Euclidean model of the spacetime – is the reality exactly as we can observe it?

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The new model of Four dimensional Euclidean Reality (FER), which recently, more and more often, appears in publications, can significantly change the manner in which we interpret the reality surrounding us. According to the approach presented here, the reality we are able to observe differs from the "true" reality. Living, in fact, in the Four dimensional Euclidean Reality, we get an impression that we are living in the four dimensional Lorentzian Reality. The impression is a consequence of the seemingly obvious assumption that the space and time distances that we are able to observe are the actual dimensions creating the reality.
However, an assumption saying that the distances we measure during the observation of surrounding objects are describing the true dimension of the reality can be similar to the assumption, accepted through centuries, saying that the motions of heavenly bodies, observed by us on the firmament from the Earth, are the motions that the bodies are actually performing. Perhaps it is just the improper model of the reality that is the source of all the troubles, misunderstandings and complications of the models based on the Relativity Theory, which, although correctly describing a wide class of phenomena, did not lead to solutions which at the beginning of the XX-th century seemed to be just a step away, e.g. unification of the electromagnetic and gravitational interactions.
It should be noted that a few hundred years ago, the geocentric theory, though complicated, was describing motions of heavenly bodies in a more accurate way than the later heliocentric theory; however, the progress of science and, for instance, planning cosmic travels, would not be possible with the geocentric model.
The new, Euclidean model of reality allows us to answer the questions asked already in my other paper concerning SRT: is the slowing of time, in a frame of body in motion, actual slowing or it is only a result of mutual observation, and why registering of the shortening of the time requires the change of velocity of the observed body.
An additional argument for the necessity of more serious treatment of new models, alternative to the hitherto ones, would be the recently observed anomalies of motions of satellites which are impossible to explain with the help of the Relativity Theory.

Introduction

In creating various physical models, we come to the conclusion that the reality should be built in as simple way as possible. However, not all of the physical models are built according to this rule. It can prove the specific properties of the reality, but it can be also the consequence of false assumptions being a foundation of the model describing the reality.

I would like to refer here to the actual model of the space-time. We know that the reality is a four dimensional one. The simplest form of such structure should be the Euclidean space. However, despite the fact that the three dimensional space is Euclidean, the four dimensional observed space-time is Lorentzian. Therefore the actual model of the reality assumes that the space is not all that simple.

Observation gave us false conviction about the structure of the Universe many times – probably the most spectacular example could be the geocentric model, which was built due to accepting the assumption that the routes of the heavenly bodies, which we are able to observe from the Earth's observatories, are the trajectories along which the heavenly bodies are in fact moving in the Universe.

Could then the acceptance of the assumption, saying that the dimensions of the true reality can be described directly by the space – and time – distances which we are able to register observing surrounding objects, be an illusion just like the assumption, accepted many centuries ago, saying that the routes of heavenly bodies, observed on the firmament, are the true routes of motion of these bodies?

We are assuming then, that, is spite of the fact that the observed reality is Lorentzian, the true reality is the simplest possible, i.e. Euclidean [1,2]. Hence, not the observed shape of the reality was accepted as the superior directive, but our often proved conviction that if anything exists in nature then it exists in the simplest possible way, independently of what we are able to observe.

Since together with the new approach the new division between the objective Euclidean reality (in which we live but which we can not observe) and the observed Lorentzian reality (the observed picture of the reality) is introduced, this paper will be divided into two parts: The Objective Reality – describing the objective non-observable Euclidean reality, and The Observation – describing the mechanism of the observation which gives us an impression that the reality surrounding us is Lorentzian.

The Objective Reality
As it has been mentioned before, it was assumed that the reality is Four-dimensional and Euclidean – in this paper we will call it the Four dimensional Euclidean Reality - FER. The FER is an objective structure which does not depend on any observation. The dimensions creating FER do not have the meaning of time or space assigned in advance. One can introduce the idea of time and space as a subjective result of an observation, as a result of which, by measuring distances between bodies, in a manner available to us, we will interpret certain directions in the FER as the space- of time- dimensions. To emphasize the fact that the dimensions of the new Euclidean reality do not denote either space or time dimension, we will simply name them abcd. We can summarize the above as follows:
Conclusion 1
The reality is four dimensional and Euclidean, and can be described with abcd symbols. The dimensions do not have the meaning of the time or space.
In this reality there are bodies. The bodies are moving along certain trajectories. While talking about the "motion" along the trajectory one should consider the following two factors:
1. direction of the motion – due to which we should define the direction for every trajectory
and
2. the time, in relation to which the motion will be defined. To distinguish this time from the time known form The Relativity Theory, the time in FER will be named the Supertime.

