Universe at point

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Abstract

We are considering the possibility of placing the space of any length in the "point" (ie, in a small region of space), including the Universe at the "point" with a diameter of 10^{-33} cm. The problem is solved in a multidimensional space.

1 How to place the Universe at the point.

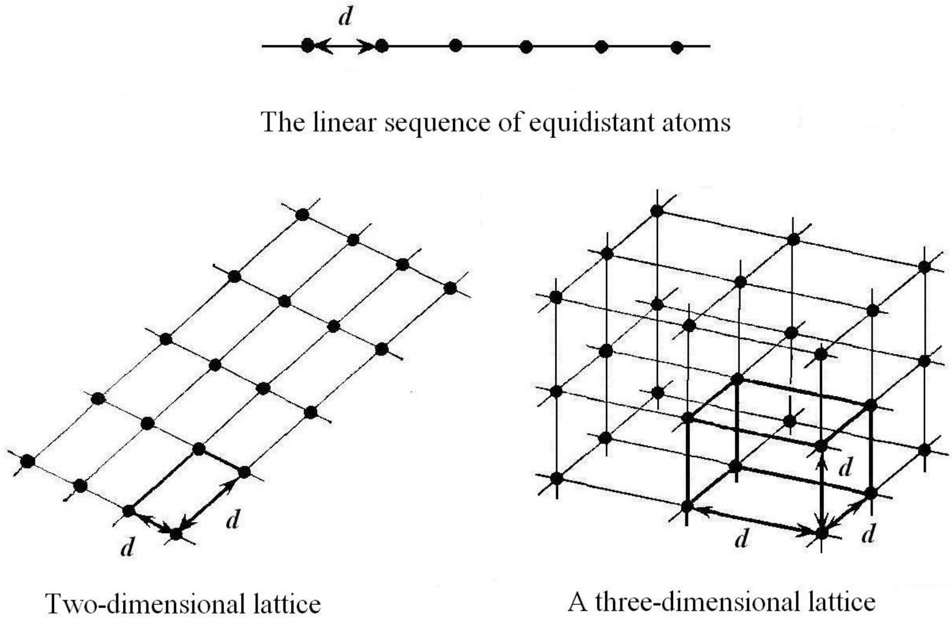

Figure 1: Multi-dimensional lattice

One of the difficulties of the general theory of relativity is the problem of singularities, which actually originated with the receipt of the non-stationary Friedman cosmological solutions of the equations of general relativity, and even more aggravated due to the problem of relativistic gravitational collapse. Singularity refers to a state of infinite density of matter, which indicates the failure of the general theory of relativity. These problems are solved in a multidimensional space.

Consider the obvious example. Take an ordinary book, 3-dimensional object. The amount of information in the form of letters in a book occupies a volume V. Let this same amount of information must be placed in the two-dimensional space, i.e. in the plane. In the form of lines of information will occupy an area of a square with the side $a(2)$. It is clear that a $a(2) > (3)$, where $a(3)$ - side three-dimensional cube depicting book.

The same amount of information is located in a one dimensional space in the form of a line with length $a(1)$, and

$$a(1) > a(2) > a(3)$$

Intuitively, it is clear that if we increase the number of dimensions of space to accommodate the same amount of information (in the form of letters), we construct an n-dimensional cube with a smaller side $a(n)$, that is

$$a(1) > a(2) > \cdots > a(k) > \cdots > a(n)$$

It is not difficult to show that $a(n)$ and $a(k)$ are related as follows

$$a(n) = a(k)^{k/n} \tag{1.1}$$

Indeed, (1.1) is a consequence of an equal amount of information (or atoms) in one or other n-dimensional space

$$V(1) = V(2) = V(k) = \cdots = V(n)$$

where $V(n)$ - ≪volume≫ n-dimensional spaces, which have an equal number of units of information (or atoms) which are located in nodes n-dimensional cubic lattices with a pitch d in that or another n-dimensional space (see Fig. 1)

So how

$$V(1) = a(1)^1; V(2) = a(2)^2; \cdots ; V(k) = a(k)^k; \cdots ; V(n) = a(n)^n;$$

Then we obtain (1.1). Here, for example, $a(1) = d \cdot t$, where t - the number of steps of the lattice.

If the space is three-dimensional, we obtain from (1.1)

$$a(n) = a(3)^{3/n} \tag{1.2}$$

From equation (1.2) should be an interesting conclusion. Suppose that we need to place the observable universe, together with the substance in the elementary n-dimensional "cube" and the side of the cube is equal to $10\,\ell_P$. Here $\ell_P = 10^{-33}$ cm - Planck length. How many dimensions of space is needed?

The size of the observable Universe is 10^{28} cm., or in units of Planck length $10^{61}\ell_P$. From (1.2) we have

$$10^1\ell_P = (10^{61}\ell_P)^{3/n} \tag{1.3}$$

Hence, $n = 183$. Thus the observed Universe can be placed in 183-dimensional "cube". Rib "cube" is $10\ell_P$.

The density of matter in a "183-cube" is equal to the density of a substance in 3-dimensional space of the observable Universe. Indeed, the density of the matter in the n-dimensional space is defined as follows: $\rho(n) = M/V(n)$, where M - mass of the substance of the observable Universe; $V(n)$ - volume of n-dimensional space; $\rho(n)$ - density of material in an n-dimensional space. And since, by hypothesis, $V(3) = V(183)$, then $\rho(3) = \rho(183)$.

An illustrative example. The one-dimensional thread of length r_1 is twisted into a flat spiral with a diameter r_2, or the three-dimensional ball with diameter r_3. It is clear that $r_1 > r_2 > r_3$, but the density of the thread remains the same (atoms substance will still be located at a distance d from each other in the direction of each axis, see Fig. 1).

Based on the foregoing, it can be assumed that the singular "point" (ie, a very small region of space), from which emerged our Universe was multidimensional. Perhaps in the center of a black hole the matter is squeezed into other dimensions of space.

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