International Journal of
Science and Engineering Investigations vol. 9, issue 97, February 2020
Received on February 2, 2020 ISSN: 2251-8843

Modeling the Entanglement Miracles

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Abstract- In spite of being observed and verified in laboratories around the world the entanglement paradox, also known as the EPR paradox and colorfully referred to as "Spooky action at a distance", has been puzzling scientists for a long time. Nevertheless, an intuitive reporting of this paradox, in seemingly unrelated scientific disciplines, has lately increased. The entanglement behavior has been addressed in contexts of the quantum physics and the quantum computing, to being a "glue" that perhaps holds the entire universe together, as well as the quantum chemistry and the DNA formation. Clearly, having a simple mathematical model that can shed some light on the entanglement phenomenon in a broad sense is of interest.

Keywords- *Entangled Solution, Globotoroid, Wormhole*

I. INTRODUCTION

The physicists have known about the entanglement behavior for a while, as they were first to observe it and name it as the quantum entanglement. A lot has been said and written on the subject, and a good introduction can be found in references [1,2]. Also, a lot of quantum entanglement information is available on Wikipedia. Likewise, the quantum entanglement property is used in the subject of quantum computing [3,4]. Here the entanglement produces a pair of photons referred to as the qubit [5], which you can think of being equivalent to binary bits in the conventional digital computing.

Lately, the quantum entanglement has also been used to explain how the universe is held together [6,7,8]. It has been hypothesized that it may be a "geometric glue" that keeps the space time together. Similarly, the entanglement paradox has been investigated in quantum chemistry [9,10], and in the makeup of DNA [11,12].

There are many excellent articles that cover these topics. However, no matter where the subject of quantum entanglement appears, there is always one common feature characterizing it. Keep in mind that the quantum entanglement idea originates from the quantum mechanics, and as such it always exhibits the Schrödinger's cat syndrome. Consequently, the quantum entanglement is all about uncertainty, and it is difficult to visualize its outcome, unless presented. It is a statistical approach, which may work well in the quantum mechanics, but it can be confusing in other applications. The question is then, is there an alternative formalism of the entanglement concept that allows an outcome to be determine a priori? This is the goal of the present investigation.

We start by a short review of the globotoroid model [13], and subsequently show how the globotoroid ODE system is transformed into input/output paradigm. At his point we use the resulting model to "engineer" the entanglement solutions. It is as if the universe has decided to use the engineering model to better utilize its resources. We show how the entanglement crosslinks information throughout the globotoroid space, which in turn opens up an enormous information pool that evolves with the time. At the heart of this pool is the wormhole containing a double helix extract. This extract holds evidence of the entangled information that crosslinks, or as stated earlier "glues", the globotoroid space. Thus, by "gluing" the globotoroid universe we are also crosslinking a matter that might be present in the space, and under certain conditions, the two may expose information about the life itself. Well, let's get on with it.

II. ENTANGLING THE GLOBOTOROID SOLUTIONS

A. The Globotoroid as the Input/Output Model

In [13,14] the ODE model,

$$d\,X(t)/dt=\omega\,Y(t)-AZ(t)(X(t)$$
$$d\,Y(t)/dt=-\omega\,X(t) \qquad (1)$$
$$d\,Z(t)/dt=-B+A[X(t)2+Y(t)2+1]$$

was used to define the globotoroid solutions. Here, t is the time, X(t) and Y(t) are the action, or orbital, spacetime variables, the coefficient $\omega=2\pi f$ is angular frequency with $f>0$. The spacetime variable Z(t) is the growth variable and is stimulated by the growth parameters A, B>0. We will use this model for the discussion in this investigation, however, the resulting analysis also applies to all model variations introduced in [15]. All solutions of (1), and all other ODEs in this report, are obtained by using the Euler method.

Now, we can always rewrite (1) as,

$$d\,X(t)/dt=\omega\,Y(t)-AU(t)(X(t)$$
$$d\,Y(t)/dt=-\omega\,X(t) \qquad (2)$$

where the spacetime variable Z(t) is dropped, and in its place an arbitrary growth function U(t) is assigned. This is depicted in Fig. 1 as the input/output relation.

