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Einstein's Illusions in STR

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Abstract

Special Theory of Relativity (STR) had been considered as a key of modern physics where Albert Einstein proved it in 1905 based on his imaginary experiment when he deduced three important conclusions related to the mass, length and time, essentially.

Many times, I tried to check this imaginary experiment and I failed to get the same conclusions, maybe because I am not as smart as Einstein, but when you check my realistic experiment with my own mathematical equations you will be satisfied that there is nothing changed on the cases of the mass, length or time, where I proved that Einstein's Beta (β) doesn't make sense in behalf of Galileo's transformations.

Keywords:

1. Introduction

Essentially, we can't talk about STR without talking about the spacetime as Einstein defined it in his special theory of relativity. For that, when I reviewed STR I could understand that Einstein had has the full perfect definition of his spacetime. I would not like (now) (Note 1) to go far in this issue, but quickly, we can't talk about spacetime without talking about its physical dimensions essentially, that because the dimension is a physical domain is used to describe the physical quantities that just measured by the physical units for advantages of the dimensional analysis where the physical equations should be physically checked based on the compatibility of its physical units. Here, you can recognize the essence of my dissension with what Einstein had deduced in this issue which is being in the core of the relationship between those two dimensions, where Einstein considered that the spacetime is a physical domain governed by the four perpendicular and equivalent dimensions of space and time, but I can define the spacetime as a physical domain adjusted by two identical and unseparated dimensions when the temporal dimension can be observed as waves are surrounding the three perpendicular axises of spatial dimension, where you can for first time imagine how I put the temporal dimension and the spatial dimension together on the same board (new concept of cartesian system) as shown in Figure 1, where you note that while the spatial dimension is propagating everywhere from the origin (o) as vectors, you find the temporal dimension is expanding around this origin (o) as waves.

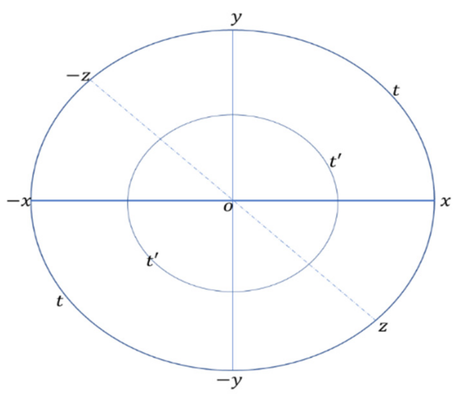

Figure 1. Spacetime and the new cartesian system

Based on this consideration, I can start my private review regarding to STR of Einstein.

2. Research Purpose

In this research, I will try to give the perfect answers (philosophy, mathematically and logically) on:

a. Is there something wrong in Lorentz transformations?
b. Is there something wrong in the special theory of Einstein?
c. How the synchronism preserves the space-time interval?

3. Research Hypothesis

Philosophy depends on an accurate imagine of three fundamentals; logic, mathematics and physics. So, I'll depend on this vision to produce convincing results in this research.

4. Special Theory of Relativity (STR)

In his postulate of STR, Einstein supposed the same imaginaries of Lorentz concerning of the two inertial reference frames (Note 2) (stationary system and moving system), where I can picture his postulate as shown in Figure 2.

