Fundamental Theory of reality

"Reality is nothing but a mathematical structure, literally"

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Abstract

In This essay I shall derive the laws of nature from a simple mathematical system. The system is derived from the postulate that reality is nothing but a mathematical structure which leads to a simple system that can be simulated to generate many results. The postulate lead to assume particles as made of lines were one end originates in a small region and it extends to all other point in space. The start point and the end point of these lines define space and the length of the line is interpreted as energy, time is just a change of state. So the system unifies space, time matter, energy all in one coherent picture, all emergent from random points and their relations. The simulations generate some basic Quantum Mechanics results and the 1/r law as in quantum field Theory. There are many other results such as the hydrogen 1s level where the universal constants like c, h, e and their relation that lead to Fine Structure constant automatically fall out of the simulation. Two such simulations are carried out; one is Bohr like model and the other Schrodinger like equations solution and show the equivalency. Also, the mass of the electron appear naturally using a simulation which is an extension of the Bohr model. The system automatically displays the non-local behavior and explains the EPR in simple terms and shows the origin of spin. Many interesting formulas connecting electron mass, FSC and electron g-factor is produced. While it is shown that coulomb potential is produced by line crossing, Gravity appears when lines meet at a region of Planck's length.

1 Introduction

Since our understanding of nature has grown tremendously in the past hundred years or so, it was the scientists in the field who got to consider that nature looks like it has more than this casual relation with mathematics. It was not just the suggestion of that casual relation but also the deeper understanding of how nature seems to be constructed. While we don't understand a lot of things about nature, it was this comprehendible thing about it that made many scientists to make that connection.

The quote of Wigner's "Unreasonable Effectiveness of Mathematics in the Natural Sciences" is very well known and pointed to as one of the first hints. Another hint you can see in the classic textbook by Wheeler , Misner and Thorne GRAVITATION where the first attempts were made to drive the law of physics by logic which they called pre-calculus. As our knowledge increased more people got to consider it like Wolfram in New Kind of Science, Conway's game of life, all kinds of automata ideas, Fractals and not the least as we got hints from how computers generate virtual realities. But Dr. Tegmark with his MUH was the first to formalize the notion in a very concrete way. So this idea did not happen in one go but in a continuous fashion. Next I will explain the system and give the major results followed by comments and conclusion.

2 Derivation of the Model

Reality exists hence we say it is true. But what is really true besides that more than anything else which we can really trust, it is mathematical facts. So, to my mind I connect both since both seem to be a statement of truth. So I took a guess that reality is something akin to a circle (truth). The relations between the points give you a mathematical structure whereby you get PI which defines the structure of the circle.

There are quite few concepts in math, but one of the most fundamental and elementary is relations between the entities, like points and lines, that make up a geometric (like circles and triangles) or arithmetic (like natural numbers) structures. So I got to think that if nature has something to do with mathematics, then why not start with these basic concepts and see what relations between what entities could give rise to reality.

I started out with a very naive simple system like in Figure.1 below. Let's say the system is made up of some relation between triangles, but to simplify we can take the simplest subsystem like two triangles. But now we have to decide on what relation, like the distance (red lines) be-tween a vertex and a vertex or center of line to a center or vertex to center or any point to any point. Obviously, there are numerous choices. But why should we choose a triangle, and not a sphere or any arbitrary shape for that matter. Again, there are infinite arbitrary shapes and by what criteria I was going to choose the relations between them, so all this looked confusing.

So then I thought to simplify more I will just go to a 1D axis instead of geometric shapes in 2D. To simplify even more I have to choose some line segment. But what can exist on a line? The answer is points and shorter line segments within the original line.

Let's first try points on the line, and let's denote arbitrary positions on the line by x1.... xn, to simplify divide the line into any numbers of equidistant. We ask what design is available to us. Not a lot, say I have 50 counts at x1, 43 counts at x2 and so on. But how many points to choose and how many counts to assign for each point. The only solution is to generalize the concept by randomly choosing any point on the line and iterating the process for let's say for J times. Every time we hit a position we update the counter by one for that position. After doing that j times you will see that all the points will have their counter to have roughly same count. But j can be any number (it should be sufficiently large) so the natural thing to do is to normalize by dividing the counters by j.

