Heuristic Thoughts About Classical Physics

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Classical physics is obsolete for more than a century if the question at stake is an accurate and complete description of Nature. Under that light if an alternative classical assumptions bundle may be capable of withstanding some of the major limitations of classical physics, it is reasonable to say that further discussion is required. This manuscript presents very specific and minimal assumptions in the domain of classical physics and extend them with bold ambitious conjectures. Although relation to nature is not shown, the main purpose of this manuscript is to inspire possibility of such relation.

INTRODUCTION

The author believes that by presenting a very simple and specific set of axioms and in trying to generalize it as much as possible, a new unexamined thread is presented. Some of the major merits of classical physics such as natural support of relativity and QM violation of Bell inequality are addressed by this manuscript. In the generalization process many conjectures are presented without proof, however the question which should be asked at this scope is not if they are true but if they are possible. The main motivation for introducing a model with many unproven conjectures is the rare chance to suggest a discussion that can lead to the calculation of all physical constants by using a very compact formulation. Regardless of this the presented ideas can be used as a classical analogy to QM and they can help to refine the ongoing discussion about QM interpretations.

I. THE MODEL

A. Axioms

- 3-d euclidean space and classical simultaneous time are assumed
- There are numerous identical size-less dot particles
- Each dot particle is attracted to all other dot particles by inverse square law: $\ddot{x}_i = \sum_{j=1}^{\infty} \frac{g r_{i,j}}{|r_{i,j}|^3}$, $j{\neq}i$

These axioms are the only ones, no other interactions are assumed, no other properties of the dot particles are assumed and no other particles are assumed.

B. Starting Conditions

Consider infinite 'sea' of dot particles with exact statistical behavior everywhere, uniform density ρ_∞ and the same velocities distribution. The system is assumed to be in equilibrium. The complete system may be finite but for current discussion it is better to ignore boundary conditions. The timescales discussed are very large in compare to two dot particles close encounter timescale so the system is a collisional one with gaussian velocity distribution.

C. Wave Properties

In this collisional framework, waves are assumed to propagate non-dispersively with constant speed C which depends on the density ρ_∞ and on the 'constant' g, both are dimensionful scaling factors. By scaling reasons C needs to be proportional to $g^{\frac{1}{2}} \rho_\infty{}^{\frac{1}{6}}$.

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D. Stable Standing Waves

Consider a small deviation from ρ_∞. Slow changes of density across long distances in compare to the average distance between the dot particles are assumed so the discretization of the dot particles can be neglected and smoothed. In order to look for localized stable standing waves spherical symmetry is assumed. Average density in infinite is ρ_∞. The basic formula will treat the infinitesimal energy density change across infinitesimal length:

$$dE(r) = \rho(r)a(r)dr \tag{1}$$

Consider the acceleration/force that act upon group of particles in infinitesimal volume. If density would be constant everywhere than the average force would be zero. The superposition principle can be used together with spherical symmetry assumption as follow:

- spherical shell with lower than average density contributes opposite sign than higher than average density shell.
- a(r) is independent on density at $r' > r$ similar to a well known fact that gravity inside spherical shell is zero[1].
- a(r) for $r' < r$ for spherical shell is the same as all excess density is located in the center[1].

Considering all that, we get:

$$a(r) = -\frac{g}{r^2}\int_{r'=0}^{r}(\rho(r') - \rho_\infty)4\pi r'^2 dr' \tag{2}$$

The average of the velocity squared is proportional to $g\rho^{\frac{1}{3}}$. Let the proportionality factor be k.

$$\frac{dE(r)}{dr} = \frac{\rho'(r)kg\rho^{\frac{1}{3}}}{2} + \frac{\rho}{6}kg\rho^{-\frac{2}{3}}\rho'(r) \tag{3}$$

$$\frac{4}{6}kg\rho'(r)\rho^{\frac{1}{3}} = -\rho(r)\frac{g}{r^2}\int_{r'=0}^{r}(\rho(r') - \rho_\infty)4\pi r'^2 dr' \tag{4}$$

$$\frac{k\rho^{-\frac{2}{3}}}{6\pi}\left(\frac{2}{3\rho}\rho'^2 - \rho'' - \frac{2\rho'}{r}\right) = \rho - \rho_\infty \tag{5}$$

Numerical computation of the above formula under the starting conditions of:

