Is Reality Euclidean?

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The fact that we observe the reality as the Lorentzian space time does not mean that the true reality must be Lorentzian, just as the fact that the complicated routes of heavenly bodies we observe on the firmament does not mean that the heavenly bodies really are performing such complicated motions. In this paper I present a model of reality where the true reality is four dimensional and Euclidean but we can observe it as the four dimensional Lorentzian space time. Description of physical phenomena is much simpler in the Euclidean model than in the Lorentzian one, while *the process of observation becomes slightly more complicated.*

1. Introduction

In the current model of the reality it is assumed that the reality is built of the dimensions of time and space identical to the observed ones. The model obtained using these dimensions is very complicated because the time is treated here a little differently from the space dimensions, and the equations describing the phenomena have to include this difference and be constructed so as to conserve the value of the space-time interval. Eventually we obtain very complicated equations which have been mysterious for almost a century.

If the theory is very complicated, it can be the result of the fact that the reality really is very complicated or it can be a result of adopting wrong assumptions as the basis of the model of reality.

An example of such a complicated theory can be the geocentric model of the Universe. When building this model, our ancestors assumed that the routes of stars and planets observed on the firmament are the true routes the heavenly bodies are moving along. The model was very complicated; however, it allowed to correctly predict positions of the planets and stars for centuries ahead. Quite the same as the hitherto models of the reality—while complicated, they still allow correct predictions of the effects obtained during various experiments.

The following question can therefore be asked:

> *Is the complicated shape of the reality a proof of the real complexity of the reality or do we make the same mistake as our ancestors with their geocentric model, assuming that the reality is Lorentzian because we are observing it as Lorentzian?*

To answer this question let us temporarily forget all the hitherto models of reality and, independently of the visible Lorentzian shape of the reality, let us assume that the reality is the simplest—namely the four dimensional and Euclidean—FER (Four dimensional Euclidean Reality). The Lorentzian shape of the reality, we are able to observe, will be now the result of the manner of performing the observation and not the real shape of the reality.

2. The Main Idea of the Model

We will assume that the reality (FER) is made of four identical absolute dimensions which describe certain distances and have no meaning of either time or space assigned in advance. The time- and space-dimensions are certain directions in the FER.

The directions in the FER, interpreted as the time- and space-dimensions, are not assigned in advance but they depend on the observed objects. It means that when observing different objects, we are interpreting different directions in the FER as the time- and space-dimensions. In general, the direction interpreted as the time-dimension is not perpendicular to the directions interpreted as the space-dimensions.

One should notice here that we do not observe the same reality. We observe objects in this reality and on the basis of these observations we picture the reality to ourselves. Therefore, binding the directions interpreted as the space- and time-dimensions with the observed bodies, and not with the observer, seems to be logical.

Instead of the reality built of observed dimensions of time and space we now have the absolute, non-observable Euclidean reality in which certain directions are interpreted as the space- and time-dimensions. The difference between the two models, the hitherto one and the one described here, is shown in Fig. 1.

In the hitherto space-time model, the relativistic effects were the result of deformations of the space-time dimensions creating the reality. In the new model, the dimensions creating the reality are absolute and do not change. The relativistic effects are now the result of the choice of the particular directions in the FER interpreted as the time and space, and the change of these directions interpreted as the space and time, when observing different objects, is responsible for the relativistic effects.

3. Observation: Absolute Euclidean Dimension and Observed Space- and Time- Dimensions

We assume that objects are moving in the FER along certain trajectories. For the trajectory which is a straight line *the length of the trajectory is a measure of time* indicated by the clock bound with the coordinate system of the object.

The directions in the FER interpreted as the space dimensions are perpendicular to the trajectory of the observed object and not to the trajectory of the observer as it had been assumed in the hitherto model. The idea of performing observation in the FER is presented in Fig. 2, where two bodies are observing each other. In Fig 2a, body 1—the observer—observes body 2. As we can see in Fig. 2a, the observer is interpreting its trajectory as the time dimension and the direction perpendicular to trajectory of the body 2 as the space dimension.

