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How to generate new mathematics-Part IV

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Abstract

Mathematics entered physics as a tool but little by little it transformed to be the master.

In previous articles entitled How to Generate New Mathematics - Parts I, II and III we discussed how to apply the statistical theory of Cairo techniques to generate new laws and rules in most fields of classical and quantum physics, statistics, and pure mathematics.

In this article, we use the same theory to extend our previous statistical analysis by introducing and analysing new important and urgent six questions:

1- Is it true that separation of variables is the most absurd idea in history?

2- Is the West losing the battle of the century?

3-Can we find the stationary energy levels of the Bohr hydrogen atom without using Bohr's hypothesis E=nhf, n=1,2,3,... up to infinity?

4-Did Einstein go through ten years of confusion and loss of knowledge in physics just before presenting his theory of general relativity?

5-Can complex Markov chains be solved using Cairo techniques?

6-What are the allowed and forbidden transitions in quantum mechanics?

Thanks to the statistical theory of Cairo techniques the answer to all the above questions is generated as yes and furthermore new rules and theorems have been generated.

This striking fact is the subject of this article.

Finally, it should be clarified that this article is not intended to minimize the major contributions of great physicists and mathematicians such as Einstein, Schrödinger, Heisenberg, Minkowski, Hilbert, and Riemann, among others, but rather to address the main slips and limitations of their theories, where applicable.

Note: If you are not familiar with the universal laws of physics, please stop reading. This article is not intended for you.

I.INTRODUCTION

Mathematics entered physics as a tool but little by little it transformed to be the master.

Every physical or mathematical problem has a natural statistical solution that works in appropriate bounded control volume which is in itself the theory of Cairo techniques.

The above fact was the core of relieving previous articles entitled How to generate new mathematics parts 1,2,3 as well as part 4 which is the present research [2,3,4,5].

In this article we introduce and analyse 6 important and urgent questions:

1- Is it true that separation of variables is the most absurd idea in history?

The method of separation of variables for solving time-dependent PDEs of f(x,y,z,t) is briefly looking for a solution in the form:

f(x,t) = f1(t) * f2(x)

Separation of variables is mathematically useful in specific boundary-value problems, but it should not be interpreted as a general physical principle.

In many realistic systems, spatial and temporal degrees of freedom are intrinsically coupled through the internal structure and dynamics of the field.

Assuming a priori factorizability of the form [1,5],

f(x,t) = X(x) . T(t) . . . . . (1)

may obscure important physical mechanisms.

Its uncritical extension can lead to conceptual misunderstandings, especially in wave and field theories.

A physically coherent approach should not favor geometric structure and dynamic mechanisms, with mathematics serving as a descriptive and analytical framework rather than a substitute for physical interpretation.

On the contrary, we believe that time can not be an external scalar quantity as implied particularly by equation 1or generally by the well known R^4 space, but should be woven in or integrated with three geometric xyz axes while remaining perpendicular to them.

2- Is the West losing the battle of the century?

We believe the West (the United States and Europe) is losing the battle of the century.

The West comes third after Russia and China and there are fears in next few decades to regress to forth after India as well.

By battle of the century, we mean the most recent and important scientific battles: artificial intelligence, quantum mechanics, general relativity , unified field theory, and the foundations of cosmo-science.

Over the past century, the West has made enormous technical and experimental advances in this field, but has not progressed one bit theoretically [1,5].

3-Can we find the stationary energy levels of the Bohr hydrogen atom without using Bohr's hypothesis E=nhf, n=1,2,3,... up to infinity?

The original Bohr atomic model is shown in Fig.1 below.[1].

