Part 3.

The analysis of invariant properties of the Lorentz transformation.

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Introduction.

For time and positions of coordinates the Lorentz transformation is fundamental to the special theory of relativity. Lorentz transformation is fundamental to principal conclusions of this theory also. If ever this transformation is repealed the foundations of special relativity will be altered or destroyed. But for the time being the range of Michelson's experiments confirms validity of the Lorentz transformation. Because of importance of the Lorentz transformation to theoretical physics the part 3 will be analyze their physical and mathematical features in more detail. This is especially important for readers who don't know deeply principle of relativity, but easy to perceive the point of view of the supporters of the special theory of relativity on impossibility of an existence of spatial ether. As is well known, their point of view is to deny the existence of ether. Arguments for confirmation of this position are summarized roughly as follows: the model of absolute ether is absurd, since inside of moving frame of reference any Michelson experiment can show a changing of the speed of light and in such frame of reference the principle of relativity doesn't exist. Therefore, the question of the existence of absolute ether was always a matter of principle in physics, and it requires additional analysis. Briefly describe the plan for further analysis and its purpose.

The first section of the part 3 will explain how, thanks to the Lorenz equations for time and coordinates in the moving inertial frame of reference the speed of light exists without a changing. It is a simple analysis and it performs next explanation. If the frame of reference at rest and the moving frame of reference exist inside the luminous ether and the moving frame of reference obey to transformation Lorenz for the time and coordinates then inside of the moving frame of reference and inside of the frame of reference at rest the speed of light isn’t changed. This small analysis is needed for the first and second parts of this work. The work shows that if properties of inertial frames to associate with specific wave properties of the elementary particles of our world, the inertial frames of reference obey to the Lorentz transformations. Thus, when a model of absolute space and ether in the first and the second parts gives the Lorentz transformation, we can assume that the speed of light in a moving frame of reference isn't changed. It was the main goal: getting the Lorentz transformation in the model of absolute space. Because then all the conclusions of the special theory of relativity are obtained automatically by themselves. Professionals, I guess, know about it. Nevertheless, why is it done? For what is necessary to repeat the earlier results which are already recognized? These questions from the proponents of the theory of relativity I had permanently. The answers are simple to these questions. These results are obtained in the new model for physical nature of elementary particles of our world (bazon Higgs). Moreover, if the foundations of the model are correct then they will give further insight into the nature of the fabric of our world and It explains the physical nature of postulates such as the postulates of theory of special relativity and Newton's laws and so on. As we know, the nature of these postulates is not clear. This model gives an explanation and understanding of the real existing of the parallel worlds and it will be received in not the abstract, mathematical form, which gives a very slow, almost blind, forward movement of physics. Here, explanation is deduced with help of the physical model.

The second section of the part 3 will continue the detailed explanation of the reasons due to which this model exists without violation of the principle of relativity into the absolute space. This section explains with help of the mathematics and physics why inside any inertial frame of reference that has a inertial motion, you will perceive a frame of reference at rest as a moving frame of reference that has motion relatively to absolute space. This effect occurs if the moving inertial frame of reference for time and coordinates obeys to the Lorentz transformation. The Lorentz transformation has invariant properties. Because of these properties if you are inside a moving frame of reference you will not be able to consider a frame of reference existing at rest as "frame of reference at rest". The invariance of Lorentz transformation takes place from the specific allocation of time along the movement of the inertial reference frame and changing of the coordinates inside this frame of reference. Because of them, being in a moving frame of reference, it is impossible to perceive the frame of reference at rest. And in normal circumstances it is impossible to find signs which saying it is some of an inertial frame of reference that is being at absolute rest but your inertial frame of reference is moving. That is, if you would were in a moving inertial frame of reference, for frame of reference at rest, you register the slow down the flow of time reducing the length of bodies along motion, as if this frame exists at motion. It seems that there are absurd contradictions. And it is logically, if you are located as an observer inside a moving frame of reference you have to register the acceleration time for frame that exists absolutely at rest. And if inside the moving frame of reference you are reduced along the movement, in this case, in the frame of reference at rest you should to register increase of the size of a body along the motion because you yourself were reduced in size. But it will not be because inside the moving frame of reference, the physical properties your body and properties of all the material bodies obey to the Lorentz transformations. Therefore, all inertial frames of reference become as invariant frames of reference relatively to each other. In addition, if we consider three inertial frames, one of which will be a frame of reference at rest absolutely, while the other two are moving at different speeds then all of these frames of reference are equivalent to each other and the principle of relativity between them is saved. All of this analysis show that the introduction of absolute space is not contrary to the principle of relativity. And in all inertial frames of reference moving relative to absolute space under normal conditions the experiments class of Michelson will not register a change in the speed of light or violations of Lorentz transformations.

The third section of the part 3 will analyze the transformation of energy and momentum in the transition from one inertial frame of reference to another a moving frame of reference. The momentum is associated with the passage of time in own frames of reference of bodies. It gives the change in the momentum transfer in these frames of reference. It takes place because of slowdown of time flow at motion. And requirement to preservation of motion energy of body leads to the automatic change of relativistic mass of the body. Existing attempts in literature for conclusion of change of the mass at motion on the basis of other physical presupposition from my point of view are not consistent. So, as an example, in the third section, there is conclusion that will remind you about conservation of momentum at relativistic speeds. It will show how the Lorentz transformations give automatically the increase of relativistic mass in inertial frame of reference at motion. The Lorentz transformation is a basis of other findings of the special theory of relativity. This applies to energy, etc. Everything revolves around this transformation in the direct or indirect latent form. It does not make sense to disclose all such findings in a detailed form. If a reader is interested by these issues in detail I hope the reader can to do that without assistance. For initial aid for the reader there are three sections in this part.

1. Derivation of constant speed of light, in the inertial frame of reference, which conforms to Lorentz transformation.

Consider two frames of reference. The first of frames of reference is at rest. See figure **1**.

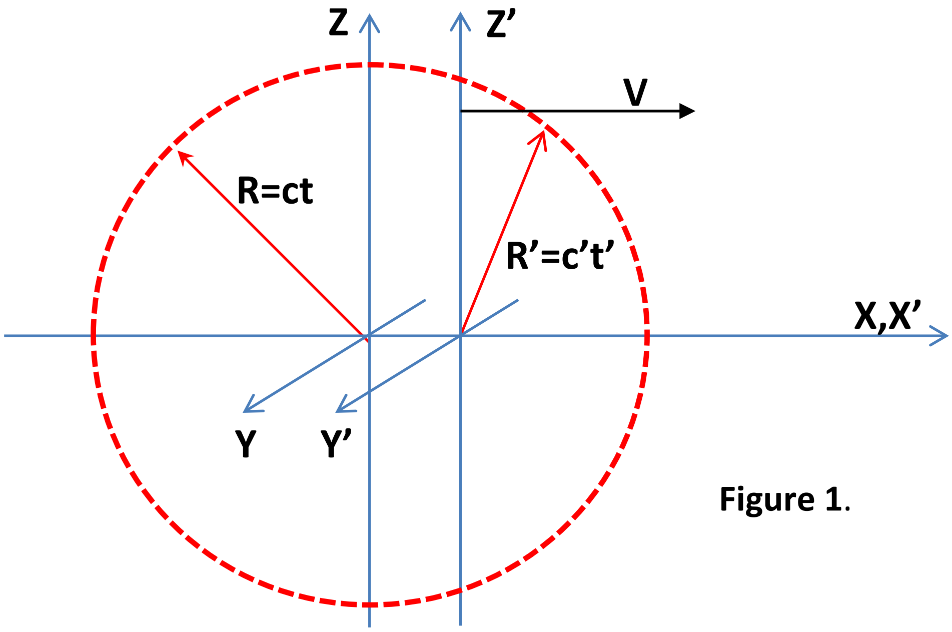

Figure 1.