Since the FER is four dimensional, one can easily guess that, during the observation, one direction of the FER will be perceived as the time dimension and the three others – as space dimensions. Therefore, the Supertime does not have to be introduced as a fifth dimension in

the FER – it is enough to define it as a parameter only. The Supertime allows us to order points along trajectory of a body in the FER. The Supertime should also be flowing with the same speed for all bodies and thanks to that we will be able to compare phenomena in various coordinate systems independently from relative motions of these systems.

Finally, the Supertime was defined as the distance between two points in the FER:

Conclusion 2

The Supertime is a parameter determining a distance between two points in the FER and it is described in the FER with a following relation:

(1) $\Delta t^2 = \Delta a^2 + \Delta b^2 + \Delta c^2 + \Delta d^2$

It should be stressed here that while talking about the Supertime, we are not talking about a length of any chosen trajectory but about relocation between two points in the FER. Hence the flow of the Supertime is identical for all bodies which were moved from point $a_1 b_1 c_1 d_1$ to $a_2 b_2 c_2 d_2$ along any trajectories (see fig. 1). As it will be shown further, shape of the trajectory a body is moving along will have influence on the time flowing in the coordinate system of this body. The situation described above is shown in fig. 1
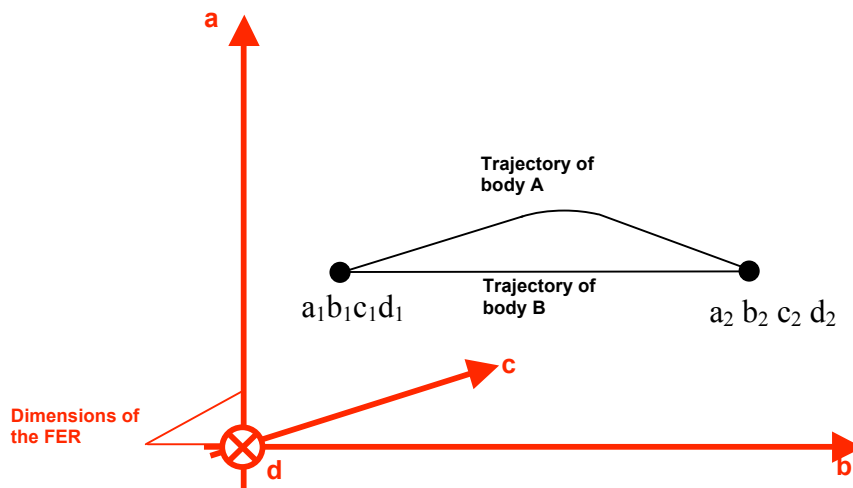
Fig. 1 If two bodies will relocate between two points in the FER along any trajectories, then the flow of the Supertime is identical for both bodies independently from the shapes of their trajectories. The flow of the Supertime is only equal to the distance between the two points.

Definition of the Euclidean Reality and the Supertime finalizes the description of the objective reality.

The next stage of the model is describing the observation, i.e. justifying why the reality looks as if it was Lorentzian.

The Observation

Model of observation has been constructed in a way which ensures that observers will observe each other's relativistic effects – the ones which have been experimentally verified.

In the beginning, let us consider two bodies moving in the FER along linear trajectories. Since in the FER the Supertime is the distance, one can assume that when an observer moves along a trajectory which is a straight line, indications of his clock overlap with the Supertime flow.

The dependence between the time of the observer and the proper time in the frame of the observed body is described by the equation of conservation of the space-time interval, which in the case of an observer observing a body takes the following form:

$$(2)\ \Delta t'^2 = \Delta t^2 - \Delta x^2 - \Delta y^2 - \Delta z^2$$

where c=1

or , to rewrite the formula differently:

