Connection between coordinates and time in pseudo-inertial systems of readout

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In article attempt to establish connection between coordinates and time in pseudo-inertial systems of readout becomes.

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The maintenance

1. Introduction

In [1] it has been shown that application of the special theory of a relativity by consideration of the linear closed mechanical systems of the bodies which interaction has constant character, can lead to default of the law of preservation of an impulse in inertial systems of readout.

And a condition of performance of the law of preservation of an impulse is equality of infinity of a constant in Lorentz's transformations.

It is offered to use a course of consideration and conclusions from [1] for communication definition between coordinates and time in pseudo-inertial systems of readout.

2. The description of pseudo-inertial systems of readout

Let's temporarily depart from habitual three-dimensional model of inertial system of readout and we will consider one-dimensional model of inertial system of readout O_1x_1, consisting of center O_1 and an axis x_1.

Let's admit that in one-dimensional inertial system of readout O_1x_1, space (the points which are on an axis x_1) - homogeneously and time is homogeneous also.

It is possible to present homogeneous one-dimensional space in the form of the space concluded inside of infinitely long tube which internal radius is infinitesimal size, and moving of points (bodies) probably only on axis O_1x_1.

Let's assume that, as is shown in fig. 1, there are two one-dimensional inertial systems of readout O_1x_1 and O_2x_2, at which:

- Axes x_1 and x_2 are on one line and are equally directed;
- System O_2x_2 moves concerning system O_1x_1 with constant speed V;
- As time reference mark (t_1=0 and t_2=0) in both systems that moment when the beginnings of coordinates O_1 and O_2 these systems coincided is chosen.

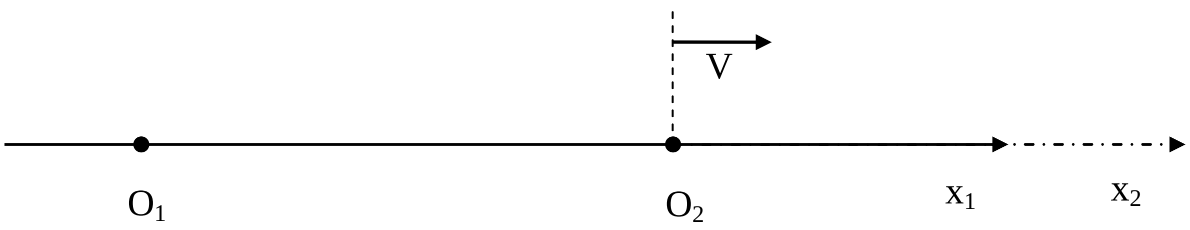

Fig. 1

Using Lorentz's [2] transformations, it is possible to write down communication between coordinate x_1 point at the moment of time t_1 in system of readout O_1x_1 and coordinate x_2 the same point in system of readout O_2x_2 at the moment of time t_2, corresponding to time moment t_1 in system of readout O_1x_1:

$$x_1 = \frac{x_2 + (V \cdot t_2)}{\sqrt{1 - \frac{V^2}{c^2}}} \quad (1)$$

$$x_2 = \frac{x_1 - (V \cdot t_1)}{\sqrt{1 - \frac{V^2}{c^2}}} \quad (2)$$

where: c – a velocity of light in vacuum.

According to transformations of speeds [2] communication between speed V_2 movement of a point at the moment of time t_2 in system of readout O_2x_2 and speed V_1 movement of the same point in system of readout O_1x_1 at the moment of time t_1, corresponding to time moment t_2 in system of readout O_2x_2, looks in a following kind:

$$V_2 = \frac{V_1 - V}{1 - \frac{V \cdot V_1}{c^2}} \quad (3)$$

$$V_1 = \frac{V_2 + V}{1 + \frac{V \cdot V_2}{c^2}} \quad (4)$$

By means of formulas (1) and (2) it is possible to write communication between values of times t_1 and t_2:

$$t_1 = \frac{t_2 + \frac{V \cdot x_2}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} \quad (5)$$

$$t_2 = \frac{t_1 - \frac{V \cdot x_1}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} \quad (6)$$

As it was already noticed that it is possible to present homogeneous one-dimensional space in the form of a tube.