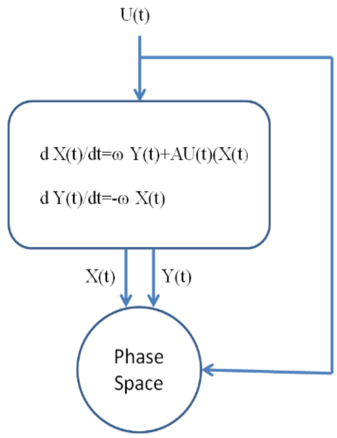

Figure 1. Input/output model for the globotoroid realization

In general, it is not trivial to obtain unfolding of action variables X(t) and Y(t) by using an arbitrary growth function. That is, in order for action variables to "perform", the input U(t) needs to "stimulate" the angular frequency ω and the gain A. However, in the present case this is not an issue as we already know that Z(t) from (1) is one function that does the job. Thus, if we let U(t)=Z(t) in the input/output scheme in Fig. 1, we will produce exactly the same phase space form as given by (1). This is illustrated with the spheroid in Fig. 2, where all phase space points are connected and trace a loxodrome which links the two poles. The connection between the points indicates how the spheroid is put, or "glued" together in the phase space. The solutions of the models (1) and (2) are always identical as long as U(t)=Z(t), and the parameters A and ω stay the same.

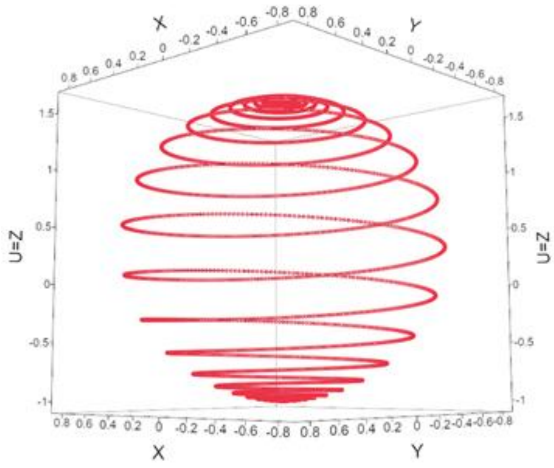

Figure 2. The spheroid realization, or the loxodrome, from the input/output model (2) with U(t)=Z(t), where Z(t) is computed from (1) with ω=62.8, A=B=5, the time increment □t=0.0004, the total number of integration steps n=8500, and the initial conditions X(t=0)=Y(t=0)=0.006 and Z(t=0)=-1.0.

An interesting observation is that the input/output scheme is independent of the growth parameter B, implying that when Z(t) is computed with B>A, the input/output model will remain identical as for B=A, and the globotoroid in Fig. 3 emerges. This is because the information about the spheroid or the globotoroid solution resides within the growth variable Z(t), which is the input function U(t).

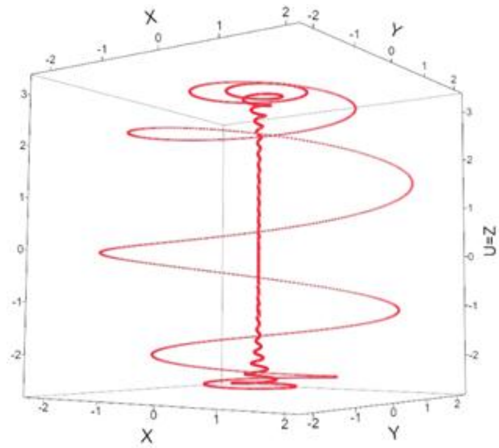

Figure 3. The globotoroid realization using the input/output model (2) with U(t)=Z(t), where Z(t) is computed from (1) with ω=62.8, A=5, B=7.2, the time increment □t=0.0004, the total number of integration steps n=8500, and the initial conditions X(t=0)=Y(t=0)=0.006 and Z(t=0)=-1.0.

It is worth noting, also, that the spheroid solutions are not cyclic, while the globotoroid solutions are. This was previously discussed and exhibited in [13], Figs. 1 and 3. Consequently, the present Fig. 3 shows only one solution cycle.