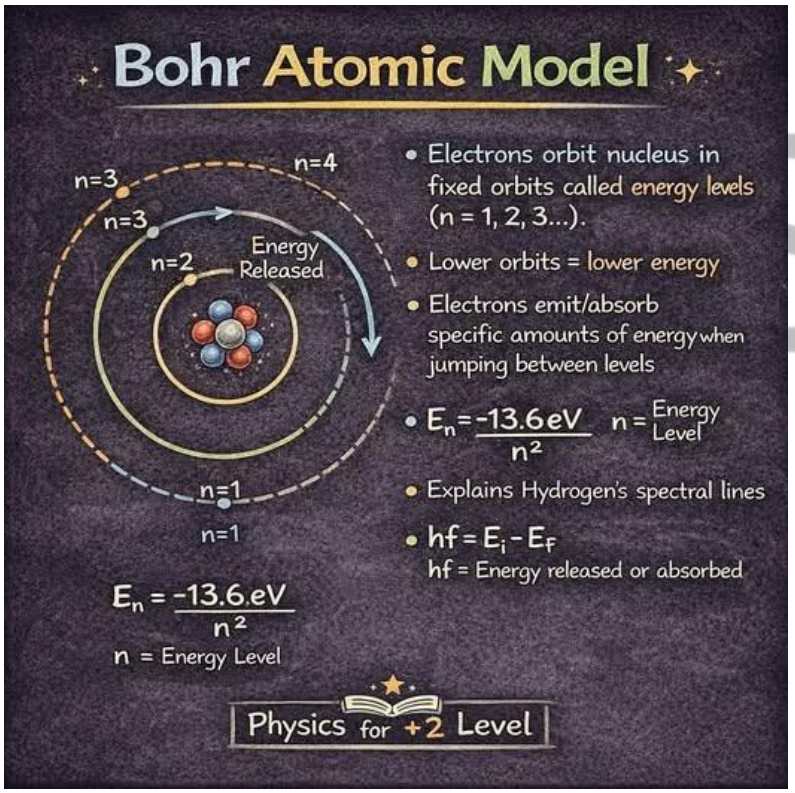

Figure 1. Classical Bohr atomic model of hydrogen atom[1,5,18,19]

Note that you completely ignore Schrodingers theory of QM or Schroodinger PDE as if they never existed. The necessary prerequisites are a sufficient knowledge of 4D unitary spaces xt, matrix algebra, and probability and statistics [1,5,18,19]

The question arises:

If the Schrödinger solution is the fundamental derivation that yields the Bohr energy levels rigorously, then why do we search for semi-classical routes such as (de Broglie standing wave or action quantization) that reproduce the same discrete spectrum while avoiding Bohr's frequency postulate E = n h f.

The answer is simple:

1-This is the first time ever where a quantum energy density transition matrix is found which means a transition quantum energy density matrix do exist.

Note that the Heisenberg transition quantum energy matrix is neither transition nor statistical.

2-A quantum transition matrix can tell us in advance about Symmetry and Asymetry of the solution to the quantum system to be examined.

3- For the first time, that efficient transition matrix proves that the Bohr hypothesis E=nhf is not needed as a statistical assumption and .not dynamical one and be replaced by the statistics inherent in discretization of time.

4-The proposed quantum transition matrix in particular and Cairo's AI techniques in general propose that QM operates according to the square of SE rather than SE itself.

.etc,etc.

So yes -We can obtain the stationary energy levels of hydrogen without using Bohr's original assumption E = n h f to make use of ; modern matrix of quantum mechanics on firm basis .

The statistical theory of Cairo techniques proposes a powerful quantum transition matrix Q that can be used to obtain the transfer quantum matrix D(N) given by [2,3,4,5],

D(N)=Q+Q^2+Q^3+ . . . . . +Q^N . . . . . (1)

For sufficiently large number of iterations N (not to be confused with n the number of free nodes in the control volume) which is also the number of time jumbs dt we have,

D(N)=[1/(I-Q)] – I . . . . (2)

Where I is the unit matrix nxn.

Note that expression 2 is the limit of expression 1 as N goes to infinity.

Now for the case of 1 D geometry discretized in 19 equidistant free nodes (the accuracy increases as n increases)we get,

D 19x19=

247/400 9/16 -9/50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

1/2 1/25 3/5 -7/50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

-7/50 21/40 53/200 91/200 -21/200 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 -21/200 39/100 23/50 33/100 -3/40 0 0 0 0 0 0 0 0 0 0 0 0 0

0 0 -3/40 11/40 5/8 9/40 -1/20 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 -1/20 9/50 19/25 7/50 -3/100 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 -3/100 21/200 173/200 3/40 -3/200 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 -3/200 1/20 47/50 3/100 -1/200 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 -1/200 3/200 197/200 1/200 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 1/200 197/200 3/200 -1/200 0 0 0 0 0 0

