Research & Reviews: Journal of Pure and Applied Physics ISSN: 2320-2459

Towards a Clasically Possible Inner Structure of Elementary Particles

Ismail German*

Department of Pure and Applied Physics, Middle East Technical University, Ankara, Turkey

Research Article

Received: 27-Jul-2022, Manuscript No. JPAP-22-70575; **Editor assigned:** 29-Jul-2022, Pre QC No. JPAP-22-70575 (PQ); **Reviewed:** 12-Aug-2022, QC No. JPAP-22-70575; **Revised:** 05-Oct-2022, Manuscript No. JPAP-22-70575 (R); **Published:** 12-Oct-2022, DOI: 10.4172/2320-2459.10.8.001

***For Correspondence :** **Ismail German**, Department of Pure and Applied Physics, Middle East Technical University, Ankara, Turkey;

Email: isoger1@gmail.com

Keywords: Natural philosophy; Atom; Democritus; Hermes; Hatom; Unit cell; Machine learning

ABSTRACT

Some basic calculations regarding a trial to make elementary particles out of indivisible, extremely tiny, infinitely hard spheres moving with the speed of light are given. For convenience, calculations are done in 2 dimensions. The concept of the unit cell is introduced, some basic calculations regarding their behavior are given and momentum transfer *via* unit cells is investigated. Mention of a scheme following Gauss' Law is made and further investigation with the help of machine learning techniques, after the results of the cost/benefit ratio, is suggested.

INTRODUCTION

The world has certainly witnessed a dominant illumination in the second half of the last millennium and two great wars in the last century despite this quasi-illumination. A second ultimate illumination or very probably a third war seems now to be in pursuit, even though a probable/possible doom may be our predetermined fate independent of whichever of these has occurred Laitman [1,2]. Considering the possibility of doom being at the gate, we seem to be in real need of a spiritual transformation in addition to a cultural one, but the second is a necessity for all possibilities mentioned in the previous paragraph.

Beginning with the 20th century, our problems in understanding the observed phenomena began to increase. We could not understand the physics of small scales and, to cope, we adopted a rather mathematical abstraction and description of them. That was to some extent due to previously applied social pressure on science and scientists as a result of the desired development or said in other words, economic growth. Two "I used to think that top environmental problems were biodiversity loss, ecosystem collapse and climate change. I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a cultural and spiritual transformation. And we scientists don't know how to do that". Pillar theories have evolved to be mainstream physics despite all objections. The first is the theory of special relativity and it is beyond our domain of interest in this manuscript [3].

MATERIALS AND METHODS

The second is the quantum theory which has got much objection from its early creators as it evolved. Schroedinger said they all should be waves, particles cannot hip-hop. There were also other objections including the ones cited below:

"It was really because quantum theory, and to a lesser extent relativity theory, were never understood adequately in terms of physical concepts that physics gradually slipped into a practice of talking mostly about the equations To some extent, this began as early as the 1920's when the astronomer Sir James Jeans proposed that god must be mathematician. Heisenberg later gave it enormous boost with his idea that science could no longer visualize atomic reality in terms of physical concepts and that mathematics is the basic expression of our knowledge of reality now I don't agree with these developments [4,5]. In fact, I feel that the current emphasis on mathematics has gone too far Johnson 2013".

"Quantum theory makes the most accurate empirical predictions. Yet it lacks simple, comprehensible physical principles from which it could be uniquely derived. Without such principles, we can have no serious understanding of quantum theory and cannot hope to offer an honest answer one that's different from a mere "the world just happens to be that way" to students' penetrating questions of why there is indeterminism in quantum physics, or of where Schrödinger's equation comes from. The standard textbook axioms for the quantum formalism are of a highly abstract nature, involving terms such as "rays in Hilbert space" and "self-adjoint operators." And a vast majority of alternative approaches that attempt to find a set of physical principles behind quantum theory either fall short of uniquely deriving quantum theory from these principles, or are based on abstract mathematical assumptions that themselves call for a more conclusive physical motivation Bruckner 2011".