$$(3)\ \Delta t^2 = \Delta t'^2 + \Delta x^2 + \Delta y^2 + \Delta z^2$$

Therefore, if the observer in his reference frame observes the time being identical with the Supertime in the FER, then in the frame of an observed body he can see shorter time t' according to equation (3). Let us notice that in equation (3), dimensions xyzt' are the dimensions of an Euclidean space, so, in practice, they represent the abcd coordinate system rotated by a certain angle. The situation described by equation (3) is shown in fig. 2 where fig 2a presents observation of body 2 from coordinate system of body 1, and fig. 2b - observation of body 1 from coordinate system of body 2.. As we can see, both observations are symmetrical and in the Euclidean reality - in the case of motion along linear trajectories - the following two conclusions can be drawn:
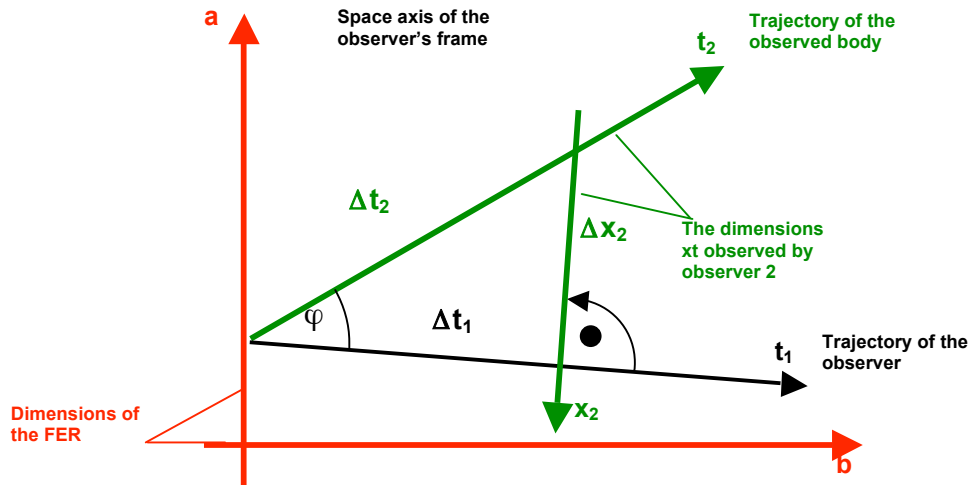
Conclusion 3
In the FER the length of the body's trajectory, being a straight line, is the measure of proper time of the body
Conclusion 4
Dimensions perceived as the space-dimensions are perpendicular to the trajectory of the observed body.
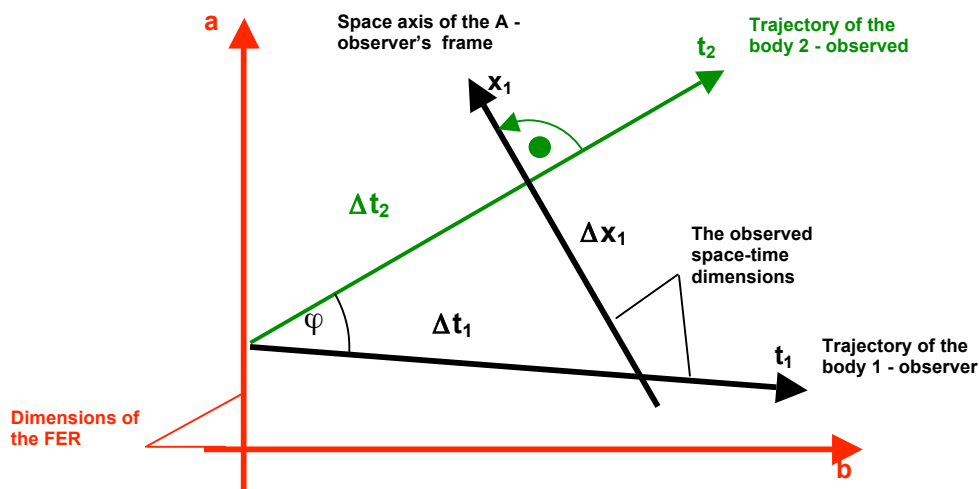
a.)

b.)

Fig. 2 Two bodies in the FER observing each other. In fig. a, body 1 observes body 2; in fig. b, body 2 observes body 1. Space axes of the observers are chosen to be perpendicular to the trajectory of the body observed at the moment.

