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Length Contraction of Special Theory of Relativity must be Wrong

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Abstract: *In classical Newtonian physics, space and time are absolute quantities. Hence, space and time can be treated independently and discussed separately. With his theory of relativity, Einstein proved that space and time are dependent and must not be treated separately. Einstein proved this idea through time dilation and length contraction formula. He proved time dilation and length contraction formula through some thought experiments. But there is no real evidence of these formulas. Here in this article I will use my thought experiments to demonstrate that length contraction formula is wrong.*

Keywords: *Length contraction, time dilation, wrong.*

1. INTRODUCTION

In 1905, Einstein gave his special theory of relativity. In his theory he proved length contraction and time dilation formula. According to the special theory of relativity, length contraction is the phenomenon that a moving object's length is measured to be shorter than its proper length, which is the length as measured in the object's own rest frame. This contraction is usually only noticeable at a substantial fraction of the speed of light. Length contraction is only in the direction in which the body is travelling. For standard objects, the effect is negligible at every speeds, and can be ignored for all regular purposes, only becoming significant as the object approaches the speed of light relative to the observer. Length contraction and time dilation are dependent. To prove length contraction wrong we have to prove that time dilation formula is incorrect. According to the special theory of relativity, A central tenet of special relativity is the idea that the experience of time is a local phenomenon. Each object at a point in space can have it's own version of time which may run faster or slower than at other objects elsewhere. Relative changes in the experience of time are said to happen when one object moves toward or away from other object. This is called time dilation. Einstein's relativity was based on two postulates:

1. The principle of relativity: The laws of physics must be the same in all inertial frames.
2. The constancy of the speed of light: The speed of light in vacuum has the same value, c, in all inertial frames, regardless of the velocity of the observer or the velocity of the source emitting the light.

Based on these two postulates and through some thoughts experiments, Einstein proved length contraction and time dilation formula. But based on these two postulates and through some thought experiments, it is possible to prove that length contraction and time dilation formula are wrong**.**

So, firstly I will prove that time dilation formula is incorrect by using my thought experiments. By proving time dilation incorrect it will be possible to easily prove that length contraction formula is wrong because length contraction is dependent on time dilation.

2. LENGTH CONTRACTION

To prove length contraction formula we have to know what is time dilation because length contraction and time dilation are related to each other. So first of all we will discuss about time dilation then we will prove the length contraction formula. Before discussing time dilation and length contraction, we will first need to define a pair of inertial frames [1]. If two frames have a constant relative velocity with respect to each other, then the two frames are said to be inertial to one another. For this discussion, we will conceive a scenario where a train bypasses by a station platform at a constant velocity. Kinetically, we are allowed to choose either the platform or the moving train to be the stationary (inertial) frame and the other to be the moving (inertial) frame. Dynamically, we should construct a stationary frame S on the platform and a moving frame S' on the train. In Fig.1, a rod is laid alongside the station platform. There is an observer on the platform and another observer on the train and both measure the rod's length using a sensor attached to the front of the train, i.e. the origin O' of the moving frame S'. The length of the rod as measured by an observer in the stationary frame S, is defined as proper (original) length, l_0, while the length of the rod as measured by an observer in the moving frame S', is defined as regular length, l' When the sensor touches the left edge of the rod, the time is recorded as 0 for both observers. When the sensor touches the right edge of the rod, the time is recorded as t for the observer in the stationary frame S and as t_0 for the observer in the moving frame S'.

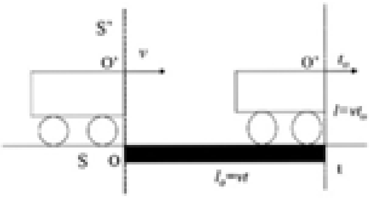

Figure1. *A rod is laid alongside the station platform. There is an observer on the platform and another observer on the train and both measure the rod's length using a sensor attached to the front of the train, i.e. the origin O' of the moving frame S'.*

The movement of the train's sensor from one end of the rod to the other end can be considered an event. This event occurs at the same location, i.e. at the front of the train, for the observer in the moving frame S', hence the period of the event as measured by this observer is defined as the proper (original) time, t_0 . This event occur sat different locations, i.e. at two different points on the platform, for the observer in the stationary frame S, hence the period of the event as measured by this observer is defined as the regular time,t. The proper length of the rod, l_0 , is calculated by multiplying the train's velocity by the regular time, $l_0 = vt$, and regular length, l', is calculated by multiplying the train's velocity by the proper time,

$l' = vt_0$

At the same time the sensor touches the left end of the rod, the observer in the moving frame S' sends a pulse of light towards the ceiling of the car, where a mirror is placed. To the observer in the moving frame S', the light travels vertically up towards the ceiling and is then reflected straight down. The ceiling height of the boxcaris adjusted such that the pulse of light reaches the ceiling at the same time that the sensor reaches the right end of the rod (see Fig.2).

