On the Origin of the Special Relativity Anomalies

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Abstract

In this paper, the conclusive origin of the Special Relativity (SR) mathematical conflicts identified in the author's prior related works will be presented and linked to these various conflicts. It is shown that for inertial reference frames in relative motion, the constancy of the speed of light postulate inherently results in time transformations independent of the spatial coordinates. The time of events occurring along the longitudinal coordinate axis is transformed with a different scaling factor than that of events occurring along the transverse coordinate axes. The incorporated x coordinate (considering that the relative motion is in the X- direction) in the Lorentz transformation time equation is the result of the assumption forcing the transformation to take a linear form as a function of the time and x coordinate. The SR derived Lorentz transformation time equation takes the assumed form by the aid of the imposed constancy of the speed of light equation, resolving itself as $x' = ct'$ and $x = ct$, to supply the x' and x terms to the assumed time transformation and its inverse, respectively. The resulting time transformation equation (and its inverse) dependence on the x' (and x) coordinate is therefore fake, since x' (x) in the transformation is nothing but ct' (ct), making the transformation time-dependent only, yet contradicting the time transformation for events in the transverse Y-Z plane.

The true time transformation resulting from the light speed principle

Considering some "stationary" and "traveling" inertial reference frames with coordinate systems $K(x, y, z, t)$ and $K'(x', y', z', t')$, respectively, in relative motion of velocity v, we will determine how the relative times of the following events will be related between two observers at the system origins.

A. $E_{Y'}$: A light wave front emitted from a point of positive coordinate on the Y'- axis of K' at the instant of time $t = t' = 0$, when the two frame coordinate systems are coinciding.

B. $E_{X'}$: A light wave front emitted from a point of positive coordinate on the X'- axis of K' at the instant of time $t = t' = 0$, when the two frame coordinate systems are coinciding.

Using the SR constancy of the speed of light postulate, the events light wave fronts can be plotted on the frame coordinate systems as shown in Figs. 1 and 2. At the instants of time t' and t, the signal arrives at K' and K origin, respectively. The following relation can be deduced from Fig. 1.

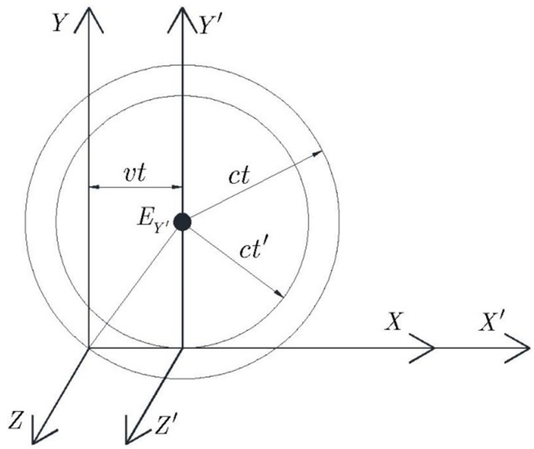

Fig. 1 Event $E_{Y'}$ diagram from the perspective of K

$$c^2t^2 = c^2t'^2 + v^2t^2;$$
$$t = \frac{t'}{\sqrt{1 - v^2/c^2}} = \gamma t'. \tag{1}$$

If the wave front was emitted in K from a point on the Y- axis, and "looked" from K', then we would get the time perceived in K' as

$$t' = \gamma t. \tag{2}$$

It should be noted that the above time transformation is independent of the event position on the Y- axis.

Using a similar reasoning, the same time transformation would be obtained for events occurring on the Z- axis, independently of the event spatial coordinates.

Hence, the time transformation for events occurring in the Y-Z plane is given by Eqs. (1) and (2), independently of the spatial coordinates.

On the other hand, Fig. 2 leads to, from the perspective of K',

$$ct = ct' + vt';$$
$$t = t'\left(1 + \frac{v}{c}\right). \tag{3}$$

If the wave front was emitted in K from a point on the X- axis, then we would get, from the perspective of K,

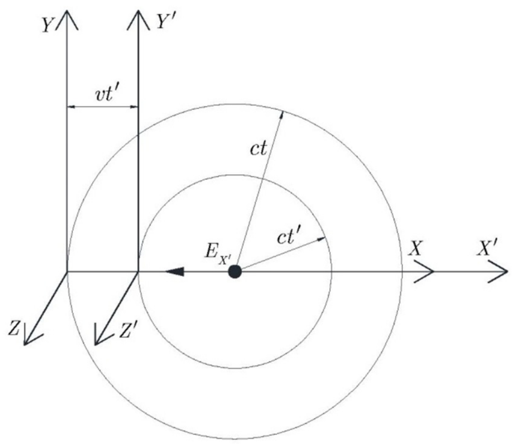

Fig. 2 Event $E_{X'}$ diagram from the perspective of K'