The conclusion that directions perceived in the FER as space dimensions are perpendicular to the time axis of the observed body's coordinate system, and not to the time axis of the observer, as it was assumed up till now, can be difficult to accept. However, we should remember that we are not able to observe the reality itself – we can only observe bodies existing in this reality. The picture of our surroundings which we are able to perceive consists of many observations of neighboring bodies, and it is from from those numerous observations that we put together the picture of the reality in our minds. During observation of each body, we are interpreting a different direction in the FER as the space dimension. However, a vast majority of phenomena in our surroundings has non-relativistic character and this non-relativistic character of the phenomena determines our actual picture of the reality. Therefore, in the world observed every day, the observed reality xyzt practically overlaps with the FER described with abcd dimensions, because for non-relativistic motions, proper time of an observed body and time in the observer's coordinate system are almost identical. Therefore the space dimensions are practically perpendicular to the direction interpreted as the time dimension of the observer in the FER. The differences occur only in relativistic cases which are in fact rarely present themselves in our life.
Accepting the assumption that the space-time dimensions are not assigned in advance, but depend on the choice of an observer and observed object, explains many seemingly unrelated physical problems [3], some of which will be discussed later on. At the same time, the model explains why the time dilation, which takes place during pure inertial motions, is not a true dilation but only the impression resulting from the manner of mutual observation, and why only changing the direction of motion of one of the bodies can actually make the time passing in the coordinate system of this body shorter. This problem was discussed in the paper concerning the paradox of Hafele&Keating's experiment [4].

As it has already been mentioned, every observer in their local coordinate system perceives the Supertime as the time. On the other hand, according to the equation (3), in the case of

observation of bodies, from the point of view of the observer, the measure of the Supertime is equal to the sum of squares of the proper time of the observed body and the distance passed by the body during this time in relation to the observer. Therefore, we could say that from the observer's point of view, the flow of the supertime consists of the "flow of the proper time" of the observed body and the "flow of the space" - hence the observer is under the impression that the greater the "flow of space" of the observed body is, the slower is its "flow of the proper time". As we can see in fig. 2, the problem is quite symmetrical, and both observers observing each other can see identical effects in their neighbor's coordinate systems. Due to such mechanism the Supertime conserves constant value independently on the coordinate system and can be used for description of any object in the manner independent of any observer. Simply, depending on the choice of the coordinate system, the same value of the Supertime consists of different "flows" of time and space, but the value of the Supertime remains constant – even for coordinate systems in which the flow of the proper time is equal to zero. The detailed description of the Supertime was presented in [2]

The velocity
As we can see in fig. 2, the velocity of a body which we apply in the observed Lorentzian reality is equal to sinus of an angle between trajectories of the bodies in the FER (4)

(4) $V = \dfrac{\Delta x}{\Delta t} = \sin \varphi$

Let us notice that the velocity defining the motion is a function of the angle between the trajectories of the bodies. It is a very important conclusion, because from now on the relative motion will be defined by the angle between the trajectories, which is a wider notion than the velocity of a body. The velocity ceases to determine the motion of a body and becomes the observed value instead of a physical one. According to definition (4), the velocity can not exceed the value of 1 – which is the boundary velocity for bodies. Velocity equal to 1 is in practice equal to the velocity of light in a vacuum – a more detailed explanation can be found in [1].
On the other hand, in the FER there are no limitations regarding the changes of angles between trajectories, and so the trajectories can be inclined to each other at a straight or even larger angle, but bodies moving along these trajectories can not be observed by observers. The boundary velocity of bodies is not the result of properties of the bodies anymore, but it is only the property of an observation. To put it simply, the value V=1 corresponds to trajectories perpendicular to each other, but there are no limitations regarding the angle between the trajectories. According to the FER, the acceleration is the changing of the angle between the trajectories and there are no reasons for limiting the change of the angle between the trajectories. Therefore in the FER, the change of an angle of the trajectory by 90^0, which corresponds to acceleration of the body to the velocity interpreted as the speed of light, is possible (I have used the phrase "acceleration of the body to the velocity interpreted as the speed of light" because the velocity of bodies and the velocity of EM waves, though equal, are two separate phenomena in the FER, so using traditional notion of the velocity to describe propagation of EM waves is not valid in the FER anymore [1]). Observation of such an accelerated body, as well as a body moving along trajectories inclined at an angle larger than 90^0 is, however, impossible.
Changing the definition of velocity has many serious consequences. Primarily, the velocity ceases to unequivocally determine the relative motion of bodies. The time needed to reach a certain point in space now is not determined by the velocity, because is turns out that for certain trajectories that the body is able to follow, the velocity can not be determined. Similarly, the relativistic increase of mass and its infinite value when a body is reaching the speed of light is only the observed quantity that is a result of defining relativistic mass by

using velocity and not the real infinite increase of the body's mass. According to the FER model, observation of a body accelerated to the speed of light will take infinite time. It means that for instance astronauts, after end of their journey, will be able to observe their spacecraft still accelerating to the speed of light for ages. Moreover, an object moving along such trajectories will be probably observed by us simultaneously in several places corresponding to several stages of the journey.

