

RESEARCH PAPER

New Quantum Computing Application with New Data Structure and Data Format

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Abstract

In this paper we will discuss about a new data structure suitable for Quantum Computing, A new data format called **Cdata** and how it is used to collect a chaotic systems data and feed into our **Non-EuStructure** using a four dimensional object to store current and past values and storing them into qubits and how we can use quantum mechanical properties such as superposition and entanglement to easily achieve such complex storing and computing of chaotic systems. First we will look at our Cdata and how it compares to JSON then I will explain the Non-EuStructure data structure and how the flow and storage takes place. After we will take a look at the architecture of Non-EuStructure. We will closely look at Equations and Circuit combinations to achieve our goal.

Keywords: New Data Structure, New Quantum Computing Application, A New Data Format for Storing Chaotic Data, Chaotic Numbers

1. Introduction

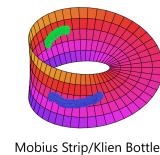
This is a proposal method, Inventing a new data format is a bold statement but what we are going to do here in this paper is to understand our data format chaotic data format (CDF) where we make use of 4 dimensional objects such as kien bottle and mobius strip. JSON format uses "key: value" to store data and this format is best known till now but since I myself made chaotic numbers Thakur (2022a) this made me think of a new way to store data to manipulate chaos by storing it in a data structure I call **Non-EuStructure** which in full form called "Non Euclidean Geometrical Data Structure" we will use low chaos and high chaos to define our "key: value" respectively with the help of the characteristics of my chaotic numbers this will be an easy task.

First we will understand our data structure to store chaotic data, for that first we need to understand Non-EuStructure data structure fig 1

why we need this new data structure? dont we have sufficient? well you see arrays, stacks are of no use to a chaotic system so I decided to create this Non-EuStructure data structure which will help us store previous state and current state of key and value respectively. This will help us in many IOT and AI applications. This will be the new quantum computing application since we are limited in thinking what a quantum computer ca actually perform what more it is capable of? I am here to introduce the quantum computing community with a new application.

Quantum Computers will be able have qvariables which is the term I created this qvariable will have more than 1 state it will be real time with the program because of Non-EuStructure and Cdata. That means quantum computers will be able to perform computations like we have never seen before. In the coming sections you will notice how Non-EuStructure operates and how Cdata helps it. Storing such multiple informations and performing computations can be done on classical computers but I leave this to the expert computer scientists.

● - Previous State of Key/Value in Cdata.
● - Current State of Key/Value in Cdata.



Mobius Strip/Kien Bottle

Figure 1. Non-EuStructure data structure

2. Literature Review

This paper is about a new data structure Non-EuStructure and new data format Cdata and how its a new application for Quantum Computing. Literature Survey on this was very very easy since so existing system exist. In fact I am the first to introduce a data structure in Quantum Computers. But my data format Cdata somewhat was derived from the existing data format called JSON in the section 6 we will take a look at how it compares to mine and how my Cdata is much much powerful from JSON. Although we will be using a existing system called mobius strip which will act as our container for data structure.

3. Cdata

Cdata is what I call chaotic data which will consist of low chaos also known as "Key" in JSON and high chaos also known as "Value" in JSON data format. Now these keys and values will be used in a situation where requirements exceeds the JSON format such example is in figure 3 where 3 different keys and their enormous values that cannot be handled with a static data format such as JSON this was the reason I thought we need a new data format that will help us in sending chaotic data. Below table 3 shows the mechanism of Cdata. As you can see

for JSON we had to write 3 times for three different key and value pairs but for Cdata we just wrote all the possible keys now this will change on it's own in real time to give you Hot Wind values from initial state say 20 all the way to 40. Let us take an example at 20 miles /h we have Hot wind now as the "key" changes it's state from Hot \rightarrow Cold and "value" with the high chaotic change Thakur (2022a) $seen_h$ also changes real time on its own say 20 \rightarrow 30, now you not only have the data for Hot Wind up to 29.9999 but also values of 30 \rightarrow 39.999999 for "key" Cold Wind. This is the power **Cdata** possesses.