If this tube to bend and connect its ends from a tube it is possible to receive a torus.

Let's assume that this torus is absolutely rigid and its weight infinitely big.

Then in torus one-dimensional inertial systems of readout O_1x_1 and O_2x_2 will turn to one-dimensional pseudo-inertial systems of readout O_1l_1 and O_2l_2, shown on fig. 2.

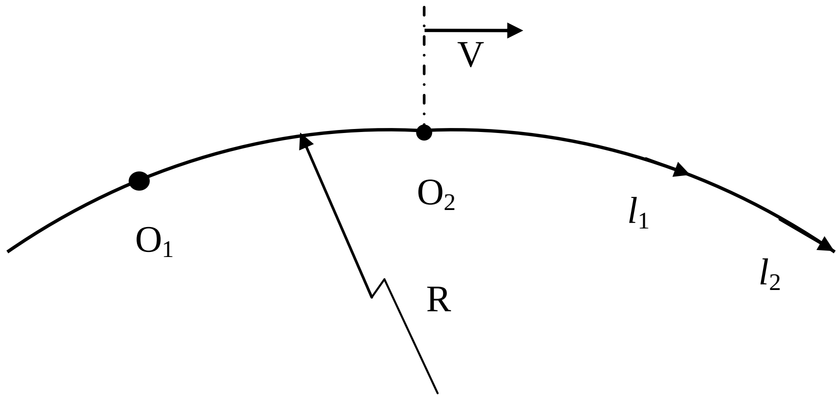

Fig. 2

At systems of readout O_1l_1 and O_2l_2 axes l_1 and l_2 are curvilinear (arches of a circle of radius R).

Also we will assume that at one-dimensional pseudo-inertial systems of readout O_1l_1 and O_2l_2:

- Axes l_1 and l_2 are on one circle of radius R and are equally directed;

- System O_2l_2 moves concerning system O_1l_1 with constant speed V;

- As time reference mark (t_1=0 and t_2=0) in both systems that moment when the beginnings of coordinates O_1 and O_2 these systems coincided is chosen.

That it was possible to consider movement of points (bodies) on axes l_1 and l_2, it is supposed that points (body), moving inside torus, don't test at the resistance movement, i.e. an impulse (speed) of a point (body) in the absence of influence of the forces enclosed on axes l_1 and l_2, will be to constants on absolute size.

In one-dimensional pseudo-inertial systems of readout O_1l_1 and O_2l_2 space (the points which are on axes l_1 and l_2) - homogeneously and time is homogeneous also.

By analogy to Lorentz's transformations, it is possible to write down communication between coordinate l_1 point at the moment of time t_1 in system of readout $O_1 l_1$ and coordinate l_2 the same point in system of readout $O_2 l_2$ at the moment of time t_2, corresponding to time moment t_1 in system of readout $O_1 l_1$:

$$l_1 = \frac{l_2 + (V \cdot t_2)}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (7)$$

$$l_2 = \frac{l_1 - (V \cdot t_1)}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (8)$$

Communication between speed V_2 movement of a point at the moment of time t_2 in system of readout $O_2 l_2$ and speed V_1 movement of the same point in system of readout $O_1 l_1$ at the moment of time t_1, corresponding to time moment t_2 in system of readout $O_2 l_2$, looks in the form of formulas (3) and (4).

By means of formulas (7) and (8) it is possible to write communication between values of times t_1 and t_2:

$$t_1 = \frac{t_2 + \frac{V \cdot l_2}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (9)$$

$$t_2 = \frac{t_1 - \frac{V \cdot l_1}{c^2}}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (10)$$

In [1] the closed mechanical system of the bodies testing constant interaction and making rectilinear movements was used.

This closed mechanical system of bodies consisting of a spring 3 and dot bodies 1 and 2, having equal weight M_0 at rest, is shown on fig. 3.

Bodies 1 and 2 are connected to absolutely elastic spring 3, which weight infinitesimal in comparison with weights of bodies 1 and 2.