The time dilation
According to fig. 2, the observers are mutually observing time dilation in their neighbor's coordinate system and:
- according to fig. 2a, observer 1 observes time dilation, in the coordinate system of the observer 2, which can be described with the following formula:

$$(5)\ \Delta t_2 = \Delta t_1 \cos\varphi = \Delta t_1 \sqrt{1 - \sin^2\varphi} = \Delta t_1 \sqrt{1 - \frac{\Delta x_1^2}{\Delta t_1^2}}$$

- in turn, according to fig. 2b, observer 2 observes time dilation, in the coordinate system of the observer 1, which can be described with the following formula:

$$(6)\ \Delta t_1 = \Delta t_2 \cos\varphi = \Delta t_2 \sqrt{1 - \sin^2\varphi} = \Delta t_2 \sqrt{1 - \frac{\Delta x_2^2}{\Delta t_2^2}}$$

However, it can be noticed that this dilation is not the result of the real dilation of the time but only the result of an observation or, more specifically, the fact that ***the directions in the FER interpreted by the observer as his space dimensions are in the FER the directions perpendicular to the trajectory of the body actually observed***. The observer 1 interprets the direction in the FER perpendicular to the observer 2's trajectory as his space dimension – and analogously, the observer 2 interprets the direction in the FER perpendicular to the observer 1's trajectory as his space dimension.

Directions in the FER interpreted as the space dimensions are different for different observed bodies. And it is this interpretation of different directions in the FER as the space dimensions that is responsible for the impression that in the moving frame the time flows slower than in the observer's frame.
As long as the observers are moving along trajectories which are straight lines, the problem is symmetrical and we are unable to check in which of the frames the time really flows slower.

Before we start discussing situation when one of the bodies changes its velocity – which corresponds to the change of the trajectory's direction in the FER – let us consider the following problem:

We have a probe positioned at the distance x from the origin of the coordinate system (for instance from the oscilloscope). In moment of time t this probe is hit simultaneously by several particles moving with different velocities – which corresponds to the particles moving along trajectories inclined at different angles to the trajectory of an observer in the FER. Since for the observation of every particle the space dimension of the observer has to be perpendicular to the trajectory of the observed particle, then for interaction with every particle the probe should be in a different location, positioned on the circle with radius x and origin in point t on the observer's trajectory. The situation described here is shown in fig. 3
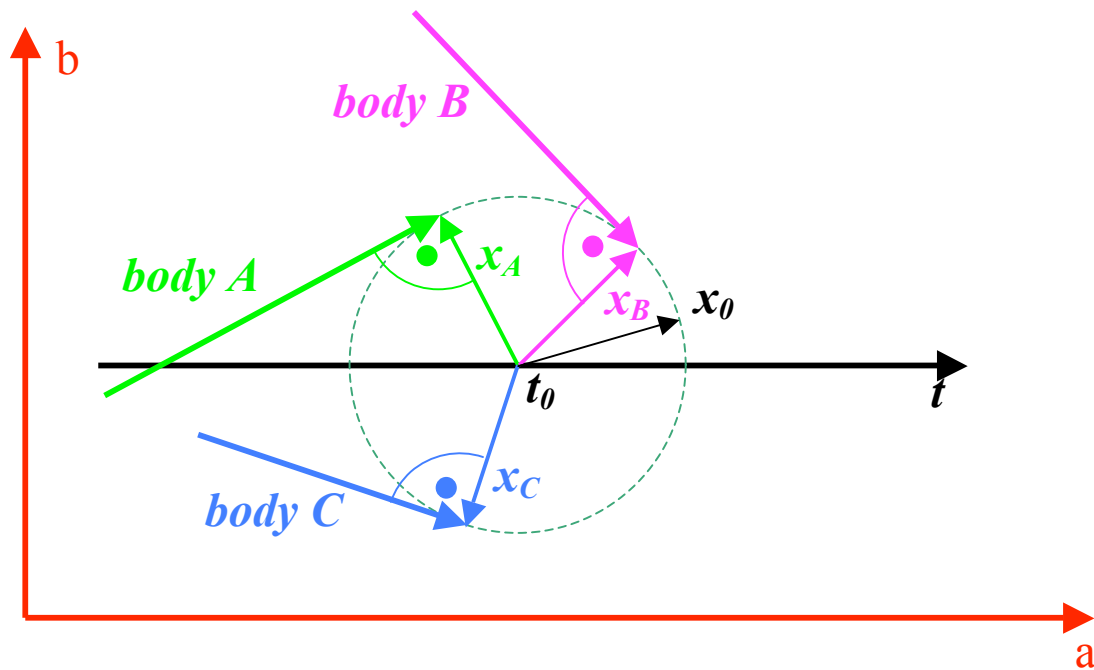
*Fig. 3 Three particles moving with different velocities are hitting the probe positioned in the point **xt** of the observer's frame. In the FER, the representation of the point **xt** is a circle with radius x and origin in point **t** on the observer's trajectory. All points on this circle correspond to one and the same moment of time **t**, and for particle moving from one point of the circle to another, the flow of time is equal to zero.*