Data Format	Key	Value
JSON	Hot Wind	20 miles/h
JSON	Cold Wind	15.3 miles/h
JSON	Humid Wind	89 miles/h
Cdata	Hot/Cold/Humid	20 \rightarrow 40/15.3 \rightarrow 20/89 \rightarrow 100 miles/h

4. Cdata and JSON Comparison

As in fig 2 we can see how Cdata compares to JSON by speed and how Cdata is dynamical and JSON is Static. The reversible bidirectional arrows shows how Cdata format utilises every aspect of its characteristics as a chaotic number using this notion Cdata jumps back and forth between values by using **Non Eustructure** which will be explained in the next section of this paper. You might ask yourself like how dynamic a chaotic data can be the answer lies in the figure 3 where we took the example of different type of winds and showed how Cdata can cope up with the uncertainty and chaos of real time data. In figure 3 three different forms of "keys" are selected Hot Wind, Cold Wind, Humid Wind and their respective values are defined first I show how it will be displayed or formatted for JSON and then comparing with Cdata we can see as explained in section 3 the bandwidth in which Cdata operates is so huge that a data format like Json can never be compared simply because in today's fast technological era we will eventually will need such data format and data structure.

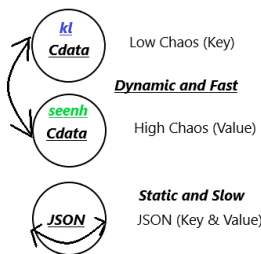


Figure 2. Comparison of Cdata and JSON

5. Non-EuStructure

The name Non-EuStructure came from Non Euclidean geometry object mobius strip and structure from the word data structure. In fig 1 we see green and blue strips on mobius

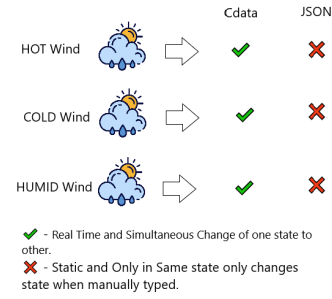


Figure 3. Realtime Comparison of Cdata and JSON with example of weather changing drastically all of a sudden which JSON can't cope up with but Cdata is made so dynamic that it will change the state on it's own and send the data where needed.

strip/klien bottle this is a visual representation of a new data structure to work with my new data format. Since our new Cdata works in such an abnormal manner I looked into many other data structures already available to lower my stress but I couldn't find one so I created one. This new data structure keeps past values handy to reuse and current value for computation. In figure 1 a mobius strip is used since it was a necessary part of this data structure without a four dimensional object like mobius strip it would have been impossible to create such a dynamic data structure in the next section 6 where I will go through how will be the flow of data and storage in Non-EuStructure. Non-EuStructure is neither linear nor non linear type of data structure its what I call **Chaotic Data Structure** which will be used for storing any type of chaotic data in Cdata format and then computed using Non-EuStructure.

As we have two principles FIFO and LIFO for Stack and Queue for Non-EuStructure we have AIAO (Anytime In Anytime Out) because of our 4D object mobius strip in figure 1 we see green and blue which are previous and current values respectively. Any program trying to access previous value can retrieve Anytime that data (green) also it can push Anytime to a current value (blue) refer fig 1. As our interactions with chaotic data are expanding daily; this new principle AIAO can aid in AI and IOT applications as well.

6. Non-EuStructure: Flow and Storage of Data

Flow of Data in Non-EuStructure is fairly intuitive since we know that mobius strip being a four dimensional object has 1 side but turns out to be 2 different sides with the same path. Figure 4 shows a mobius strip with vectors drawn on it. I've labeled each vector's color to indicate what role it will have in storing, retrieving, and utilizing the data. Referring fig 4 we see that red colored vector indicates current value, and yellow indicates previous value. For storing a data format like Cdata we will need a new type of way to store so, I introduced **Mobius Array** which will contain 2 slots but due to it being representation of a 4D object we will consider our Mobius Array to be only 1 single way to store our data. In fig 4 I showed hands for more graphical understanding of how this Mobius Array will work. Red color box top array is where current values will be stored and yellow color box the box

below it will represent previous values. Picking up hands indicate how a processor/program can simultaneously pick up both current and previous values at the same time creating a first data structure which is real time in storing, running and retrieving data.

The wiggly hand drawn arrow indicates how a current value 2 is then stored into previous values slot and the coming current value say 3 is stored in current values slot. Which then program/processor can retrieve and store data simultaneously at the same time. Advantage of this method is that lets say the program wants to store and retrieve a certain data, with the current data structures and technology this would be linear and first it would finish of storing and then it will jump to using/retrieving. Since now we have Mobius Array don't you think these of tasks would be very easy?