- $\rho(0) = \rho_\infty + d\rho$
- $\rho'(0) = 0$

gives the following spherical density graph:

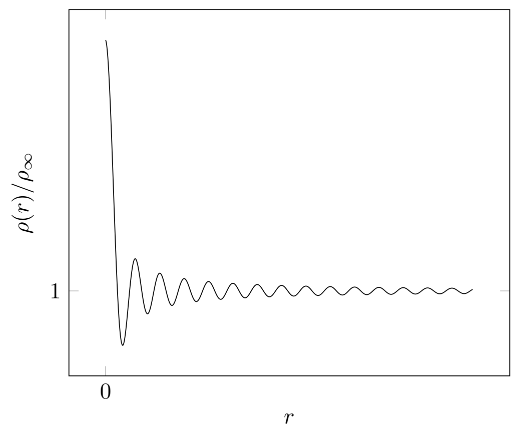

FIG. 1: Density of standing wave.

Within the calculation accuracy, the gaps of average density crossing are equidistant and are independent of $d\rho$. We will mark the average density crossing distance as D. D should depend on the density ρ_∞ and on g as C does. To be more specific, D should depend only on ρ_∞ as long as there are interactions, since if we change time scaling g will change but D shall not. This can be obeyed if g is proportional to the average speed of the dot particles v squared as can be seen in equation (5) and should be expected by similar scaling reasons. By the formula, the swaves seems to extend to infinity, however it cannot extend further than the area of density change of order of few dot particles.

E. Short-Range Interactions Between Standing Waves

To a first order approximation we can assume that the shapes of the standing waves do not get distorted by the interaction. This approximation may be reasonable if the centers of the two standing waves are not so close to each other relative to the average density crossing distance D.

1. Two Standing Waves Interactions

It can be argued that two standing waves will have stable equilibrium positions at either aligned peaks along the line leading from one center to the other or anti aligned or both. At each such equilibrium position if exists, we can consider small displacements along the line leading from one center to the other as harmonic oscillator like behavior.
The next graph describes numerical results of simulating two swaves under the 'rigid body' approximation where each swave does not change its shape. Positive force means attraction and negative force means repulsion.

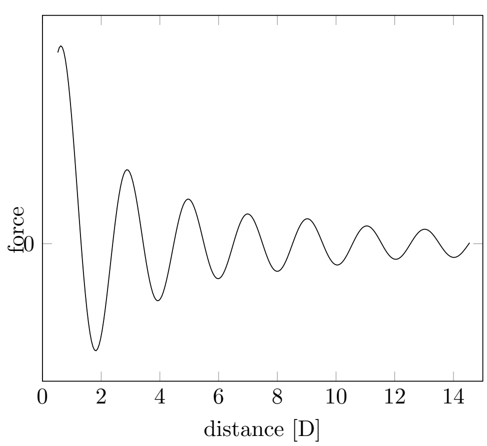

FIG. 2: Force between two standing waves.

If two standing waves are bound to each other, it is reasonable to claim that they are orbiting each other on a fixed plane in the 'center of mass' frame similar to classical point particles. It can be reasoned using the 'rigid body' approximation by rotation symetry around the axis connecting the two centers (z). Because of this symmetry, no force can exist in the θ direction (considering cylindrical coordinate system) and any force in ρ direction will be accommodated by it's inverse to be cancelled leaving only forces along the z axis.
Assuming two such standing waves are orbiting one another, since each standing wave is constructed from lower and higher densities than average and those deviations accelerate, we can assume that propagating waves will radiate in general direction opposite of the accelerations which as assumed laid on a plane.
Propagating waves can carry momentum so they could act as a force that can carry other standing waves away from the source. However Since this effect is assumed to be bounded to a plane, it can be negligible. For this reason we will discuss bonds of three standing waves which are not restricted to a plane.

2. Three (or more) Standing Waves Interactions

Interactions between three bound standing waves are not limited to a plane and it involves more than centric interactions which may be very complicated to analyze, however it can be argued that propagating waves with angular momentum can be sustainable. This can happen if the standing waves centers trajectories have combined non zero average torsion. From now on we will assume that this is the case.