Let's denote its axes of coordinates and time with help **X, Y, Z, t**. The time **t** in Figure **1** isn't displayed. The second frame of reference moves relative to the first frame of reference at a constant speed **V** without rotation. Let the movement takes place along the positive direction of the **X**-axis relative to the frame of reference at rest. Let's denote its axes of coordinates and time with help **X', Y', Z', t'**. A point in time when the frames of reference were combined with each other by centers we take as **t = 0** and **t '= 0** for each of the frames of reference. Let the frame of reference **X, Y, Z** will be at rest relative to absolute space. We assume that light travels through the ether of the absolute space, which is fixed. Then the speed of light in ether is constant and does not depend on motion of the frames of reference.

Let's assume that at time zero from the joint centers of the frames of reference a flash of light is emitted. In the frame of reference at rest the light spreads in form of a sphere at speed of **c**. At time **t** the sphere's radius is equal to **R=ct** wherein **R** is $R=(x^2+y^2+z^2)^{1/2}$. Inside the moving frame of reference, the light will spread at different speeds. In the negative direction of the axis **X'** speed of light is equal to the speed **V** increased by moving of this frame of reference and will be equal to **c' = c + V.** In the positive direction of the axis **X'** speed of light is reduced due to the motion of the moving frame of reference. In this case, the speed of light is equal to **c'=c-V**. Along axes **Y'**,**Z'** the speed of light is equal to $c'' = (c^2 - V^2)^{1/2}$. Such is the picture of the propagation of light in the classical frames of reference.

Now assume that the moving frame of reference obeys to the Lorentz's transformation for coordinates and time. It takes place relative to frame of reference at rest:

$$X' = \frac{x -/+ Vt}{\sqrt{1-\frac{V^2}{C^2}}}; \quad Y'=Y; \quad Z'=Z; \quad t' = \frac{t -/+ \frac{V}{C^2}x}{\sqrt{1-\frac{V^2}{C^2}}} \qquad (1)$$

Now we will compare the propagation of light in such a frame of reference with respect to the frame of reference at rest. For the frame of reference at rest, equation of propagation for spherical wave in an arbitrary point in time **t** is:

R = ct, где $R = \sqrt{x^2 + y^2 + z^2}$

Alternatively, it can be written as is $t = \frac{\sqrt{x^2+y^2+z^2}}{c}$ **(2)**

In a moving frame of reference, the propagation of light can be written as are

$(R')^2 = (c')^2 (t')^2$ **(3)** , here $(R')^2$ is $(R')^2 = (x')^2 + (y')^2 + (z')^2$

Making the substitution into (3) out of the Lorentz transformation (1), we get

$$\frac{(x -/+ Vt)^2}{1-\frac{V^2}{C^2}} + Y^2 + Z^2 = (c')^2 \frac{(t -/+ \frac{V}{C^2}x)^2}{1-\frac{V^2}{C^2}}$$

After some transformations, we obtain:

$$c^2(X -/+ Vt)^2 + (c^2-V^2)Y^2 + (c^2-V^2)Z^2 = (c')^2c^2(t -/+ \frac{V}{C^2}X)^2$$

From the last expression we find the unknown value of the speed of light in the moving frame of reference $(c')^2$. It is equal to:

$$(c')^2 = \frac{c^2(X-/+Vt)^2+(c^2-V^2)Y^2+(c^2-V^2)Z^2}{c^2(t-/+\frac{V}{c^2}X)^2}$$

Now we execute the substitution of value **t** from the expression (2).

$$(c')^2 = \frac{c^2(X-/+\frac{V}{C}\sqrt{X^2+Y^2+Z^2}\,)^2+(c^2-V^2)Y^2+(c^2-V^2)Z^2}{c^2(\frac{\sqrt{X^2+Y^2+Z^2}}{c}-/+\frac{V}{c^2}X)^2} =$$

$$= c^2\,\frac{(cX-/+V\sqrt{X^2+Y^2+Z^2}\,)^2+(c^2-V^2)Y^2+(c^2-V^2)Z^2}{(c\sqrt{X^2+Y^2+Z^2}-/+VX)^2} =$$

$$= c^2\,\frac{c^2X^2-/+2cXV\sqrt{X^2+Y^2+Z^2}+V^2X^2+V^2Y^2+V^2Z^2+c^2Y^2-V^2Y^2+c^2Z^2-V^2Z^2}{(c\sqrt{X^2+Y^2+Z^2}-/+VX)^2} =$$

$$= c^2\,\frac{c^2(X^2+Y^2+Z^2)-/+2cXV\sqrt{X^2+Y^2+Z^2}+V^2X^2}{(c\sqrt{X^2+Y^2+Z^2}-/+VX)^2} =$$

$$= c^2\,\frac{(c\sqrt{X^2+Y^2+Z^2}-/+V\,X)^2}{(c\sqrt{X^2+Y^2+Z^2}-/+VX)^2} = c^2 = (c')^2 \text{ or } c' = c$$

This equality shows that if in the moving frame of reference the time and coordinates are subjected to the Lorentz transformations, the light in this frame of reference is propagated exactly as in the frame of reference at rest. Therefore, with the help of a class of experiments of Michelson it is impossible to determine the movement of the frame of reference relative to absolute space (ether). Since the velocity **V** can take any value, the above is true for any velocity **V** from zero up to light speed.

Thus, from the mathematical analysis is above it can be concluded that if for the model in this work (parts 1 and 2) the Lorentz's transformations are obtained for inertial frame of reference at motion, in this case, in such frame of reference the propagation of light is the same as in the frame of reference at rest. Moreover, it must be noted that in contrast to the model of frames of reference in the special theory of relativity the model of the first and second parts discloses the essence of this phenomenon. It is based on the wave properties of fabric (matter) of our world.

2. Perception of frame of reference at rest from point of view of an inertial frame of reference at motion that obeys to the Lorentz transformations.

Thus, the first section has executed a direct transition from frame of reference at rest into a moving frame of reference. This transition was subjected to the Lorentz transformation. If we consider such transition in the theory of special relativity this transition was performed on the basis of the postulate which states that the speed of light in any inertial frame is constant. In the theory of special relativity in order to perform the postulate, affine frame of reference was found with help of mathematical modeling. Such reference frame gives the Lorentz transformation for the direct transition from the frame of reference at rest to a moving frame of reference, in case if weighting factor is applying to this transition. The reverse transition from the frame of reference at motion to the frame of reference at rest is automatically obtained because of the invariance of the Lorentz transformations. This property allowed simulating transitions in both directions mathematically without explaining why there are these changes for coordinates and the time in the inertial frames of reference. In such simulation the ether was not needed. It was replaced by mathematics.

In order to ensure that the Lorentz transformation is invariant, consider the reverse transition in more detail. Revers transition is by transition from the frame of reference at motion to the frame of reference at rest. We assume that the direct transition from the frame of reference at rest to the frame of reference at motion is already there. In this work the part 1 gives a natural explanation for this physical phenomenon. The analysis will be carried out without frames of reference from the special theory of relativity. Analyses were carried out using conventional classical frames of reference. Let us analyze the transition. We assume that the coordinates and the time in frame of reference at motion relative to frame of reference at rest are subjected to the Lorentz transformations. Consider the Figure 2. It shows frame of reference at rest with its metric on the axes **X,Y,Z**. The frame of reference has an arbitrary point **x** (x-small) on the positive half **X**- axis.

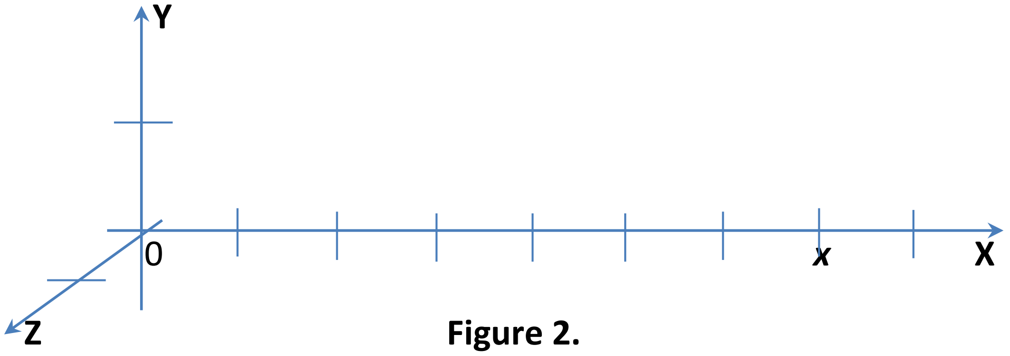

Figure 2.