Despite all objections, the evolution continued and we eventually got the following judgment: "A fundamental conclusion of the new physics acknowledges that the observer creates the reality. As observers, we are personally involved with the creation of our own reality. Physicists are being forced to admit that the universe is a "mental" construction. Pioneering physicist Sir James Jeans wrote: "The stream of knowledge is heading toward a non-mechanical reality; the universe begins to look more like a great thought than like a great machine [6]. Mind no longer appears to be an accidental intruder into the realm of matter, we ought rather to hail it as the creator and governor of the realm of matter. Get over it, and accept the inarguable conclusion. The universe is immaterial-mental and spiritual. We obviously need reconsideration [7,8].

RESULTS AND DISCUSSION

Encapsulation

Quantum mechanics and classical and relativistic field theories are abstract mathematical models that allow no way to visualize what in the subatomic world goes on. Despite many objections, they are still valid models because they give, sometimes with manipulation, the numerical results of the experiments. Many scientists tried but none was able to construct numerical or analytical, models to replace them with classical countrparts.

Even though Freemasonry, the Holy Quran, and simple logic say that matter should be made up of the smallest indivisible elements that constantly move and may form stable bundles whenever enough density happens to are present, no successful models appeared due to the difficulty of dealing with such a huge number of involved elements. We believe machine learning techniques should be applied in this area, to get at the least a satisfactory primordial model to make stable interacting elementary particles out of these with the speed of light moving indivisible smallest particles that we call "hatoms" as an abbreviation of Hermes- atoms, since we somehow anticipate that democritus must have transferred the idea of the atom from Accad to Greece.

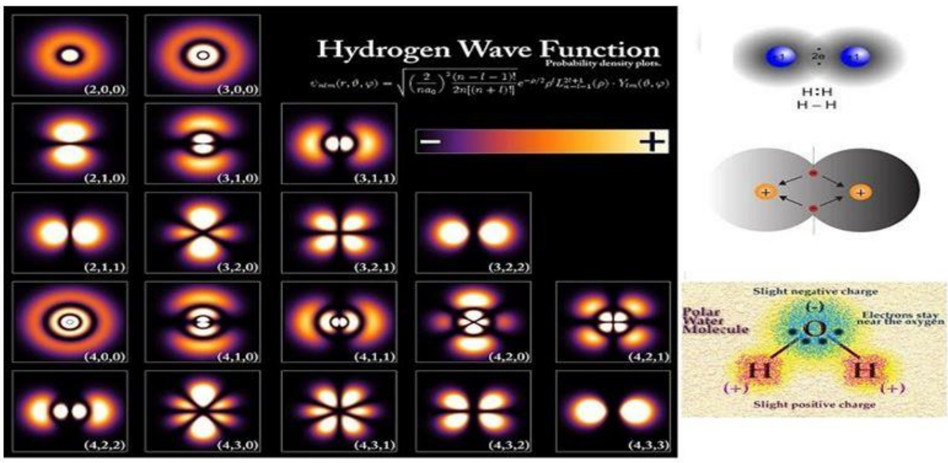
Ever since we began our physics studies at Robert college/Bosphorous university we had intentions to develop such a model and we hopefully came to a point that could allow the use of machine learning techniques. The reasons and the past of our work we summarized in German and Gezerman 2022. In this manuscript, we make a potpourri out of our officially unpublished two relatively recent works, and we mention some results we recently obtained.

We hope our primordial work will give way to the application of machine learning techniques and eventually to satisfactory results.

The implication of solutions of Schrodinger equation

The solution of the Schroedinger equation for the simplest atom and the visualization of the covalent bond the equation explains are given in Figure 1.

Figure 1. Hydrogen atom wave functions and H-H covalent band.



Schroedinger's approach reminded somehow of a substructure of unknown type but Copenhagen interpretation and associated difficulties with any substructure forced us to forget about it. Very great scientists like de Broglie, Bohm, scientists referenced in "a survey of hidden variable theories" tried some hidden variables Belinfante 1973. Works on MIT bag and Stanford bag tried extended particle models. All were not aiming for visualization, all were without much success.

Objections do still continue. Rather recently Claes Johnson has written: "The big trouble with QM is that the wave function does not represent any physical quantity, only a probability which has no physical representation, a fact which has made quantum mechanics into a deeply mystical subject beyond the comprehension of human minds, as witnesses by many nobel laurates of physics: Quantum mechanics cannot be understood but is nevertheless very useful." Johnson.

Recently Hirwani has written a good deal and from his publications, we got Figure 2 Hirwani. As a naive thinker, he may be right, but experts are of some other opinion.