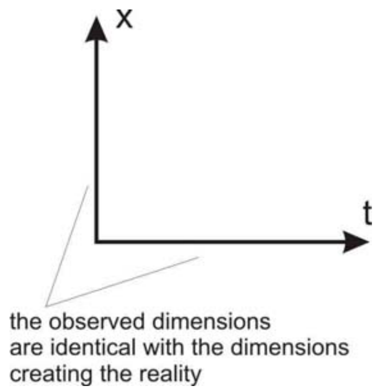

Fig. 1a. In the hitherto model of the reality the observed dimensions of space and time were at the same time dimensions creating the reality — Fig. a. In the FER model, the reality is built of absolute dimensions — in fig b. these are the ab ones — while the observed dimensions of space and time — xt — are nothing more than certain directions in the FER.

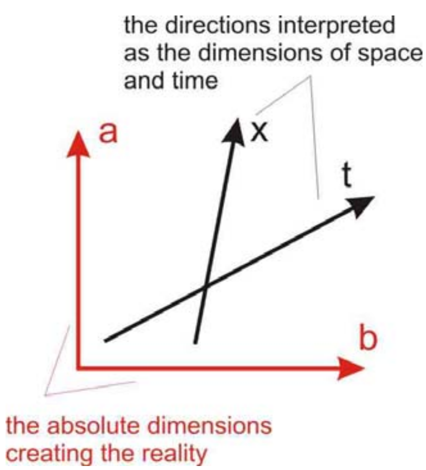

Fig 1b. These directions (*xt*) are generally not perpendicular to each other, and they are chosen in relation to the currently observed object. These directions (*xt*) are different for the observation of different objects.

As we can see in this figure, such a choice of direction ensures the conservation of the space-time interval during the observation.

If, in turn, the body 2 becomes the observer (Fig. 2b) then, from point of view of body 2, the time dimension will overlap with its trajectory, and the space dimension will be perpendicular to the trajectory of body 1.

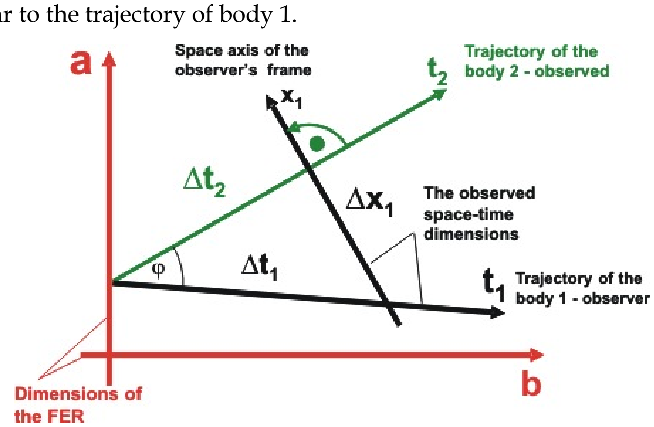

Fig. 2a. Mutual observation of two bodies. Body 1 observes body 2.

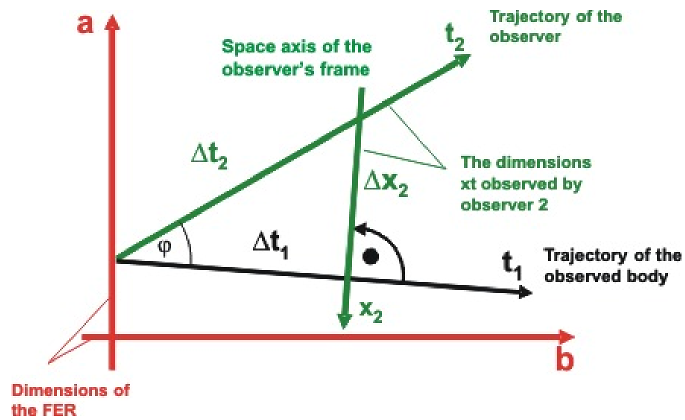

Fig. 2b. Body 2 observes body 1. The directions in the FER interpreted as the space- and time-dimension depend on the choice of the observer and the observed object according to the following rule: the time dimension overlaps with the trajectory of the observer in the FER, the space dimensions are the directions perpendicular to the trajectory of the observed object.