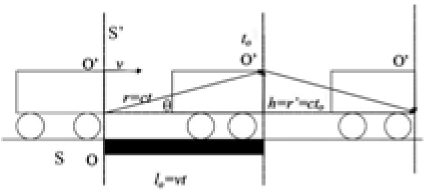

Figure2. *The ceiling height of the boxcar is adjusted such that the pulse of light reaches the ceiling at the same time that the sensor reaches the right end of the rod.*

If it takes an amount of time t_0 for the pulse light to reach the ceiling then the height of ceiling is equal to the distance traveled by the light, which is $h = r' = ct_0$ as measured by the observer in the moving frame S'. To the observer in the stationary frame S the light travels diagonally upwards towards the ceiling and is then reflected diagonally downwards. If it takes and amount of time t for the pulse of light to reach the ceiling then the distance traveled by the light on each diagonal leg is $r = ct$, as measured by the observer in the stationary frame O, where

$r = \sqrt{(l_0{}^2 + h^2)}$

$= \sqrt{\{(vt)^2 + h^2\}}$

$= \sqrt{\{(vt)^2 + r'^2\}}$

$= \sqrt{\{(vt)^2 + (ct_0)^2\}}$ [1]

From Fig.2, we can derive the following property for sin θ: $\sin\theta = h / r$

$= \sqrt{(r^2 - l_0^2)}/r$

$= \sqrt{\{(ct)^2 - (vt)^2\}}/ct$

$= \sqrt{(1 - v^2/c^2)}$ [2]

From Fig.2, we can also derive the following relation for sinθ knowing that $r = ct$ and $h = r' = ct_0$

$\sin\theta = h / r$

$= r' / r$

$= ct_0 / ct$

$= t_0 / t$ [3]

By combining Eq.(2) and Eq.(3), we arrive at the time dilation formula

$t = t_0 / \sqrt{(1 - v^2 / c^2)}$ [4]

This equation shows that the regular time, t, is always larger than or equal to the proper (original) time, t_0 . This result states that the time interval as measured by an observer in a stationary frame is longer than the one measured by an observer in a moving frame.

Multiplying both the numerator and the denominator of Eq.(3) by v , we can derive the following formula for :

$\sin\theta = t_0 / t$

$= vt_0 / vt$

$= l' / l_0$ [5]

By combining Eq.(2) and Eq.(5), we arrive at the length contraction formula

$l' = l_0 \sqrt{(1 - v^2 / c^2)}$

This equation shows that the regular length, l', is always less than or equal to the proper (original) length, l_0 . This result states that the length of a rod as measured by an observer in a moving frame is shorter than the one measured by an observer in a stationary frame.

3. PRESENTING LENGTH CONTRACTION IS WRONG

We have seen that length contraction and time dilation are related to each other. So we have to prove time dilation wrong to prove that length contraction is wrong. To prove time dilation wrong we have to do two thought experiments. We have to base on the two postulates of relativity to do these experiments.

Experiment 1

To do this experiment we first have to imagine that an observer is sitting on a moving train with a clock. Standing at the platform and looking at the clock, another observer is trying to measure his own time. The clock will be different. It has two points alongside o and o'. o' will be on the right side of o. The distance from o to o' is d. A pulse of light will go from o to o' and then it will be vanished. At that moment, another pulse of light will start again to go from o to o'. In this way it will continue. The train is moving at a speed of v. The observer sitting on the moving train will measure his time,

$t_0 = d/c$ [1]

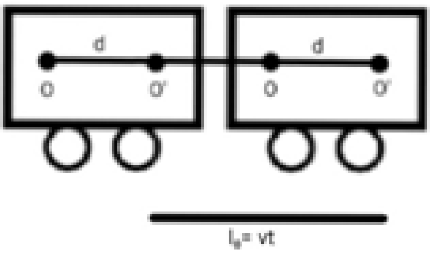

Figure3(a). *The observer sitting on the moving train will see that the pulse of light is going from o to o' and getting vanished.***(b).***Another observer will see when the pulse of light will go from o to o', o' will not be in its own place. It will move to right.*