F. Electrostatics

Consider two groups where each group consists of three standing waves. Assuming that those two groups are separated by distance much larger than the distance between standing waves within each group, we can argue that the dominant interaction between the groups is via the hypothetic angular momentum waves generated by each group. The propagating waves do not have spherical symmetry with regard to the group center because of the structure of the group, however for general motion of the group if we average the propagation over time we can approximate it to have spherical symmetry. The flux of the waves is proportional to the inverse square of the distance. The groups can be tagged by the angular momentum sign along the propagation direction. This can be related as stated before to the average torsion sign. The propagated waves keep the same sign of torsion as that of the originating sources trajectories. This can be seen easily if we take as example a helix source of which the waves are propagated as helix with changing radius but with the same orientation. A repulsion force is expected to occure between two groups with same sign since there will be high correlation between the waves and the group trajectories and by that each group will act by the momentum transfer of the waves. An attraction force is expected between two groups of opposite sign due to low correlation between the waves and the group trajectories which can cause each group to effectively feel unbalanced velocity distributions in the opposite direction of the wave propagation.

G. Special Relativity

In trying to give classical interpretation to the invariance property of the speed of light, Lorentz had an 'artificial' argument that lengthes are contracted in each direction to exactly compensate the speed relative to 'the absolute aether' [2]. In the presented model this argument is naturally fulfilled if one assumes that the main forces are mediated by waves, it is just that the only way to measure the speed of light is by using the speed of light. Since there is no way to measure the absolute velocities distribution of the dot particles within this framework, both assumptions of Special Relativity are obeyed.

H. General Relativity

The equivalence principle [3] together with the special theory of relativity were the candles that Einstein followed when he forged the general theory of relativity. The equivalence principle works well with the presented assumptions as we compare the two following observations:

- Uniform environment without density variations as seen by some observer which is accelerating.

- localy 'flat' environment without density variations which is located in a gravity field

Both observations look the same, on both of them all the dot particles accelerate the same way and their statistics will have the same behaviour. However, this presentation do differ from GR by possible negligble effect which is related to the dependence of time on the density change. time is proportional to $\frac{\rho^{\frac{1}{6}}}{g^{\frac{1}{2}}}$ So position with higher density will have faster time flow in contradiction to GR. But if we take the reasonable assumption that the vaccum energy density is of planck scale than this effect is negligble in compare to the acceleration affect which causes time to slow down in places of higher densities. Take Earth as an example. According to GR time is slowing down on earth surface by about 7e-10 in comparison to remote observer [4] where if we take a density change of earth density in addition to the vaccum density in contrast to the vaccum density alone we get fraction of about 1e-93. This may cause time to speed up on earth position by about 1e-16 which is more than 6 orders of magnitude smaller than GR prediction. It is not an accurate calculation, it is just an order of magnitude estimation but still it shows that the density affect can be neglected in non-extreme environments.

I. Proton like - Complex Stable Structures

1. Preface

The circulation speed of bounded standing waves around each other is derived from the 'forces' acting on them around equilibrium positions as assumed in section I E 1. Because of that it is reasonable to assume that this speed is much lower than the speed of free waves propagation. Consider two groups of bounded standing waves where the distance between the two groups is far enough so that each group will remain distinct and close enough so that the time it takes for a propagating wave to reach from one group to the other is very small relative to the characteristic time of a rotation of the standing waves within the group.

2. Synchronization

Let us consider two such groups that are forced to remain at the same distance apart from each other. The claim is that no matter what are the starting conditions of the two groups, after long enough time they will synchronize such that in each group the standing waves will have the same relative positions and velocities. Synchronization is an extremely common effect if there are coupled oscillators.

3. The complete structure

The number of synchronized groups is not necessarily limited to two and the number of groups that can be synchronized is determined by the maximum distance that the time of propagation is still very small relative to the characteristic time of each groups rotation. This maximum distance defines the 'proton like' structure diameter.