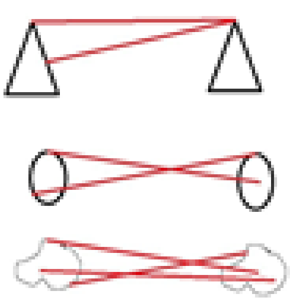

Figure.1

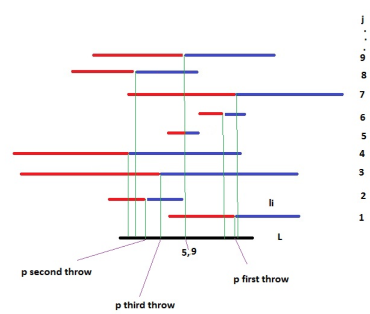

Figure 2

And this will give you the probability of hitting each point which is 1/n. and so, if you sum up all the probabilities they add up to one i.e. n*(1/n)=1, does that remind you of QM?. This simple design carries the seed of the design of reality.

Generalizing the above process from points to lines, you will get more complicated Quantum mechanical systems. I will refer to Figure.2 above to explain the process. Just like in the points example I use a line segment of length L, then in this case I throw **two random** numbers each time. One number **P** denotes the position on the line **l** (just like last time) the other a line segment that extends from that position to the right (blue) and to the left (red), denoted by **li** (we will specify the maximum length later)**.** The green vertical lines denote where a random position hit occurred. And I repeat the process j times.

The only thing that we can do now is to register how many times we hit each **P** position (like 5, 9 in the drawing) and save the counter, and add up the lengths of all the lines of **li** associated for each point and save that in a counter. Then I normalized by dividing by j for the points and multiplying the inverse of totals of the lines by j.

So far I have done the basic operation possible on the line, but what other possible operations are available to us. Well not much only few things.

1. Limit **li** maximum length to **L,** and
   A. Put a constraint so that **li** does not go out of **l** on either side.
   B. Let **li** cross the line on either side.

2. Let **li** go to any distance outside of the line.

Those three options are pretty much the only design that is available to us on the line **l.** But we can complicate the system a bit more, like having two line segments **l**(let's call them **d0 and d1** as in the programs) sitting on a longer line segment **L** which we consider as the universe, so it can be as long as you want. The lines **d0/d1** is interpreted as a particle which can be any number but using the Compton wave length is typical. The only other main complication that we can add is to go to N dimensions.

Now for the amazing results:

1. If you simulate using 1A above you will get Schrodinger equation solution for a particle in a box, by again registering the particle **P** position when the constraint is satisfied. Normalizing the number of hits on each position on the line will give you the probability of finding the particle just like SE. adding the lines and normalizing will give you the energy of the particle.
2. If you simulate using 2. Above and using the two lines of **l** (with some distance between them) on **L.** Then the only way that they can interact is by the crossing of the random lines coming out of the two particles. If they don't cross, particle P positions are registered and the lines li are added up just like before with the above mentioned interpretation**.** Doing that will get SE solution for finite potential in case the two lines of **l** overlap. And when the paticles are far away you get some of the results of QFT like the 1/r law and other results mentioned in the abstract, that I will go through later. Some results are not attainable by "mainstream" physics. The system can be generalized to N dimensions like mentioned earlier.

So that is it, reality popping out due to the only possible design on the line using fundamental entity which is the line segment, which generates the mathematical structure we call reality.

Before I present the simulations that produce the claimed results I would like to clarify few points. The programs were originally written in basic and eventually converted to C++ to gain speed, better random number generator and handling large numbers. In the following programs I use **d0** and **d1** to represent the two line segments we denoted by **l** and use **l** instead for the universe size which is not fundamental, just as a reference. But also used as the length of the box.

Another issue is whether to use real numbers or integers. For large distances they are almost equal, but generally I use real numbers they seem to give the best results but we will discuss later.

2 Basic results that shows how QM arises.

As you will see in the presentation of the results, the system follows very much standard physics. I start out with Schrodinger equation like results for particle in a box and then to more complicated systems. This is the first result that I will present. The program essentially implements the derivation process I have described above. I also converted the program to JavaScript so anybody can run and modify it even to the more complicated programs which I have written in C++.

The particle in a box is generated by throwing a random number denoting a position ("p") on the line and associate a line whose length ("**li**") is also chosen randomly but cannot exceed the length "**l**". A constraint was chosen so that if **li** went out of bound then neither it nor the position associated with it will be registered. Surprisingly this constraint is nothing but the same line crossing we will use in the rest of the programs.

if ((L-p-li)/L < Math.random()) {continue;}….if ((p-li)/L< Math.random()) {continue;}, the constraint

The result is shown in Fig.3, the probability density is a sin^ wave with the correct amplitude. Note the energy will quadruple as the line becomes half. However, at this stage of this simulation the fundamental constant of nature will not show up, only when we get to the Bohr model. None the less you can still match it to the SE solution by multiplying by h_bar^2/Melc. Also, for higher energies it is as simple as dividing by a number and repeating the process.