B. Entangled Spheroid

This is where it gets interesting. Suppose that in (2) we throw in the switch **S**

d X(t)/dt=**S**[ω Y(t)-AU(t)(X(t)]

d Y(t)/dt=**S**[-ω X(t)] (3)

that toggles between the values 1 and -1. So clearly for **S**=1, the solutions of (3), are the results reported in the last section. However, if one sets **S**=-1, then Fig. 4 illustrates the spheroid for the same input function U(t) given in Fig. 2. At the first glance it appears that the loxodrome now has twice as many cycles, and the points are crosslinked. How can this be since the input function has the same number of points in both instances, n=8500, and why are the points crosslinked?

The answer is given by the time solutions of (3), which are illustrated in Fig. 5. As can be seen, the action variables X(t) and Y(t) now have entangled solutions, where they appear as two separate solutions for the same nuber of points n, while the input U(t) remains defined as stated.

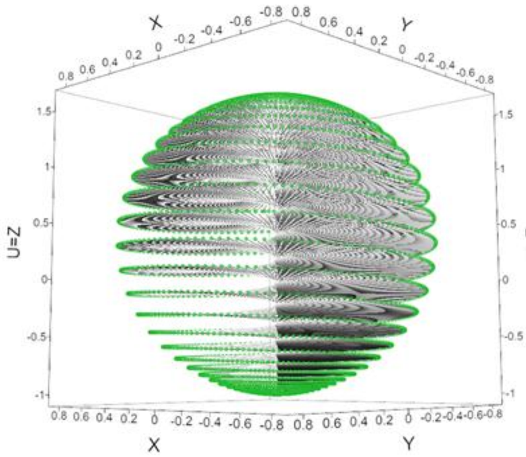

Figure 4. The spheroid realization using the input/output model (3) with **S**=-1, and U(t)=Z(t) as described in the caption of Fig.2. The spheroid loxodrome is now entangled.

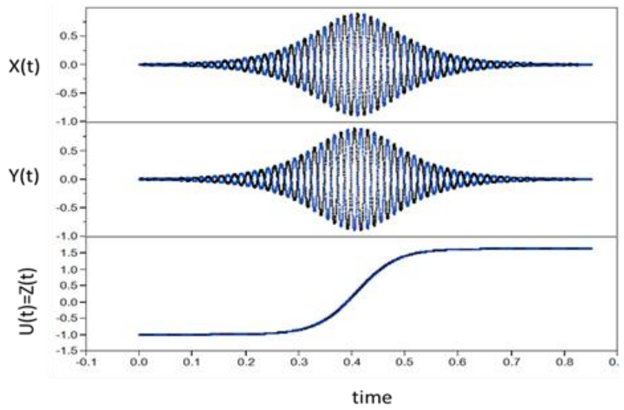

Figure 5. Evidence of entanglement in the time dependent action variables X(t) and Y(t), derived from (3) with **S**=-1 and the input U(t)=Z(t) in Figure 4.

If we disentangle the solutions of X(t) and Y(t), as in Fig. 6, we obtain highly correlated entangled components. However, for both action variables the correlation among the entangled components is negative, which further implies that the entangled solution, or the entangled loxodrome in Fig. 4, contains point pairs which are crosslinked in the phase space. This makes any point object on one side of the spheroid fliped over on the opposite side. Figure 7 indicates the fliping by colorring the entangled pairs.

As in the previous section, connections between the points indicate how the spheroid is "glued" in the phase space. For **S**=-1 this is achieved by crosslinking, which makes the entangled spheroid appear more fortified, but also "spooky". This is because, while the crosslinked point pairs may be quite separated in the phase space, they are by being sequential very close in the time, which for the present case is Δt=0.0004. In terms of the quantum physics, what separates the pair is the quantum time, which could be another explanation for the use of term the quantum entanglement. Thus, any effect on a point in the phase space is very likely to provoke the same on its crosslinked opposite. Basically, the crosslinked point pair will share the same influence, independent of how far apart they are in the phase space.