Let's add a moving frame of reference (**X',Y',Z'**) to the picture 2. This frame of reference has own metric. According to Lorentz transformation on the axes **Y'**, **Z'** the metric coincides with the metric **Y, Z** frame of reference at rest. On the axis **X'** metric is reduced. Frame of reference will move relative to frame of reference at rest at speed **V**. The motion will take place along positive direction of **X** -axis without rotation. Center of the moving frame of reference has a small, arbitrary shift on **Z** -axis. This shift is made only for artificially improving image perception. At time **t,t '= 0** center of the moving frame of reference is located on the axis **Z**. See figure 3.

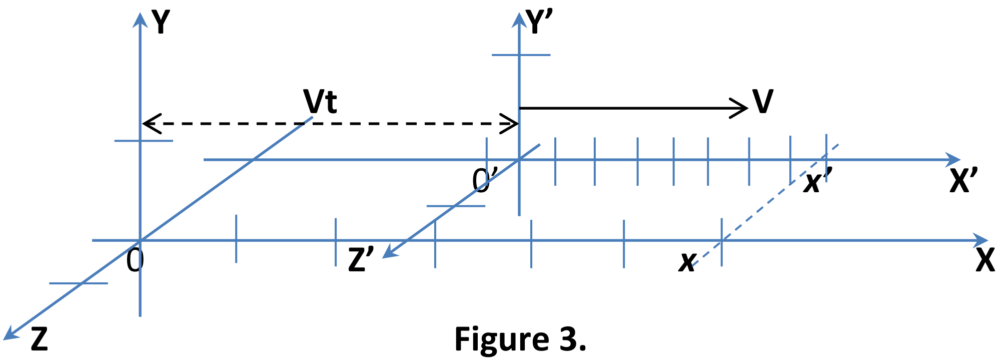

Figure 3.

Inside of the moving frame of reference at time **t** position of point **x** will correspond to the point **x'**. If we don't take into account of the metric of the axis **X'** in moving frame of reference, the length of the segment **0'*x'*** is equal to ***x*-Vt**. However, the moving frame of reference has relativistic contraction of material bodies along the axis **X'**, including measuring rulers. For this reason, onto the interval ***x*-Vt** is placed more metric lengths and we have to write the coordinate **x'** in the following form:

$$x' = \frac{x - Vt}{\sqrt{1 - \frac{V^2}{c^2}}} \quad (4)$$

Let's perform the transition back in order to estimate the changing of the coordinates of the frame of reference at rest relative to the frame of reference at motion. The transition back will analyze step by step in detail. Obviously, along axes **Z'** and **Z**, **Y'** and **Y** the transitions don't give changes on axes because **Z'= Z, Y' = Y.** The picture is changed between the axes **X** and **X'**. Let us consider it in more detail. We perform the first action of the transition. From (4) we obtain:

$$\boldsymbol{x - Vt = x'\sqrt{1-\frac{V^2}{C^2}}} \quad \textbf{(5)}$$

This result underlines the complete asymmetry of the two frames of reference. In case if the result would have symmetry the segment length ***x – Vt*** should be equal to the value ***x'***. But in the frame of reference along the axis **X'** the metric reduced according to the value of the relativistic root. See the figure 3. Because of this, in formula (4) in the denominator there is the relativistic root. If you perform the reverse transition out of the moving frame to the frame of reference at rest the length **x'** should be reduced in order to reduce the artificially increasing of the absolute length **x'**. This reduction is performed with using of the relativistic root which acts with a multiplication on the length of **x'**. This is essence of the action for the relativistic root on the right side of equation (5). Let's do the next step is for the formula (5).

$$\boldsymbol{x = x'\sqrt{1-\frac{V^2}{C^2}} + Vt} \quad \textbf{(6)}$$

In expression (6) segment ***Vt*** is a special shift during time t. This restores motion of the frame of reference during time **t** with respect to point zero of the frame of reference at rest. See figure 3. This segment by itself is not subjected to transformation because of the metrics of the frame of reference at motion. Therefore, in (6), it is as an additional element without mathematical influences.

Now it is clear that the expression (6) for relations of the coordinate axes **X'** and **X** gives the asymmetry for the reverse transition from frame of reference at motion to the frame of reference at rest. See the formula (4) and (6). It would seem that the reverse transition is a violation of the principle of relativity, but in the expression (6) the element ***Vt*** has a time **t** that belongs the frame of reference at rest. But we need find a relation between the parameters of the frame of reference at motion and of the frame of reference at rest. Therefore it is necessary to associate the time **t** with the time **t'**. For this we use the Lorentz transformation to the time that ties time **t** of the moving frame of reference to the frame of reference at rest.

$$t' = \frac{t - \frac{V}{c^2}X}{\sqrt{1 - \frac{V^2}{c^2}}} \qquad (7)$$

We find from (7) the time **t**. For the finding we will do the following

$$t'\sqrt{1 - \frac{V^2}{c^2}} = t - \frac{V}{c^2}X$$

Hence, the time t is

$$t = t'\sqrt{1 - \frac{V^2}{c^2}} + \frac{V}{c^2}X \qquad (8)$$

Pay attention to the last term in this expression: $\frac{V}{c^2}X$. This a time, but it is associated only with the location of the point **X** on the **0X** -axis and in during time it doesn't change. Making the substitution of obtained value (8) for the time in the expression (6). Then we get:

$$x = x'\sqrt{1 - \frac{V^2}{c^2}} + V\left(t'\sqrt{1 - \frac{V^2}{c^2}} + \frac{V}{c^2}X\right) = \frac{V^2}{c^2}X + Vt'\sqrt{1 - \frac{V^2}{c^2}} + x'\sqrt{1 - \frac{V^2}{c^2}}$$

This result is displayed in Figure 4.

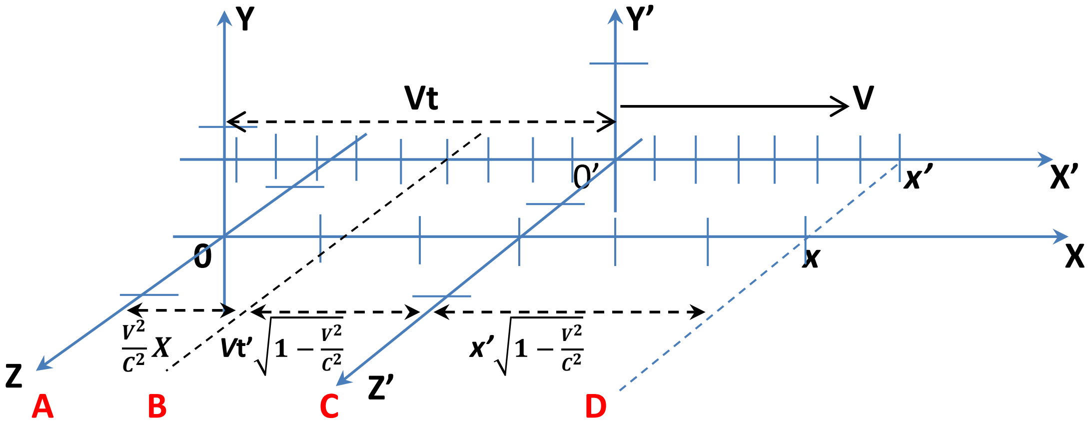

Figure 4.

Figure 4 shows a segment **0x**. It is divided into three sections, i.e. **0x** = **AD** = **AB** + **BC** + **CD** where are

$$\mathbf{AB} = \frac{V^2}{c^2}X\ ,\ \mathbf{BC} = Vt'\sqrt{1-\frac{V^2}{c^2}}\ ,\ \mathbf{CD} = x'\sqrt{1-\frac{V^2}{c^2}}\ .$$

From this result, it is clear that the time-varying displacement ***Vt*** consists of two components. One of the components is a constant that is equal to $\frac{V^2}{c^2}X$ and depends only on the position of **X**.