Therefore, the representation of the point xt from the Lorentzian space-time in the FER is a circle with radius x and origin in the point t on the observer's trajectory. Due to an immediate change of velocity (of course it is a hypothetical case because it corresponds to the infinite acceleration), the body moves along the circle from point tangential to the trajectory of a body moving with one velocity to the point tangential to the trajectory corresponding to the another velocity. Since all points of the circle correspond to the same time t, motion along the circle is not connected with the time's flow. This situation is shown in fig. 4, which illustrates time dilation in the system of two bodies – the first one, moving with a constant velocity, and the second one - in the beginning running away from the first body and then approaching it. The change of the velocity, described above, corresponds to relocation of a body from point A to point B on the circle with radius x and origin at point t – fig.4. Therefore, the change of velocity of the body is equal to the body in the FER performing a "jump" and, in case of infinite acceleration as it is shown in fig.4, during such a "jump" the time flow is equal to zero in both reference systems – the observer's and the observed body's.
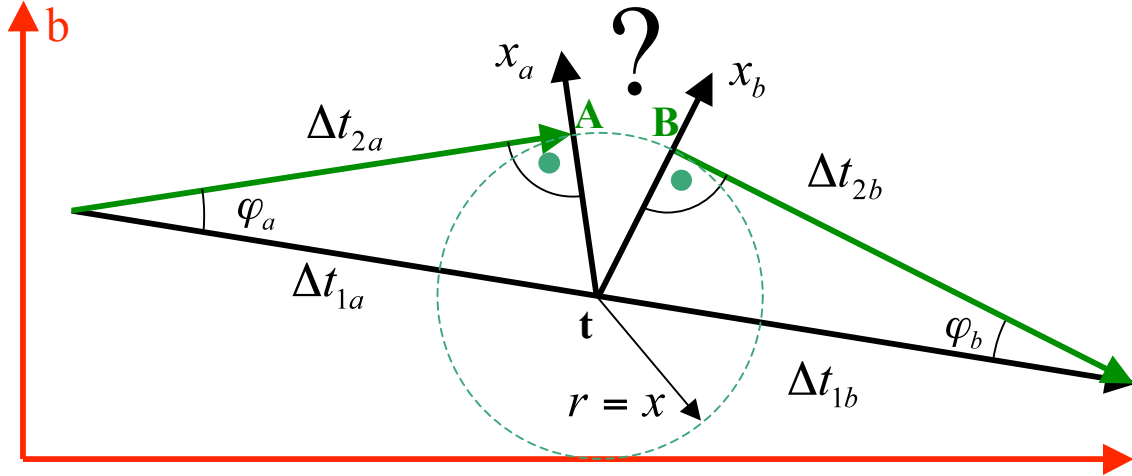
Fig. 4 Mechanism of time dilation during the change of velocity. Time of the body changing velocity is shorter that time in the frame of the observer moving with continuous motion because the flows of the times in both systems the systems are equal to:
$\Delta t_{2a} = \Delta t_{1a} \cos\varphi_a$ and $\Delta t_{2b} = \Delta t_{1b} \cos\varphi_b$ while the flow of time on the arc AB is equal to zero.

