Hypersphere space-time model

(draft)

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Abstract

Our universe seems to have 3 spatial dimensions, in addition to a special dimension for time that has one direction.

This representation has some obvious problems with our current physical theory and the experience. Amoung other things :

- There is no explanation about such number of dimensions, except "it's as is".
- Elementary particles, like electron, seems to be punctual, with no spatial dimension, so where are they really ?
- In quantum electrodynamic theory, elementary particles are also field excitations, so again, where are fields really ?
- Quantum theory introduces some absract mathematical spaces for explaining interactions, typically U1xSU2xSU3, but there is no correspondance with the real space.
- According to special relativity, space and time are not absolute, it's a kind of illusion.
- Mass is energy but once again, where is this mass/energy, especially for punctual particles ?

It's clear that our space-time model is not adequate. It's perhaps one of the biggest obstacle to create a physical theory that brings together general relativity theory and quantum theory. Some theories, like string theory, try to introduce more than 3 dimensions (10, 11, 26) to be in adequation with their mathematical formalism but this subterfuge is not convincing and it doesn't answer to the same question : why such number of dimensions ?

Following some fundamental principles of physic (homogeneity, isotropy, symetry, ...), this article propose a simple model for our universe. Time is no more a fundamental dimension, it's the result of the 3 spatial dimensions, in addition with one dimension for mass. Furthermore, there is no 4 fundamental dimensions but as much dimensions as energy quanta. Each energy quantum is a cyclic dimension. Universe is an hypersphere of quanta. Our 3D space appearance is the result of interaction between quanta.

Assumptions

Universe is only made by pieces of energy, called quanta.

If each quantum can be independant to each other, it can be modelised by an euclidian spatial dimension. Supposing that the dimension is circular and that the quantum runs in a constant speed, the result is a wave with a constant angular movement. For homogeneous reasons, we also suppose that all quanta have the same angular movement and wave amplitude.

For symetry reasons, we suppose that each quantum has its opposite running on the same circle in the other direction. There is a reference point where the quantum and its opposite meet to each other. So, difference between two quanta is only expressed by a phase difference (complex number) between reference points. Energy difference is a phase difference.

Each quantum and its opposite have their own orthogonal dimension, it's an hermitian space (euclidian space with complex numbers). There is no 3 fundamental dimensions, there is as much fundamental dimension as the number of quanta.

So the universe structure seems like the surface of an hypersphere. The number of dimensions of the hypersphere, corresponding to the number of quanta, could be finite or infinite but Nature seems to prefere finite limits.

Space (or mass) is a volume, so space is a multiplication of quanta dimensions. Each quantum has a frequency, so volume of quanta is an higher frequency, related to higher energy. Volume and energy can be modeled by the external product ($x \wedge y$).

Our universe is also made by addition of independant frequencies. Each particle is a bundle (addition) of waves. Addition can be modeled by the internal product ($(x.y)^2 = x^2+y^2$).

!!! TODO !!!
restriction to 3D space thanks to 3D vectorial product where result remains in 3D space, so linearly independant vectors in nD space become dependant with interaction in 3D space.

Consequences

In this theory, frequency and 'mass' are discrete, what seems to be in contradiction with the observation but a very high number of quanta could simulate a smooth frequency and 'mass' distribution. Note that how high is the number of quanta, how low can be the angular speed of each quantum, a quantum cycle on its dimension could be the lifetime of the universe.

In this theory, all particles, except at most one (photon), have mass because distinction of particle types is made inside mass dimensions.

The concept of FIELD is more intuitive. It's the quantum wave envolving the whole universe on its dimension.

Indeterminacy, fundamental in quantum theory and even more in philosophy (determinacy means a completely static world), is expressed by indeterminacy of vectorial product. Two opposite directions are possible and one is arbitrarily (randomly) chosen in 3D modelisation (entaglement).

There is no difference between quantum and its opposite, so there is usually no antimatter. Antimatter existence is not directly explained by this theory.

The space-time structure is euclidian, so fundamentally flat.

Theory is in accordance with SPECIAL RELATIVITY. Using rearranged Minkowski formula ($x^2+y^2+z^2+s^2=t^2$), we have the euclidian distance t in a multi-dimensional space, where each variable (x,y,z,s) can also be the euclidian distance in a multi-dimensional subspace (e.g. $x^2=a^2+b^2+c^2+d^2+...$). Note that the 4th dimension is not time (t) but mass (s), time is only a side effect.

Gravity is generated by the 'mass' dimension ('s' variable above) that curves the spatial dimensions because 'mass' dimensions take quanta from spatial dimensions. Mathematical verification of this principle with the GENERAL RELATIVITY theory is not yet done.

All other interactions (electromagnetic, weak, strong) are only rotations of 'mass' in one (U1), two (SU2) or three (SU3) dimensions. Rotation has no meaning in the global universe but has effect locally to the apparent 3 spatial dimensions. Everything is rotation.

Conclusion

This article introduces new representation of space-time structure of universe. It tries to propose a model that seems to be more adequate with the physical theory and observation than the classical 3D model : an hypersphere structure on a multi-dimensional space, each dimension is an energy quantum with its opposite.

We are conscient that this article is only an introduction which avoids consolidating the theory with the formal calculations of quantum and relativistic theories. Nevertheless, we hope that this article will open some thoughs about a fundamental problem : why has the universe an apparent 3 dimensional structure ?