This component appears due to the changing time along axis **X'** in the moving frame of reference. If we consider the segment **BD** then it is a constant over time too and segment **BD** depends on the chosen point ***X*** in the frame of reference at rest. It can be found equal to

$$\mathbf{BD} = \mathbf{AD} - \mathbf{AB} = X - \frac{V^2}{c^2}X = X\left(1 - \frac{V^2}{c^2}\right)$$

But the total length of this segment has a connection with the time **t'** and the coordinate **x'**. See figure 4. According to this figure we obtain:

$$\mathbf{BD} = X\left(1 - \frac{V^2}{c^2}\right) = Vt'\sqrt{1-\frac{V^2}{c^2}} + x'\sqrt{1-\frac{V^2}{c^2}}$$

The segment **BD** has a shorter metric. But since this metric is strictly related to location of the point of ***X*** then we can find an unit metric to measure the distance up to the point ***X***. The distance up to this point ***X*** in new metric is equal to:

$$X = \frac{Vt'\sqrt{1-\frac{V^2}{c^2}} + x'\sqrt{1-\frac{V^2}{c^2}}}{1-\frac{V^2}{c^2}} = \frac{x' + Vt'}{\sqrt{1-\frac{V^2}{c^2}}}$$

Given that ***Z = Z'***, ***Y = Y'*** we are getting the full inverse Lorentz transformation for coordinates

$$X = \frac{x' + Vt'}{\sqrt{1-\frac{V^2}{c^2}}}\ ;\quad Z=Z',\quad Y=Y'$$

Last result shows that in the frame of reference at rest, the coordinates are also subjected to the Lorentz transformations. Let's analyze physics of the result in this reverse transition. To understand it better, we first consider a hypothetical frame of reference at motion. Let this frame of reference is obeying to the following transformation. It takes place relatively to frame of reference at rest.

$$x' = \frac{x - Vt}{\sqrt{1 - \frac{V^2}{C^2}}};\ y' = y;\ z' = z;\ t' = \frac{t}{\sqrt{1 - \frac{V^2}{C^2}}}$$

This transformation differs from Lorentz transformation by lack of the second element for time when there is a passage from **t** to **t** '. It is additional time.

$$\frac{-\frac{V}{C^2}X}{\sqrt{1 - \frac{V^2}{C^2}}}$$

This time is distributed along the **X**-axis. Let's perform common inverse transformation for the hypothetical frame of reference. It is equal to

$$x = (x' + Vt')\sqrt{1 - \frac{V^2}{C^2}};\ y = y';\ z = z';\ t = t'\sqrt{1 - \frac{V^2}{C^2}}$$

The result shows that the hypothetical frame of reference does not give invariance transformations in the reverse transition. The frame of reference turns out an asymmetrical. Without additional mathematical analysis, it could be argued that the speed of light will have a different meaning in the frames of reference that are related with help of such transitions.

However, note the following are. The hypothetical frame of reference gives the correct asymmetrical transition to the frame of reference at rest. It has a reduction of spatial and time metrics relative to the frame of reference at rest. So, for example, at the reverse transition to the **x**-axis, on axis **x'**, a distance must be multiplied by the relativistic root.

It is obvious that in the considered transformations, there is not symmetry due to lack of the additional element for time in the direct transformation. It is that gives correction metric along the **x**-axis when there is the reverse transition to the Lorentz transformation. Let's consider how this additional element of time affects the metric.

To do this, go back to the Figure 4. It is seen that absolute shift (**Vt**) is equal to two components:

$$Vt = Vt'\sqrt{1 - \frac{V^2}{C^2}} + \frac{V^2}{C^2}X$$

The first component of the sum is real shift of the frame of reference during time **t'**. The second component of the sum is a shift of the frame of reference, which appears due to the second element of time. The shift provides a time that does not change over time and this time is a function of the position in space of a point on the **x**- axis. Shift of frame of reference during this time can be called a virtual shift. In the physical movement it does not exist. This shift reflects presence of changes in properties of the frame of reference. To understand a hidden action of the shift, let's perform this analyze with help of an observer.

It is obvious that during of absolute time (**t**) the observer detects the shift of the frame of reference, its value is equal to **Vt**. Virtual motion of the frame of reference with respect to himself, he cannot see. However, inside of the absolute length **Vt** the additional shift should be because the observer at the point **x** has the additional time that is equal to ($\frac{V}{C^2}X$). For this time, the observer must ascertain additional shift. Its length is equal to ($\frac{V^2}{C^2}X$).

But in absolute measurement, the frame of reference has the motion, which is equal to **Vt**, and there is no additional motion of the frame of reference. Here we have a seeming contradiction. But in reality it is not, since in a fixed length **Vt** the additional shift is possible if there is a natural decrease in the metric of the length. More short metric enables to include greater length ($\frac{V^2}{C^2}X$ and **Vt'**$\sqrt{1-\frac{V^2}{C^2}}$) inside fixed length (**Vt**). This is the physics of changes of properties of the frame of reference at rest from a position of a moving frame of reference. Therefore, because of the changing of metric onto **x**-axis, the segment (**BD**) is equal to **BD** = $X(1 - \frac{V^2}{C^2})$. Changing of the metric because of distribution of time along the movement gives the end result for reverse Lorentz transformation. For this reverse Lorentz transformation, the frame of reference at motion is transformed into the frame of reference at rest and the frame of reference at rest is transformed into the frame of reference at motion, which moves in the opposite direction. In this case the transition from one frame of reference to another keeps in force the Lorentz transformation. A similar analysis can be performed for the reverse transition of time. Because of identity of such analysis to the performed analysis, it will not be executed.

Obviously, the reason for invariance of the inverse transformation of Lorentz is provided by the frame of reference at motion. This frame of reference obeys to the Lorentz transformation at a direct transition out of frame of reference at absolute rest. It is property of the system that gives at the reverse transition the perception of frame of reference at absolute rest as frame of reference at motion, which is subjected to the same Lorentz transformation. However, the property of moving frame of reference cannot be determined by abstract reasons. Physical properties of frame of reference must be connected with the properties of the physical space and the properties of material bodies of our space.

The model proposed here, gives explanation of this connection. This model reveals the essence of the general connections between material objects of our world, parallel space and space of our world.

For a more complete reverse transition, it remains to analyze the relationship between the times of the two frames of reference.

Let's consider it with purely mathematical transformations. We write expression of the direct Lorentz transformation for the time from a point of view of the frame of reference at rest onto a frame of reference at motion.

$$\mathbf{t'} = \frac{t - \frac{V}{C^2}X}{\sqrt{1 - \frac{V^2}{C^2}}}$$

We transform this expression to the form:

$$\mathbf{t'}\sqrt{1 - \frac{V^2}{C^2}} = \mathbf{t} - \frac{V}{C^2}X \quad \text{or} \quad \mathbf{t} = \mathbf{t'}\sqrt{1 - \frac{V^2}{C^2}} + \frac{V}{C^2}X$$

We use the expression (6) in order to replace the value of **X**. Then we obtain the following

$$\mathbf{t} = \mathbf{t'}\sqrt{1 - \frac{V^2}{C^2}} + \frac{V}{C^2}\left(x'\sqrt{1 - \frac{V^2}{C^2}} + Vt\right) = \mathbf{t'}\sqrt{1 - \frac{V^2}{C^2}} + \frac{V}{C^2}x'\sqrt{1 - \frac{V^2}{C^2}} + \frac{V^2}{C^2}\mathbf{t}$$

$$\text{or} \quad \mathbf{t}\left(1 - \frac{V^2}{C^2}\right) = \mathbf{t'}\sqrt{1 - \frac{V^2}{C^2}} + \frac{V}{C^2}x'\sqrt{1 - \frac{V^2}{C^2}}$$

The last equation gives the Lorentz transformation for the time.

$$t = \frac{t' + \frac{V}{c^2}X'}{\sqrt{1-\frac{V^2}{c^2}}}$$

The results for the time and coordinates show that inside absolute space from the point of view of a moving frame of reference it is impossible to define that the frame of reference at rest is motionless.