Under the influence of a spring 3 bodies 1 and 2 make symmetric linear back and forth motions concerning the general center of weights of system of bodies 1 and 2 - points S.

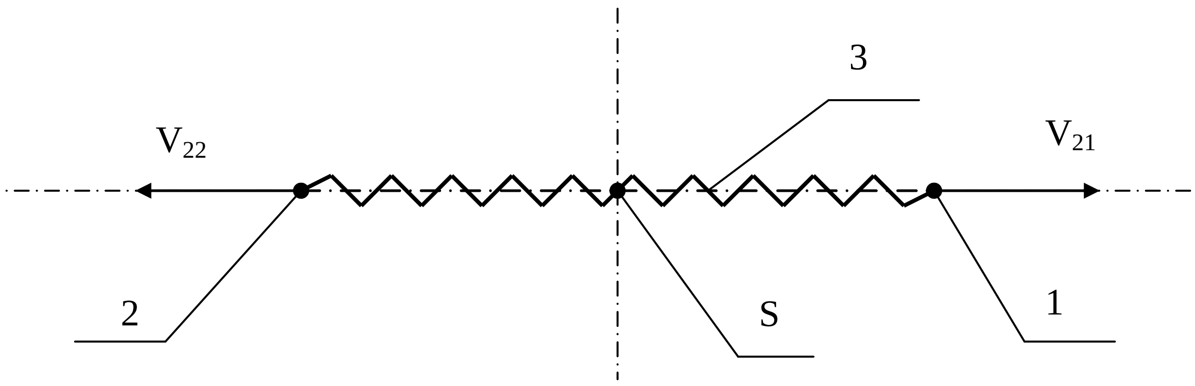

Fig. 3

Let's place the closed mechanical system of bodies 1 and 2 with a spring 3 in pseudo-inertial system of readout $O_2 l_2$ (in inside torus) so that point S would be motionless in this system of readout and coincided with the beginning of coordinates O_2, and bodies 1 and 2 would be on an axis l_2, as is shown in fig. 4.

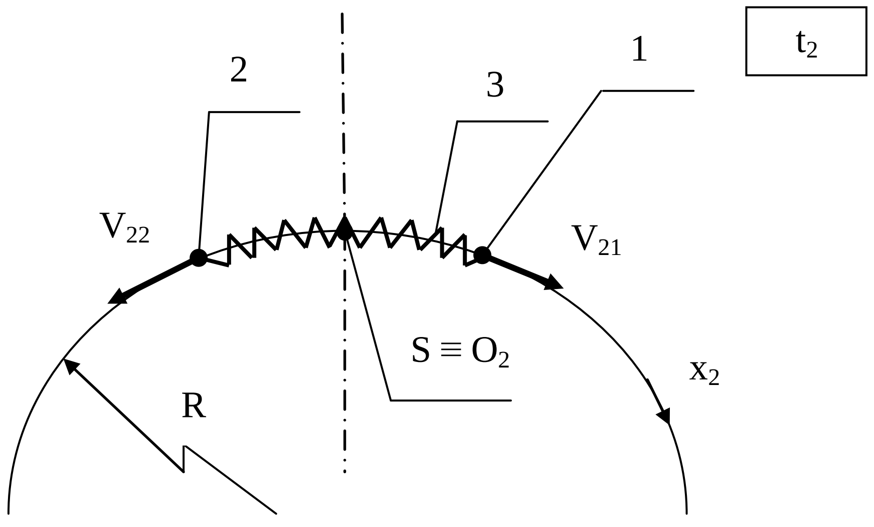

Fig. 4

In pseudo-inertial system of readout $O_2 l_2$ bodies 1 and 2 make the symmetric movements periodically repeating through time t_{2n} (the period of fluctuation of system of bodies 1 and 2 and springs 3).

Let's assume that at the moment of time reference mark (t_2=0) in system of readout O_2l_2 the spring 3 is completely compressed, bodies 1 and 2 are at rest, and bodies 1 and 2, point S and the beginning of coordinates O_2 coincide.