0 0 0 0 0 0 0 0 0 -1/200 3/100 47/50 1/20 -3/200 0 0 0 0 0

0 0 0 0 0 0 0 0 0 0 -3/200 3/40 173/200 21/200 -3/100 0 0 0 0

0 0 0 0 0 0 0 0 0 0 0 -3/100 7/50 19/25 9/50 -1/20 0 0 0

0 0 0 0 0 0 0 0 0 0 0 0 -1/20 9/40 5/8 11/40 -3/40 0 0

0 0 0 0 0 0 0 0 0 0 0 0 0 -3/40 33/100 23/50 39/100 -21/200 0

0 0 0 0 0 0 0 0 0 0 0 0 0 0 -21/200 91/200 53/200 21/40 -7/50

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -7/50 3/5 1/25 1/2

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -9/50 9/16 247/400

Note that D^2=D and hence Q^2=Q which is property of quantum eigen matrix.

This type of matrices A=A^2 is called in physics idle matrix and in mathematical terms, an idempotent matrix has eigenvalues ev of 0 or 1 which satisfy the golden rule ev = ev^2 [2,4,5,18,19,23].

Therefore the stationary energy levels Of Bohr H-atom or solution vector b of matrix D19x19 is obtained by multiplying the matrix D 19x19 above by the vector 13.6 ev/n^2 shown in Fig,1.

The numerical results obtained is as follows

b*= (-0.1403 ,- 0.163, -0.2121, -0.2769 , -0.377, -0.5404 ,-3.435 , -13.6 ev . . . etc) T

This stationary distribution is sometimes called quantum particle in a central field.

the vector b above is the eigen vectors of the transfer matrix D with eigen value ev=1 only if

Q.b*= b.

The numerical result of matrix multiplication above is b*=,

[-877/6250 -163/1000 -10607/50000 -13843/50000 -377/1000 -54041/100000 -167633/200000 -74419/50000 -687089/200000 -68/5 -687089/200000 -74419/50000 -167633/200000 -54041/100000 -377/1000 -13843/50000 -10607/50000 -163/1000 -877/6250]T

Which is almost exact (b*=b).

4-Did Einstein go through ten years of confusion and loss of knowledge in physics just before presenting his theory of general relativity?

We assume that Einstein went through ten years of confusion and loss of knowledge in physics from 1905, the year he presented his semi-successful special relativity, to 1915 just before presenting his catastrophic theory of general relativity.

It is clear that his 1915 general relativity contradicts the 1905 special relativity, and that adding more failures contradicts itself.

The question arises:

How can it be that the theories that are successfully implemented in functioning technologies and which have been used to predict every particle in the standard model of physics are absolute failures?

The answer is simple and we call the far reaching success of Einstein theory of relativity is just a sort of deception.

In other words how could Einstein SR and GR be fundamentally wrong when they make the precise calculation for GPS everyday?

Note that you completely ignore Einstein's theory of gravity or general relativity as if they never existed. The necessary prerequisites are a sufficient knowledge of 4D unitary spaces xt, matrix algebra, and probability and statistics [8,9,10,11,12]

The claim of incompleteness and incorrectness of Einstein GR and SR despite it was proved by GPS measurements is supported by counterwise questions [1,3,4,5,24,25]:

Counter-question i

Why Einstein failed to derive SR from GR simply by equating acceleration to zero?

Answer i

SR and GR remain two distinct theories up to this day.

Counter-question ii

Did Einstein ever got a scientific prize for his GR or SR?

Answer ii

The answer is no but on the opposite he was met by opposition explained in the article 100 authors against Einstein.

Note that Einstein awarded Nobel Prize in 1916 for his contribution equation in photoelectric effect, hf = W + 1/2 m v^2 maximum.

Counter-question iii

Did Einstein ever succeed in defining time t?

Answer iii

On the contrary Einstein never succeeded in finding rigorous definition of time and stated once that time is an illusion.

The result is that all of Einstein's equations are limited in time to explain only the current stationary state and never predict the future or what will happen tomorrow.

A straightforward proof to the theory of general relativity starts by the Cauchy-Riemann stress srain tensor as follows:

Stress tensor x 1/strain tensor = I the unit matrix.

The stress tensor in 3D geometric space is expressed as [1,4,5,18,19]

Fxx Fxy Fxz

Fyx Fyy Fyz

Fzx Fzy Fzz

We call it Matrix M1.