The above analysis considered two of the transition. The first transition was direct transition from a frame of reference at rest to a moving frame of reference. Speed of the frame of reference at motion, was introduced in an arbitrary range of 0≤**V**<c. Here the direct transition wasn't considered. You can see the proof for the direct transition in part 1 and part 2 this work. The reverse transition is carried out from a moving frame of reference to the frame of reference at rest. Figure 5 shows these two transitions.

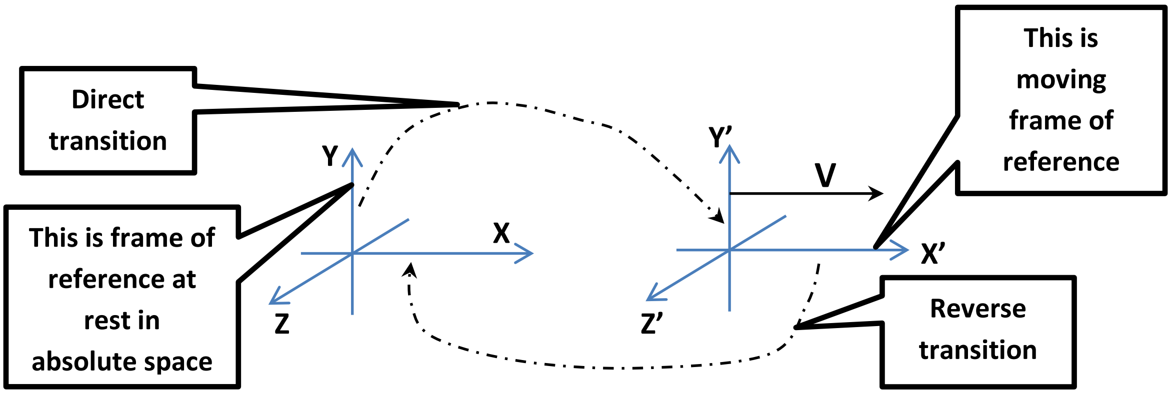

Figure 5.

For a more complete check of invariance Lorentz transformation, it is required to consider another transition between two inertial frames of reference. Let these two frames of reference are moving linearly with different constant velocities relative to the fixed frame of reference at rest. This frame of reference is fixed with respect to absolute space. The two frames of reference move without rotation along the positive axis x of the fixed frame of reference. Let the time and coordinates each of frames of reference relative to the frame of reference at rest are subjected to the Lorentz transformations. We need find out the next: does the transition obey to the Lorentz transformations between moving frames of reference? See Figure 6.

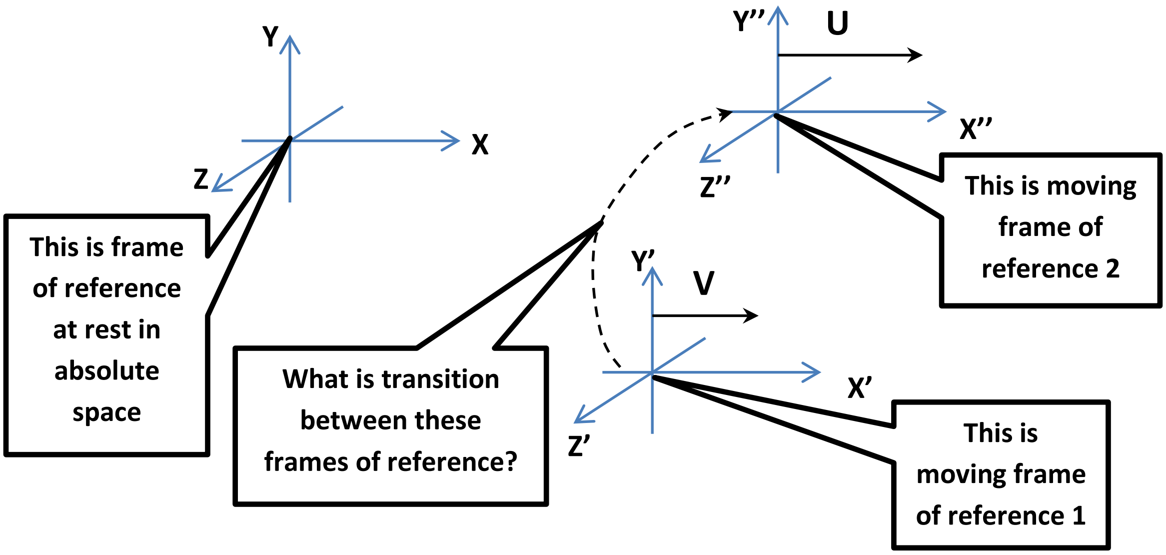

Figure 6.

To determine this transition we need perform two intermediate transitions. See Figure 7.

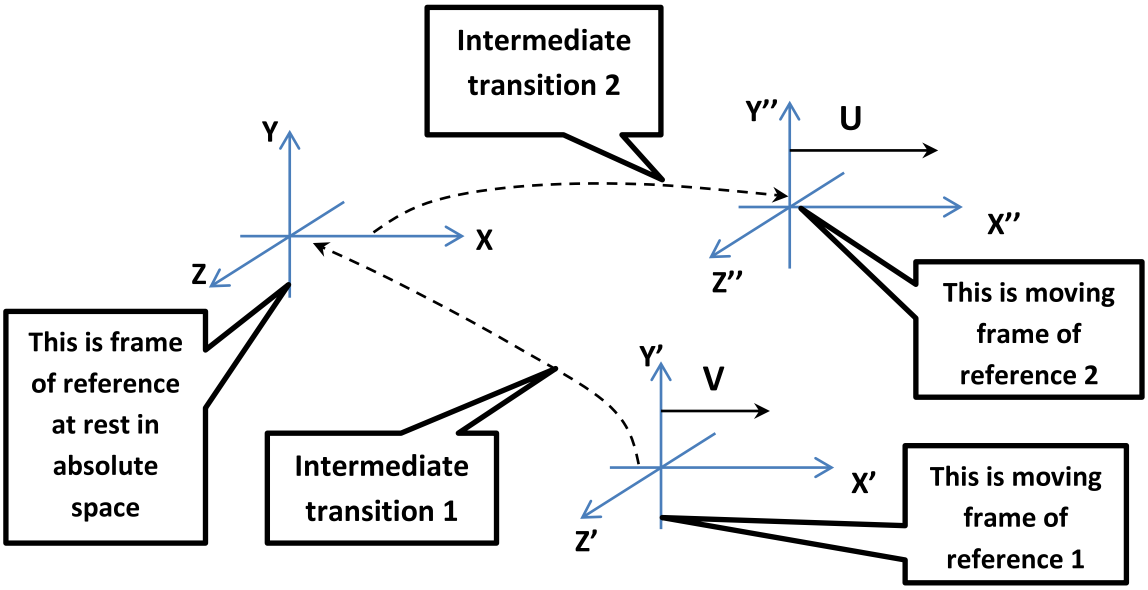

Figure 7.