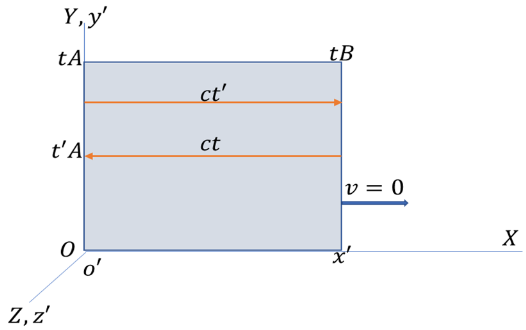

Figure 2. My own imagine about Einstein's postulate in STR

In his postulate, Einstein supposed that "a ray of light propagates from (tA) to (tB) and reflects from (tB) to $(t'A)$ with speed (c) within time (t)." (Note 3) For that, Einstein was right when he concluded that "$(tB - tA = t'A - tB)$, $(tB - tA = \frac{ct'}{c-v})$, or $(t'A - tB = \frac{ct}{c+v})$" (Note 4), if he considered the velocity of moving system equals zero $(v = 0)$. But if one of these two reference frames moved with high speed, like: $(v = c)$, I think that Einstein's conclusions become wrong; especially when he concluded that $(t' = \frac{t - xv/c^2}{\sqrt{1 - v^2/c^2}})$ or $(x' = \frac{x - vt}{\sqrt{1 - v^2/c^2}})$ (Note 5). For that, when you let the moving system, moves with $(v = c)$, you will find that Einstein's equation $(t'A - tB = \frac{ct}{c+v})$ becomes wrong: $(t'A - tB = \frac{ct}{c+c} = \frac{ct}{2c})$ (Note 6), while it should be equaled (ct): $(t'A - tB = ct)$ because $(t'A - tB)$ is a trip of light from (tB) to $(t'A)$. Also, when we consider $(v = c)$ then these spacetime intervals; $(ct, ct', vt, x, and\ x')$ become equaled; $(ct = ct' = vt = x = x')$ (Note 7).

By my point view, the synchronism has the full responsibility for this confusion. I think that Einstein fell in this default when he believed that the spacetime interval had been preserved by this equation: $(\Delta x^2 + \Delta y^2 + \Delta z^2 - c^2\Delta t^2 = \Delta x'^2 + \Delta y'^2 + \Delta z'^2 - c^2\Delta t'^2)$. (Note 8)

To prove that, let us suppose that a stationary system and moving system have different origins (o and o') on the same location, and the length of moving system is $149986229m$ $(x' = 149986229m)$. Then let the ray of light propagate from the rear edge of moving system (tA) with speed (c), trying to head the front edge of moving system and reflect to the rear edge of moving system again while moving system is moving along of positive (x) axis with $(v = \frac{1}{2}c)$.

In this case, as shown in Figure 3, you will note that the ray of light (ct_1) could not reflect from (tB) but it needs to follow the front edge of moving system from (tA) to (tB') just to touch it as $(ct_1 + ct_2)$. Also, you will note that while this ray of light is trying to reflect from (tB') and back as (ct_3) to the rear edge of moving system which becomes now on $(t'A)$ after one second of its motion from tA. In this time, you will note that the front edge of moving system had moved from (tB') to (tB'') as (vt_3).

Hence, I expect that the origin of moving system had moved from (o') to (o'_3) within one second, and the front edge of moving system had also moved from (x'_1) to (x'_3) as $(vt_1 + vt_2 + vt_3)$ within the same time (one second). Also, I expect that while the ray of light trying to head (tB') from (tA) and reflect from (tB') to (t'A) within one second, the back of moving system had moved from (o') to (o'_3) within one second also. By using the velocity law and speed of light, you can check that the events of this experiment had been synchronized: ct_1 and vt_1, had occurred in the same time ($0.5t$), ct_2 and vt_2 had occurred in the same time ($0.25t$), also, ct_3 and vt_3 had occurred in the same time ($0.25t$). By result, the observer in stationary system reported that he observed the ray of light propagated from (tA) to (tB') and reflected from (tB') to (t'A) within one second, but the observer in moving system reported that the ray of light propagated from the rear edge of moving system to front edge of moving system and reflected from front edge of moving system to the rear edge of moving system within one second, but an external observer said he feels that: $[(tB - tA) + (tB' - tB) + (t'A - tB')] > [(tB'' - tB) + (t'A - tB')]$, which is a wrong feeling because he didn't pay attention to the reflection points.