J. Hydrogen Like

In order to get 'opposite charge' envelope to mask the 'proton like' nucleus we need about the same number of groups with opposite 'charge' sign outside the 'proton like' structure. However as well known in electrostatics there can be no stable formation like that. A way around this is to require the outer groups to have 'partial' synchronization. In order to achieve outer synchronization, which will be explained shortly, we need another assumption, it is now required that the outer groups will have repeating movement, which means that the standing waves doing the exact same movement each period cycle. Now we can have synchronization between two groups not only under the condition that they are very close to each other but also at distances of integer times the distance a wave propagate during the period time. Now we can have partial synchronization where each group is surrounded by other groups which are positioned at the distance of same phase and farther groups are either sits on N times this distance or they can be absorbed in a complicated stability condition together with the 'opposite charge' from the nucleus. From this description it is difficult to envision equilibrium state between the core and the shell, however if there is no equilibrium, the net angular momentum radiation is not balanced so it is keep beeing bombarded by outer groups and by that it increases its energy and its angular momentum of the nucleus groups. Reaching equilibrium state is a substantially open issue in this model, however it may be possible.

K. Multi-Nucleus Particles Like

Similar to the requirement of the groups in the envelope to have periodicity, demanding it also from the groups in the nucleus allows more than one 'proton like' to be synchronized in distances related to the period time.

II. INTERPRETATION OF MASS $E = mC^2$ LIKE

The standing wave distribution described in section I D has zero 'mass' as seen from infinity. However there is a good reason why it can become positive.
The dot particles are in equilibrium in all space meaning that their distribution of velocities is identical in all directions. Assuming there is an interaction between two 'bodies' than there is a constant flow of dot particles in a limited region in space and in specific directions which violates the equilibrium distribution. However this is a constant distribution with higher values in specific directions. Since the distribution should be normalized and at equilibrium, it can happen only if there is excess of dot particles at the area of the excess flows.
The relation of the gravitation forces inside a proton to the non-gravitation forces can be approximated by a simple toy model of a dot particles flowing inside the proton. For simplification, the following two assumptions are made:

- The average speed of the dot particles has the same order of magnitude as C

- The proton's mass is caused by excess of dot particles which are going back and forth across the proton diameter D_p

The author's objective here is just to calculate an order of magnitude of the forces ratio so the estimations are very rough. The gravitational force is in order of $\frac{Gm_p^2}{D_p^2}$. In each turn of the dot particles we can estimate the momentum change by $2Cm_p$. The force that is caused by the momentum change is $F = \frac{dP}{dt} = \frac{2C^2m_p}{D_p}$. The relation between the two forces is $\frac{Gm_p}{2D_pC^2}$ which is about 10^{-40}. This has a similarity to the relation between gravity and the other forces of nature.

III. BELL INEQUALITY VIOLATION

The presented model is explicitly nonlocal and deterministic and is implicitly causal if we consider all interactions to be mediated by waves. In order to see this we need to take as example some complex structure which is constructed from groups of three standing waves. Each group radiates waves due to the accelerations of the standing waves. Those waves propagate in time, however, the waves creation is based on newtonian forces between the dot particles which are symmetric under time reversal. It is clear that there will be also waves which 'propagate' backwards in time spreading in space, this is a direct consequence of the deterministic nature of the model. We can see that the presented model naturally fits the Transactional interpretation of quantum mechanics by Cramer[5] of retarded and advanced waves. By that, it is possible to acheive all QM predictions. The main open issue is the possibility of cancelling the waves outside the 4-vector interaction area between the source and the target. This issue is equivalent to the sensitivity of the possibilities of forming complex structures with regard to the initial conditions of the model and requires further exploration.

IV. INSTANTANEOUS GRAVITY

According to Will, C. M.[6] it seems extremely difficult to measure the speed of gravity and the limits are not set to a finite speed.

V. SUMMARY

The author introduced a set of axioms, followed by many conjectures which leave the discussion open. The following merits of classical physics can be relaxed by the suggested conjectures if there will be ways to proove them:

- Framework for relativity

- Bell inequality violation of QM

- Classical analog of QM spin
- The usage of the same mass parameter in both Newton's second and third laws

It is important to stress the idea that based on very specific and simple axioms we can hope to find description of nature. In this presentation we can find hints for the strong force, for particles generations and for quarks. Dark matter can become trivial effect and even dark energy can be relaxed by the suggested correction to GR. The nature of this manuscript is heuristic and imprecise and if it has any hope to be refined it can be done only by a great deal of work from the scientific community. However, this may be an impossible barrier, since the mainstream theories are of such a great perfection and precision that investigating the presented ideas can be similar to going back a century.

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AUTHOR CONTRIBUTIONS STATEMENT

F.O. conceived the model and wrote the manuscript.

ADDITIONAL INFORMATION

Competing financial interests The author declare no competing financial interests.