The breakthrough here is to extend the stress tensor to the 4D unitary xyzt space where this extension is logically assumed as,

Fxx Fxy Fxz Fxt

Fyx Fyy Fyz Fyt

Fzx Fzy Fzz Fzt

Ftx Fty Ftz Ftt

We call it Matrix M1*

The curvature C defined 1/radius of curvature generates the curvature matrix in 4D unitary xt space as follws,

$\nabla^2 xx \quad \nabla^2 xy \quad \nabla^2 xz \quad \nabla^2 xt$

$\nabla^2 yx \quad \nabla^2 yy \quad \nabla^2 yz \quad \nabla^2 yt$

$\nabla^2 zx \quad \nabla^2 zy \quad \nabla^2 zz \quad \nabla^2 zt$

$\nabla^2 tx \quad \nabla^2 ty \quad \nabla^2 tz \quad \nabla^2 tt$

We call this Matrix C1*

Where,

$\nabla^2 xx = d^2/dx^2$, $\nabla^2 yz = d^2/dx^2$, $\nabla^2 zt = d^2/dx^2$ . . . . ***etc.***

It is worth mention that both stress tensor and strain tensor is symmetric about the main diagonal and has 10 independent components.

The Stress tensor can be expressed in terms of Laplacian or ∇^2 as follows,

∇2xx ∇2xy ∇2xz ∇2xt]U(x,y,z,t)

∇2yx ∇2yy ∇2yz ∇2yt]U(x,y,z,t)

∇2zx ∇2zy ∇2zz ∇2zt]U(x,y,z,t)

∇2tx ∇2ty ∇2tz ∇2tt]U(x,y,z,t)

We call the above stress tensor matrix M1*.

The theory of GR follows in one sentence as,

M1*. C1*=I . . . (1)

Where I is the unit matrix 4x4.

Equation 1 is the theory of GR by itself .

Note that the curvature C is proportional to the energy density U in any case, and not necessarily to the gravitational energy density as Einstein's hypothesis suggested.

Note also that the previous analysis suggest that the seat of gravitational energy density is vacuum near the sun which constitutes 99% of the mass and gravity of the solar system.

If the graviton is responsible for transmitting gravity force it should be found in the far space near the sun not on earth

Calculating gravitational energy density as function of universal gravitational constant G=6.7E-11 MKS, Mass of the sun Ms=2. E30 Kg and Rs radius of the sun=7E8 m.

We arrive at C=E-2 m^-1 near the surface of the sun.

This is almost the same numerical value for curvature C near the sun surface obtained by Einstein in his general relativity.

The question arises assuming that the numerical value of C obtained by Einstein has been confirmed by cosmic measurements, do we need other cosmic measurements to confirm the same C obtained by the techniques from Cairo?

The answer is NO.

5-Can complex Markov chains be solved using Cairo techniques?

Today we know only two transition matrices and two matrix chains:

i-Markov transition matrix and Markov transition matrix chains.

ii-The B-transition matrix resulting from the Cairo techniques and the B-transition matrix chains.

Markov matrix Mnxn is a non-negative real square matrix subject to a statistical condition,∑Mi,j =1 for all lines i,Or ∑Mi,j =1 for all columns j**.**

Note that Markov chains themselves do not directly create new mathematics, but they can inspire novel mathematical frameworks, explore complex structures, and generate insights that lead to new mathematical developments.

In section II of the theory, we explain how to solve complex Markov chains through a suitable illustrative example.

6-What are the allowed and forbidden transitions in quantum mechanics?

Allowed transitions are jumps of electrons between energy levels that obey the selection rules, such as a change in the orbital quantum number (δL) of ±1, making them highly probable. Forbidden transitions, on the other hand, violate these rules; they therefore have a much lower probability, but can nevertheless occur.

"Allowed transitions are jumps of electrons between energy levels that obey the selection rules, such as a change in the orbital quantum number (δL) of ±1, making them highly probable. Forbidden transitions, on the other hand, violate these rules; they therefore have a much lower probability, but can nevertheless occur."[1].

An opposite and breakthrough answer to this question other than that of ref.1 is (δn) of ±1, as presented in Section II of the theory.

In order not to worry too much about the details of the introduction let us go directly to section II the theory.

II. THEORY and NUMERICAL RESULTS

Nature is statistically symmetric and bounded [1]

Nature's creatures exhibit a wide range of symmetry, from the intricate patterns of snowflakes to the streamlined bodies of sharks.