Figure 2. Some objections from Hirwani to quantum mechanics.

B. The conceptual problems with the Schrodinger's electron wave

As mentioned above, it is forbidden to visualise about the wave of the electron in an atom, but it needs to be visualised to understand the wave nature of an electron in an atom as described by the Schrodinger's equation. There are many conceptual problems regarding the "wave" of the electron.

a. How exactly a particle electron generates or gets converted into a wave of electron?
b. What is the speed of this wave of electron? Is it equal to the speed of an electron v itself, or it is equal to c?
c. What is waving in this wave of electron?
d. How an electron can fill a very large 3-dimensional volume around the nucleus compared to its own volume, how it can distribute its mass unless it is made of many small parts? But an electron is considered an elementary particle which can't be subdivided; therefore, scientifically Schrodinger's 3-dimensional wave of electron is not possible.
e. Similarly, how an electron can distribute its charge in a very large 3-dimensional volume? The same argument given for distribution of mass applies here also, therefore this is also scientifically not possible.
f. How the wave of electron can move in a curved path, what makes them to follow a curved path to remain confined in the regions of space called orbitals.
g. How these waves create complicated 3-dimensional nodes. These nodes are created because of wave nature of the electron.
h. There are no starting and end points in the orbitals then why not any wavelength is possible in an orbital? How a wave can move within geometrically complicated orbitals?
i. How a 3-dimensional wave can create 3-dimensional stationary waves? There is no physics or no good reason to accept Schrodinger's assumption of 3-dimensional waves, there are no boundaries from where the transverse wave gets reflected and can create stationary waves. It must be noted that like de Broglie's model, this is the heart of the concept of quantisation using the wave picture of electron, this is just an extension of de Broglie's model from 2-dimensions to 3-dimensions, and there is no physics to support it.
j. Mathematical determination of shape of orbitals is just arbitrary, there are many possibilities available to select the shape, there is no rule why one shape is preferred over another, for example, the shape of d_0 orbital and this arbitrary chosen shape of the orbital define perfectly the probability of finding an electron. How can an arbitrary shaped abstract orbital explain the physical reality of atomic and molecular bonding?
k. Arbitrary determination of orientations of orbitals, there are many possibilities available to create an orbital with the combination of other orbitals, for example $d_{(x^2-y^2)}$ or d_z^2, once arbitrary chosen, somehow it reflects the physical reality of atomic or molecular bonding.

Within this regard we rather mean the following well-known partly passive sentence, "In small scale, nature behaves in a peculiar way it is ununderstandable" should be said in the active form, the subject is each scientist. We all are not able to understand, and it may be better if we do/can.

On the other hand, the basics of electrodynamics have also reminded us of a substructure, again without any success. Regarding these, a good amount of sound thoughts is to be found in Free e-book. Especially to be noted are:

"We know that the effects of an electric field propagate at a finite speed that of light. If we could suddenly introduce an identical charge nearby another, the existing charge would not respond immediately. Instead, there would be a brief pause before the existing charge began accelerating away. This would seem to indicate there is something physically moving from one charge to the other and then striking that second charge with a force."

"Could what we describe as an electric field be in fact, not just be an abstract mathematical entity, but an actual flow of material that moves outward from a charge and imparts a force on other charges when it hits them? On one hand, this sounds logical because it explains why there would be a delayed effect if the 'material' moved at the speed of light. It would also explain how an electric force is exerted at a distance: it isn't, the force is applied directly when the material meets/hits the other charge. On the other hand, it sounds illogical because the material is not coming from anywhere. It flows out of the particle, yes, but without first coming into it from somewhere else. So what if the electric field 'material' was not coming from elsewhere but being generated "on the fly"?

That is, it was continuously being produced and then ejected?"

The problem is that particles and fields are being handled as separate entities, integral-handling fails, which was prone to fail before the properties of elementary particles were discovered. Let us investigate further *via* some simple calculations regarding the electric forces between two stable particles, an electron and another one (disregarding magnetic force for the time being and assuming one of the particles are forced to stay at rest).