The first intermediate transition will give link between the moving frame 1 of reference **(X',Y',Z',t')** and the frame of reference **(X,Y,Z,t)** at rest. The second intermediate transition will give link between the frame of reference **(X,Y,Z,t)** at rest and the moving frame 2 of reference **(X'',Y'',Z'',t'')**. The sum of these two transitions gives a general transition from the moving reference frame 1 into the moving frame of reference 2. Let's perform these transitions. Before performing mathematical analysis let's agree that the speed **U** of the second frame of reference more the speed **V** of the first frame of reference. Both speeds are considered relative to the frame of reference that is at rest in absolute space. Let's write the Lorentz transformation for the first transition.

$$X = \frac{x' + Vt'}{\sqrt{1-\frac{V^2}{C^2}}} \;;\quad Y=Y'; \quad Z=Z'; \quad t = \frac{t' + \frac{V}{C^2}x'}{\sqrt{1-\frac{V^2}{C^2}}} \qquad \textbf{(9)}$$

It links the coordinates **X', Y', Z'** and the time **t'** of the first moving frame of reference with coordinates **X, Y, Z** and the time **t** of the frame of reference at rest. Lorentz transformations for the second transition is following

$$X'' = \frac{x - Ut}{\sqrt{1-\frac{U^2}{C^2}}} \;;\quad Y''=Y; \quad Z''=Z; \quad t'' = \frac{t - \frac{U}{C^2}x}{\sqrt{1-\frac{U^2}{C^2}}} \qquad \textbf{(10)}$$

This transition gives relationship between the coordinates **X, Y, Z** and the time **t** of the frame of reference at rest and **X'', Y'', Z'', t''** of the second moving frame of reference. But for further mathematical analysis we need the transition between the two moving frames of reference. Therefore, in the last equalities (10) let's will make a replacement of values **X, Y, Z, t**. They will be taken from (9). Such a replacement will link the values (**X'', Y'', Z'', t''**) of second moving frame of reference with the values (**X', Y', Z', t'**) of first moving frame of reference. Let's carry out these changes:

$$X'' = \frac{\frac{x' + Vt'}{\sqrt{1-\frac{V^2}{C^2}}} - U\frac{t' + \frac{V}{C^2}x'}{\sqrt{1-\frac{V^2}{C^2}}}}{\sqrt{1-\frac{U^2}{C^2}}} \;;\quad Y''=Y'; \quad Z''=Z'; \quad t'' = \frac{\frac{t' + \frac{V}{C^2}x'}{\sqrt{1-\frac{V^2}{C^2}}} - \frac{U}{C^2}[\frac{x' + Vt'}{\sqrt{1-\frac{V^2}{C^2}}}]}{\sqrt{1-\frac{U^2}{C^2}}}$$

(11).

At first, let's perform mathematical transformations for the time **t''**

$$t'' = \frac{\frac{t' + \frac{V}{c^2}x'}{\sqrt{1-\frac{V^2}{c^2}}} - \frac{U}{c^2}[\frac{x'+Vt'}{\sqrt{1-\frac{V^2}{c^2}}}]}{\sqrt{1-\frac{U^2}{c^2}}} = \frac{t' + \frac{V}{c^2}X' - \frac{U}{c^2}X' - \frac{VU}{c^2}t'}{\sqrt{1-\frac{V^2}{c^2}}\sqrt{1-\frac{U^2}{c^2}}} = \frac{t'\left(1-\frac{VU}{c^2}\right) + \frac{V-U}{c^2}X'}{\sqrt{1-\frac{V^2}{c^2}}\sqrt{1-\frac{U^2}{c^2}}} =$$

$$= \frac{\left(1-\frac{UV}{c^2}\right)[t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X']}{\sqrt{1-\frac{V^2}{c^2}}\sqrt{1-\frac{U^2}{c^2}}} = \frac{t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X'}{\frac{\sqrt{1-\frac{V^2}{c^2}}\sqrt{1-\frac{U^2}{c^2}}}{\left(1-\frac{UV}{c^2}\right)}} = \frac{t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X'}{\frac{\sqrt{c^2-V^2}\sqrt{c^2-U^2}}{c^2\left(1-\frac{UV}{c^2}\right)}} =$$

$$= \frac{t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X'}{\frac{\sqrt{c^4-c^2U^2-c^2V^2+U^2V^2}}{c^2\left(1-\frac{UV}{c^2}\right)}} = \frac{t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X'}{\frac{\sqrt{c^4-c^2U^2-c^2V^2+U^2V^2-2c^2UV+2c^2UV}}{c^2\left(1-\frac{UV}{c^2}\right)}} =$$

$$= \frac{t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X'}{\frac{\sqrt{(c^2-UV)^2 - c^2(V-U)^2}}{(c^2-UV)}} = \frac{t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X'}{\sqrt{1-\frac{c^2(U-V)^2}{(c^2-UV)^2}}} = \frac{t' - \frac{U-V}{c^2\left(1-\frac{UV}{c^2}\right)}X'}{\sqrt{1-\frac{(U-V)^2}{c^2(1-\frac{UV}{c^2})^2}}} \quad \textbf{(12)}$$

Consider the last result. There is a fraction in the numerator and the denominator. It is equal to the value of some speed. We denote it by the letter **U'** and write down its value

$$U' = \frac{U-V}{(1-\frac{UV}{c^2})} \quad \textbf{(13)}$$

In order to understand the physical meaning of the velocity **U'** let's consider Figure 8, and analyze a speed with which the second frame of reference **X'', Y'', Z''** is moving relative to the first frame of reference **X', Y', Z'**. We denote the unknown velocity as U' and find its value.

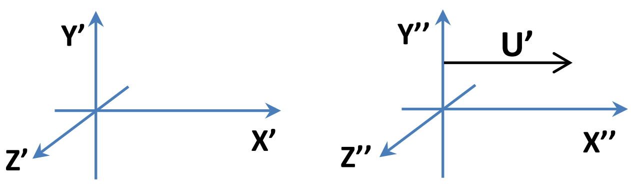

Figure 8.

Speed conclusion will be performed in a simplified form but it will give the exact speed to final value of **U'**.

In the first reference frame of reference **X', Y', Z'** let's consider two infinitesimal interval associated with the movement of the second frame of reference. Suppose the first interval $\Delta X'$ corresponds to the displacement of the second frame of reference on axis ***X'***. The second interval corresponds to the time **t'**. It is equal to an interval of the time during which the second frame of reference is shifted by the amount ***ΔX'*** along the axis ***X'***. Since the speed of the first frame of reference and the second frame of reference are known only to a relatively frame of reference at rest, let's find out the intervals with help of the Lorentz transformation of the frame of reference at rest. On the axis ***X'***, the first interval is equal to

$$\Delta X' = \frac{\Delta X - V\Delta t}{\sqrt{1-\frac{V^2}{C^2}}}$$

We take the second interval over time:

$$\Delta t' = \frac{\Delta t - \frac{V}{C^2}\Delta X}{\sqrt{1-\frac{V^2}{C^2}}}$$

Let's find the ratio of the two intervals:

$$\frac{\Delta X'}{\Delta t'} = \frac{\Delta X - V\Delta t}{\Delta t - \frac{V}{C^2}\Delta X} = \frac{\frac{\Delta X}{\Delta t} - V}{1 - \frac{V}{C^2}\frac{\Delta X}{\Delta t}} \qquad \textbf{(14)}$$

The ratio ***ΔX'/Δt'*** is velocity of the second frame of reference that is moving relative to the first frame of reference. The ratio ***ΔX/Δt*** is equal to the velocity of the second frame of reference it is relative to the frame of reference at rest in absolute space. Then, according to previously introduced symbol ***ΔX'/Δt'*** is equal to

$\frac{\Delta X'}{\Delta t'} = U'$ and the ratio ***ΔX/Δt*** is $\frac{\Delta X}{\Delta t} = U$

Let's rewrite (14) in accordance with the symbols that are introduced for the speeds. Then we get

$$U' = \frac{U - V}{1 - \frac{VU}{C^2}}$$

This speed coincides with the speed that was used in the expression (13). Let's substitute this value into the expression (12) and we rewrite the value of time **t''**.

$$t'' = \frac{t' - \frac{U'}{C^2} x'}{\sqrt{1 - \frac{(U')^2}{C^2}}}$$

Thus, relative to the first frame of reference, the time (**t''**) of second moving frame of reference is also subjected to the Lorentz transformation for time.