Every physical or mathematical problem has a natural statiscal solution that works in appropriate bounded control volume which is in itself the theory of Cairo techniques.

The above fact was the core of relieving previous articles entitled How to generate new mathematics parts 1,2,3 as well as part 4 which is the present research.

1-Is it true that separation of variables is the most absurd idea in history?

The short answer is Yes. We assume that separating variables in time-dependent PDEs by looking for a solution in the form:

f(x,t) = f1(t) * f2(x)

is incomplete and misleading.

Time must be woven in geometrical axes x,y,z and mean while kept orthogonal to those axes not sparated as in the case of R^4 space.

2- Is the West losing the battle of the century?

This question is well explained in Section 1 of the introduction and there is almost nothing to add.

3-Can we find the stationary energy levels of the Bohr hydrogen atom without using Bohr's hypothesis E=nhf, n=1,2,3,... up to infinity?

Similar to Q2, this question is well explained in Section 1 of the introduction and there is almost nothing to add.

4- Can Markov chains be solved using Cairo techniques?

The Markov transition matrix A and the Cairo transition matrix B obey the same recurrence principle and exhibit both similarities and differences.

The problem with a Markov matrix A is that its determinant is extremely small, such as 1/1000 or even much less. This fact makes solving the Markov equation,

Ax = 0 . . . . . (1)

via iteration methods extremely painful if not impossible [1,14,18,19].

Cairo techniques present or invent a simpler and more efficient method to find the solution of equation 1 in 3 consecutive steps:

Step 1

Rearrange the rows (or columns) of matrix A to obtain the A* diagonal matrix.

Step 2

Note that the solution to equation 1 exist if and only if, i-Determinent of A=0 ii-Inversion of matrix A ,ie,A^-1 =A* exist.

Step 3

where A* is an inactive matrix (called an idempotent matrix) satisfying the equality: $A^* = A^{*2} = A^{*3}$, etc. Now the solution to equation 1 is simply A*N for N goes to infinity. Note also that, A*N = (1/[1-A*]) . . . (2) For N sufficiently large. It is obvious that the expression 2 is the solution of equation 1.

Here is a nice example of the solution of Ax = 0.. . . (1)

Let A 10x10 be arbitrary chosen as real matrix while complex ones have exactly the same method of solution,

A10x10=

1-{{0.3, 0.1, 0.1, 0.0, 0.2, 0.4, 0.5, 0.2, 0.3, 0.1},

2- {0.1, 0.15, 0.1, 0.2, 0.1, 0, 0.1, 0, 0.1, 0.4}

3= {0, 0.1, 0.5, 0.1, 0, 0.1, 0, 0.1, 0, 0.1}

4-, {0.05, 0.2, 0.1, 0.05, 0.04, 0, 0.1, 0, 0.1, 0},

5- {0.05, 0.05, 0, 0.1, 0.06, 0.07, 0, 0.1, 0.2, 0.1},

6- {0.2, 0.2, 0.04, 0.05, 0.1, 0.03, 0.1, 0, 0.0, 0}

7-{0, 0.02, 0, 0.2, 0.3, 0.1, 0.05, 0.1, 0.1, 0.04},

8-{0.15, 0.08, 0.06, 0, 0.1, 0, 0, 0.05, 0.1, 0.06},

9-{0, 0.1, 0.05, 0.1, 0, 0.1, 0.05, 0.05, 0.09, 0.2},

10-{0.15, 0, 0.05, 0.2, 0.1, 0.2, 0.1, 0.4, 0.01, 0}}

Note that the determinant of A is very small 1/273800 which makes solving the Markov equation, Ax = 0 . . . . . (1) via iteation methods is extremely painful if not impossible.

Rearranging the rows (or columns) of matrix A to obtain the A* diagonal matrix.