For the same moment of time t_2 in system of readout O_2l_2 of size of speeds V_{21} and V_{22} movements of bodies 1 and 2 accordingly will be equal on absolute size.

By analogy to [1] dependences of speeds V_{11} and V_{12} of movement of bodies 1 and 2 accordingly from time t_1 in one-dimensional pseudo-inertial system of readout O_1l_1 are represented on fig. 5.

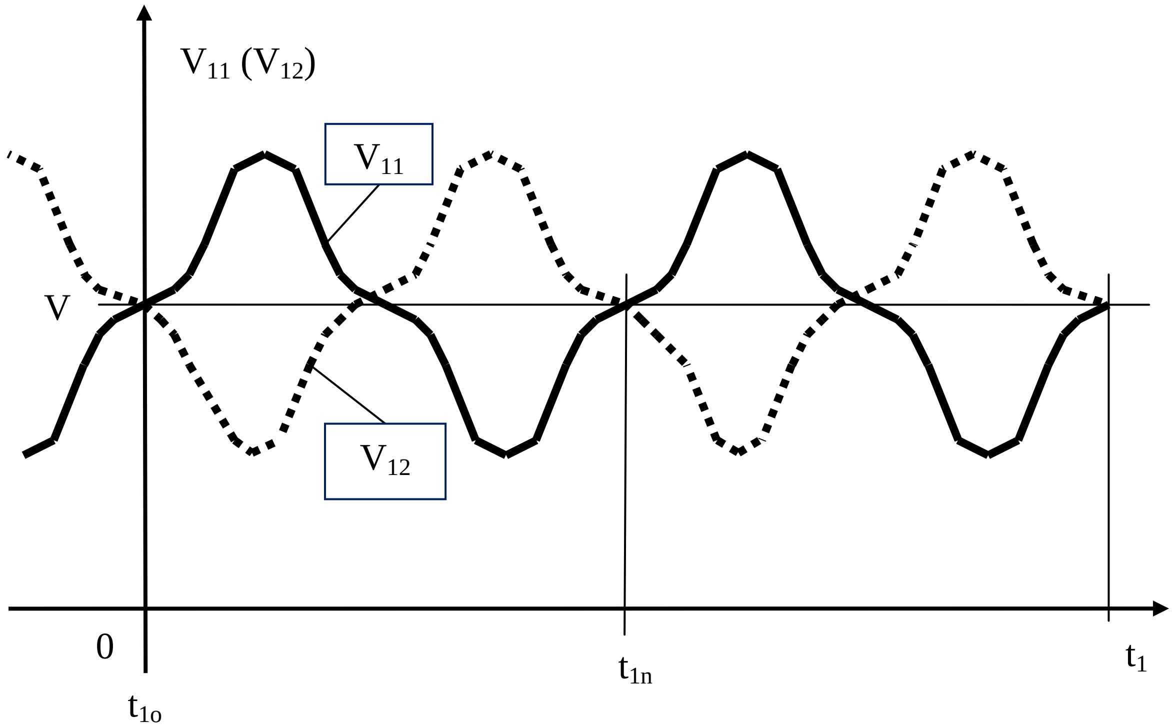

Fig.5

Knowing dependence of an impulse of a body on speed of its movement [2] it is possible to write down formulas for impulses P_{11} and P_{12} bodies 1 and 2 in system of readout O_1l_1:

$$P_{11} = \frac{M_0 \cdot V_{11}}{\sqrt{1 - \frac{{V_{11}}^2}{c^2}}} \qquad (11)$$

$$P_{12} = \frac{M_0 \cdot V_{12}}{\sqrt{1 - \frac{{V_{12}}^2}{c^2}}} \qquad (12)$$

Considering fig. 5, dependence of size P_1 equal to the sum of absolute sizes of impulses P_{11} and P_{12} of bodies 1 and 2, if speed $V_{12t} > 0$ of body 2, or difference of absolute sizes of impulses P_{11} and P_{12} bodies 1 and 2, if speed $V_{12t}<0$ of body 2, from time t_1 in one-dimensional pseudo-inertial system of readout $O_1 l_1$ look, as is shown in fig. 6.