It remains to obtain the Lorentz transformations for coordinates. Let's execute it. Obviously, if we use the expressions (9) and (10) then we shall obtain the identities

Y'' = Y', Z'' = Z'

Now, we find the connection between **X''** and **X'**. For its definition let's continue the mathematical transformations for **X''** from (11).

$$X'' = \frac{\frac{x' + Vt'}{\sqrt{1 - \frac{V^2}{C^2}}} - U\frac{t' + \frac{V}{C^2} x'}{\sqrt{1 - \frac{V^2}{C^2}}}}{\sqrt{1 - \frac{U^2}{C^2}}} = \frac{X' + Vt' - Ut' - \frac{VU}{C^2} X'}{\sqrt{1 - \frac{V^2}{C^2}}\sqrt{1 - \frac{U^2}{C^2}}} = \frac{X'\left(1 - \frac{VU}{C^2}\right) - (U - V)t'}{\sqrt{1 - \frac{V^2}{C^2}}\sqrt{1 - \frac{U^2}{C^2}}} =$$

$$= \frac{\left(1 - \frac{UV}{C^2}\right)[X' - \frac{U - V}{\left(1 - \frac{UV}{C^2}\right)} t']}{\sqrt{1 - \frac{V^2}{C^2}}\sqrt{1 - \frac{U^2}{C^2}}} = \frac{X' - \frac{U - V}{\left(1 - \frac{UV}{C^2}\right)} t'}{\frac{\sqrt{1 - \frac{V^2}{C^2}}\sqrt{1 - \frac{U^2}{C^2}}}{\left(1 - \frac{UV}{C^2}\right)}} = \frac{X' - \frac{U - V}{\left(1 - \frac{UV}{C^2}\right)} t'}{\frac{\sqrt{C^2 - V^2}\sqrt{C^2 - U^2}}{C^2\left(1 - \frac{UV}{C^2}\right)}} =$$

$$= \frac{\dfrac{X' - \frac{U-V}{\left(1-\frac{UV}{C^2}\right)}t'}{\dfrac{\sqrt{C^4 - C^2U^2 - C^2V^2 + U^2V^2}}{C^2\left(1-\frac{UV}{C^2}\right)}}}{} = \frac{X' - \frac{U-V}{\left(1-\frac{UV}{C^2}\right)}t'}{\dfrac{\sqrt{C^4 - C^2U^2 - C^2V^2 + U^2V^2 - 2C^2UV + 2C^2UV}}{C^2\left(1-\frac{UV}{C^2}\right)}} =$$

$$= \frac{X' - \frac{U-V}{\left(1-\frac{UV}{C^2}\right)}t'}{\dfrac{\sqrt{(C^2 - UV)^2 - C^2(V-U)^2}}{(C^2 - \mathrm{UV})}} = \frac{X' - \frac{U-V}{\left(1-\frac{UV}{C^2}\right)}t'}{\sqrt{1 - \frac{C^2(U-V)^2}{(C^2 - UV)^2}}} = \frac{X' - \frac{U-V}{\left(1-\frac{UV}{C^2}\right)}t'}{\sqrt{1 - \frac{(U-V)^2}{C^2(1-\frac{UV}{C^2})^2}}}$$

The latter result gives the final equation:

$$\mathbf{X''} = \frac{X' - U't'}{\sqrt{1 - \frac{(U')^2}{C^2}}} .$$

Now, we get finally a common link between the first moving frame of reference and the second moving frame of reference for the coordinates and time. This relationship takes the forms:

$$\mathbf{X''} = \frac{X' - U't'}{\sqrt{1 - \frac{(U')^2}{C^2}}} \text{ , Y'' = Y', Z'' = Z', t'' = } \frac{t' - \frac{U'}{C^2}x'}{\sqrt{1 - \frac{(U')^2}{C^2}}} .$$

Obviously, these formulas are the Lorentz transformation. Similarly, we can get feedback for the moving frames of reference for the coordinates and time. This feedback will also be subjected to the Lorentz transformations, which take the forms:

$$\mathbf{X'} = \frac{X'' + U't''}{\sqrt{1 - \frac{(U')^2}{C^2}}} \text{ , Y' = Y'', Z' = Z'', t' = } \frac{t'' + \frac{U'}{C^2}x''}{\sqrt{1 - \frac{(U')^2}{C^2}}} .$$

The analysis show that the Lorentz transformations are invariant and it is true for inertial reference frames existing in absolute space, and analysis showed that if the inertial reference frames obey the Lorentz transformations, there is no absolute frame of reference in order to be chosen. But there is the only problem. We have to find a physical model which could explain why in inertial systems of our world the coordinates and time obey to the Lorentz transformations. Model of this work solves this problem. The model is based on the ideas of de Broglie wave nature of matter but the model develops them on a different basis. Because the model uses the properties of waves the model exists in form that gives very easy understanding of the basic physical laws. They are obtained as simple consequences of this model.

3. Transformation of energy and momentum in the transition from one inertial frame to another inertial frame of reference.

Lorentz transformation defines the transformation of energy and momentum in case of a transition from one inertial frame of reference to another moving frame of reference. To understand the principle of relativity let's consider these transformations. It will be clear from further text: the changing of energy and momentum in the transition from one inertial moving frame of reference to another takes place because of the differences of flows times in these frames of reference. A lot of proofs try to explain these phenomena by other methods. In my view they are inconclusive.

Let's consider two inertial frames of reference. One of the frames of reference is at rest. The second frame of reference will move relative to the frame of reference at rest with a velocity **V** without rotation. Where they exist - it does not matter for further analysis. For example, the frame of reference at rest can be in absolute space. The main thing for the frames of reference is that they are linked by Lorentz transformation. See Figure 9. It show that the frame of reference at rest is marked by **X, Y, Z,** the moving frame of reference is marked by **X', Y', Z'.** Relative to the frame of reference at rest, there is a mass point, which is moving with constant velocity **U**. At rest the value of the point mass is equal mass $\mathbf{m_0}$. In Figure 9, it is shown by a black circle. In the moving frame of reference the velocity of the moving mass is **U'**.

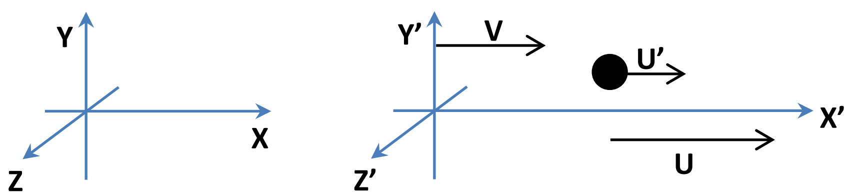

Figure 9.

Let's use the Lorentz transformation to define transformations of energy and momentum in the transition from one inertial frame of reference to another. Let's start with the differential form of the Lorentz transformations. We denote the infinitesimal interval of own time of the point mass as Δƽ. Let's write a link of this interval relative to the moving frame of reference. This relationship is next:

$$Δƽ = Δt'\sqrt{\mathbf{1} - \left(\frac{U'}{C}\right)^{2}} \qquad \textbf{(15).}$$

A similar relation of the interval of time with the frame of reference at rest is equal to

$$Δƽ = Δt\sqrt{\mathbf{1} - \left(\frac{U}{C}\right)^{2}} \qquad \textbf{(16).}$$

Let's consider the infinitesimal interval **ΔX'** in the moving frame of reference and we associate it with the frame of reference at rest.

$$\mathbf{ΔX' = \frac{1}{\sqrt{1 - \frac{V^2}{C^2}}} [ΔX - VΔt]} \quad .$$

Let's divide both sides by Δƽ. Then we obtain the result

$$\frac{\mathbf{ΔX'}}{\mathbf{Δƽ}} = \frac{\mathbf{1}}{\sqrt{\mathbf{1} - \frac{V^2}{C^2}}}\left[\frac{\mathbf{ΔX}}{Δƽ} - \boldsymbol{V}\frac{\mathbf{Δt}}{Δƽ}\right] .$$

Carry out the change Δƽ. On the left hand side of the equation we shall replace Δƽ with help of 15, and on the right hand side of the equation with help 16. Then we get

$$\frac{\mathbf{1}}{\sqrt{\mathbf{1} - \left(\frac{U'}{C}\right)^{2}}}\ \frac{ΔX'}{Δt'} = \frac{\mathbf{1}}{\sqrt{\mathbf{1} - \frac{V^2}{C^2}}}\left[\frac{\mathbf{1}}{\sqrt{\mathbf{1} - \frac{U^2}{C^2}}}\ \frac{\mathbf{ΔX}}{\mathbf{Δt}} - \frac{\boldsymbol{V}}{\sqrt{\mathbf{1} - \frac{U^2}{C^2}}}\ \frac{\mathbf{Δt}}{\mathbf{Δt}}\right]$$ or it is equal to

$$\frac{\boldsymbol{U'}}{\sqrt{\mathbf{1} - \left(\frac{U'}{C}\right)^{2}}} = \frac{\mathbf{1}}{\sqrt{\mathbf{1} - \frac{V^2}{C^2}}}\left[\frac{\boldsymbol{U}}{\sqrt{\mathbf{1} - \frac{U^2}{C^2}}} - \frac{\boldsymbol{V}}{\sqrt{\mathbf{1} - \frac{U^2}{C^2}}}\right] \quad .$$

