Fundamental Theory of reality, revisted

"Reality is nothing but a mathematical structure, literally"

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Abstract

In last year's contest I presented a simple mathematical system(structure) that reproduced many of the results of Quantum Mechanics, including QFT. This time I will show more connections to the standard physics including path integral and similar QFT techniques. Also, I will present the simulation for gravity where Newton's law is generated from the same system. In this essay I have no discussion regarding "goals and intentions" , that is because I believe these questions cannot be satisfactorily be answered unless we get to the bottom of the main question. That is, what exactly is reality.
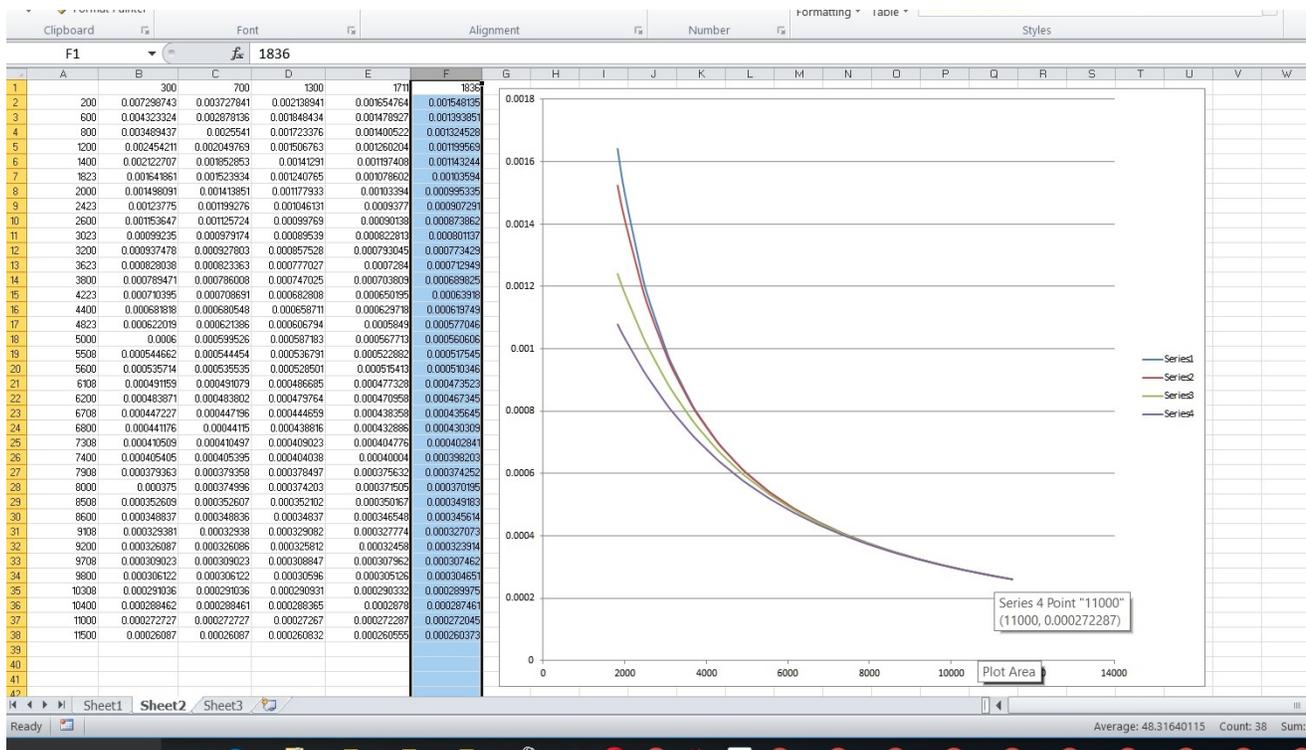
Introduction

In my original essay I derived the laws of nature inclusing particle content, interactions, space and time all from one cohesive mathematical structure. However, the system relied on simulations and while the results matched known results, the simulation technique did not give clear connection to standard physics.