Electron's mass: 9.1×10^{-31} kg

Magnitude of the force at 1 F:230 N
Magnitude of the force at 2 F:57.5 N
Focusing on classical e-e interaction:
Average acceleration and force between 1 and 2 F: 12.86 x 1031 m/s^2 and 115 N
Time required for displacement: 39 x 10^{-23} s
Final velocity if initial is 0: 12.86 x 1031 m/s^2 x 39 x 10^{-23} s=5.07 x 10^8 m/s
Kin. E.: 5 x 9.1 × 10^{-31} kg x 25.72 x 10^{16} Joule=1.17 x 10^{-13} Joule
E=force x way=115 N x 10^{-15} m=1.15 x 10-^{13} Joule
r. m. energy of electron=0.82 x 10^{-13} Joule
That is, more energy than the rest mass energy of an electron is needed to accelerate an electron at rest from 1 to 2 F under the force of another electron forced to stay at rest. This energy is supplied by the field which was previously vacuum and created by the presence of the charge of an electron, a point particle without any structure, and how this energy is created is obscure. Quite an interesting scientific description of the event.

Our proposal

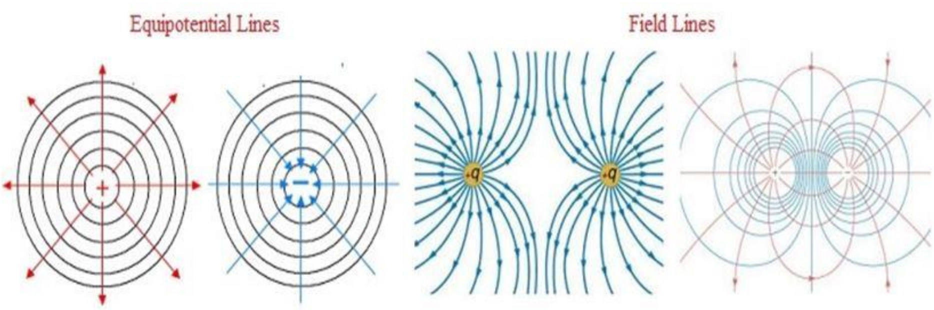
It is said that curiosity killed the cat. We were no "cat" but curious, and we killed ourselves in the last 50 years being very eager to understand. We now have a proposal, and our proposal has a history; it is based on some observations and it of course has a body.

History

The idea of an atom as the smallest indivisible moving particle is first stated in a script by democritus. Narratives are pretty controversial due to the lack of written documents from that time. Google search with "democritus' atom" is of some help. We tend to adopt that democritus has heard of the idea/rumor during his stay in Accad. Accad inherited it from Babylon. Probably, (if Hermes the first is Enoch) Hermes the second, Harut-Marut as mentioned in the Holy Quran, and Zoroaster the first are the same. The idea was revealed by these; Democritus brought it to Grece, and discussed it with his contemporaries. People having such an idea must also be able to make stable bundles out of moving indivisible particles before they express it. It coasted us about 50 years to make stable bundles though we know much more about the behavior of elementary particles.
Scientists are unsure of exactly how the waves and the particles relate to each other Northwestern Uni.
Facebook
Newton seems to have shown interest in the subject since he is known to have investigated the problem of sphere packing. It can hardly be a result of a practical need for cannonball storage, since cannon balls are stored on flat surfaces and the art is practical. He might also have an opportunity to have a look at archaic original scripts.
Our interest in the idea that matter is made up of extremely tiny, hard, indivisible spheres moving with the velocity of light goes back to 1968. We rather thought the momentum transfer and the force would diminish as speed increases. The first calculations were made in 1974. The trial to attain Huygens' obliquity factor was made in 2002 (Figure 3).

Classical observations

Figure 3. Equipotential lines and field lines for single charges of both kind.



Regarding Figure 3:

- Fields around charges do have much more energy than the rest mass energy of the charges.
- If charges are creating the fields *via* repetitive emission of particles, they need substitution from the space around them.
- Equipotential lines are a result of 1/r2 forces and have spherical forms. They indicate that the energy (the number of outgoing particles) is conserved if any surface covering the total volume around the charge is taken

into account.

- Field lines are tangents to the differential areas on the surfaces of the spheres formed by equipotential lines.
- At any point, an imaginary charge of a certain kind (the same kind as the creator of the field) is supposed to feel a repulsive force and the other an attractive.
- An imaginary charge feels the resultant force as a result of linearity (superposition principle). Again repulsive and attractive forces are present at any point. To feel the due force is the duty of the imaginary charge placed at the point. That, of course, means we can't deal with direct simple bombardment, the mechanism is a bit more complicated.