As it is shown in fig. 4, the time dilation in a coordinate system of the body which changes its velocity can be described by formulas:

(7a) $\Delta t_{2a} = \Delta t_{1a} \cos\varphi_a = \Delta t_{1a} \sqrt{1 - \sin^2\varphi_a} = \Delta t_{1a} \sqrt{1 - V_a^2}$

(7b) $\Delta t_{2b} = \Delta t_{1b} \cos\varphi_b = \Delta t_{1b} \sqrt{1 - \sin^2\varphi_b} = \Delta t_{1b} \sqrt{1 - V_b^2}$

The time in the reference frame of body b, changing the velocity, is shorter in spite of the greater total length of its trajectory in the FER, because the flow of time during the "jump", on the arc AB, is equal to zero.

The formula describing the time dilation in the FER remains in accordance with predictions of the SRT and one can get an impression that time in the frame of the body in motion really slows down with velocity.

However, the true reason of the time dilation is performing the "jump" along the arc AB, (fig. 4) by the body which is changing its velocity, and it is this "jump" – during which the time flow is equal to zero - that is responsible for registering the time dilation.

Due to the mechanism of the "jump" , the observed time dilation is only a function of the velocity, but the velocity and physical processes correlated with the velocity are not the reason of the time dilation anymore. The true reason of the time dilation is the "jump" along the part of a circle in the FER, and the physical processes that occur during this "jump" are in fact responsible for the time dilation phenomena. The mechanism of the "jump" has many interesting and controversial properties which have not been explained yet; however, it seems that the analysis of physical processes taking place during the "jump" will allow to understand the idea of the time flow and mechanisms responsible for the phenomena of different time flow in frames of bodies that change their velocity or bodies in gravitational fields. At this point I would like to notice that in the FER the body can be described in a straightforward way as a wave propagating through a wave medium [2] where the wave moves in direction (in the FER) perceived by us as the time dimension, while the relative motion of bodies

corresponds to propagation of these waves along directions inclined to each other at any angle (the relative velocity of bodies-waves is equal to the sinus of this angle). Therefore we can now come back to the concept of ether and still remain in accordance with hitherto experiments that contradict its existence. It can be done now because in the FER the relative motion of bodies and the motion in relation to the medium/ether are separate phenomena, so it is impossible to detect the motion relative to ether, using tools appropriate for detection of relative motion of bodies.

Finally, we can say that the change of velocity and the change of time corresponding to it can be the consequence of the enigmatic mechanism of mutual interaction of waves-particles which causes the change of direction of propagation of one of the waves-particles.

Conclusions

In the Relativity Theory we considered the change of the time flow in moving frames only as a the result of the velocity of the bodies. In the FER the most important factor determining the physics of the time dilation phenomenon is not the uniform motion, because then the phenomena appear symmetrically in the systems of both observers, but the moment when one of the bodies changes its velocity. This moment causes problems which, if solved, would give us the knowledge of the mechanism responsible for the physics of the time dilation in the moving body's frame. This conclusion remains in accordance with similar conclusions resulting from SRT, which were shown in the paper dedicated to the Hafele and Keating experiment [4].

This paper does not give an answer to the question of what are the real processes, connected with propagation of a particle in space, responsible for the time dilation phenomenon – but it clearly distinguishes stages of motion responsible for this dilation. According to the above reasoning, despite the fact that the time dilation is unequivocally connected with the observed velocity, it is not the velocity that is the true reason of the real, and not only observed, time dilation. The time dilation phenomenon is caused by yet unknown processes – probably of wave character - taking place at the moment of changing the direction of the trajectory of one of the bodies. I would like to emphasize here that the idea of Euclidean reality, together with the model of observation where the observer's space axes are not determined in advance but are perpendicular to trajectory of a currently observed body, allows to explain and describe, in a trivially simple way, many seemingly different phenomena, such as: the time dilation, limit of velocity, constancy of the light speed, recession of galaxies, or relation between Hubble's constant and the age of the Universe [3]. The fact that one common mechanism can be applied to explain many phenomena and to significantly simplify the description of phenomena (for instance, the recession of galaxies and relation between the Hubble's constant and age of the Universe are described by a trivially simple formula consisting of just a few symbols) cannot be a matter of coincidence, and more and more elements seem to show that the model of the Euclidean reality can at last bring answers to the problems concerning the nature of the time and space which have been haunting us for almost a century. The additional argument for the necessity of taking models alternative to the Relativity Theory more seriously is, apart from the absence of significant progresses in RT within almost a century, the recently discovered flyby anomaly – increase of velocity of satellites, which is an enigmatic function of Earth's rotation – which up to now wasn't unequivocally explained within the Relativity Theory [15].

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