Unveiling the Conflict of the Speed of Light Postulate: Outlined Mathematical Refutation of the Special Relativity Theory

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My earlier posted paper ref. viXra:1306.0098 is a formal dissertation on Lorentz Transformation (LT) and Special Relativity Theory (SRT), dealing with the mathematical contradictory aspects of the speed of light principle and the transformation equations. In this simplified communication, only the essential analyses of the equations, leading to the logical refutation of the mathematical foundation of the SRT, are emphasized in an outlined structure.

Introduction

For the introductory section, paper ref. viXra:1306.0098 is referred. This memorandum outlines the therein performed deductions leading to the refutation of the SRT.

Lorentz Transformation

Consider two inertial frames of reference, $K(x, y, z, t)$ and $K'(x', y', z', t')$, in translational relative motion with speed v.

LT equations [1, 3]:

$$\begin{aligned} x' &= \gamma(x - vt) \\ t' &= \gamma\left(t - \frac{vx}{c^2}\right) \end{aligned} \tag{1}$$

$$\begin{aligned} x &= \gamma(x' + vt') \\ t &= \gamma\left(t' + \frac{vx'}{c^2}\right) \end{aligned} \tag{2}$$

$$\begin{aligned} y &= y' \\ z &= z' \end{aligned} \tag{3}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{4}$$

Equations (1) and (2) result in the following relativistic velocity transformation equations:

$$\begin{aligned} u' &= \frac{u - v}{1 - \frac{uv}{c^2}} \\ u &= \frac{u' + v}{1 + \frac{u'v}{c^2}} \end{aligned} \tag{5}$$

Where c is the speed of light propagation in empty space, and u and u' are the velocity of a moving body in the x-direction, when measured with respect to K and K', respectively.

Constancy of the Speed of Light

Equations:

In line with [2], the space-time coordinates obey the light sphere equations:

$$x^2 + y^2 + z^2 = c^2t^2, \tag{6}$$

$$x'^2 + y'^2 + z'^2 = c^2t'^2. \tag{7}$$

Subtracting equation (7) from equation (6), given that the y and z coordinates remain unaltered, we get

$$x^2 - x'^2 = c^2t^2 - c^2t'^2. \tag{8}$$

Analysis:

Lorentz transformation equations (1) can lead to

$$x'^2 = \gamma^2(x^2 + v^2t^2 - 2xvt), \tag{9}$$

and

$$c^2t'^2 = \gamma^2\left(c^2t^2 + \frac{v^2x^2}{c^2} - 2xvt\right). \tag{10}$$

Eliminating the term $2xvt$ from equations (9) and (10), yields

$$x^2 + v^2t^2 - \frac{x'^2}{\gamma^2} = c^2t^2 + \frac{v^2x^2}{c^2} - \frac{c^2t'^2}{\gamma^2}. \tag{11}$$

Similarly, Lorentz transformation equations (2) bring about the following expression;

$$-x'^2 - v^2t'^2 + \frac{x^2}{\gamma^2} = -c^2t'^2 - \frac{v^2x'^2}{c^2} + \frac{c^2t^2}{\gamma^2}. \tag{12}$$

Adding equations (11) and (12) will lead to the following expression;

$$x^2(1 + \frac{1}{\gamma^2}) - x'^2(1 + \frac{1}{\gamma^2}) + v^2(t^2 - t'^2) =$$

$$= c^2t^2(1 + \frac{1}{\gamma^2}) - c^2t'^2(1 + \frac{1}{\gamma^2}) + \frac{v^2}{c^2}(x^2 - x'^2);$$

which can be simplified to

$$(x^2 - x'^2)(1 + \frac{1}{\gamma^2} - \frac{v^2}{c^2}) = c^2(t^2 - t'^2)(1 + \frac{1}{\gamma^2} - \frac{v^2}{c^2});$$

$$\mathbf{x^2 - x'^2 = c^2(t^2 - t'^2)}, \tag{13}$$

returning actually equation (8).