As a result of Fig. 2:

1. The relative velocity is equal to the sine of the angle between the trajectories of bodies:

$$V = \frac{\Delta x_i}{\Delta t_i} = \sin\phi\, , i = 1,2\ . \tag{1}$$

Such defined velocity has a limit equal to the one, what corresponds to the straight angle between the trajectories. In the FER there are no restrictions regarding the angle between the trajectories, therefore the limitation of the value of velocity does not mean that we are not able to change the trajectory of a body to the one inclined at an angle 90^0 or greater (to the trajectory of an observer) but the observed velocity will not exceed the value of one. According to this, the velocity is no longer the value describing univocally the time needed to pass a certain distance. Now this role is played by the trajectory and it is probably possible to pass a certain distance in time shorter than needed for the light to traverse it, however the observed velocity will still be lower than one — the velocity equal to one will be equal to the speed of light, which will be shown in the next chapter.

2. The observers observe the mutual shortening of time in the other's coordinate system. The shortening of time is equal to: From point of view of observer 1 (Fig. 2a),

$$\Delta t_2 = \Delta t_1 \cos\phi = \Delta t_1 \sqrt{1 - V^2}\ , \tag{2a}$$

and from point of view of observer 2 (Fig. 2b),

$$\Delta t_1 = \Delta t_2 \cos\phi = \Delta t_2 \sqrt{1 - V^2}\ . \tag{2b}$$

This shortening of the time is not the real shortening. It results from the manner of performing the observation and is registered by both observers observing each other. The effect responsible for the fact that the observed time dilation becomes the real one is changing velocity by one of the bodies. The mechanism of changing the observed time dilation into the real one, as the function of the velocity change, had been explained in detail in the proceedings of PIRT Conference 2009 [3] and on my website dedicated to the Euclidean model of the reality [4].

4. The Speed of Light

According to the new model, the motion of quanta is quite a different phenomena than the motion of mass bodies. Because in our previous considerations we neglected the shortening of time as the function of the constant velocity (it is only the observed time dilation, not the real one), we now have to justify the constancy of the speed of light in some other way than it had been done up to now. Therefore we have to assume that:

1. The quantum is emitted in a direction perpendicular to the trajectory of the body emitting the quantum,
2. The trajectory of the quantum is carried along the trajectory of the body receiving the quantum,
3. If the quantum passes the distance Δx along its trajectory, its trajectory will be carried for the distance Δt along the trajectory of the body receiving the quantum and in the vacuum both distances are equal to each other: $\Delta x = \Delta t$.

This situation is described in the Fig. 3:

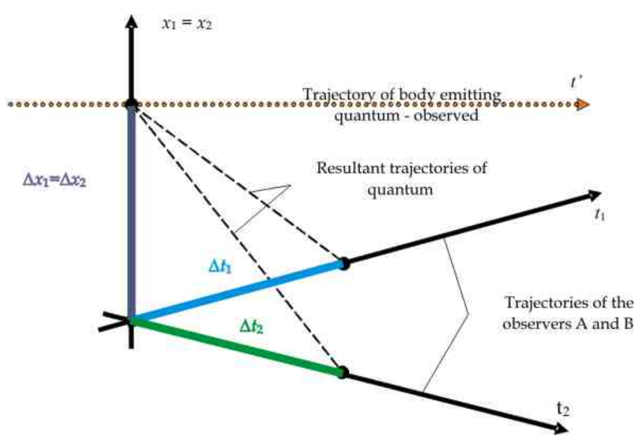

Fig. 3. Two observers watching one body using quanta. The quanta are emitted along the trajectory perpendicular to the trajectory of the body emitting the quanta, being at the same time the space axes of the coordinate systems of both observers. The trajectories of the quanta are carried along the trajectories of the observers. Hence, the resultant trajectory of quantum is a composition of moving along the trajectory perpendicular to the observed body (the space axis of the observers) and carrying the trajectory along the trajectory of the observer. In vacuum and in the absence of gravitation field: $\Delta x_1 = \Delta x_2 = \Delta t_1 = \Delta t_2$.

