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The Lorentz factor and a most simple disproof of special relativity (gemeinverständlich*/a popular account)

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Abstract

The paper shows that the Lorentz factor which is part of the Lorentz transformation, the mathematical representation of the Theory of Special Relativity [1][2][3], does not follow from the basic assumptions it was derived from and is thus wrong.

*[2], title page

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The Lorentz factor γ

The Lorentz factor γ is the factor that appears in the Lorentz transformation, the mathematical representation of the theory of special relativity:

$$x' = \gamma\,(x - vt) \tag{1}$$

$$t' = \gamma\left(t - \frac{xv}{c^2}\right) \tag{2}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{3}$$

It can be found explicitly and implicitly in all relativistic formulas where relative motion is involved (e.g. explicitly: relativistic mass $m = \gamma m_o$, implicitly: $E = mc^2$).

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A straightforward derivation of special relativity

The theory of special relativity is based on the postulate of the constancy of the speed of light. It says that the speed of light (in vacuum) is the same in all inertial systems, regardless of the motion of the source or the observer.

This means, using the standard example, that a light front $x_+ = ct$, propagating in the positive x-direction of an inertial system $S(x, t)$ at speed c, is described by $x'_+ = ct'$ in another inertial system $S'(x', t')$ which is moving at velocity v relative to $S(x, t)$ in the same direction (i.e. $x_{o'} = vt$). It is assumed that the spatial origins of both systems ($x = 0$, $x' = 0$) coincide at time $t = t' = 0$.

The coordinates of the light front with respect to the origins of both systems at an arbitrary point in time $t > 0$ are shown in Figure 1 (for the diagrams in this paper $v = 0.25c$ is assumed).

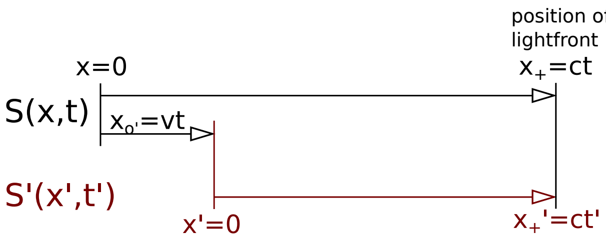

Figure 1: A light front propagating from $x = 0$ to $x = ct$ in the system $S(x, t)$, and from $x' = 0$ to $x_+ = ct'$ in the system $S'(x', t')$

From the diagram we find

$$x'_+ = x_+ - vt = ct - vt = (1 - v/c)ct \tag{4}$$

Now we can calculate t' from

$$x'_+ = ct' = (1 - v/c)ct \tag{5}$$

and get the final result

$$x'_+ = (1 - v/c)ct \tag{6}$$

$$t' = (1 - v/c)t \tag{7}$$

Since the equations above are only valid for $x_+ = ct$ (or $t = x_+/c$) we can also write the equations as:

$$x'_+ = x_+ - vt \tag{8}$$

$$t' = t - \frac{vx_+}{c^2} \tag{9}$$

The results for $t = T > 0$ are shown in an x-t-diagram in Figure 2, where T is an arbitrary chosen time constant.

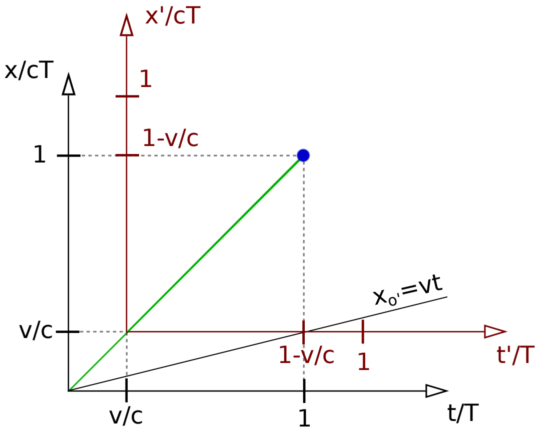

Figure 2: x-t-diagram showing the relationship between both systems and the lightfront (blue dot) at time $t = T > 0$

The result is of course absurd. It says that in S' time runs faster when some light sourced in S comes from behind ($x = ct$), and time runs slower when some light sourced in S comes from in front ($x = -ct$). The postulate of the constancy of light is self-contradicting.

Now let's compare our results with the results of the Lorentz transformation, given by

$$x' = \gamma\,(x - vt) \tag{10}$$

$$t' = \gamma\left(t - \frac{vx}{c^2}\right) \tag{11}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{12}$$

Substituting $x = x_+ = ct$ we get (see also [3], ch. XI)

$$x'_+ = \gamma(1 - v/c)ct \tag{13}$$

$$t' = \gamma(1 - v/c)t \tag{14}$$

We see that the Lorentz factor γ which shows up in all relativistic formulas is wrong. It does not follow from the assumptions. The assumptions lead to simple linear equations that can be solved whithout any quadratic terms.

Conclusion

It is shown that the Lorentz transformation is wrong. It does not even give correct results for a single lightfront. Thus special relativity and everything based on it is also wrong.

References

[1] A. Einstein, *Zur Elektrodynamik bewegter Körper*. Annalen der Physik 322 (10), 891–921 (1905).

[2] A. Einstein, *Über die spezielle und die allgemeine Relativitätstheorie (Gemeinverständlich)*. Druck und Verlag Friedr.Vieweg&Sohn, Braunschweig, 1917.

[3] A. Einstein, *RELATIVITY, The special and general theory (A popular account)*. Henry Holt and Company, New York, 1921.