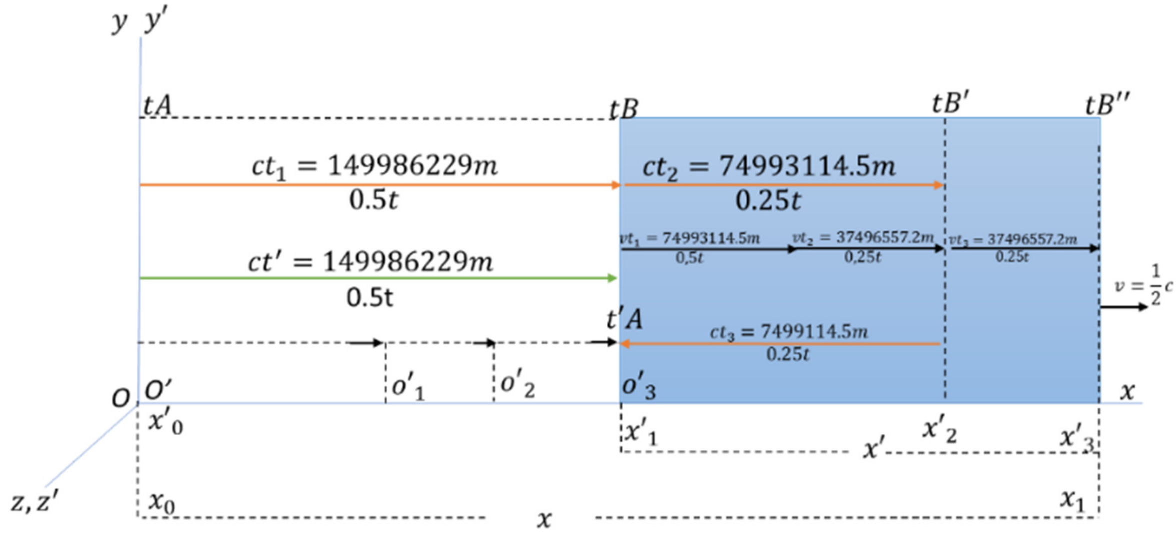

Figure 3. My imaginary experiment

By using this certain imaginary experiment as shown in (Figure 3) I can now define any physical quantity is wanted in this experiment, as follows:

$$\left(\frac{x'_1 - x'_0}{tB - tA}\right) = \frac{149986229m}{0.5\ sec} \equiv x' = ct_1 \tag{1}$$

$$\frac{x'_2 - x'_1}{tB' - tB} = \frac{74993114.5m}{0.25\ sec} \equiv \frac{1}{2}x' = ct_2 \tag{2}$$

$$\frac{x'_1 - x'_2}{t'A - tB'} = \frac{74993114.5m}{o.25\ sec} \equiv \frac{1}{2}x' = ct_3 \tag{3}$$

$$ct = ct_1 + ct_2 + ct_3 = 299972458m = x \text{ (Note 9)} \tag{4}$$

$$\frac{x'_3 - x'_1}{tB'' - tB} = \frac{x'_1 - x'_0}{t'A - tA} = \frac{149986229m}{0.5\ sec} \equiv ct' = x' \tag{5}$$

Now it is easy to check that $(ct' = x')$ when we recognize that the time interval $(tB - tA\ )$ is the trip of light from (tA) to (tB) within half second. And then, it is easy to check that $2x' \equiv (tB - tA) + (tB'' - tB)$, which means that the length of moving system never contracted:

$$\frac{x'_3 - x'_1}{tB'' - tB} = \frac{x'_1 - x'_0}{tB - tA} \equiv ct' = 149986229m\ = x' \tag{6}$$

It is straightforward to figure out that we have $(ct' = x')$ but $(ct \neq x)$ if we change the velocity of moving system to ($c > v > 0.333c$), where then we find ($ct > x$), which means; Eq (27) (Note 10) of Lorentz transformations becomes wrong:

$$x = ct' + vt \neq ct \text{ (Note 11)} \tag{7}$$

In this case ($c > v > 0.333c$) you will find that it is curtain we have $(ct > x), (ct' = x')$, and $(x - vt = ct' \neq x')$ (Note 12) which means that spacetime interval is not preserved:

$$(ct)^2 - x^2 \neq (ct')^2 - (x')^2 \tag{8}$$

Also, when I supposed that ($v = \frac{1}{2}c$) then I found that the Einstein's equation (Note 13) of length contraction and equation (27) (Note 14) of Lorentz transformation become wrong; $(x' > x')$ as shown in the following formula:

$$x' = \frac{x - vt}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{x'}{\sqrt{1 - \frac{v^2}{c^2}}} \neq x' \tag{9}$$

Hence, you find that the space-time interval is just preserved by:

$$\mathrm{c} = \frac{\mathrm{x}}{\mathrm{t}} = \frac{\mathrm{x}'}{\mathrm{t}'} \tag{10}$$

which means that the speed of light is still invariant when the synchronism is defined by the following formula:

$$\mathrm{c} = (\mathrm{xt}') + (\mathrm{yt}') + (\mathrm{zt}') = (\mathrm{x}'\mathrm{t}) + (\mathrm{y}'\mathrm{t}) + (\mathrm{z}'\mathrm{t}) = \mathrm{c} \tag{11}$$