As result of such a momentum transfer velocities of atoms in a bundle change, but no speed change can occur. These manuscripts are not on our website anymore, but we summarize some of the results in the followings. Some other main results of our assumptions are given in German, I and Gezerman, A.O.

We lately figured a resolution out and will soon publish it just after this potpourri of our two previous manuscripts. Take care that Gauss' Law indicates no distance-dependent loss in the radial direction, loss is due to expanding spherical area, *i.e.* spatial. That of course means not only emissions in the direction between centers of interacting particles are effective n momentum transfer. This fact may give us clues about the number and dimensions of atoms, but we intend to consider them in future work.

The body of our work

We previously introduced the concept of the unit cell to attain the Huygens' obliquity factor. The cell is a sphere (circle in 2-dimensions) with a definite diameter in which the emitted particle makes a 0-momentum collision with certainty.

We have introduced the concept of atom and vacuum consisting of moving atoms in one of our previous works German and Gezerman. That charges and all elementary particles are to be considered as spherically formed bundles acting like harmonic oscillators is also mentioned previously.

We tend to deduce from the previously given data that almost all of the mass of the particle is to be consumed at each burst. We recently adopted the view that momentum transfer would only be possible in case the target particle is in contracted form. This brings convention.

The ordered spherical forms we mention may have been and still being created in space where the dark matter density, the number of atoms per unit volume, is higher than we have now around. They will cease to exist, due to failing support, if density gets much lower than we have now around. Regarding charges, the dual character of the forces, we have thought of quantized phase for about two decades. It was pretty easy to guess that the particles should be some kind of harmonic oscillators and phase of oscillations could be different which would create high pressure regions among and outside of charges. This was natural to expect in case of presence of 0-momentum collisions due to the fact that the particles making collisions will remain longer in the region. The problem is that phase alone changes as the particle moves and it can't be a solution alone. This we have mentioned in one of our posts to a Yahoo group, digital physics/digital philosophy about 20 years ago.

The problem is resolved if;

- The particles move in discrete quantas, over a cellular region,
- Momentum transfer is made as the particle got contracted,
- The probability of finding a atom after a full period on the axial way toward the other particle is equal to 1 (no radial loss), and
- The probability of finding an atom after a full and a half period on the axial way toward the emitting particle is equal to 1 (no radial loss).

In such a case if both particles is of equal phase the other one is contraction phase as the emitted atom arrives and momentum transfer is done. Otherwise the other particle is in the expansion phase, the atom travels through. The returning atom is now effective in the contraction phase and momentum transfer is again done but towards the other particle.

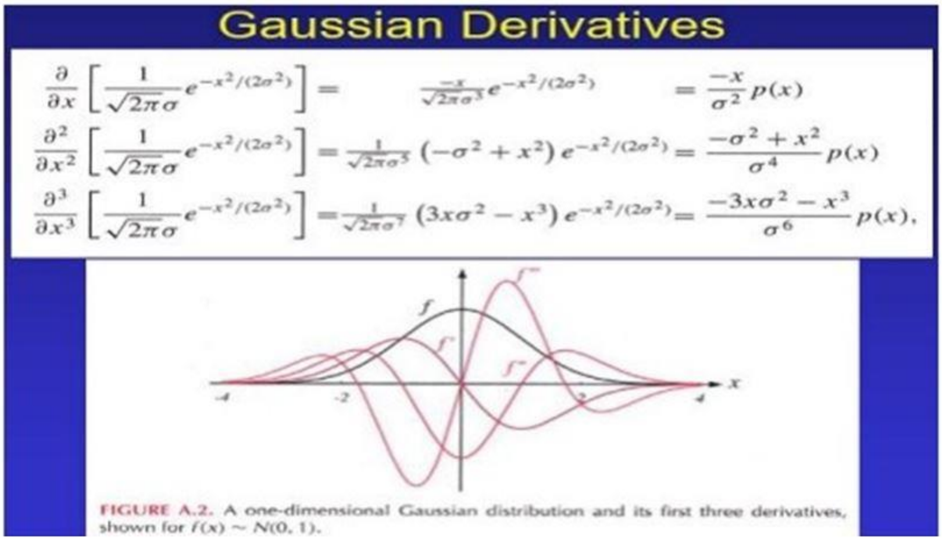
To provide a probability equal to 1, contributions of all previous oscillations are to be taken into account.