Whereas, the subtraction of equation (12) from equation (11), results in

$$(x^2 + x'^2)(1 - \frac{1}{\gamma^2} - \frac{v^2}{c^2}) = c^2(t^2 + t'^2)(1 - \frac{1}{\gamma^2} - \frac{v^2}{c^2});$$

$$\mathbf{x^2 + x'^2 = c^2(t^2 + t'^2)}. \tag{14}$$

Equations (13) and (14) readily reduce to

$$\mathbf{x^2 = c^2t^2}, \tag{15}$$

$$\mathbf{x'^2 = c^2 t'^2}. \tag{16}$$

In other words, equation (14) makes equations (15) and (16) the only solution for the constancy of the speed of light equation (8).

Consequently, the light sphere equations (6) and (7) are collapsed to the line equations (15) and (16):
– When equations (15) and (16) are substituted into equations (6) and (7), they result in the vanishing of y, z, $y'$and z'.
– This can be reconfirmed by adding equations (6) and (7), and using equation (14).

- **First flaw: The constancy of the speed of light equations (6) and (7) are preliminarily restricted to one-dimentional light propagation, parallel to the direction of the relative motion.**

Now, dividing equation (15) by equation (16) yields

$$\left(\frac{x}{x'}\right)^2 = \left(\frac{ct}{ct'}\right)^2,$$

or

$$\frac{x}{x'} = \pm\frac{ct}{ct'}. \tag{17}$$

For $c > v$, x and x' will always have the same sign (positive or negative)—whether the light beam is emitted in the positive or negative $x-$direction with respect to K and K' origins. Therefore,

$$\frac{x}{x'} \geq 0,$$

and given that

$$\frac{ct}{ct'} \geq 0,$$

equation (17) becomes

$$\frac{x}{x'} = \frac{ct}{ct'}. \tag{18}$$

Hence, equation (18) combined with equations (15) and (16), leads to

$$\mathbf{c = \frac{x}{t} = \frac{x'}{t'}}. \tag{19}$$

Outcome: the constancy of the speed of light can be expressed by equation (19).

The implication

Assuming the space-time is preserved (i.e. cannot be modified), the coordinates x and x' (Fig. 1) would then be related by the following equation with respect to K;

$$x' = x - vt. \tag{20}$$

Whereas, with respect to K', the same coordinates (Fig. 2) would be related by the following equation

$$x = x' + vt'. \tag{21}$$

Substituting equation (20) into equation (21), we get

$$t = t'. \tag{22}$$

Dividing both sides of equations (20) and (21) by c, and applying the speed of light constancy principle as determined above ($c = x/t = x'/t'$), the following expressions are obtained;

$$t' = t - \frac{vx}{c^2}. \tag{23}$$

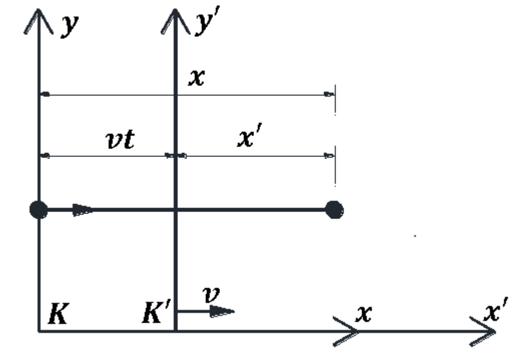

Fig. 1: x-coordinate with respect to K.

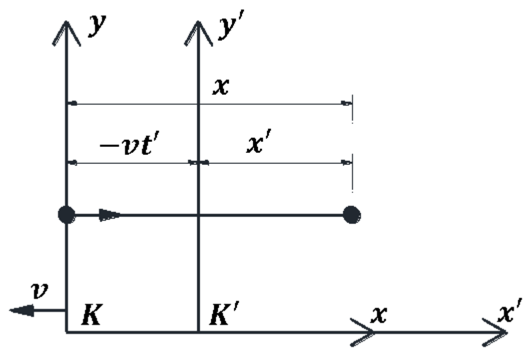

Fig. 2: x'-coordinate with respect to K'.

and

$$t = t' + \frac{vx'}{c^2}. \tag{24}$$

Substituting equation (23) in equation (24), we get

$$x = x'. \tag{25}$$

Using equations (22) and (25), we can replace t' with t, and x' with x in equations (23) and (24), to obtain the following contradiction,

$$x = -x,$$

or

$$\mathbf{1} = -\mathbf{1},$$

indicating the set of equations (20), (21), (23) and (24), resulting from the principle of the constancy of the speed of light, yield an impossible solution, generating an imaginary space-time. Thus the constancy of the light speed principle is unviable, at least in the case of no space-time distorting transformation.