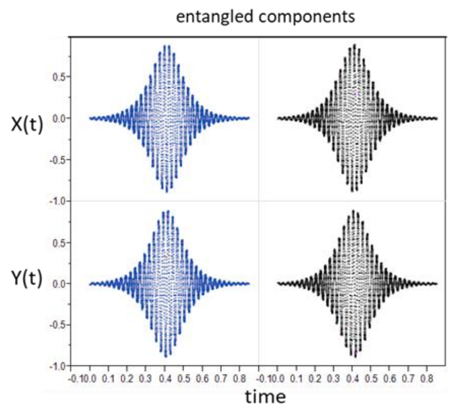

Figure 6. The entangled solution of each action variable in Fig.5 is separated in 2 functional components. The correlations among these components have high negative values: as one component increases the other will decrease.

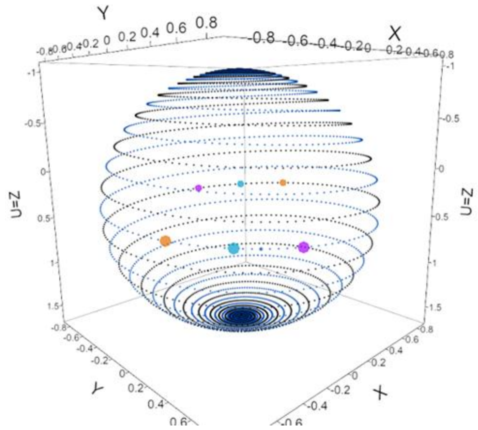

Figure 7. Negative correlation flips any point object on the opposite side of the spheroid. Entangled pairs are marked by the same color, and the perspective is set to make points in front larger than in the back of the spheroid

Now, like with anything in nature, the switch S is not perfect. It may be affected by all sorts of events, no matter how large in magnitude they may be. Its actions often appear random, but in reality it may be leaving the record on the sphere of what has transpired. This record is data points that are stored by the spheroid, and they provide information. A lot of data points, or information, can be stored on a spheroid. It all depends on the loxodrome formed, which is related to the size of the total number of points n, and ω which contains the frequency of construction f described in [13]. In our example f=10Hz and n=8500, which is significant but not terribly large.

To further explore our present case, let's randomize the switch **S** by applying the following function,

$$S=1-2*ROUND[U(0,1),0] \quad (4)$$

where U(0,1) is the uniform distribution between 0 and 1, while ROUND is the round function which rounds U(0,1) to the nearest integer. This mimics the coin-toss outcome with the values -1 or 1. There are other methods for stimulating **S**, however, in this communication we always use (4). For instance, this randomization produces a spheroid with information depicted in Fig. 8. As before, the green points are entangled and correspond to **S**=-1, while the red ones appear when **S**=1 and have no counterpart. Therefore, not all points are crosslinked, and collectively they transcribe information onto the spheroid. There is a logic to the transcribing process, but this topic is outside the scope of the present investigation. For now we observe that the transcribed information on spheroids is always limited by the two poles.

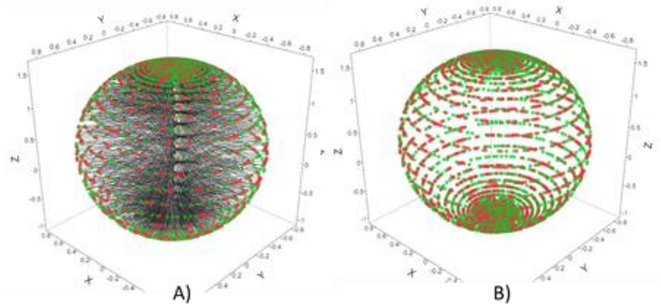

Figure 8. The randomly transcribed spheroid. In A) the entangled pairs are connected, while crosslinking is hidden in in B).

C. *Entangling the Globotoroid*

To avoid the pole limitations, we now turn our attention to the globotoroid in Fig. 3. Recall that one solution cycle of Z(t) feeds the input U(t) and the action variables in (2). If we now feed the same Z(t) into (3) with **S**=-1, the result obtained is illustrated in Fig. 9A). As in the spheroid case, the action variables are perfectly entangled with the perfect crosslinking, and all spheroid properties also apply here.

