Approach to Nature of Time

Zygmunt Morawski

ABSTRACT: Starting with a feature of the spacetime interval it has been explained why the time is a dimension different from the others. Next, three other interpretations have been done. The most important of them has been the proof which says that the time is the generalized field of charges and interactions. Next it has been shown that this interpratation isn't discrepant to the law of the conservation of energy.

1. Introduction

For centures the thinkers puzzled what the time is. It is the fact that time is a dimension different from the others, becouse one can't rest towards the time. There is no doubt that the time is something extraordinary. In this work the author tries to describe these facts.

2. We have the spacetime interval:

$$ds^2 = x^2 + y^2 + z^2 - c^2t^2 \qquad (1)$$

It arises from the formula:

$$ds = x + y + z + ict \qquad (2)$$

after taking the square and assuming that $x_j x_k = 0$ for $j \neq k$ and $x_j t = 0$

The complex value in the equation (2) supports the idea that the time is the newcomer from the regions of the space characterized by the velocity v, $v > c$ and it behaves differently than others dimensions moving towards us, whether we want it or not.

If we have N dimensions: $N = 2^n$ or $N = 10, 11, 26...$ then:

$$ds^2 = \sum_{i=1}^{N-1} x_i^2 - c^2t^2$$

And analogically $ds = \sum_{i=1}^{N-1} x_i + ict$

assuming the same as in the case (2)

Next problem arises:

- We assume that the space is locally flat. It means that there exists the surrounding of every point in which the space is Euclidean. But what to do with the mixed expressions $x_i x_j$ or $x_i t$ in the analogous equation of (1) if we can't neglect it.
- We have assumed that the only one time dimension exists.
- We ask the question if we can't use other spaces than the Minkovski spacetime.

If we put

$$ds^2 = c^2t^2 - x^2 - y^2 - z^2$$

then we have

$$ds = ct + i(x + y + z)$$

ds is radically complex and multiplying both sides with i we obtain : on the left side the number radicylly complex and on the right side the complex time and the real space coordinates. The conclusions are the same.
We can see this effect once way more. If we put
$x = y = z = 0$ and $t \neq 0$ or $x^2 + y^2 + z^2 \neq 0$ and $t = 0$
In the first case ds is complex, in the second- real.

3. Time has three interpretations:
   - the only time dimension in the spacetime
   - the entropy field

$$\frac{\partial S}{\partial t} \geqslant 0 \Rightarrow \partial S \cong \varepsilon \partial t$$

   - the generalized field of charges and interactions.

4. The statement that the time is the field of charges and interactions is very brave but the proof is easy ans elegant.
   We start with the dependence

$$\frac{dQ}{dt} = J$$

   Q is any charge and J-current connected with this charge
   So:

$$Q = \int J dt + Q_0$$

We can accept that for $t = 0$ $Q = 0$ and J is the function of positions and velocities, so $J = J(x_1,\dots,x_n, v_1,\dots v_{n-1})$

One can analyse it differently, too; $J = const.$, becouse the spacetime fluctuations are absorbed by the time (see for example [1]).

So we have:

$$Q = \int J dt = \int J_o f(x_1,\dots,x_n, v_1,\dots, v_{n-1})dt =$$

$$= J_o \int f(x_1,\dots, x_n, v_1,\dots, v_{n-1}) dt = J_o T$$

We have assumed that at the moment of the Big Bang the charges were precisely equilibrated, so $Q = 0$ (and the negative mass equilibrated the positive one, too).
The inside time t is the time in the Euclidean space in which the given manifold is immersed, while T is the time of the curved spacetime.
The problem arises, whether the law $Q \sim T(x)$ doesn't break the law of the conservation of energy. We remember that the charge is equivalent to the mass, so to the energy, too. Moreover, the charge is the sum of all the charges including the gravitational mass.

Possible answers:

1) The charge can be transferred or taken from the conjugated spaces what makes possible (x). The charge can oscillate this way, so the time is an oscillating quality [1].
2) The time can be a complex number, so the charge can be complex, too.
3) $Q = \alpha T$ but $Q = -\beta T$ (xx) too, becouse the time may be negative or the motion backwards the time can exist. The resultant ~~solution~~ solution is the superposition of both solution (x) and (xx).

Reference:

[1] M.J. Duff, C.N. Pope, E. Sezgin, Physics Letters B vol. 225, no. 4, 27 July 1989 p.319