On the other hand, although equations (20), (21), (23) and (24), result in mathematical impossibility, they generate the constancy of the speed of light equation (8):

- **Second flaw: The speed of light constancy principle is merely a mathematical impossibility.**

In fact, equations (20) and (23) lead to

$$x'^2 = x^2 + v^2t^2 - 2xvt,$$

and

$$c^2t'^2 = c^2t^2 + \frac{v^2x^2}{c^2} - 2xvt.$$

Eliminating $2xvt$ from the above two equations yields

$$x^2 + v^2t^2 - x'^2 = c^2t^2 + \frac{v^2x^2}{c^2} - c^2t'^2. \tag{26}$$

Similarly, equations (21) and (24) can lead to

$$-x'^2 - v^2t'^2 + x^2 = -c^2t'^2 - \frac{v^2x'^2}{c^2} + c^2t^2. \tag{27}$$

Adding equations (26) and (27), returns equation (8):

$$x^2 - x'^2 = c^2t^2 - c^2t'^2.$$

Indeed, the addition of equations (26) and (27) results in the following expressions,

$$2(x^2 - x'^2) + v^2(t^2 - t'^2) = 2c^2(t^2 - t'^2) + \frac{v^2}{c^2}(x^2 - x'^2);$$

$$(x^2 - x'^2)\left(2 - \frac{v^2}{c^2}\right) = c^2(t^2 - t'^2)\left(2 - \frac{v^2}{c^2}\right);$$

yielding the speed of light constancy principle equation,

$$(x^2 - x'^2) = c^2(t^2 - t'^2).$$

Further, equations (20), (21), (23) and (24), resulting in mathematical impossibility, also generate the relativistic velocity equations (5) — by dividing equation (20) by equation (23), and equation (21) by equation (24).

- **Third flaw: The Lorentz velocity transformation equations are merely invalid velocity criteria of the speed of light constancy principle.**

Lorenz Transformation Re-derivation

Owing to equation (19), the derivation of the Lorentz Transformation is substantially simplified:

– Assuming a space-time distorting transformation, a length conversion by a factor of β (a positive real number) along the direction of motion is hypothesized.

–This length conversion can therefore be expressed using Figs. 1 and 2 as follows.

$$x = vt + \beta x'. \tag{28}$$

and

$$x' = -vt' + \beta x. \tag{29}$$

Rearrange equations (28) and (29):

$$x' = \frac{1}{\beta}(x - vt), \tag{30}$$

$$x = \frac{1}{\beta}(x' + vt'). \tag{31}$$

Divide both sides of equations (30) and (31) by c, and apply the speed of light constancy principle equation (19):

$$t' = \frac{1}{\beta}\left(t - \frac{vx}{c^2}\right), \tag{32}$$

$$t = \frac{1}{\beta}\left(t' + \frac{vx'}{c^2}\right). \tag{33}$$

Solving equations (30), (31), (32) and (33) for β results in

$$\beta = \sqrt{1 - \frac{v^2}{c^2}},$$

or

$$\frac{1}{\beta} = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} = \gamma. \tag{34}$$

In fact, for $x' = 0$, equations (30) and (33) yield $x = vt$, and $t' = \beta t$, respectively, reducing equation (32) to

$$\beta t = \frac{1}{\beta}\left(t - \frac{v^2 t}{c^2}\right);$$

therefore

$$\beta = \sqrt{1 - \frac{v^2}{c^2}}.$$

Conversely, for $x = 0$, equations (31) and (32) yield $x' = -vt$, and $t = \beta t'$, respectively, reducing equation (33) to

$$\beta t' = \frac{1}{\beta}\left(t' - \frac{v^2 t'}{c^2}\right);$$

hence

$$\beta = \sqrt{1 - \frac{v^2}{c^2}}.$$

$\beta < 1$, then the hypothesized length conversion is a length contraction.