But the real results that give away the model is that when another particle is added inside a bigger particle and then interact by their line crossing you will get particle in finite potential well phenomenology of a particle in a finite potential, with the exponential decay and the tunneling. see figure.4

Multidimensional implantation is so easy just add the constraints for each axis, that is all. See figure.5.

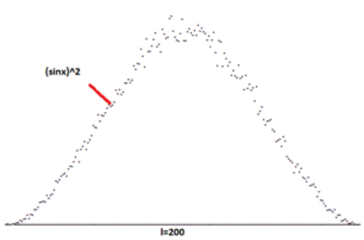

figure.3

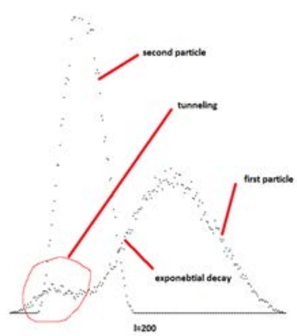

figure.4

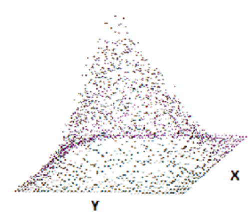

figure.5

3 Description of two particles interacting

In the last section we simulated some the typical particle in an infinite and finite potential. In this section the particles will sit at some distance from each other and the lines from one particle will be allowed to go to the other.

Figure.6 shows 1D implementation. Two particles represented by two line segments d0 and d1 sitting at a distance of dist+d0, d0 represent the added distance from the center of the particles. 1,2 ….j are the number of loops. In each loop two random numbers are thrown for each particle denoting their position (**p, p1**) and length (**li, li1**). If the lines don't cross (star) the positions **p, p1** (the round/square marks) are registered. Then for each particle I have a counter that simply adds the lengths of the corresponding li, li1 line to the previous total for each particle.

I do that (loops) a million, sometimes a 100 trillion times. Then I normalize to the number of throws. The totals of the lines (normalized) are the energy. The numbers of hits for each position is operated on to get the expectation values. Normalized position hits are the probability densities that are the ones we get from the "squaring" of the wavefunction. Without interaction the expectation value is the midpoint of the particle, but when interaction happens, the expectation value moves. Let's say to left in the left particle and right in the right particle that denotes repulsion. You can also get attraction with different (opposite) logic. But more on the logic part later.

Then the particles are moved to a different distance and the operation is repeated. Now I explain the code in more detail.

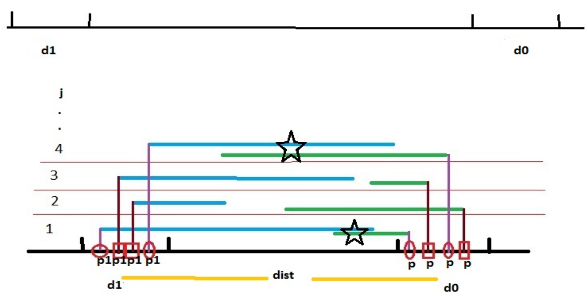

figure.6

4 The simulation of the Bohr model for the hydrogen atom 1s level.

In the last section the interaction for two particles in the system was explained. Here we present one of the most important results of the theory by making the particles interact at a Bohr radius, then we find that Fine structure constant, c, h_bar, charge e2 all fall out of the system with usual relation, ultimately producing the correct lagrangian automatically.

The simulation leads to the following data for two runs (1 hour each)

D0	distance	potential energy	expectation 1	expectation 1
1823	249801	1.2009548424e-005	2.2159720335	-2.218201416
1823	249801	1.2009565477e-005	2.2152697050	-2.218144778

The distance is the Bohr radius

1/(m*alpha)=1/(.00054858*.007297352569) = 249801.3, m=1/1823

Average of all expectation values=2.2159720335 +2.218201416 +2.2152697050+2.218144778

EV = 2.216896983125

After inspection I find that expectation value, EV= 1/(2mc^2)

Solving for c^2=2m*EV =2*(1/1823)* 2.216896983125 = 411.16028, so c= 20.277087

Charge e^2= distance *Potential energy =249801 * 1.2009548424e-005=2.9999972 almost 3

But dividing e^2/c^2= 3/411.16028 = **0.00729642**

The number .00729642 looks very much like alpha(FSC)

So that means c =h_bar,

also from standard physics c*h_bar=alpha/e^2=.007297352569/3=411.108,

the rest will follow Bohr model , V^2=c^2*alpha^2 =411.16028 *0.00729642=0.021889246

K.E.=.5*m*V^2=6.00363304e-6

2* K.E.= 1.2007266e-5 almost equal to the potential energy 1.2009548424e-005

All errors are due to simulation accuracy.