As seen on Fig. 3, the measured speed of light in both observers' coordinate systems is equal to:

$$V = \frac{\Delta x_i}{\Delta t_i} = 1 \tag{3}$$

apart from the relative motion of the observers (the angle between the trajectories of the observers).

Let us notice that the resultant trajectory of the quantum depends on the trajectory of the body receiving the quantum.

It means that *already in the moment of emission, the quantum must "know" by which body it will be received.*

Therefore the emission of the quantum should be an effect of some instant interaction between the emitter and receiver, and the emission anywhere in the empty space should not take place in this model.

5. Time and SUPERTIME

If we use the term "motion" in the FER we should define the time the motion is related to. The time in the FER was named SUPERTIME. SUPERTIME is not the 5th dimension; it is not necessary to introduce a new dimension in the model. It is enough to assume that SUPERTIME is a parameter. SUPERTIME flows identically for all the bodies, independently on their relative motion. The basic definition of SUPERTIME (T) is the following:

$$dT^2 = dx^2 + dt'^2 \tag{4}$$

It means that SUPERTIME consists of the "flow of time" t' measured in the coordinate system of the moving object and the distance x in space passed by the body - i.e., the "flow of space". One could say that the higher the "flow of space", the lower the flow of time in the moving body's reference frame.

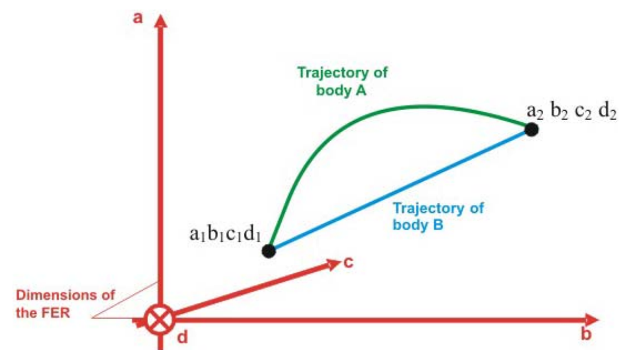

Fig. 4. The SUPERTIME is identical for two bodies moving from point $a_1b_1c_1d_1$ to the point $a_2b_2c_2d_2$. The time flowing in the coordinate system of body A will be shorter from the time that flows in the coordinate system of body B according to the formula (4).

The SUPERTIME is equal to the distance in the FER. If we have two bodies A and B moving from point $a_1b_1c_1d_1$ to point $a_2b_2c_2d_2$ in the FER, then the flow of the SUPERTIME for these bodies depends only on the distances between the two points and does not depend on the shape of the trajectories the bodies travel along. While the SUPERTIME does not depend on the shape of the trajectory of the body, the time flow in the coordinate system of the traveling body does. In practice, the longer and more complicated shape of the trajectory of the body, the shorter time is flowing in the coordinate system of the body. This situation is presented in the Fig. 4. The more detailed description of the SUPERTIME, its complex form and the detailed mechanism responsible for the time dilation in the moving body's coordinate system, are presented in [2] and [3].

References

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[2] W. Nawrot, "The structure of time and the wave structure of the matter", *Galilean Electrodynamics* **18** (3): 49-53 (2007).

[3] W. Nawrot, "Euclidean Model of the Spacetime: Is the Reality Exactly as We Can Observe It?", *Mathematics, Physics and Philosophy in the Interpretations of Relativity Theory* (Budapest, 4-6 Sep 2009).

[4] W. Nawrot, "Euclidean Model of the Spacetime: Is the Reality Exactly as We Can Observe It?", www.euclideanreality.com.