At the end, by using Eqs (1-11), you will find that; the time is not dilated:

$$(\mathrm{t} > \mathrm{t}') \text{ if } \left(\frac{\mathrm{x}}{\mathrm{t}} > \frac{\mathrm{x}'}{\mathrm{t}'}\right) \tag{12}$$

5. Einstein and Galileo's Transformations

It seems that when Einstein tried to check Galileo's transformations (Note 15), he had proved that these transformations should be adjusted to become more accurate by using another inertial reference like Beta (β) as invariant reference speed, then physicists tried to prove Einstein's conclusions by the following transformations: (Note 16)

1. They reformed Galileo's transformations by using an invariant reference speed like this parameter (β) to get:

$$(\mathrm{x}' = \beta(\mathrm{x} - \mathrm{u}))(\mathrm{x} = \beta(\mathrm{x}' + \mathrm{u})) \tag{13}$$

2. Then they have:

$$\mathrm{x}'\mathrm{x} = \beta^2(\mathrm{x}'\mathrm{x} + \mathrm{x}'\mathrm{u} - \mathrm{xu} - \mathrm{u}^2) \tag{14}$$

3. by dividing on xx':

$$\frac{\mathrm{xx}'}{\mathrm{xx}'} = \frac{\beta^2(\mathrm{x}'\mathrm{x} + \mathrm{x}'\mathrm{u} - \mathrm{xu} - \mathrm{u}^2)}{\mathrm{xx}'} \tag{15}$$

4. then they got:

$$1 = \beta^2\left(1 - \frac{\mathrm{u}^2}{\mathrm{xx}'}\right) \tag{16}$$

5. when they considered that $ct = x$, $ct' = x'$ and $u = vt$, then they got:

$$\beta = \frac{1}{\sqrt{1 - \frac{\mathrm{u}^2}{\mathrm{x}'\mathrm{x}}}} = \frac{1}{\sqrt{1 - \frac{\mathrm{v}^2}{\mathrm{c}^2}}} \tag{17}$$

By this way, Einstein got that (Note 17): $t' = \beta\left(t - \frac{xv}{c^2}\right)$ and $x' = \beta(x - vt)$ where; $y' = y$ and $z' = z$.

But when I tried to check these transformations as shown above, I found some tricks in its derivations:

a. If we considered: $\frac{v^2t^2}{c^2tt'} = \frac{v^2}{c^2}$. then $\left(\frac{t}{t'}\right) = \left(\frac{1}{1}\right)$. which means; $t = t'$.

b. When we have $(v = \frac{1}{2}c)$, then; $(\beta^2 = \frac{1}{(1-\frac{1t}{4t'})}$, when we check that: $(\frac{v^2t^2}{c^2tt'} = \frac{1t}{4t'})$, where we find that $(\frac{v^2}{c^2} = \frac{1}{4})$ so; $(t = 2t')$ despite of $t_v = t_c$ in this case.

c. If we have $x = \frac{x'+vt}{\sqrt{1-\frac{v^2}{c^2}}}$, as STR said, and we have a case of $(v = \frac{1}{2}c)$, then (x) becomes longer than (x). It is easy to check that; $x = \frac{x'+0.5x}{\sqrt{1-0.25}} = \frac{x}{\sqrt{0.75}} > x$, which means that the length of moving system is expanded by motion of x', which leads to destruction of Einstein's relativity.

d. Also, when we refer to my postulate in Figure 3 above, where: $v = \frac{1}{2}c$, and $t' = \frac{1}{2}t$, then I find that; $\beta =$ 1 or ∞, as shown in the following solutions:

$$\beta^2 = \frac{1}{(1-\frac{v^2t^2}{c^2tt'})} = \frac{1}{\left(1-\frac{(\frac{1}{2}c^2)t^2}{c^2tt'}\right)} = \frac{1}{\left(1-\frac{\frac{1}{2}t}{t'}\right)} = \frac{1}{\left(1-\frac{t'}{t'}\right)} \tag{18}$$