Nevertheless, there is one property that spheroids do not have, and that is the wormhole, or the hole that connects the two poles. In the globotoroid case the wormhole will reduce the entangled loxodrome into the double helix strand, Fig. 9B). For the perfect entanglement conditions depicted in Fig. 9, the double helix will also be perfect. As described, the reduced entanglement offers a potential DNA scaffold, but without appropriate chemical components being present it will never materialize into DNA in the true sense. Furthermore, and as discussed in [13], the globotoroids are not limited by poles, and consequently exhibit cyclic nature. Therefore, each action variable supports the entangled solution indefinitely, thereby creating infinite opportunities for the double helix to form. Every time solutions pass through the wormhole a unique double helix emerges.

Let's now stimulate the switch **S** by applying information. This will setup the transcription process that will crosslink the wormhole and encode its double helix configuration. Any time a new information passes through the wormhole the double helix will "mutate". This is depicted in Fig. 10 where the 3-cycles of the growth variable Z(t) are used as the input to randomly entangle the globotoroid in Fig. 9. The randomized information is passed on through the wormhole where the double helix is encoded.

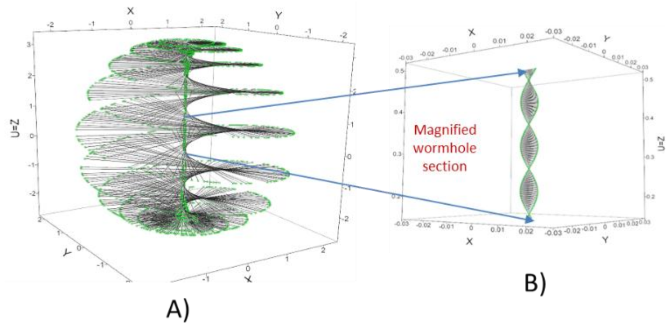

Figure 9. A) Shows the entangled globotoroid from Fig.3, and B) is a magnified section of the entangled wormhole and its double helix configuration.

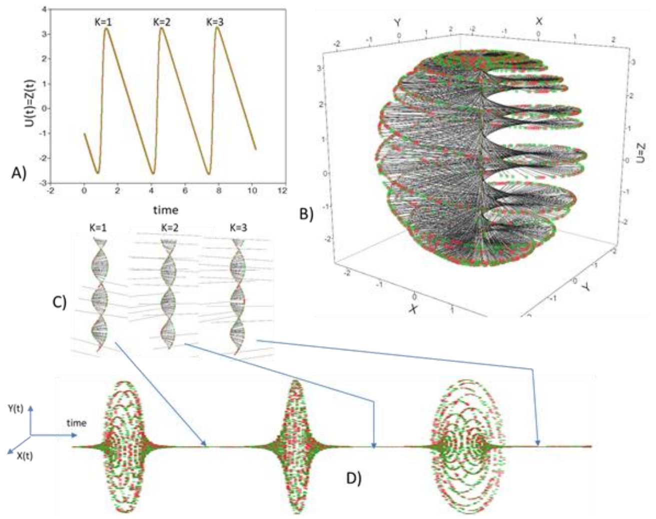

Figure 10. The globotoroid realization in Fig.3 is evaluated in (1) for n=26000, and produces 3-growth cycles of Z(t) exhibited in A). Letting U(t)=Z(t) in (3), and subjecting **S** to the random switching in (4), the randomly entangle globotoroid is obtained and depicted in B). The results of 3-cycles also randomly generated three double helix configurations illustrated in C). In D) the entangled information exhibits the corresponding action variables over the time

Figure 10 D) also gives an interesting plot of the action variables over the time. In this plot the cyclic nature of the solutions reveals a progression of the encoded information with the time. Furthermore, it exposes the double helix regions and their significance for passing information with the globotoroid cycles. Thanks to this cyclic behavior the globotoroids can store massive amounts of data, more so than the spheroid. It is quite plausible that the history of Earth may be contained within one globotoroid.

III. DISCUSSION

An input/output model is used to broadly address the entanglement phenomenon of the globotoroid dynamics. The proposed model is derived from the globotoroid theory, and is described in (3). It contains the switch **S** that can alter the globotoroid solutions from being entangled or disentangled. The points of the entangled solutions are crosslinked, while no crosslinking occurs in the unentangled case. Moreover, by passing the crosslinked solutions through the globotoroid's wormhole the entangled formation reduces to that of the double helix configuration, hence, a DNA scaffold. All these features are regulated through by the switch **S**, and can be used to transcribe information onto the globotoroid. With this, some very interesting topics open up for observations and discussions.