Equations (30), (31), (32), (33), and (34) are the Lorentz transformation.

Lorentz Transformation Contradictions

For the origin of $K(0, 0, 0, 0)$, the corresponding K' coordinates shall satisfy the relation

$$\frac{x'}{t'} = \frac{x}{t} = \frac{0}{0},$$

yielding the set of K' coordinates

$$\left(\mathbf{x'} = \frac{\mathbf{0}}{\mathbf{0}}, \mathbf{0}, \mathbf{0}, \mathbf{t'} = \frac{\mathbf{0}}{\mathbf{0}}\right)$$

with undetermined x' and t'.

- **Fourth flaw: The frames of reference origin-coordinates are undetermined with respect to each other.**

Consequently, Lorentz transformation, implicitly incorporating equation (19), results in various conflicts.
For instance, substituting equation (32) into equation (33), returns

$$t = \gamma\left(\gamma\left(t - \frac{vx}{c^2}\right) + \frac{vx'}{c^2}\right). \tag{35}$$

Equation (35) is simplified in the following steps.

$$t = \gamma^2 t - \frac{\gamma^2 vx}{c^2} + \frac{\gamma vx'}{c^2},$$

or

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

Using $c = x/t$ back in the above equation, we get

$$\frac{x}{c}(\gamma^2 - 1) = \frac{vt}{c}\left(\gamma^2 - \frac{\gamma x'}{x}\right). \tag{36}$$

From equation (30), we note that for $x' = 0$, $x = vt$. Therefore, equation (36) reduces to

$$x(\gamma^2 - 1) = x\gamma^2,$$

yielding the contradiction,

$$(\gamma^2 - 1) = \gamma^2,$$

or

$$\mathbf{0} = \mathbf{1}.$$

Similar contradiction is obtained by substituting equation (33) into equation (32), replacing $x' = ct'$ back in the equation, and using equation (31) for $x = 0$ ($x' = -vt'$).

Furthermore, substituting equation (30) into equation (31), and equation (31) into equation (30), yields

$$x = \gamma\left(\gamma(x - vt) + vt'\right),$$

or

$$x(\gamma^2 - 1) = \gamma v(\gamma t - t'). \tag{37}$$

And

$$x' = \gamma\left(\gamma(x' + vt') - vt\right),$$

or

$$x'(\gamma^2 - 1) = \gamma v(t - \gamma t'). \tag{38}$$

Dividing equation (37) by equation (38), we get

$$\frac{x}{x'} = \frac{\gamma t - t'}{t - \gamma t'} = \frac{t\left(\gamma - \frac{t'}{t}\right)}{t'\left(\frac{t}{t'} - \gamma\right)}.$$

Using equation (19), we obtain

$$\gamma - \frac{x'}{x} = \frac{t}{t'} - \gamma.$$

From equation (33), we note that for $x' = 0, t = \gamma t'$. Therefore, the latter equation reduces to the following contradiction

$$\gamma = \frac{\gamma t'}{t'} - \gamma,$$

or

$$\mathbf{1} = \mathbf{0}.$$

- **Fifth flaw: Lorentz Transformation generate mathematical impossibilities.**

It follows that, the Lorentz transformation is deemed to be refuted.

The Lorentz transformation obtained contradictions are indeed expected, as it derives the constancy of the speed of light equation (8) that has been demonstrated to be mathematically impossible.

Conclusion

Analysis of the Lorentz transformation revealed mathematical restrictions in terms of the deduced, simplified form of the constancy of the speed of light equations residing in the transformation. The Lorentz transformation, readily reconstructed using these basic, restricted light velocity invariance equations, resulted in mathematical contradictions. The principle of the constancy of the speed of light was thus demonstrated to be an unviable assumption, and the ensuing Lorentz transformation was subject to refutation.

References

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