So, if $\beta^2 = \frac{1}{\left(1-\frac{t'}{t'}\right)}$, then; $\beta = \frac{1}{\sqrt{0}} = 1$ or ∞ if we considered $(\frac{1}{0} = \infty)$ as I proved that in my book that published before in Germany (Note 18). Note: if $(v = \frac{1}{2}c)$ then:

$$(½\ c^2)t = c^2\ (\frac{1}{2}t), \text{ and; } \frac{v^2t}{c^2t'} = 1 \tag{19}$$

e. Anyway, if we consider that $(ct = x)$ and $(ct' = x'\ )$ as STR considered, I think that these transformations as shown in last section (above) are correct as a mathematical derivation, if it is derived as follows:

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

$$(ct)(ct') = \beta^2[(c^2(t')^2 + cvtt' + c^2t^2 + c^2tt' + cvt^2 - cvt^2 - cvtt' - v^2t^2)] =$$

$$c^2tt' = \beta^2[c^2(t')^2 + c^2t^2 + c^2tt' - v^2t^2] =$$

$$\frac{c^2tt' = \beta^2\left[c^2(t')^2 + c^2t^2 + c^2tt' - v^2t^2\right]}{c^2tt'} =$$

$$1 = \beta^2\left[\frac{t'+t}{t+t'} - \frac{v^2t^2}{c^2tt'}\right] =$$

$$\beta^2 = \frac{1}{\left[1-\frac{v^2t}{c^2t'}\right]}$$

$$\therefore \beta = \frac{1}{\sqrt{1-\frac{v^2t}{c^2t'}}} \tag{20}$$

But, when we want to check these derivations on experimental example, we find something wrong. To do that, let me suppose that I have two stationary boxes with different sizes as follows; while box (A) has a size $15 \times 15 \times 15m$ moves on X axis with velocity $v = 15m/s$, I have another box (B) has a size $16 \times 16 \times 16m$ on same axis with velocity $v = 0.00m/s$. So, in this case we have $(u = x' - x)$. Then, we find that $x' = x - u$ and $x = x' + u$.

By using use the Prof. Shankar's method (as shown above) to prove Einstein's conclusions, I find that:

$$(x' = \beta(x - u))(x = \beta(x' + u)) =$$

$$x'x = \beta^2(x'x + x'u - xu - u^2) =$$

$$x'x = \frac{\beta^2(x'x + x'u - xu - u^2)}{x'x} =$$

$$1 = \beta^2\left(1 - \frac{u^2}{x'x}\right) =$$

$$\therefore \ \beta = \frac{1}{\sqrt{1 - \frac{u^2}{x'x}}} \tag{21}$$

Then, we find that the length of the moving box is expanded, which is incredible. Of course, the reason is this (β) when it was added as invariant reference to Galileo's transformations, which means that Einstein made some forced modulations on Galileo's transformations to make his special theory. Note; $A, B, x, x', ct, ct', vt, or\ ut$ are distances (d) or time intervals, and STR should be got its results when $v > 0.4c$, but it should not give us its results when $v \ll 0.4c$.

6. Realistic Experiment

In this experiment I suppose that we have a moving system is located on the same location of stationary system, and while moving system has its private coordinates (x', y', z'), the stationary system also has its private coordinates (x, y, z), then, suppose that any ray of light needs half second to travel from (o') to (o'_1) or to (y'), which means that $(o'_1 - o' = y' - o' = 149986229m)$, and then, let the ray of light head towards from rear edge to the front edge of the moving system, while in the same time, the moving system starts its motion with velocity $(v = \frac{1}{3}c)$ along (x) axis. Please, don't forget that we have here many Nano clocks had adjusted on the same time (time now is zero). Exactly with one second of this synchronized motion, we note that; while a ray of light (c) try to touch the front edge of the moving system within time (t), we discover that this ray can do that just when the front edge of moving system had completely used its velocity (v) to move from (x'_1) to (x'_3) within same time (t), but another ray (c) traveled from (o') to (x'_1) within half second (t'), as shown in Figure 5:

Now, it is easy to check that we have $(ct \neq x)$, $(ct' = x')$, and $(vt_1 + vt_2 + vt_3 = vt \neq x')$, where you can define these relations by one equation:

$$x = ct' + vt \neq ct \ \text{(Note 19)} \tag{22}$$

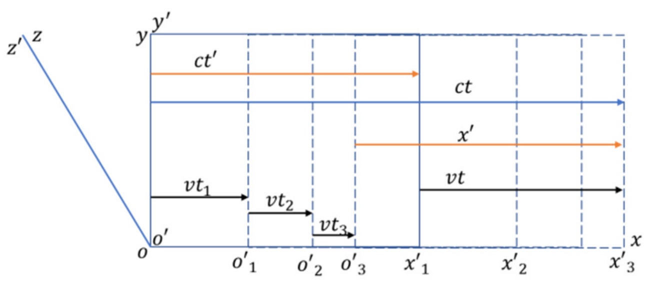

Figure 5. The first postulate of my experiment with $v = \frac{1}{3}c$

So, it is easy to check that; the time interval (ct) is the total trip of light from (o) to (x), within time (t) which means that its space interval should be equaled $(299972458m)$ where it is easy to check that $(x = 249962039.333m)$ by using Eq (22), but the time interval (ct') is the total trip of light from (o') to (x'_1) within time (t') which means its space interval equals $(149986229m)$ and the time interval (vt) is the total trip of the front edge of the moving system from (x'_1) to (x'_3), which equals $(vt_1 + vt_2 + vt_3)$ which is the same total trip of the back of the moving system from (o') to (o'_3) within time (t) which means that its space interval equals $(99975810.333m)$, which means that the time is not dilated and the length of the moving system is not contracted as Einstein claimed before. When you pay attention to the full motion of moving system, you will note that the rear of moving system had stopped on o'_3 where the front of moving system had stopped on x'_3 and it is easy to check this finding by the following formula:

$$ct' = (x'_1 - x'_0) = (x'_3 - o'_3) = x' \text{ (Note 20)} \tag{23}$$

And, it is straightforward to check the spacetime interval is not preserved:

$$(ct - x)^2 \neq (ct' - x')^2 \text{ (Note 21)} \tag{24}$$

7. Synchronism

Till now, I am talking about linear motion, but if we want to check this experiment with different motions, let us go back to the beginning of this experiment, where the origins of moving and stationary systems are parallel, then, put a lamp exactly on (o'), and another one exactly on (o'_3) (Note 22), then turn on these lamps in the same time of starting of motion of the moving system along (x) axis with velocity $(v = \frac{1}{3}c)$. And then, while observer in moving system notes that, a ray of light had completed its trip from (h') to (H) within time (t'), another observer in stationary system notes that this ray of light had used the same time (t') to complete its trip from (o') to (d). In this time, we noted that the moving system had completed a trip from (o') to (h'), within same time (t'). So, to let these trips end within time (t), let the moving system move from (o') to (h) within time (t) to be sure that the ray of light had completed its trip from (h') to (H) and reflected from (H) to (h') within time (t) as observer of moving system says, where another ray of light had just traveled from (o') to (d) and suddenly reflected from (H) to (a) within total time (t), as observer of stationary system says.

Thus, with help of this certain realistic physical experiment, we settled what should be understood by synchronism, where many Nano clocks located at different places on stationary system show us that events (H) and (h) had never synchronized with time (t').

For that, I note that we have missed space intervals in this experiment estimated as $(H - d) + (h - a)$ represents a real variance between STR and Euclidean geometry (EG), where I can define it as $(ct_4)^2 \neq (ct')^2 + (vt_1)^2$, then I also fined that:

$$(ct_5)^2 \neq (ct')^2 + (vt_2)^2 \tag{25}$$

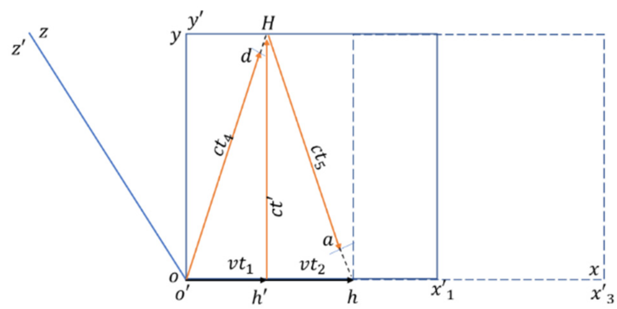

Figure 6. The second postulate of my experiment

In this experiment (as shown in Figure 6), it is easy to check that; $(ct = ct_4 + ct_5 \neq x)$, where $(ct' = x')$, which means that the Einstein's equation of synchronization is not running, where I find that the spacetime interval isn't preserved:

$$[2(ct')^2 - 2(x')^2] \neq [(ct_4)^2 + (ct_5)^2 - (x)^2] \tag{26}$$

Hence, remember that we got these data in this experiment; $(vt = 99975810.333m \neq x')$, $(ct' = 149986229m = x')$, $(t' = 0.5\ sec)$, $(t = 1sec)$ and $(x = 249962048.333m)$.