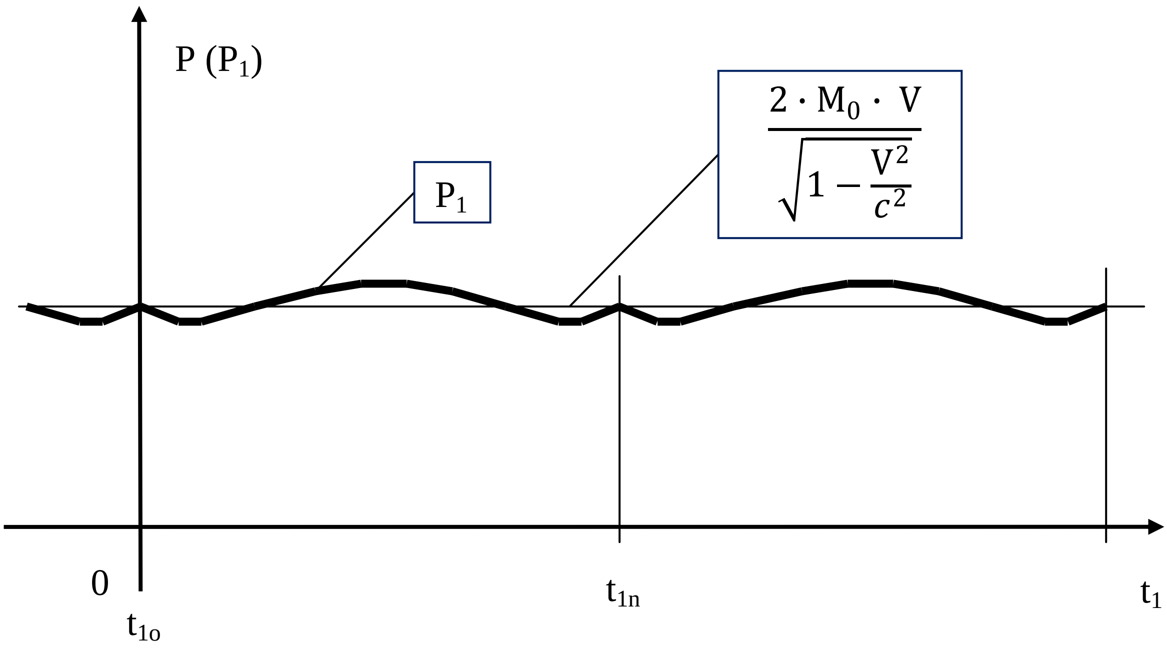

Fig.6

From fig. 6 it is visible that in one-dimensional pseudo-inertial system of readout $O_1 l_1$ the closed mechanical system of bodies 1 and 2 (and springs 3) has size P_1 variable in time t_1 (i.e. size P_1 of this closed system is time function t_1).

By analogy to use of the law of preservation of the impulse applied in [1], in the considered example with one-dimensional pseudo-inertial systems of readout $O_1 l_1$ and $O_2 l_2$ we will use the constancy of size P_1 following from uniformity of space and time, absence to resistance to movement of bodies inside torus and properties of torus: its absolute rigidity and infinitely big weight.

As a result it is possible to draw a conclusion that in one-dimensional pseudo-inertial system of readout O_1l_1 application of the special theory of a relativity at the description of movement of the closed mechanical system of the bodies considered in the given example, leads to that size P_1 depends on size of the moment of time t_1.

And it, as well as infringements of the law of preservation of an impulse in inertial system of readout, shouldn't occur in one-dimensional pseudo-inertial system of readout.

3. Condition of performance of equality of size P_1

To check up the results received above, it is necessary to define a condition at which in one-dimensional pseudo-inertial system of readout O_1l_1 for the closed system consisting of bodies 1 and 2 (and springs 3), equality of size P_1, which is equal to the sum of absolute sizes of impulses P_{11} and P_{12} of bodies 1 and 2, if speed $V_{12t} > 0$ of body 2, or difference of absolute sizes of impulses P_{11} and P_{12} of bodies 1 and 2, if speed $V_{12t} <0$ of body 2, for any moment of time t_1 will be carried out.