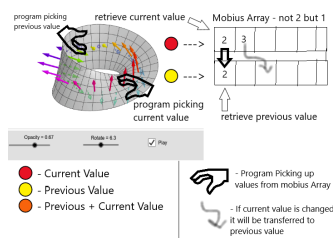


Figure 4. Full Data Flow of Mobius Array

7. Architecture of Non-EuStructure

Explaining architecture of Non-EuStructure refer 5 which clearly shows the flow at which realistically our Mobius Array will work. A program starts computing and user has given it some inputs and decided to store that information inside our Mobius Array which will divide coming inputs into two different types where coming values are stored in current values slot and values which has already been stored will then be stored inside previous values slot. Using this mechanism our ALU will compute the required program and can use our powers of Non-EuStructure, By retrieving, reusing data at anytime by principle of AIAO.

Variables defined in figure 6 are not our regular variables so lets call them **qvariables** since as we can see in the fig 5 and in fig 6 that our mobius array actually spits our real time values and not just one at a time but the set of values refer table 3 and section 3 all the values need to be fit inside of that variable since we don't have such powerful technology that is the reason **this can be a new application of quantum computing** as every variable in an itself contains tons of information just like a qubit which is an information bit in quantum computing, each qubit can store infinite number of information. In fig 6 mobius array is declared as $a[MAX]$ (where brackets indicates current values and $[]$ brackets indicates previous values) the qvariables a , MAX then for checking if the current value slot is full then we cannot insert and if the current value is empty and new values can be added then we will simply add that value as shown in figure 6 if the current values slot is full then simply printing out "current values not empty".

Now for the retrieve operation refer figure 7 as explained for storage flowchart in fig 6 variables here are also qvariables we are first declaring our mobius array then we check if the previous values slot does have element to retrieve or not and take a close look at fig 7 I have used "empty" instead of 0 since processor might also want to retrieve the value 0 so we use the word *empty* to let mobius array know that we want to check "nothingness" of previous value slot to retrieve. If there are elements we simply "pop" them out or retrieve them and print that we the element has been retrieved if the previous values slot is empty we simply print it is empty.

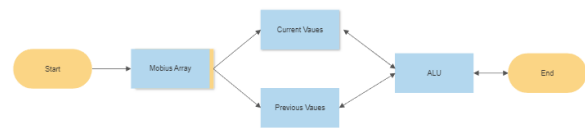


Figure 5. Architecture of Non EuStructure: As the program starts our Mobius Array will start separating the input by current and previous values and this information will be real time connected to ALU/processor as you can see the bidirectional arrow all the values which are needed will be stored and anytime program needs a previous value it can retrieve anytime hence AIAO.

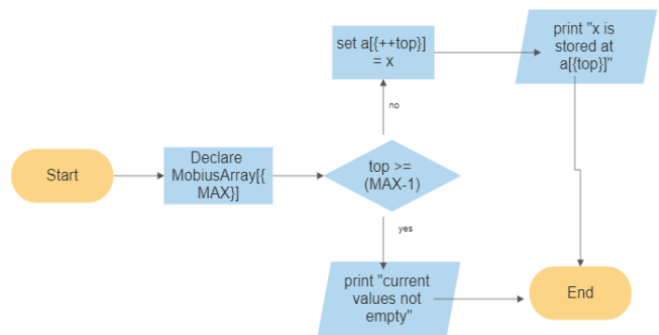


Figure 6. Storing in Mobius Array: Flowchart showing the actual mechanism of Non Eustructure

8. A New Quantum Computing Application with Non-EuStructure

As explained in section 7 we went through how our qvariables are a different kind for reference see the table 3 such bandwidth can be covered with Cdata and Non-EuStructure. With a data structure and data format Cdata so chaotic, big and complex we will need something totally new and powerful so as shown in figure 8 this is a bloch sphere which is a primary way to visualize and store a quantum bit or a qubit each point on a bloch sphere represents information and has different states like 0 1 like our data structure and data format this is a perfect way to store our information our qvariables can represent a single qubit so all the complex and continues