The unit cell revisited

The unit cell the unit cell is the circle in a random vacuum where the atom will have made a 0-momentum collision for certain. We previously investigated the structure inside a unit cell by naïve methods and here we use Python and Pyplot to see the probabilities inside. Suppose a atom just begins to move in +x direction. It will have a certain probability to make a 0-momentum collision on the way. A 0-momentum collision requires a atom moving in +x direction at point x, and another one moving in –x direction at x. That the atom began at x=0 at the beginning is assumed, but its probability of moving along x-axis decreases as collisions are made. Let Phat (x+) be the probability of a atom at x, moving in x+ and Phat(x-) the probability of finding a atom at x, moving in –x. Then, considering these probabilities as independent, we will have Pcoll(x)=Phat(x+) * Phat(x-) with Pcoll(x) being the probability of a 0-momentum collision at x. The case of considering only exponentially increasing 0-momentum collision probability is then pretty unsound, several plausible cases may be considered though:

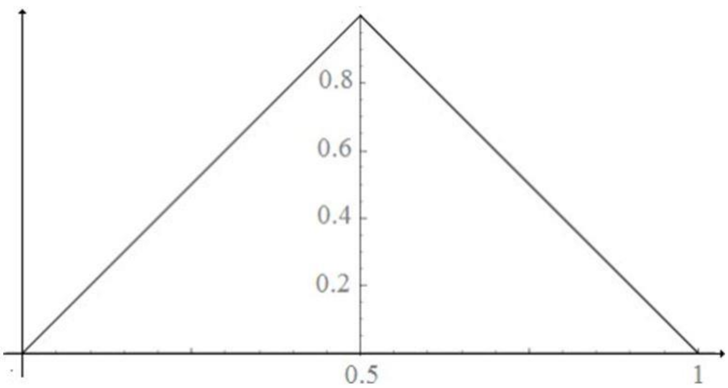
- At each point there is a certain constant probability of 0-momentum collision, *i.e.* Pcoll(x)=kPhat(x+). In this case, the probability of finding the hatom, Phat(x+), on the way at any point of x-axis moving in x+ direction will decrease exponentially. This is of course a situation in which the possibility of a unit cell is nil. It can be studied only as an approximation.
- At each point there is a certain probability of 0-momentum collision that is proportional to the distance traveled, *i.e.* Pcoll(x)=kxPhat(x+). In this case the probability of finding the atom, Phat(x), on the way at any point of x-axis will be a positive region half of a Gaussian form, since at the beginning there was a atom at x=0. The collision probability will then be almost Gaussian. Justification of the claim made above Srihari (Figure 4).

Figure 4. A one dimensional Gaussian distribution and its first three derivatives, shown for f(x)~N(0-1).



A normalized triangular function for Pcoll (x), as in Figure 5, to simplify the Gaussian.

Figure 5. The triangle function, normalized.