For consideration it is possible to choose in one-dimensional pseudo-inertial system of readout O_1l_1 two moments of time t_1 and to define a condition providing a constancy of size P_1 of system of bodies 1 and 2 (and springs 3) for these two moments of time.

As the first moment of time t_1 we will choose the right time $t_1=t_{1o}=0$.

As the second moment of time we will choose the right time $t_1=t_{1t}$ when the spring 3 from a body 1 is completely unclenched, thus speed V_{11t} movement of a body 1 is equal V (speed of movement of system of readout O_2l_2 concerning system of readout O_1l_1).

The calculations spent similarly [1], show that a necessary condition (values of speeds V_{12t} and V_{22t} of body 2 at the moment of time t_{1t} in system of readout O_1l_1 and in system of readout O_2l_2 at the moment of time t_{22t}, corresponding to time moment t_{1t} in system of readout O_2l_2, and also values of speeds V_{11t} and V_{21t} of body 1 at the moment of time t_{1t} in system of readout $O_1 l_1$ and in system of readout $O_2 l_2$ at the moment of time t_{21t}, corresponding to time moment t_{1t} in system of readout $O_2 l_2$) at which in a considered example the constancy of size P_1 in one-dimensional pseudo-inertial system of readout $O_1 l_1$ will be carried out, is:

$$V_{11t} = V_{12t} = V \qquad (13)$$

$$V_{21t} = V_{22t} = 0 \qquad (14)$$

And for performance of the equation (14) it is required, that:

$$t_{21t} = t_{22t} \qquad (15)$$

From equality (15) follows that:

- Time course in one-dimensional pseudo-inertial systems of readout $O_1 l_1$ and $O_2 l_2$ - is identical;

- The constancy of size P_1 will be carried out only when:

$$c = \infty \qquad (16)$$

In a result (by analogy with [1]) in an example considered in one-dimensional pseudo-inertial system of readout $O_1 l_1$, we have two requirements contradicting each other:

- The constancy of size P_1 demands performance of a condition (16),

- The special theory of a relativity demands, that the condition was satisfied:

$$t_{21} < t_{22} \qquad (17)$$

, arising owing to not simultaneities occurring in one-dimensional pseudo-inertial system of readout $O_2 l_2$ of events which in one-dimensional pseudo-inertial system of readout $O_1 l_1$ occur simultaneously.

Also it is possible to notice that in any two-dimensional pseudo-inertial system of readout ORl represented on fig. 7, time course is identical, since irrespective of size of radius R in any one-dimensional pseudo-inertial system of readout time course is identical, and the two-dimensional pseudo-inertial system of readout consists of infinite number of one-dimensional pseudo-inertial systems of readout.

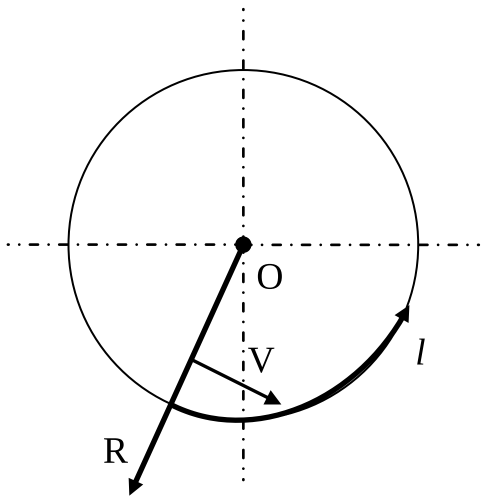

Fig. 7

4. The conclusion

In summary it is possible to notice that in all one-dimensional and two-dimensional pseudo-inertial systems of readout, as well as in all inertial systems of readout, time course is identical that contradicts the special theory of a relativity according to which should be non-simultaneity of the events occurring in different systems of readout.

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