As a result, the observer standing at the platform will see when the pulse of light will go from o to o', o' will move to l_0 distance for the speed of the train. So, the pulse of light has to overcome a little extra distance. The distance will be, $d + l_0$

As the speed of light in vacuum has the same value, c, in all inertial frames, the observer standing at the platform will measure his time,

$t=(d + l_0)/c$[2]

Here, the observer standing at the platform will measure the distance

$l_0 = v\,t$[3]

But the observer sitting on the moving train will measure the same distance

$l' = vt_0$ [4]

By combining Eq.[2] and Eq.[3] we get,

$t = (d + v\,t)/c$

$\Rightarrow c\,t = d + v\,t$

$\Rightarrow c\,t - v\,t = d$

$\Rightarrow t(c-v) = d$

$\Rightarrow t = d/(c-v)$

$\Rightarrow t = (d/c)/\{(c-v)/c\}$[5]

By combining Eq.[1] and Eq.[4] we get,

$t = t_0 /(1-v/c)$ [6]

But according to the special theory of relativity, the observer standing at the platform will measure his time,

$t= t_0 /\sqrt{(1-v^2/c^2)}$ [7]

Here, Eq.[6] $\neq$ Eq.[7]

Again, suppose this train going backward.

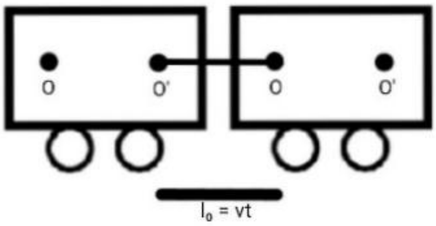

Figure4.*The observer standing at the platform will see when the pulse of light will go from o to o', o' will not be in its own place. It will move to left.*

As a result, the pulse of light has to overcome a little less distance. The distance will be,

$d - v\,t$

So, the observer standing at the platform will measure his time,

$t = (d - v\,t)/c$

$\Rightarrow c\,t = d - v\,t$

$\Rightarrow c\,t + v\,t = d$

$\Rightarrow t(c + v) = d$

$\Rightarrow t = d/(c + v)$

$\Rightarrow t = t_0 /(1+v/c)$ [8]

Here, Eq.[7] ≠ Eq.[8]

Here, when the clock is vertical, the observer standing at the platform measures his time $t = t_0 /\sqrt{(1-v^2/c^2)}$.When the clock is parallel to the floor of the train and goes forward that observer measures his time $t = t_0 /(1-v/c)$. Again, when the train goes backward the same observer measures his time $t = t_0 /(1+v/c)$. The observer standing at the platform measures his time differently because of the position of the clock and the direction of the speed of the train. So, time cannot be naturally slow and time dilation is completely wrong.

Experiment 2

We first have to imagine that an observer is standing at the platform with a clock. Sitting on a moving train and looking at that clock, another observer is trying to measure his own time. The clock has two points o and o'. The point o is bellow and another point o' is above it. The distance from o to o' is d. A pulse of light will go from o to o' and then it will be vanished. The observer standing at the platform will see that the pulse of light is going straightly from o to o'. So, he will measure his time,

$t = d/c$ [9]

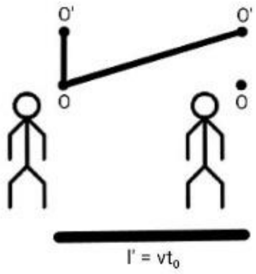

Figure5.*The observer sitting on the moving train will see that he is stationary and another observer is moving with his clock. He will also see when the pulse of light will go from o to o', o' will not be in its own place. It will move to right.*

The observer sitting on the moving train will see when the pulse of light will go from o to o', o' will move to l' distance. As a result the pulse of light has to overcome a little extra distance. According to the Pythagorean theorem the distance will be,

$\sqrt{(l'^2+d^2)}$

As the speed of light in vacuum has the same value, c, in all inertial frames, the observer sitting on the moving train will measure his time,

$t = \sqrt{(l'^2+d^2)}/c$ [10]