So during the past few months I have tried to find some connection between my system and standard physics techniques. While I cannot claim to have been able to fully do the matching yet I think I can show that there are surprising similarties between the two although they both look so different from first look.

Moreover, in my last essay the generation of gravity was approximate, however, now I have the correct constraint the generates Newton's gravity law and even at any distance, like near planck lengths!

Links to standard physics

In the previuos essay I showed the simulations that seemed to producle the mass of the electron and the proton mass and size. Of course these results looked wacky because there was no standard physics results to compare. However, now I will show that these curves can also be reproduced using ordinary physics, a big surprise with hugue implications I think.

	300	700	1300	1711	1836
200	0.007298743	0.003727841	0.002138941	0.001654764	0.001548135
600	0.004323324	0.002878136	0.001848434	0.00147927	0.001393851
800	0.003489437	0.0025541	0.001723376	0.001400522	0.001324528
1200	0.002454211	0.002049769	0.001506763	0.001260204	0.001199569
1400	0.002122707	0.001952853	0.00141291	0.001197408	0.001143244
1823	0.001641861	0.001523934	0.001240765	0.001078602	0.00103594
2000	0.001498091	0.001413851	0.001177933	0.00103394	0.000995335
2423	0.00123775	0.001199276	0.001046131	0.0009377	0.000907291
2600	0.001153647	0.001125724	0.00099769	0.00090138	0.000873862
3023	0.00099235	0.000979174	0.00089539	0.000822813	0.000801137
3200	0.000937478	0.000927803	0.000857528	0.000793045	0.000773429
3623	0.000828038	0.000823363	0.000777027	0.0007284	0.000712949
3800	0.000789471	0.000786008	0.000747025	0.000703809	0.000689825
4223	0.000710395	0.000708691	0.000682808	0.000650195	0.00063918
4400	0.000681818	0.000680548	0.000658711	0.000629718	0.000619749
4823	0.000622019	0.000621386	0.000606794	0.0005849	0.000577046
5000	0.0006	0.000599526	0.000587183	0.000567713	0.000560606
5508	0.000544662	0.000544454	0.000536791	0.000522882	0.000517545
5600	0.000535714	0.000535535	0.000528501	0.000515413	0.000510346
6108	0.000491159	0.000491079	0.000486685	0.000477328	0.000473523
6200	0.000483871	0.000483802	0.000479764	0.000470958	0.000467345
6708	0.000447227	0.000447196	0.000444659	0.000438358	0.000435645
6800	0.000441176	0.00044115	0.000438816	0.000432886	0.000430309
7308	0.000410509	0.000410497	0.000409023	0.000404776	0.000402841
7400	0.000405405	0.000405395	0.000404038	0.00040004	0.000398203
7908	0.000379363	0.000379358	0.000378497	0.000375632	0.000374252
8000	0.000375	0.000374996	0.000374203	0.000371505	0.000370195
8508	0.000352609	0.000352607	0.000352102	0.000350167	0.000349183
8600	0.000348837	0.000348836	0.00034837	0.000346548	0.000345614
9108	0.000329381	0.00032938	0.000329082	0.000327774	0.000327073
9200	0.000326087	0.000326086	0.000325812	0.00032458	0.000323914
9708	0.000309023	0.000309023	0.000308847	0.000307962	0.000307462
9800	0.000306122	0.000306122	0.00030596	0.000305126	0.000304651
10308	0.000291036	0.000291036	0.000290931	0.000290332	0.000289975
10400	0.000288462	0.000288461	0.000288365	0.0002878	0.000287461
11000	0.000272727	0.000272727	0.00027267	0.000272287	0.000272045
11500	0.00026087	0.00026087	0.000260832	0.000260555	0.000260373

