SCIREA Journal of Physics
ISSN: 2706-8862
http://www.scirea.org/journal/Physics
August 12, 2020
Volume 5, Issue 3, June 2020

Lorentz Transformations And Time Dilation Do Not Verify Reality

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Abstract

The special theory of relativity deals with, inter alia, how two inertial reference systems refer to each other, how the coordinates of events in one of the two reference systems can be calculated using the events coordinates from the other reference system. For this, Lorentz's transformations are used which form the basis of the whole special theory of relativity. One of the consequences of the special theory of relativity is the time dilation which states that the time in the reference system in motion is dependent on the speed at which the system moves. In this paper we analyze how Lorentz transformations and time dilation relate to each other and that they do not verify reality. We come to this conclusion by first doing a mathematical verification of Lorentz transformations. We do a logical analysis by using thought experiments. Using these thought experiments, we make a mathematical model of reality. Then, on this mathematical model, we apply the formulas for Lorentz transformations and the formula for time dilation. This analysis leads to contradiction with the conditions of origin. From here, we conclude that Lorentz

transformations and time dilation are not self-consistent!

Keywords: Special Relativity, Lorentz Transformations, Time dilation, Reality

1. Introduction

The most crucial concept in the theory of special relativity is the so-called Lorentz transformations. This is where other concepts originate.

Not just concepts, but also some paradoxes, such as the Twin Paradox.

Quote:

"At the same time, these are the worlds we have the hardest to understand, worlds where illustrative models deceive us and we find paradoxes. But there is only one world and it has no paradoxes. Only our models that hold paradoxes "

[At the Crossroads: Essays on Man and Her Future; Ulf Sinnerstad; 2006, swedish]

I have never accepted this paradox! No one should!

A paradox is just a paradox! Something that's not right.

It is said that they have done experiments that confirm that time dilation takes place

when two reference systems move relative to each other at velocity $v > 0$.

However, this can be observed only at very high velocities.

It has also been said that you can trap the special theory of relativity only with experiments! This statement is also hard to accept! Why only with experiments?

The special theory of relativity is a theoretical construction. It basically has some physical claims, postulates, which you associate with simple mathematics.

But the result was a theory that has given us concepts such as time dilation, the ultimate velocity in space, the velocity of light, and which forces our real world to be pushed into a 4-dimensional coordinate system, so-called space-time.

But what about the claim that the special theory of relativity has been verified?

Quote:

"A physical theory is always provisional in the sense that it is merely a hypothesis: one can never prove it. However many times the experimental results are consistent with a particular theory, one can never be sure that the results next will contradict the theory. On the other hand, one can disprove a theory by finding only one that does not conform to the predictions of theory"

[The cosmos: a brief history; Stephen Hawking; 2015, swedish]

Who to believe?

From here, I was inspired to search for evidence, for causes of paradoxes, for contradictions that drain from the special theory of relativity.

My motto:

When we study the physical phenomena, we always make a mathematical model of them. In such a model are built the current physical laws held together by mathematical tools. If the description of the physical phenomenon is correct, the mathematical model has no errors!

We do a theoretical analysis of Lorentz's transformations and the time dilation, mathematical and logical. We do this with the help of some thought experiments. These thought experiments are the

same as those used in [1-5].

2. The basics and notations

We use the following notations to easily refer to different formulas, relationships.

These notations are used in [5].

LEx' – Linear Equation for x'

LEt' – Linear Equation for t'

SC1 – Special Case 1

SC2 – Special Case 2

SC3 – Special Case 3

LTx' – Lorentz Transformation for x'

LTt' – Lorentz Transformation for t'

TD – Time Dilation

The basis of the special theory of relativity is Lorentz transformations (LT):

$$x' = (x - vt)\gamma \qquad \text{(LTx')}$$

$$t' = (t - vx/c^2)\gamma \qquad \text{(LTt')}$$

where $\gamma = 1/(1 - v^2/c^2)^{1/2}$ is called the Lorentz factor.

These transformations show the relationship between an event's coordinates as two reference systems measure them. We are talking about two inertial reference systems,

S and S', that move relative to each other at a constant velocity $v > 0$.

See the definition and derivation of the Lorentz transformations in [1-3].

One derives the Lorentz transformations LTx', LTt' from two linear general transformations / equations, LEx', LEt', see [1]:

$$x' = Ax + Bt \qquad \text{(LEx')}$$
$$t' = Cx + Dt \qquad \text{(LEt')}$$

For this derivation one uses three special cases:

$$x' = 0,\ x = vt \qquad \text{(SC1)}$$
$$x' = -vt',\ x = 0 \qquad \text{(SC2)}$$
$$x' = ct',\ x = ct \qquad \text{(SC3)}$$

As a direct consequence of the Lorentz transformations we have time dilation.

Time dilation is expressed by the following formula:

$$t' = t\gamma \qquad \text{(TD)}$$

3. Mathematical analysis

We replace the above three conditions, SC1, SC2, SC3 in LTx', LTt' to see how t' and t relate to each other.