Here, $l' = v\, t_0$

So, $t_0 = \sqrt{(v^2 t_0{}^2+d^2)}/c$

$\Rightarrow c^2 t_0{}^2 = v^2 t_0{}^2 + d^2$

$\Rightarrow c^2 t_0{}^2 - v^2 t_0{}^2 = d^2$

$\Rightarrow t_0{}^2(c^2-v^2) = d^2$

$\Rightarrow t_0 = d/\sqrt{(c^2-v^2)}$

$\Rightarrow t_0 = (d/c)/\{(c^2-v^2)/c\}$ [11]

By combining Eq.[9] and Eq.[11] we get,

$t_0 = t/\sqrt{(1-v^2/c^2)}$

But according to the special theory of relativity, the observer sitting on the moving train measured his time $ts_0 = d/c$ and another observer standing at the platform measured his time $t = t_0 /\sqrt{(1-v^2/c^2)}$.

That's why $t = t_0$. If the observer standing at the platform measure his time to see the clock which is on the moving train and another observer sitting on the moving train measure his time to see the clock which is at the platform, they will measure their time same. So time can not be different for any observer.

Now by dividing Eq.[4] by Eq.[3] we get,

$l'/l_0 = vt_0 /vt$

$\Rightarrow l' = l_0 (t_0 /t)$ [12]

We have proven that,

$t_0 = t$ [13]

By combining Eq.[12] and Eq.[13] we can get,

$l' = l_0$

This equation shows that length contraction formula is wrong. The regular length, l', is always equal to the proper (original) length l_0 .

4. DISCUSSION AND CONCLUSION

According to the theory of relativity, space and time are dependent and must not be treated separately. So time dilation and length contraction are dependent. In his theory, through time dilation Einstein proved that there is no standard time, every time is local time. According to the special theory of relativity, time dilation is a difference in the elapsed time measured by two observer, either due to a velocity different relative to each other. He said that time is an illusion. So time will be different for different observer. If any observer moves faster his time will be slow. Einstein proved the time dilation based on some thought experiments. But we have seen that through some thought experiment it is possible to prove that time dilation is wrong. Time is always same in all observer's reference frames. We have seen that the observer measure his own time differently because of the position of the clock and the direction of the speed of the train. When the train is vertical the observer will measure his time $t= t_0 /\sqrt{(1-v^2/c^2)}$. If the same clock is parallel to the floor of the train, the same observer will measure his time $t = t_0 /(1-v/c)$ or $t = t_0 /(1+v/c)$. But it is not possible. So time is absolute for all observers. In reality, there will never be such a change in time. There is no real evidence of time dilation. Now it is clear to us that in reality it will never happen. So time is not an illusion and there is a standard time.

It is no matter whether an object is moving or not, its time will be always same. In other words, a stationary observer will measure his time same with the moving observer. If we stop our eyes, we will not see anything. It does not mean that there is nothing. Time dilation is like this. Time will not be naturally slow. If we move faster our time will not change. In classical Newtonian physics, time is absolute and this is true. Einstein mathematically proved the time dilation. But we have seen that mathematically time dilation is wrong. So Einstein was very much wrong. As time dilation is wrong, length contraction must be wrong because time dilation and length contraction are dependent. It is no matter whether an object is moving or not, its length will be always same. In other words, a stationary observer will measure his length same with the moving observer. According to the special theory of relativity, $l' = l_0 \sqrt{(1-v^2/c^2)}$. But I have proven that $l' = l_0$. so, $l' \neq l_0 \sqrt{(1-v^2/c^2)}$. It proves that space and time are not dependent and can be treated separately. In classical Newtonian physics, space and time are absolute quantities and can be treated independently and discussed separately. It is true. So Einstein was very much wrong and length contraction is incorrect.

REFERENCES

[1] Iqbal, M.Z.(2008).*Theory of relativity.*Ahmed Mahmudul Haque of mowla brothers.

[2] MLA:"phenomenon" Merriam-Webster Online Dictionary,(2008http://www.merriamwebster.com/help/citing.htm.

[3] T. Chen and Z. Chen(2009).Time dilation and length Contraction shown inthree-dimensional space-time frames, *Concepts of Physics.* Vol. VI, No. 2, 221-235.

[4] S. Mahmud (2018).Reconsidering time dilation of special theory of relativity. *International Journal of Advanced Research in Physical Science.5*(8).7-11.

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