Chart legend: Series1, Series2, Series3, Series4

Series 4 Point "11000" (11000, 0.000272287)

$$e^2/r-(e^2/r)*EXP(-1*r/a)$$

The above equation is called Helmann type potential which is a combination of Yukawa and coulomb potential. It is used to solve many problems in physics, for example https://arxiv.org/pdf/1307.2983.pdf

But I noticed a remarkable property. Now, with Yukawa potential we typically interpret "a" in above equation as the exchange mass for the force. However here we interpret "a" just as length for inverse of two masses that INTERACT with each other.

if we use e^2=3 and use several values for "a"(the horizontal column in Exel sheet) and plot against distance, we see something strange. It seems that all the curves converge to a value of .000272287.

I used 300,700,1300,1711 for the shown plot. but you can use any such numbers. Also I have calculated for 1836 as an info only.

so if we multiply .000272287 by 2 and take the inverse we get 1836.2977 which is close to the proton-electron mass ratio. Or in another way, the electron mass can be taken to be .000272287*2=0.0005445

Now we figure which r,a will give us 1 which is the mass of the proton compared to the electron mass.

by inspection I find a nice solution(although others exist) r=3.8, a=3.8 that gives the potential to be .499 and multiply that by 2 you get almost 1

If we take 1836.1526 to be the electron reduced Compton wave and see the value of 3.8 by comparison

we have 3.86159e-13*3.8/1836.1527= .7991738 e-15

which is very close to proton radius

The system is also remarkable in that it is scale invariant

I don't know what all that means. but I wonder if it is possible to get this potential from first principle at least.

You can use this to do and verify all calculations

3/r-(3/r)*EXP(-1*r/a)
http://m.wolframalpha.com/

The above results is very close to the simulations of the electron mass and proton size in my system. That is quite remarkable.

One of the nice other links That I noticed is the that the random lines(see below) that are generated and in the end counted and interpreted as energy can be also looked at as a path integral that adds up all the energies, however in my system the normalization is done naturally with no infinities to deal with. Also, these lines that shoot out from each point can be looked upon as a bunch of harmonic oscillators.
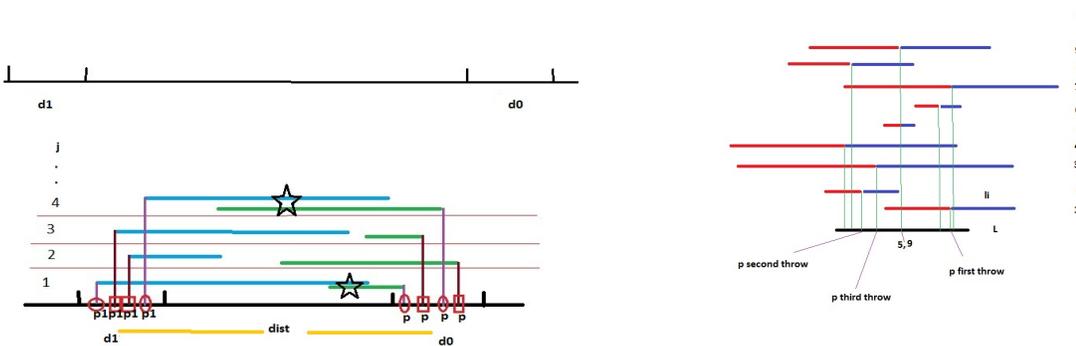

Figure.1

Gravity

In the previuos simulation I was getting a very tiny force but it did not take the effect of the mass. with the new simulation Newton's gravity law at large distance appears naturally from the the same system that produces all the QM?QFT results.
Please note: there is an error in the description
this
only energy of p1 should be considered
should read
only energy of p2 should be considered

Conclusion

I hope the reader can see some of added explaination to make the simulated system more understandable although I am sure a lot more work is needed, I thought the new interesting results are worth publishing. I appologize for the brevity of the essay which was beyond my control. Hopefully I will be able to explain more in the discussions.