For further clarification about the reports came from observers, while the observer of moving system said he saw the ray of light traveled from (h') to (H) and reflected from (H) to (h') within time (t), the observer of stationary system said he saw the ray of light traveled from (o') to (d) within time (t') (Note 23) and then it shown by him as it suddenly reflected from (H) to (a) and stopped there within time (t'). But the third observer out of these systems said he observed the events from the beginning and he saw another light traveled directly from (o) to the point of $(event)$ within time (t). (Note 24) Now, it is easy to check if these reports are correct or not, when you back to Figure 6 by using Pythagorean law of right triangle to be sure that the distance between (o') and (H) is longer than the distance between (o') and (d), and the distance between (H) and (h) is longer than the distance between (H) and (a), where $(\overrightarrow{Hh'} = \overrightarrow{Ha} = \overrightarrow{o'd})$ depending on the speed of light. Then you will find that all equations above are perfect and running so well.

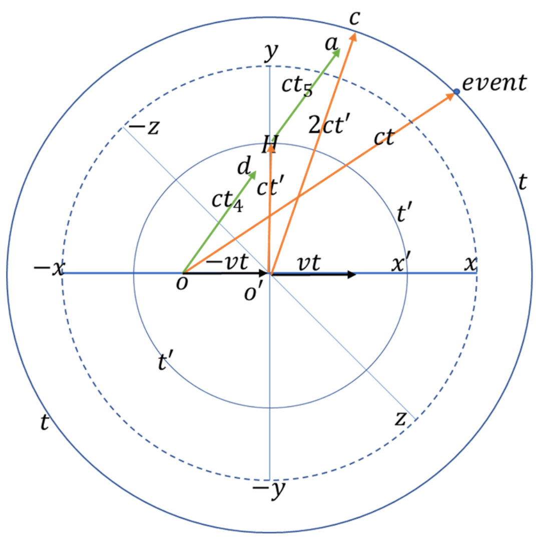

Figure 7. My realistic physical experiment with four coordinates (x, y, z, t) (Note 25)

But, if we want to get a clear vision about the variance between STR and EG, let us take a long look on Figure 8, where I consider that we have many rays of light are propagated from many points to head other points in these systems in synchronous with the motion of moving system, as shown in figure-8, where we note, while Einstein considered that the events (H, d, c) and events (h, a, b) are synchronized events, EG strongly considers that it never ever achieved any rule of synchronization according to Pythagorean theory and the invariant speed of light.

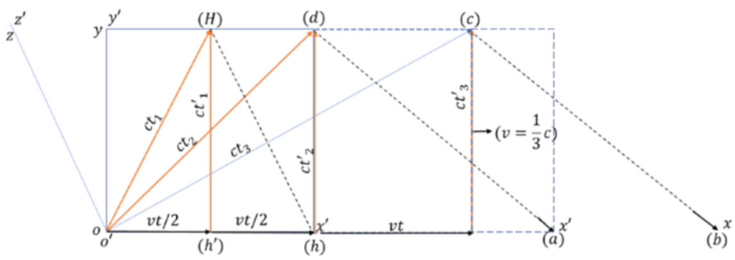

Figure 8. Euclidean Geometry and the synchronization

8. Conclusion

I proved in this research that:

a) STR established on so many confused assumptions.

b) A lot of mathematical tricks had been used to produce some illusions in STR.

c) Spacetime interval is not preserved by STR.

d) Time is not dilated, also length is not contraction.

e) STR could not deal with the rules and laws of EG.

Conflict of interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

Notes

Note 1. Because I'll discuss this issue in different research.

Note 2. H. A. Lorentz, A. Einstein, H. Minkowski and H. Wey; The principle of relativity, Dover publications, INC, 2017, p. 38.

