Non-Physical Nature of Lorentz Transformation

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"Almost right is no better than wrong".
Isaac Asimov.

Introduction

The Lorentz transformation is a heart of the special relativity. Gamma factor is everywhere. But if you take just another look at the transformation, you will see that it never deals with physical bodies, always with mathematical points of no dimension. Is it even possible to apply the abstraction of Lorentz transformation to the real life? Let's see…

The Transformation

Lorentz transformation set up the following relationship:

$$t' = \gamma\left(t - \frac{vx}{c^2}\right) \quad (1)$$

$$x' = \gamma(x - vt) \quad (2)$$

$$y' = y;\ z' = z \quad (3)$$

where (t, x, y, z) are coordinates of some event in stationary frame and (t', x', y', z') are coordinates of the same event in frame moving with velocity v along x axis and

$\gamma = \left(\sqrt{1 - \frac{v^2}{c^2}}\right)^{-1}$ is the Lorentz or gamma factor.

The Life

How Lorentz transformation works for something a little bit closer to reality instead of dimensionless point? Let us do some calculations for one-dimensional spring moving along x coordinate.

In the stationary system the coordinates of the two ends of the spring are x_1 and x_2.

The time t_1 in stationary frame is our only time. Both ends of the spring are at the same time at any particular moment.

Let's the math begin.

The Math

Lorentz transformation for the two ends of spring:

$$t_1' = \gamma\left(t_1 - \frac{vx_1}{c^2}\right) \tag{4}$$

$$t_2' = \gamma\left(t_1 - \frac{vx_2}{c^2}\right) \tag{5}$$

$$x_1' = \gamma(x_1 - vt_1) \tag{6}$$

$$x_2' = \gamma(x_2 - vt_1) \tag{7}$$

In stationary reference frame the times for both ends of the spring are always have the same value.

To our surprise two ends of the spring will appear in the moving reference frame at different times.

You could take a look at relativity textbooks how time dilation was derived. Such derivation assume $t_1' = t_2'$ in equations (6) and (7), which makes perfect sense – the length measurement should be done at the same time for both ends of the spring.

But is this really possible? Will two ends of our spring will ever be at the times?

$$t_1' = t_2' \tag{8}$$

From (4) and (5) yields:

$$\gamma\left(t_1 - \frac{vx_1}{c^2}\right) = \gamma\left(t_1 - \frac{vx_2}{c^2}\right) \tag{9}$$

and:

$$x_1 = x_2 \tag{10}$$

We could see that both ends of the spring will never be at same times in moving reference frame unless our spring is dimensionless point.

It appears that common derivation of length contraction in relativity based on the wrong assumption of time equality.

Conclusion.

Lorentz transformation for physical body of not zero dimension produces absurd results. Two ends of the spring of some length will never be at the same time in moving reference frame, which makes the length measurement not possible.