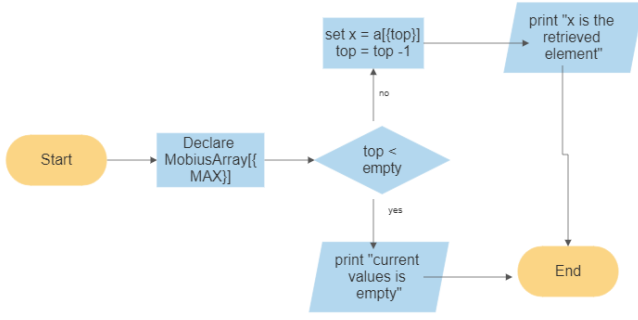


Figure 7. Retrieving in Mobius Array: Flowchart showing the actual mechanism of Non Eustructure

and real time changing values can be easily stored. So all the above flowchart and architecture applies easily. As shown in Shor (1999) shor's algorithm was a big revolution a quantum computing application so powerful for factorization. We don't need that kind of complexity since as discussed in my paper Thakur (2022b) we can easily use the chaotic plane to get the exact state/information from any qubit and use it to our needs. As our requirements for this include,^a

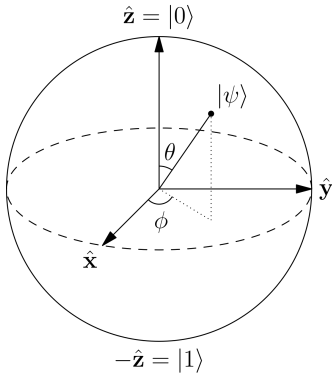


Figure 8. Bloch Sphere the infinite information can be stored inside one single qubit.

8.1 how data and qubit relates to each other

Since we know qubit is the unit of information and our Cdata and Non Eustructure needs this kind of storage as in figure 6 the flow of data is similar but lets show with the diagram how it fits perfectly. Refer figure 9 which shows how a bloch sphere/qubit has infinite number of vector points and each contains a value and those values are our mobius array and qvariables each value as it grows in chaos. And as for storing and retrieving information as discussed in 7 will be the same since we are just using qubits to realistically store our qvariables which was the hardest part in this paper, how can we find a perfect information source to store such complex data and

^aqvariable: A variable which is never fixed and changes as the environment desires. This variable concept is straight brought from Quantum Mechanics and how a particle behaves. Each value stored in Quantum Computer is decided by the state in which the qubit is in.

data structure? and we got the answer utilizing Qubits and in the process I might have discovered a new application for quantum computers. As we Quantum Computer Scientists know the nature of a qubit and also proven to be true in recent physics noble prize 2022. This is a strong argument for my papers Thakur (2022a) and Thakur (2022b), as it shows that this non-intuitive field of science needs a better understanding and that Quantum Mechanics and its rules are insufficient. This new theory can therefore help us understanding the World of Quantum Mechanics better.

The Non-EuStructure says it will store current and previous values of any given system so as we know how a single qubit can store infinite number of information so we can safely say it is possible to have Non-EuStructure as a data structure for Quantum Computers.

8.2 The Non-EuStructure Quantum Flowchart and Equations:

For a Non-EuStructure to work as discussed in previous section it needs to be handled with laws of quantum mechanics. Since the complexity of this data format (Cdata) and structure is too much for classical computers. As the quantum process starts first we have to entangle 4 qubits let us call them A and B so, A is a combination of low chaotic qubit and high chaotic because of the property of entanglement. B exhibits the the same as A . This simple process will help us storing the values in our Non-EuStructure a Mobius strip. The process can be perform with our circuit a combination of U-Z Gate and U-NOT gate refer fig 10 and fig 9 Thakur (2022a). Equations 1 and Equation 2.

Collected Data	Aq	Bq
Cdata (Fluid)	2.5, 29, 50000, 20, -23i, ...	8.5, -99, 6713500, 29320i, -23
Cdata(DNA)	23452435.90875, -4875, 7i ...	-5.90875, -3.48445, 45, -7i
Cdata(AI Vehicle)	[45, 89, 475] ...	[49387.875, 3, 753298043]

$$A(q1_{seen_k} = A(q2_{k,een} \quad (1)$$

$$B(q3_{seen_k} = B(q4_{k,een} \quad (2)$$

As this process stores the values after this process as shown in fig 9 we have to send this to a processor for required calculations. But before that we have to store this immense information through something and we already have that Cdata. A data format designed for this type of tasks. After the entanglement which is a process of collecting the information, after this we can send this information through Cdata format like Table 8.2. These values collected by qubits A and B are formatted into Cdata (Qubit) now looking at table 8.2 we see how values are stored in series of numbers since these things are stored on Mobius strip it is stored all over the mobius strip now we have current values and previous values all stored at the same time this will give processor all the data it needs literally in one place and since quantum processors will be a beast in computation power due to its nature of superposition and entanglement.