Multiplying both sides by $\mathbf{m_0}$ we get

$$\frac{m_0\,U'}{\sqrt{1-\left(\frac{U'}{C}\right)^2}} = \frac{1}{\sqrt{1-\frac{V^2}{C^2}}}\left[\frac{m_0 U}{\sqrt{1-\frac{U^2}{C^2}}} - \frac{m_0 V}{\sqrt{1-\frac{U^2}{C^2}}}\right] .$$

From this it follows the natural conclusion that if the point mass at motion is dependent on the speed in according to the form

$$\mathbf{m(u)} = \frac{m_0}{\sqrt{1-\left(\frac{U}{C}\right)^2}} .$$

Then in the transition from one frame of reference to another the momentum is equal to

$$\mathbf{P_x'(u')} = \frac{P_x(U)}{\sqrt{1-\frac{V^2}{C^2}}} - \frac{m_0 V}{\sqrt{1-\frac{V^2}{C^2}}\sqrt{1-\frac{U^2}{C^2}}} \quad \mathbf{(17).}$$

Pulse values along the axes **Y',Y** and **Z',Z** is not changed therefore $\mathbf{P'_y = P_y}$, $\mathbf{P'_z = P_z}$.

We find the conversion of energy. Let's consider the infinitesimal interval **Δt'** in the moving frame of reference and tie it with the frame of reference at rest.

$$\Delta t' = \frac{1}{\sqrt{1-\frac{V^2}{C^2}}}\left(\Delta t - \frac{V}{C^2}\Delta X\right) .$$

Dividing both sides by Δ Ƒ we get the result.

$$\frac{\Delta t'}{\Delta Ƒ} = \frac{1}{\sqrt{1-\frac{V^2}{C^2}}}\left(\frac{\Delta t}{\Delta Ƒ} - \frac{V}{C^2}\frac{\Delta X}{\Delta Ƒ}\right) .$$

Carry out the change ΔƑ. On the left hand side of the equation we shall replace ΔƑ with help of 15, and on the right hand side of the equation with help 16. Then we get

$$\frac{1}{\sqrt{1-\left(\frac{U'}{C}\right)^2}}\ \frac{\Delta t'}{\Delta t'} = \frac{1}{\sqrt{1-\frac{V^2}{C^2}}}\left[\frac{1}{\sqrt{1-\frac{U^2}{C^2}}}\ \frac{\Delta t}{\Delta t} - \frac{V}{C^2\sqrt{1-\frac{U^2}{C^2}}}\ \frac{\Delta X}{\Delta t}\right] \text{ или}$$

$$\frac{1}{\sqrt{1-\left(\frac{U'}{C}\right)^2}} = \frac{1}{\sqrt{1-\frac{V^2}{C^2}}\sqrt{1-\frac{U^2}{C^2}}} - \frac{VU}{C^2\sqrt{1-\frac{V^2}{C^2}}\sqrt{1-\frac{U^2}{C^2}}} \quad .$$

Multiply both sides by $\mathbf{m_0C^2}$. Equality becomes

$$\frac{m_0C^2}{\sqrt{1-\left(\frac{U'}{C}\right)^2}} = \frac{m_0C^2}{\sqrt{1-\frac{V^2}{C^2}}\sqrt{1-\frac{U^2}{C^2}}} - \frac{m_0C^2VU}{C^2\sqrt{1-\frac{V^2}{C^2}}\sqrt{1-\frac{U^2}{C^2}}} \qquad \textbf{(18).}$$

Introduce the notation $\mathbf{E'(u')} = \frac{m_0C^2}{\sqrt{1-\left(\frac{U'}{C}\right)^2}}$, $\mathbf{E'(u)} = \frac{m_0C^2}{\sqrt{1-\left(\frac{U}{C}\right)^2}}$ and substituting them into (17) and (18) we finally obtain

$$\mathbf{P_x'(u')} = \frac{P_x(U)}{\sqrt{1-\frac{V^2}{C^2}}} - \frac{m_0Vc^2}{c^2\sqrt{1-\frac{V^2}{C^2}}\ \sqrt{1-\frac{U^2}{C^2}}} = \frac{P_x(U)}{\sqrt{1-\frac{V^2}{C^2}}} - \frac{E'(U)V}{c^2\sqrt{1-\frac{V^2}{C^2}}} \quad .$$

$$\mathbf{E'(u')} = \frac{m_0C^2}{\sqrt{1-\frac{V^2}{C^2}}\sqrt{1-\frac{U^2}{C^2}}} - \frac{m_0C^2VU}{C^2\sqrt{1-\frac{V^2}{C^2}}\sqrt{1-\frac{U^2}{C^2}}} = \frac{E(U)}{\sqrt{1-\frac{V^2}{C^2}}} - \frac{P_x(U)V}{\sqrt{1-\frac{V^2}{C^2}}} \quad .$$

This result shows that in inertial frames of reference the pulse is stored, even if frames of reference are subjected to the Lorentz transformation. But the value of the mass must be a function of speed and vary inversely proportional to the relativistic root. The reason for this there is slowing down of the time flow in the moving frame of reference. Physical nature of this phenomenon may be explained by the following way. Let’s assume that in the moving frame of reference you take a mass equal to unit in order to accelerate this mass up to unit of speed. Suppose that the acceleration has been performed for a period that is equal to a conventional unit of time. Now, we turn to the frame of reference at rest. Inside this frame of reference, the mass has been accelerated for a longer time than the time unit. It takes place, because in the moving frame of reference the time flow has been delayed with respect to the frame of reference at rest. Therefore, in the frame of reference that is at rest, by contrast, time flowing faster than the in the moving frame of reference. If for a simplified approach, inside both frames of reference we consider the value of an accelerating force as a constant, in this case, we must conclude that the mass inside of the frame of reference at rest has a value much greater than a unit. It takes place, because the work was performed for the mass acceleration for a long time. But since an accelerating force has not changed, the slow acceleration of the mass could be caused only by an increasing value of the mass. Such is simple physics of this phenomenon. Almost all the conclusions of the special theory of relativity there are inherently geometric and mathematical promotion of the Lorentz transformation in various forms without the use of a physical model. Such approach allowed to reject the ether's model of absolute space because there wasn't need use the ether for all the theoretical conclusions. But in special theory of relativity, the mathematical model could not explain the physical nature of its postulates. Besides the application of the principle of relativity to the frames of reference lead to various paradoxes. The essence of their well-known and they are many times discussed in the literature. The problems associated with paradoxes are usually removed by using verbal arguments without the physical and mathematical proofs. In this work, on the contrary, the input of absolute space and ether became needful because the work develops the idea of de Broglie further about wave nature of elementary fabric of our world. Thanks to a new physical model this work was able to prove that our elementary fabric by properties has symmetry relative to the photon. In particular, the elementary particles have a hidden continuous wave motion like a wave of the photon. This work has physical explanation for the postulates of special relativity and the Lorentz transformation. Besides the model has a simple physical and geometrical form. This work explains how and where waves of matter exist and it explains true essence of time. All these explanations give a clear understanding of why in our world the frames of reference obey to the Lorentz transformation. From the model, it becomes clear why the ether model of absolute space does not violate the principle of relativity for inertial frames of reference. In addition, this model shows why all the main conclusions of the special theory of relativity in such a model are valid and can be obtained automatically. To verify this, see the first and second parts of this work. It reveals additional properties of matter in our world because of which the inertial frames of reference of our world obey to the Lorentz transformation for the time and coordinates.

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