LTx', SC1 → $0 = 0$ OK

LTt', SC1 → $t' = t/\gamma$

LTx', SC2 → $t' = t\gamma$

LTt', SC2 → $t' = t\gamma$

LTx', SC3 → $t' = t\gamma(c - v)/c$

LTt', SC3 → $t' = t\gamma(c - v)/c$

This represents a verification of Lorentz transformations. Lorentz transformations have been derived using the above three special cases, SC1, SC2, SC3.

But I ask a crucial question here:

Why do we get **equality** only in one of six (6) cases?

See the comparison with the verification of the solution of an equation system in chapter *Verification of LT* in [5].

We get three different relationships:

LTx', LTt', SC1 → $t' = t/\gamma$

LTx', LTt', SC2 → $t' = t\gamma$

LTx', LTt', SC3 → $t' = t\gamma(c - v)/c$

We see that the time dilation formula verifies only one of the three relationships,

LTx', LTt', SC2 → $\boldsymbol{t' = t\gamma}$!

How is this possible? All three special cases have been used in the derivation of Lorentz transformations!

How is it possible that the time dilation is dependent on where the event occurs?

This verification of Lorentz transformations has led to further exploration of the theoretical

foundations of the special theory of relativity, in particular the derivation of Lorentz transformations.

It was the idea that the derivation of Lorentz transformations made using the three special cases, SC1, SC2, SC3 and that the verification of the final relationships, LTx ', LTt' with precisely these three special cases, resulted in so different relations between t' and t which made me continue to look for inconsistencies, contradictions, errors in the special theory of relativity.

4. Logical analysis, thought experiments

What do t' and t represent from the equations for Lorentz transformations and the three special cases? And what do these two variables represent in the equation for the time dilation? In my opinion, they do not represent the time spent in the two inertial reference systems!

Anyway, I think that both in [1] and [2-3] they do not define exactly what you think t', t represents. Yes, t' and t, represent time, but what time?

Is it the time measured by S, S' when the event occurs, or is it the time when the light signal from the event reaches the respective coordinate system, or some other time?

I think t', t should be the time measured by the two inertial reference systems when the light signal is registered in them!

It is this property of t', t I use in the thought experiment below.

Note that in the thought experiment below we use **three (3)** inertial reference systems, but we refer and compare them as they did in the derivation of Lorentz transformations in [1-3].

S' is referred to S and S" is referred to S.

We now look at these thought experiments and start with Fig. 1.

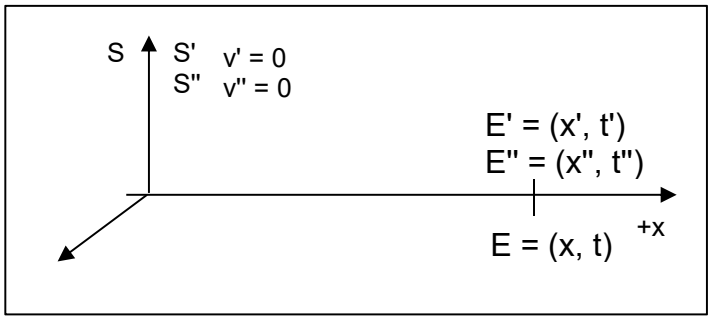

Fig. 1

We have three (3) inertial reference systems, S, S' and S".

S' moves to the right relative to S at speed v'.

S" moves to the right relative to S at the speed v'', $v'' > v'$.

At the beginning of the experiment, all three reference systems are at the same point. Their clocks are then reset, $t = t' = t'' = 0$.

At this moment, an event occurs on the x-axis, at the distance x from the S-origo.

The light signal from the event will move towards the three reference systems, will first reach S", then S' and finally S.

We show the moment when the light signal reaches S", see Fig. 2.

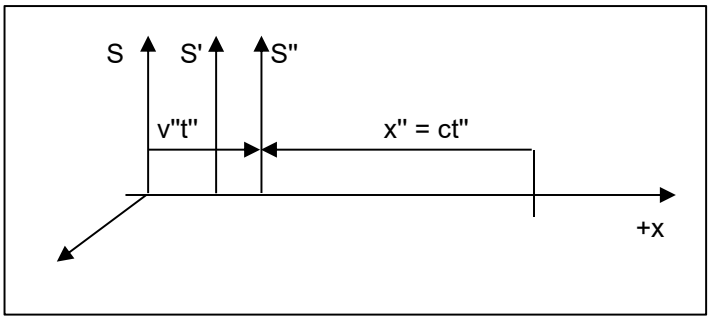

Fig. 2

The distance between the event and the S-origo is $x = v''t'' + ct''$.

The light signal continues towards S'.

We show the moment when the light signal reaches S' in Fig. 3.

The distance between the event and the S-origo is $x = v't' + ct'$.

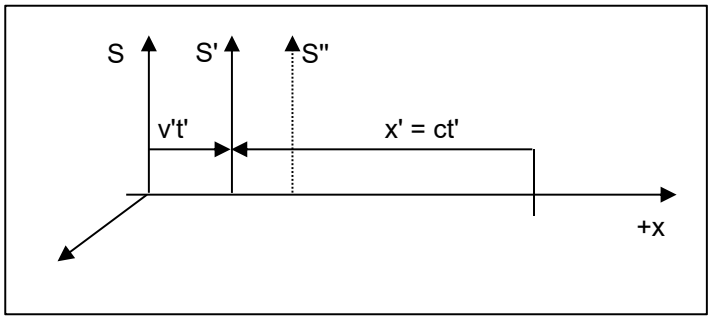

Fig. 3

The light signal continues towards S.