We obtain, A*=

1-({{0.2209, 0.2209, 0.2209, 0.2209, 0.2209, 0.2209, 0.2209, 0.2209, 0.2209, 0.2209},

2-{0.1305, 0.1305, 0.1305, 0.1305, 0.1305, 0.1305, 0.1305, 0.1305, 0.1305, 0.1305},

3-{0.09560, 0.09562, 0.09571, 0.09562, 0.09559, 0.09561, 0.09559, 0.09562, 0.09559, 0.09562},

4-{0.06652, 0.06653, 0.06654, 0.06653, 0.06652, 0.06653, 0.06652, 0.06653, 0.06652, 0.06653},

5-{0.06756, 0.06756, 0.06755, 0.06756, 0.06756, 0.06756, 0.06756, 0.06756, 0.06756, 0.06756}

6-{0.09380, 0.09380, 0.09378, 0.09380, 0.09380, 0.09380, 0.09380, 0.09380, 0.09380, 0.09380},

7- {0.06786, 0.06786, 0.06785, 0.06786, 0.06786, 0.06786, 0.06786, 0.06786, 0.06786, 0.06786},

8-{0.07357, 0.07357, 0.07356, 0.07357, 0.07357, 0.07357, 0.07357, 0.07357, 0.07357, 0.07357},

9-{0.06997, 0.06997, 0.06997, 0.06997, 0.06997, 0.06997, 0.06997, 0.06997, 0.06997, 0.06997},

10-{0.1137, 0.1137, 0.1136, 0.1137, 0.1137, 0.1137, 0.1137, 0.1137, 0.1137, 0.1137

Note again that,

i- Determinant of A*=0

ii- ii-Inversion of matrix A ,ie,A^-1 =A* exist.

5- What are the allowed and forbidden transitions in quantum mechanics?

The answer in reference 1 is as follows,

"Allowed transitions are jumps of electrons between energy levels that obey the selection rules, such as a change in the orbital quantum number (δL) of ±1, making them highly probable. Forbidden transitions, on the other hand, violate these rules; they therefore have a much lower probability, but can nevertheless occur."

Without any mention of the principal or orbital quantum number n[1,2,4,5,18,19].

To explain the allowed and forbidden transitions of the principal quantum numbers, we present the 3D Figure 2. It shows 3D cube of

27 equidistant free nodes.