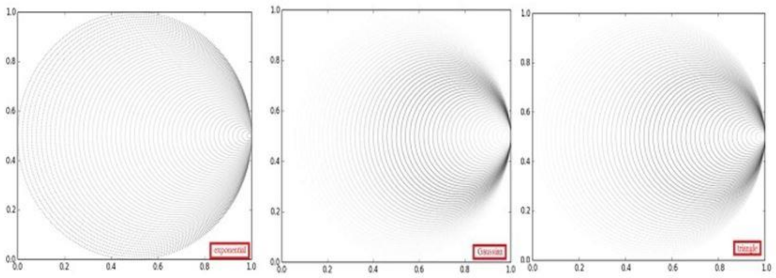


To calculate the probabilities within the unit cell we made us of Python and Pyplot. The code we used is given below: import math (Figure 6).

```
Import numpy as np
Import matplotlib.pyplot as plt
e=np.e x,
y=np.meshgrid(np.linspace (0, 1, 100),
np.linspace (0, 1, 100)) f=(x-.5)**2
g=(y-.5)**2
fig=plt.figure()
ax=fig.add_subplot(1, 1, 1)
for r in range (50,101,1):
```

```
for theta in range (-270,90,1):
a=r/100+(1-r/100)*(np.sin(np.deg2rad(theta)))
b=.5+(1-r/100)*(np.cos(np.deg2rad(theta)))
#exponential decrease
#1 fct1=math.exp(-((r-50)/50))
fct1=math.exp(-((r-50)/25))
#end of exponential
#Gaussian
#fct1=(1/math.sqrt(2*math.pi))*(math.exp(-(((r/100-0.75)**2)/0.014)))
#end of Gaussian
#triangular approximation of Gaussian
#if r<75:
# fct1=4*(r/100-0.5)
#else:
# fct1=-4*(r/100-1.0)
#end of triangular/linear
fct2=math.fabs((np.sin(np.deg2rad((theta-90)/2))))+math.fabs((np.cos(np.deg2rad((theta-90)/2))))
#exponential decrease
t=(fct1*fct2)/1.42
#end of exp.
#Gaussian #t=(fct1*fct2)*1.76
#end of Gaussian
#triangular #t=(fct1*fct2)/1.42
#end of triangular if theta==-90:
print(t) col = (1-t/1.0, 1-t/1.0, 1-t/1.0)
circ=plt.Circle((a, b), radius=0.0003, color=col)
ax.add_patch(circ)
plt.show()
```

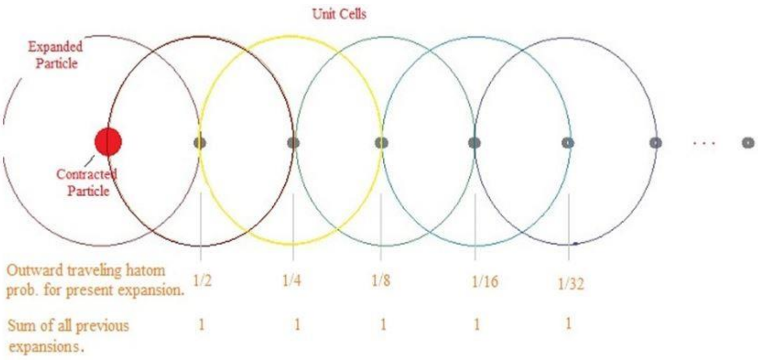
Figure 6. The distribution of inner probabilities for the 3 cases considered.



Our present work

We now work to show, by getting expanded particle and unit cell dimensions to be equal for convenience, each unit cell behaves as seen in Figure 7. The same probabilities should be valid for inward travel. After each eapsed half period, there is a probability of 1 that an atom is present at each node (grey dot) traveling both inward and outward. In such a case the particle stays stable since it is ever oscillating. The conditions for initiation of oscillations are not investigated.

Figure 7. The way a unit cell behaves.



Future work

Two possibilities seem plausible:

- To investigate the spatial loss due to spherical expansion. At a distance of 1 m. the acceleration caused by an electron on another electron is about 10^{-7} m/s^2. If we take this acceleration as to be accounted by only one atom, the number of atoms involved in an oscillation will be about 1030. This is a huge number. At this stage, a feasibility study for the necessary work should be done considering possible outcomes, cost and benefit. Depending on the result, either the work should be canceled or be given a decision to be continued. In case of cancelation the truth of the validity of classical physics should be acknowledged; the probability that the basic truths of the universe are revealed to us by Heavens should be accepted, and; working with mathematical models should be continued.
- If a decision to continue to work on such a classical model is given, it should be noted that the process will involve a good deal of trial and error. Machine learning techniques including algorithms that produce/change algorithms, algorithms that change parameters and check the validity of results, etc. should be tried. If such a decision is given, the relation between Schroedinger Equation and the picture given here should be well investigated.

CONCLUSION

Ever since we began our physics studies at Robert college/Bosphorous university we had intentions to develop such a model and we hopefully came to a point that could allow the use of machine learning techniques. The reasons and the past of our work we summarized in German and Gezerman 2022. In this manuscript, we make a potpourri out of our officially unpublished two relatively recent works, and we mention some results we recently obtained. As result of such a momentum transfer velocities of atoms in a bundle change, but no speed change can occur.

ACKNOWLEDGEMENTS

Dr. Ahmet Ozan Gezerman has promoted our desire to work on the subject and to publish the results. We owe him sincere thanks.

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