We show the moment when the light signal reaches S in Fig. 4.

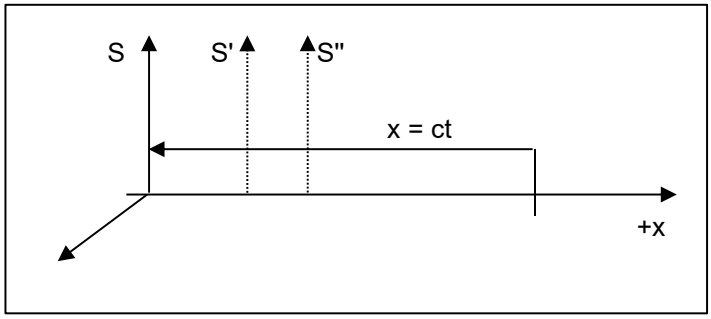

Fig. 4

The distance between the event and the S-origo is $x = ct$.

What does Fig. 1 - Fig. 4 represent?

Three inertial reference systems are placed in such a way that their x-axis coincides.

On this axis, at the distance x from the S-origo, an event occurs in the form of a short light signal.

This signal moves toward the three reference systems, two of which move toward the point where the event occurred. The three reference systems record the time when the light signal reaches

them, one by one.

This is reality!

We believe that the mathematical model of reality we built is flawless: mathematical, logical and physical!

We will see below that after applying Lorentz Transformations and the time dilation to this reality a contradiction with our original conditions occurs!

5. Summary of the experiment

We have obtained the following relationships between variables t, t' and t''.

$$x = v''t'' + ct''$$

$$x = v't' + ct'$$

$$x = ct$$

$$\rightarrow v''t'' + ct'' = v't' + ct'.$$

On the other hand we have the formula for time dilation, TD: $t' = t\gamma$.

We apply this formula for S-S' and S-S".

Note that S' and S" have different speeds. This means that even γ will be different.

TD for S-S': $t' = t\gamma'$.

TD for S-S": $t'' = t\gamma''$.

$\rightarrow$ t'/γ' = t''/γ''

So we have the following equation system:

$$v''t'' + ct'' = v't' + ct' \quad (1)$$

$$t'/\gamma' = t''/\gamma'' \quad (2)$$

The relationship between t' and t" in (1) results from our mathematical model which we consider to be flawless. The relationship between t' and t" in (2) results from the application of the formula for the time dilation.

We make calculations by substituting t' = t"(γ'/γ") from (2) into (1).

$(v'' + c)t'' = (v' + c)t' \rightarrow$

$(v'' + c)t'' = (v' + c)t''(\gamma'/\gamma''),$ divide by $t'' \rightarrow$

$(v'' + c) = (v' + c)(\gamma'/\gamma'') \rightarrow$

$(v'' + c)\gamma'' = (v' + c)\gamma',$ squaring $\rightarrow$

$(v'' + c)^2\gamma''^2 = (v' + c)^2\gamma'^2 \rightarrow$

$(v'' + c)^2c^2/(c^2\text{-}v''^2) = (v' + c)^2c^2/(c^2\text{-}v'^2) \rightarrow$

$(v'' + c)/(c\text{-}v'') = (v' + c)/(c\text{-}v') \rightarrow$

$(v'' + c)(c\text{-}v') = (v' + c)(c\text{-}v'') \rightarrow$

$v''c - v'v'' + c^2 - v'c = v'c - v'v'' + c^2 - v''c \rightarrow$

$v''c - v'c = v'c - v''c \rightarrow$

$2v''c = 2v'c \rightarrow$

$v'' = v'$

This result contradicts our initial conditions that the two reference systems, S' and S", move at different speeds relative to S, $v'' > v'$.

6. Conclusions

The formula for time dilation is derived from Lorentz transformations.

The results of our experiment show that Lorentz transformation / Time Dilation does not verify reality.

One or both of these concepts must be incorrect!

The Lorentz transformations/The Time Dilation are not self-consistent!

From this follows that the theory of special relativity is nonsense.

References

[1] R. Harris, *Modern Physics*, 2nd ed. (Pearson, London, 2008), pp. 14–15.

[2] A. Einstein, *Den Speciella Och den Allmänna Relativitetsteorin*, (Daidalos, Gothenburg, 2006), (The Special and General Theory of Relativity) (Swedish).

[3] A. Einstein, *Relativity: The Special and the General Theory*, 100th anniversary ed. (Princeton University Press, Princeton, NJ, 2015).

[4] J. Slowak, *Mathematics shows that the Lorentz transformations are not self-consistent* (Physics Essays, Vol. 33 No. 1, 2020).

[5] J. Slowak, *Special Relativity is Nonsense,* 2nd ed. *(*Books on Demand, Stockholm, 2020).