Note 3. Last reference, the same page.

Note 4. You can check this equation which is mentioned in the lecture of: Prof. Victor Yakovenko, Derivation of the Lorentz transformation, lecture note for course Phys171H-Introductory Physics: Mechanic and Relativity-Department of Physics, university of Maryland, College Park, 15 Nov 2004, pg.4. www.physics.umd.edu/lorentz transformations.

Note 5. Same reference NO.2, p. 46.

Note 6. Which means that: $(2c = ct)$.

Note 7. It is easy to prove it; when $(v = c)$ then (vt) becomes $(ct)$and (ct') becomes (ct) while $(ct' = x'), so\ (x = x'). etc.$

Note 8. The same reference No.2, p. 46.

Note 9. Look to this trick: $ct_1 + ct_2 + vt_3 \neq x$ but $ct' + vt = ct = x$.

Note 10. Prof. Victor Yakovenko, Derivation of the Lorentz transformation, lecture note for course Phys171H-Introductory Physics: Mechanic and Relativity- Department of Physics, university of Maryland, College Park, 15 Nov 2004, pg.4. www.physics.umd.edu/lorentz transformations.

Note 11. For more details see section 6, below.

Note 12. Be careful to this complex and confused equation which represents the basic assumptions of STR where I find, it is wrongly to believe that: $x = ct' + vt = ct$ when the velocity of moving system is ($c > v > 0.333c$).

Note 13. H. A. Lorentz, A. Einstein, H. Minkowski and H. Wey; The principle of relativity, Dover publications, INC, 2017, p. 46.

Note 14. Same reference No.8.

Note 15. I think we've a trick in Galileo's transformations when they considered that $u = vt$ and derived that $(u = vt - vt' = \left(\frac{x}{t}t\right) - \left(\frac{x'}{t'}t'\right) = x - x'$, where this equation should be as: $(ut = x - x')$, then we have; $u = \frac{x-x'}{t}$.

Note 16. Prof. Shankar, introduction to relativity, lecture 12, Yale university, 2008, https://www.youtube.com/watch?v=pHfFSQ6pLGU.

Note 17. H. A. Lorentz, A. Einstein, H. Minkowski and H. Wey; The principle of relativity, Dover publications, INC, 2017, p. 46.

Note 18. Mohammad Tayseer Altamimi, Classical Physics, LAP, Saarbrucken, Deutschland, Germany, 2013, ISBN:978-3-569-46618-2, p. 20.

Note 19. Note: this is the most confusing equation, because $(ct = ct' + vt = x)$ just in three cases; $(v = 0)$, $(v = \frac{1}{2}c)$ or $(v = c)$, where we find Eq (23) becomes $(x'_1 - x'_0 = x'_3 - x'_1 = x')$. But out of these cases, Eqs (22, 23) still correct, as is. If you pay attention to the figure-5 you will note that we have a shared spacetime interval $(x'_1 - o'_3)$, which is the reason of the wrong conclusion in STR (Einstein's illusions in STR).

Note 20. Note: $(x'_0 = o')$.

Note 21. Try to repeat this experiment with $(v = 0.6c)$, then you will find that: $x' = x - vt$. Also, you will find: $(ct)^2 - x^2 \neq (ct')^2 - x'^2$, where $ct > x$, $x' = ct'$ and $x' = vt$: (the same results of the assumption: $(c > v > 0.333c)$.

Note 22. Note: (o'_3) in figure-5 became (h) in Figure 6

Note 23. Be careful here; depending on the speed of light, each of the spacetime intervals of (ct_4), (ct_5) and (ct') are equaled, so we have spacetime intervals are missed in report of observer of stationary system. The first missed spacetime interval is located between (d) and (H) and the other one located between (a) and (h). See Figure 7 to check that the events are not synchronized in this experiment.

Note 24. As shown in Figure 7, where I re-pictured Figure 1 and Figure 6 by interference method and then I used these data and results of it, where you will get a new scientific show which replaces the four coordinates (x, y, z, t) on one new cartesian system.

Note 25. Be careful; $(ct = 2ct')$, because: $(vt - vt = 0)$. Also, $(ct = 2ct')$, because: $c(t) = c\ \ (2t')$ when $(t = 2t')$.

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