First, is the cyclic nature of universe driven by energy, matter and information, real? This was originally addressed by physicist John Archibald Wheeler [16], who believed that information is the most important drive of the three. The present investigation and references [14,15], corroborate Wheeler's observation that the confluence of the three components creates the reality we live in. Without information the universe would be Newtonian, or a machine like, which would replicate itself mindlessly without ever considering other existential possibilities. If this was the case life would never exist. Thankfully, information is the catalyst that brings the universe to life. The information diversity continuously evolves in the globotoroid setting, and by far exceeds the diversity of matter and energy. One method of increasing the information diversity is by use of entangled and disentangled states. These two options may help "glue", or fortify, the reality we live in. This certainly seems to be the case when information is passed through the wormhole. The resulting fortified double helix structure turns into a DNA scaffold, without which life would not be possible.

What about other means for diversifying information? Other than having the switch **S** do the job, it is also possible to increase diversity by selecting the input U(t). Recall that U(t) can be anything that represents growth, and in the present investigation U(t) is a fragment of the growth variable Z(t). Hence, if different growth fragments of Z(t) are selected, they would also stimulate the action variables in the input/output models. Mathematically speaking, for each set of model parameters there is a class of input functions U(t) which will excite the action variables These functions diversify growth patterns which provoke the energy required for information to move the globotoroid universe closer to reality, Fig.11. The last will finalize only in the presence of matter, and without it, the reality at the best is virtual.

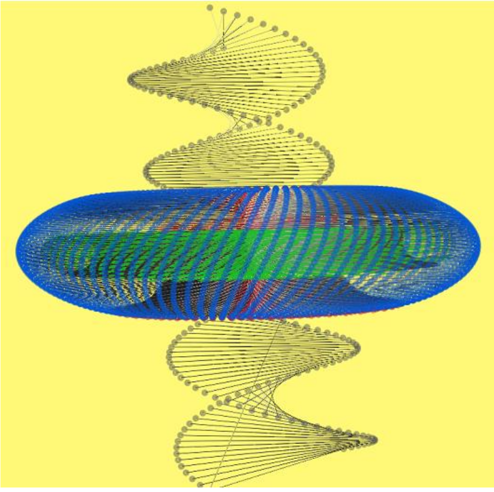

Figure 11. The double helix configuration surrounded by the toroid cloud may serve as a precursor for the DNA clamp, also known as the sliding clamp.

Infusing matter into the structures noted is, however, not at all intuitive. In some sense, the information encrypted becomes selective of the matter constituents, and when the right match occurs the entanglement organizes spontaneously over the entire space effected by the growth U(t). In reality there is no need for teleportation, or faster than light travel through the wormhole. The organization may already be encoded in the wormhole, or some derivative we call the seed, which under the right circumstances is released into the space. For these reasons, it is not obvious how to draw a comparison between entanglement in the quantum physics to that of the DNA clamp, or entanglement in the gravitational dynamics. The scales and the underlying information in all these instances are vastly different.

In conclusion, it is demonstrated how the globotoroid theory helped develop a novel approach for modeling entanglement phenomena in the universe. The modeling results suggest that the universe may encrypt and store information by using the entanglement process, which can also be thought of as a "glue" that fortifies the surrounding space. It was further argued, that within this space, a confluence of the cycling energy, matter and information promotes enormous existential options for the reality we live in.

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His professional calling led him to various research and data sciences positions at DuPont Co. and Emerson Electric Co. He published numerous papers and gave presentations at national and international conferences, primarily on the subject of nonlinear systems. He is also an inventor and has 10 patents.

In 2010 Dr. Samardzija founded an independent research initiative on exploring the subject of globotoroids. In 2011 this effort was named globotoroid.com after his web site www.globotoroid.com. Presently he is an independent researcher and manages all activities for globotoroid.com.

How to Cite this Article:

Samardzija, N. (2020) Modeling the Entanglement Miracles. International Journal of Science and Engineering Investigations (IJSEI), 9(97), 23-28. http://www.ijsei.com/papers/ijsei-99720-04.pdf