry provides a way to deal with unknown data sets via coordinate-free geometry. It liberates the data and its visualization from the XoY co-ordinate geometric systems. It gives a way to understand the concepts, space, and distinct branch of mathematics for precise analysis of data and its pattern. It will play a major role in dealing the unknown data, ungeometrical data, robotics, or quantum data visualization.

5. Conclusion

This paper teid to explore the missing or unknown geometry using Turiyam set with an applications. It is also discussed a method for exploration of unknown data via Turiyam or co-ordinate free geometry. Some of the example and real life exploration of proposed method is discussed for future applications.

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