THAT MEANS THAT OUR SYSTEM PRODUCED THE MAIN CONSTANTS OF NATURE, WITH NO INPUT FROM EXPERIMENT.

5 Simulation of the hydrogen 1s level with Schrodinger equation type solution.

In the last section we simulated a system similar to Bohr atom as if you had the electron circling the proton at the Bohr radius, and that was because the 1/r law automatically appears. Now, if I assume a particle with a wave almost as large as the hydrogen atom and a particle which is as small as the proton sitting in the middle, then I very much get the hydrogen 1s picture, but this time the wave looks like the Schrodinger equation solution.

Simulating the electron wave having almost six times the Bohr model with a particle almost the proton size then I get very much the energy of the electron which the Bohr simulation came up with and the maximum wave is almost at the Bohr radius, see fig.7. That is simply amazing and the strongest point of the viability of the theory. And solves the long standing problem of why Bohr model works. The reality of these lines is clearly shown in this result.

Even more amazing, it seems to predict the hydrogen size by giving the electron/proton mass ratio correction to the electron energy.

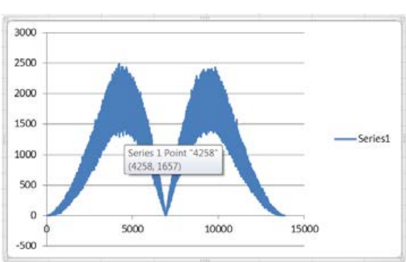

figure.7

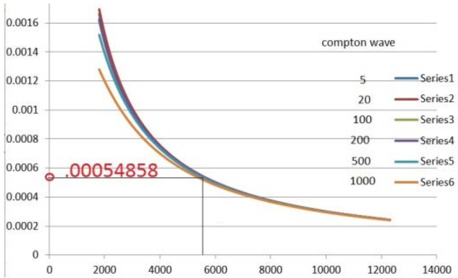

figure.8

6 Mass of the electron

In the Bohr model simulation two particles with electron Compton wave size(1823) was used, now if the size is changed from let's say to 10 ,100,500,1500 and simulate for each particle from the minimum distance which is the particle size all the way to about r=100000. When that is done for all the different Compton waves and plot the results as shown in Figure another amazing result is obtained. All the curves merge almost at an energy which equals the mass of the electron numerically at a distance of three times the electron Compton wave. Also for distances less than that the running phase for the charge starts. fig.8

7 Spin of particles

In this section I will be very brief since this is an ongoing research. The simulation show very strange results which some of it I am not sure of. To simulate a spin the two lines d0/d1 are put on top of each other and the interaction is calculated in the usual line crossing manner. Intuitively, the density waves should be similar but I get a very asymmetrical wave for the two particles. Calculating the probabilities when integers are used in the simulation (lines **li, li1** and **p, p1**) I find the electron g-factor in the vicinity of twice the electron Compton wave. The very big surprise is also I find the proton g-factor in the vicinity of the proton size. Also, interpreting the sign of the expectation value as spin, then one will be up and the other down.I will show more details in my website as they become available.

Moreover, assuming two particles interact as in Bohr model for the X axis and in the Y axis as in the spin method. Meaning that the particle in the Y (and Z axis) axis can only interact with their Compton wave length, then no matter how far are the particles they are linked. One will be up spin and the other down, but you can never differentiate between them. All this is forced upon the model to keep the rotational invariance, just like relativity produces spin in Dirac equation. That means the non-locality in the EPR automatically arises as a natural consequence of the system. No more brain racking, I hope.

8 Gravity

Here I will also be brief as it is an ongoing research. If an assumption is made the gravity is a result of only when the lines meet, then you will get an incredibly small force translated into a very very tinny expectation value shift. Moreover it seems that the expectation values are linked to the quantity mass in an intimate way. I will post more in my website.

9 Conclusion

Unfortunately the space of the essay is too short to make more robust arguments with details; however, I think any reasonable person with good grasp of Physics should see that the system merits serious investigation. The system arose as the result of the only possible design on the line from its own characteristic. You can do the usual tricks of differential equations and other mathematical techniques (coupled with experiment) to represent how reality behaves, but they cannot show the origin as in my system. Actually it is not mine but of reality!

A similar system has been the dream of the century, a system that can produce the universal constants and show the ontological origin of reality with no ambiguity. There is no ambiguity in this system; reality is just a mathematical structure which does not need an explanation as to its origin. Mathematics is just is. I will close with Wheeler's quote "How could it have been otherwise".