

Hypersphere space-time model

(draft)

Abstract

Following some fundamental principles of physics (symmetry, homogeneity, ...), this article proposes a simple model for the structure of the universe. Time is no more a fundamental dimension, it's the result of the 3 spatial dimensions (3D), in addition to one dimension for mass. Furthermore, there is no 4 fundamental dimensions but as much dimensions as energy quanta. The universe is an hypersphere of quanta. Each energy quantum behaves like a wave. Our 3D space appearance is the result of interaction between quanta.

Generation of mass and 3D space

Supposing that nothing (symmetry) generates something (energy), we can formalize an elementary quantum a and its opposite a' like this :

$$a + a' = 0 \text{ (symetry)}, aa' = 1 \text{ (energy)}, \text{ so } a = i \text{ and } a' = -i \text{ where } i^2 = -1.$$

The quantum a is a complex number so it behaves like a wave (more precisely like the phase of a wave). The quantum a and its opposite a' form a pair of complex numbers (a, a') , commonly referred as a spiner or a quaternion : $a + ja'$ where $j^2 = -1$, $ij = -ji$. A quaternion is vectorial space of 4 dimensions : one *scalar* dimension and three *vectorial* dimensions. Note that $(a, a') = -(a', a)$.

According to homogeneity principle, there is no difference between each elementary quantum. So the only way to express dynamics of the universe is the relation between quanta.

Quanta are supposed to be independant (orthogonal) to each others, on their own vectorial space of dimension 4 (quaternion). As the quanta are independant on their dimension, the relation between quanta takes effect on their projection on a common space. The modification of the projection on the common space gives the impression of change in relations between quanta.

The common space is the product of each elementary space or dimension. It's a 3 dimensional vectorial (3D) space, with additionnal scalar space (mass) because elementary quanta can be seen as quaternions. The product of quaternions remains a quaternion. The 3D space of the universe is the resulting product of each quantum.

Product of quaternions looks like a 3D rotation, up to an indeterminacy (two possible values for one 3D rotation). This – random – indeterminacy is the key of the dynamics of the universe. *This point should be further explored.*

The propagation (delay) and interaction (rotation) should also be further explored.

Consequences

An elementary particle can be punctual (no 3D dimension) because its existence can be expressed in the 'mass' dimension. All elementary particles, except at most one (photon), shall have mass because distinction of elementary particles can only be made inside mass dimension.

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

Indeterminacy is explained and is fundamental in the dynamics of the universe.

There is no difference between a quantum and its opposite. So there is usually no antimatter. *Nevertheless, short-live antimatter existence should be further explored.*

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. $x^2 = a^2 + b^2 + c^2 + d^2 + \dots$). 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. Intuitively, 'mass' dimension 'eats' spatial dimensions. *Mathematical verification of this principle with the GENERAL RELATIVITY should be further explored, in particular by calculating the same expected slowing down of time.*

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. Any effect comes from a rotation.

Conclusion

This article introduces new representation of space-time structure of the 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.

This article is only an introduction which avoids consolidating the theory with the formal calculations of quantum and relativistic theories. It's an experimental approach to try to answer to a fundamental question : why has the universe an apparent 3 dimensional structure ?