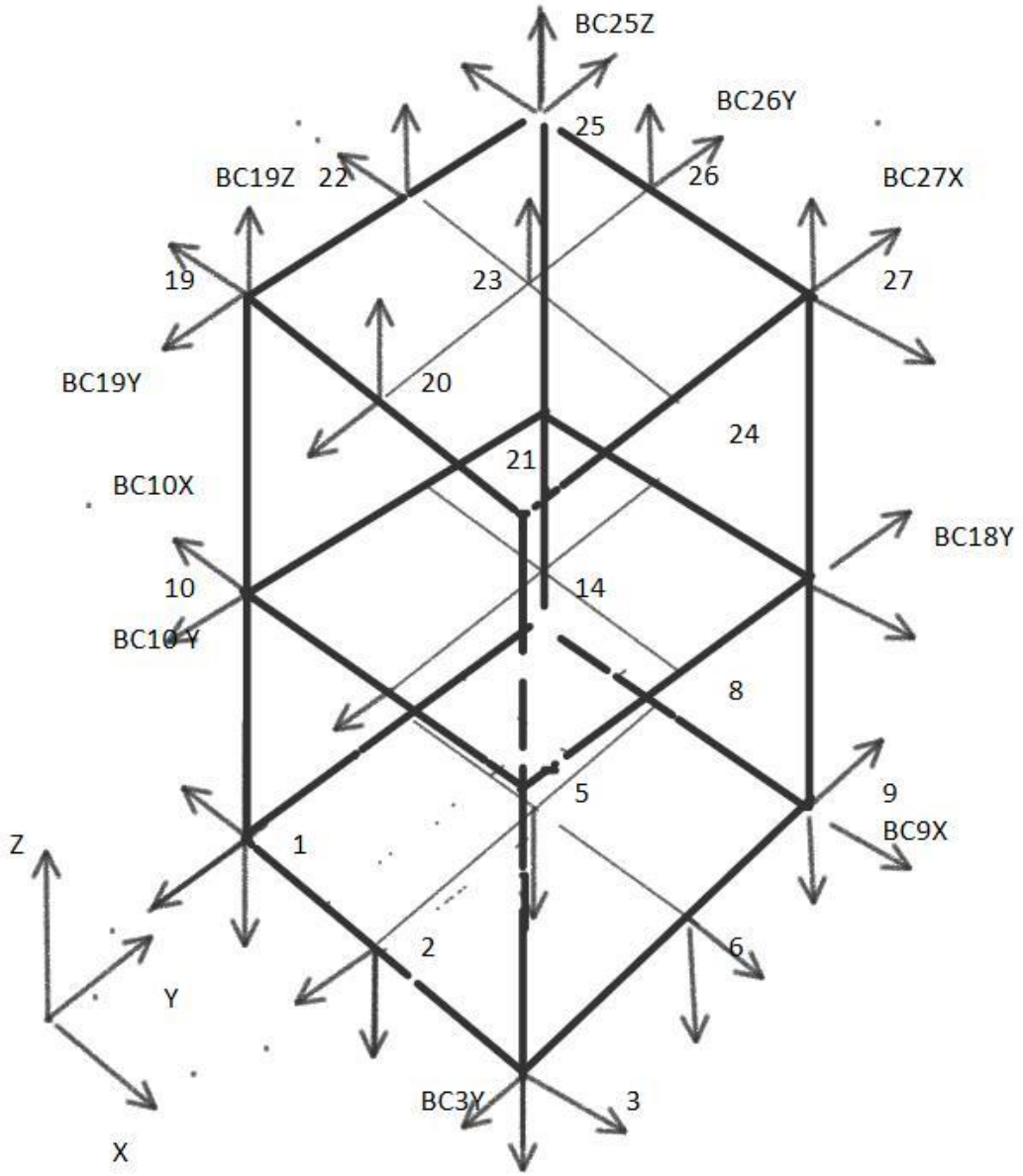

Fig.2, A 3D cube of 27 equidistant free nodes

The transition matrix input elements Bi,j =1/6 for i adjacent to j and zero otherwise. This means that for the mid point or free node 14 the transitions from nodes 5,11,13,15,17,23 to node 14 and vice versa are allowed but other transitions are forbidden.

III-CONCLUSION

Nature is statistically symmetric and bounded [1]

Nature's creatures exhibit a wide range of symmetry, from the intricate patterns of snowflakes to the streamlined bodies of sharks [1,4,5].

Every physical or mathematical problem has a natural statiscal solution that works in appropriate bounded control volume which is in itself the theory of Cairo techniques.

The above fact was the core of relieving previous articles entitled How to generate new mathematics parts 1,2,3 as well as part 4 which is the present research.

In this article we introduced and analysed 6 important and urgent questions:

1- Is it true that separation of variables is the most absurd idea in history?

2- Is the West losing the battle of the century?

3-Can we find the stationary energy levels of the Bohr hydrogen atom without using Bohr's hypothesis E=nhf, n=1,2,3,... up to infinity?

4-Did Einstein go through ten years of confusion and loss of knowledge in physics just before presenting his theory of general relativity?

5-Can complex Markov chains be solved using Cairo techniques?

6-What are the allowed and forbidden transitions in quantum mechanics? Is it true that separation of variables is the most absurd idea in history?

Note that in this article we completely ignore Schrodingers theory of QM and Einstein theory of gravity or GR as if they never existed.

The Matrix mechanics of Cairo techniques is our new mechanics choice.

The necessary prerequisites are a sufficient knowledge of 4D unitary spaces xt, matrix algebra, and probability and statistics [1,2,4,5,18,19]

Thanks to the statistical theory of Cairo techniques the answer to all the above questions is yes and furthermore new rules and theorems have been generated.

The numerical results are surprisingly accurate.

Finally, it should be clarified again that this article is not intended to minimize the major contributions of great physicists and mathematicians of their time such as Einstein, Schrödinger, Heisenberg, Minkowski, Hilbert, and Riemann, among others, but rather to address the main slips and limitations of their theories, where applicable.

NB. The author uses his own double precision algorithm, such as that of references 27,28,29.

No ready-to-use Python or MATLAB algorithms are needed.

Aknowledgement

The author expresses his gratitude to the Military Technical College, a distinguished part of Cairo University where he began his work at the college as a lecturer assistant in physics and mathematics, in collaboration with an extremely distinguished group of Czechoslovak and Russian experts.

An experience that was both enjoyable and rewarding until he later became a professor and head of the Department of Basic Sciences, which comprises experimental and theoretical physics as well as pure mathematics.

During this long experience. He went to the Atomic and Nuclear Physics Center in Toulouse, France, where he earned his doctorate and worked as a professor at ULP and UPS Universits, as well as a research director at CNRS in France.

The last experience, as with the first, was an opportunity to collaborate with the best leaders and the latest scientific knowledge.

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