All the 4 qubits are entangled to form a quantum network or circuit. These entangled qubits will communicate through their entanglement and collect information fast. This is not just fast but instantaneous so to keep up with this we have Cdata (Qubit) as a format and Non-EuStructure as a data structure. This data structure will empower the quantum computers perfectly because of its nature.

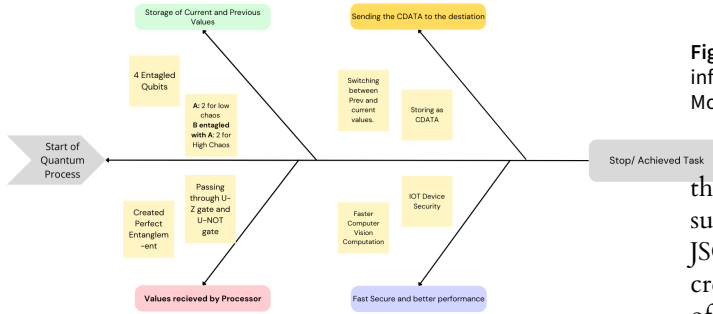


Figure 9. The process of a Non-EuStructure in a quantum system and how first qubits are entangled to store high chaos and low chaos values which then passes through the U-Z gate and U-NOT gate Thakur (2022a) which then is provided to the processor in the form of CData (Qubit) which is then processed in a processor. How applications in other devices like IOT and AI can benefit from.

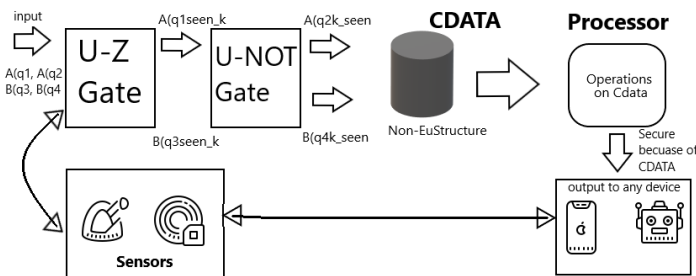


Figure 10. Sensors which have ability to collect and send real time data like weather monitoring or and AI which is performing any computer vision task or any complex training model. So that input will be given to the U-Z gate and then to U-NOT gate which will be converted to Cdata as this data format is designed to store such real time and dynamic values. This Cdata will be sent to processor which will perform calculations. Which will then output on to the device. Then the device asks for more information.

9. Conclusion

In conclusion we have learnt how my Non-EuStructure and Cdata interacts with each other to give a completely new and powerful way to store and retrieve data. A qvariable which is defined specially to handle and store a chaotic systems input/output. And how qubits entanglement property is used to get the desired output. A new application of quantum computers a super powerful way quantum computers will help us in AI, IOT and many other modern problems we face and

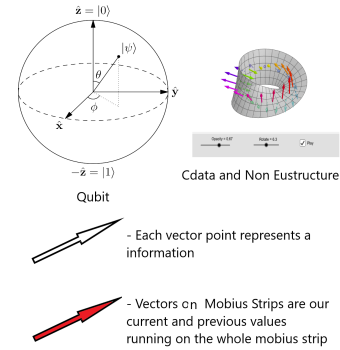


Figure 11. This figure shows how each point on a bloch sphere indicates an information and that point is one of the values in our qvariables running in Mobius array.

this Cdata and Non-EuStructure will help us when we need such requirements. We looked into how Cdata compares to JSON a classical data format, And how mobius strip helped us create Non-EuStructure and Cdata. How a life cycle and flow of these things look with figures. We used my papers Thakur (2022a) and Thakur (2022b) to solve our Non-EuStructures Circuit and Equation problems.

9.0.1 Future Work:

Computer Scientists can use this new method in classical computing by using your expertise. Quantum Computer Scientists can help it build more by building its algorithm and what would be the time complexity. You can reference my paper and give your own mathematical equation for this with or without chaotic numbers. Engineers and Scientists working in the quantum lab can test this and let the world know the importance of this paper.

Acknowledgements

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