$$ct = ct' + vt;$$
$$t' = t\left(1 - \frac{v}{c}\right). \tag{4}$$

However, Eqs. (3) and (4) would lead to $v = 0$, unless a time deformation factor (say κ) was assumed. Hence, Eq. (3) becomes

$$t = \kappa t'\left(1 + \frac{v}{c}\right), \tag{5}$$

which is a time transformation with respect to K'. Based on Eq. (4) and the principle of relativity, the time transformation with respect to K becomes

$$t' = \kappa t\left(1 - \frac{v}{c}\right). \tag{6}$$

Substituting Eq. (6) into Eq. (5), and solving the resulting equation for κ, we get

$$\kappa = \frac{1}{\sqrt{1 - v^2/c^2}} = \gamma. \tag{7}$$

Therefore, the SR constancy of the speed of light principle as depicted in Fig. 2, results in

$$t = \gamma t'\left(1 + \frac{v}{c}\right), \tag{8}$$

$$t' = \gamma t\left(1 - \frac{v}{c}\right), \tag{9}$$

Here too, the above time transformation for events occurring on the X-axis is independent of the event spatial coordinates. It should be noted the above equations are the same as the equations obtained in a different paper,[1,2] using Einstein's own 1905 derivation.

Now, as shown above, the same SR light speed principle as depicted in Fig. 1, leads to

$$t = \gamma t', \tag{10}$$

$$t' = \gamma t. \tag{11}$$

It follows that, since the obtained time transformation for events on the X-axis, as well as the time transformation for events on the other system axes, are independent of the event spatial coordinates, these transformations ought to be identical. Therefore, we obviously get, from the above equations, the inconsistency $v = 0$.

The SR anomaly origin

What happens in the SR is that the time transformation is forced to be given as a linear function of the proper time and the spatial X-coordinate. This is implicitly done, in the transformation derivation process (e.g., Einstein's 1905[3] and 1907[4] derivations), by splitting the time in Eqs. (8) and (9) into a time term and an X-coordinate-to-speed term, by indirectly using $x' = ct'$ and $x = ct$, as follows.

$$t = \gamma\left(t' + \frac{vt'}{c}\right) = \gamma\left(t' + \frac{vx'}{c^2}\right); \tag{12}$$

$$t' = \gamma\left(t - \frac{vt}{c}\right) = \gamma\left(t - \frac{vx}{c^2}\right), \tag{13}$$

getting the Lorentz transformation time equations. The Lorentz transformation for the X-coordinates can be readily obtained by multiplying the above equations by c, and forcing the desired, assumed linear form by using $x' = ct'$ and $x = ct$. In other words, in the Lorentz transformation derivation procedure, the constancy of the speed of light equation, supposedly in the three dimensional space,

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

ends up with its solution in the X-direction, $x = ct$ and $x' = ct'$, being intrinsically emerged to incorporate the x and x' terms into the transformation equations with the imposed linear form $t' = at + bx$ (or $t = at' + bx'$), since the actual form of the time transformation, resulting from the speed of light principle, incorporates no spatial coordinates, as demonstrated above.

Hence, by replacing x' and x by zero in Eqs. (12) and (13) for events occurring in the Y-Z plane, the time transformation Eqs. (10) and (11) are obtained. However, Eqs. (12) and (13) are invalid for $x' = 0$ and $x = 0$, when t' and t are different from zero, since they are based on $x' = ct'$ and $x = ct$, which would result in $t' = t = 0$. We can see from Eqs. (12) and (13) that replacing x' and x by zero eliminates the terms vt' / c and vt / c from the time transformation

Eqs. (8) and (9), although these terms are not necessarily zero, erroneously truncating the latter equations to the transformation Eqs. (10) and (11) for events in the Y-Z plane.

This is the reason why replacing x' and x by zero in the Lorentz transformation equations, obtained under $x' = ct'$ and $x = ct$, leads to various contradictions, as demonstrated throughout various studies.[5-7]

Another conflict with the SR prediction to be pointed out is that Eq. (9), the inverse of the time dilation Eq. (8), shows a time contraction. Furthermore, for approaching frames, Eq.(8) becomes a time contraction, as revealed in earlier works :[8-11]

$$t = \gamma t'\left(1 - \frac{v}{c}\right), \tag{14}$$

Equations (8) and (14) are in line with the relativistic Doppler effect for receding and approaching frames, respectively, if the time t and t' represented the perceived and emitted light wave periods, respectively, since in such a case, inverting Eqs. (8) and (14) leads the relativistic frequency shift equations. However, these equations are in contradiction with the SR time dilation prediction, as demonstrated in other related studies.[10-13]

Conclusion

It follows that, the actual consequence of the SR speed of light postulate is the inconsistency $v = 0$, or $\gamma = 1$, defying the viability of SR, and leading us back to the classical Galilean transformation and Newtonian physics.

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