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# Einstein's Lorentz Transformation is a Mathematical Game


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**[Abstract]:** This paper indicates that the calculation of time dilation in relativity theory is as the indirect calculation of $t^{'}$ from 'positive transformation'. While, the calculation of the length contraction is different. X is gotten from the 'inverse transformation', and then $x^{'}$ is resolved. From the mathematical point, if we reverse the calculation methods, it will be time contraction and length dilation… In addition, this paper adopts Einstein's methods and gets W relativity theory. When W is given infinite value, there will be infinite relativity theories. From these, we can conclude that Einstein's Lorentz transformation is a mathematical magic, and it is not only without any mathematical logic, but also without any physical significance.



**[Keywords]:** Einstein's Lorentz transformation, positive transformation, inverse transformation, the geniture of infinite relativity theories


## 1. Introduction

Through the speculation on the mathematical logic of special theory of relativity, we can easily find that the calculation of length contraction in relativity theory is as the calculation of X from 'inverse transformation'. While, the calculation of time dilation directly uses $t$ in 'positive transformation'. From the mathematic point, it is without logical reasoning; it is also without fixed physical meaning from the physical point. If we reverse Einstein's calculation methods, it will be time contraction and length dilation; if both are used 'reverse transformation', it will be time and length contraction. On the other hand, if both are used 'positive transformation', it will be time and length dilation. This question belongs to the basic question of the relativity theory. In other words, the basis of the relativity theory is not only without logical reasoning in mathematics but also without fixed physical meaning in physics. Now that the different calculation will lead to different time and space dilation and contraction, which just illustrates that Einstein's relativity theory is magical. At the same time, it illustrates Lorentz transformation is a pure mathematical game without fixed physical meaning. In addition, the paper assumes light velocity is an optional value $w$, and adopting Einstein's calculation methods, we also get $w$ relativity theory. $w$ Relativity theory has only high-order infinite small amount of differences with respect to Einstein's relativity theory. The infinite value of $w$ will bring infinite relativity theories, which is just like what Lorentz stressed 'local time is just a mathematical hypothesis without real physical meaning'

## 2 Einstein’s Lorentz Transformation

The reason why we call it Einstein's Lorentz transformation is that Lorentz himself did not rewrite the transformation into time and space contraction. Dilating the mathematical transformation to time and space transformation is what Einstein has done. Let us look at the following transformation process of Einstein.

He assumes a point $P$ in the space, the position is P(x, y, z) in $S$ axis frame and the time is indicated by $t$, just like Fig. 1 showing. Three coordinates in another axis frame $S'$ are parallel to axis frame $S$. $P$ moves along the $x$ direction at the speed of $v$. The time coordinate of $t'$ in $S'$ is $P(x', y', z')$. So, the relativity theory wants to solve the relationship of two coordinates in axis frames $S$ and $S'$ of point $P$.

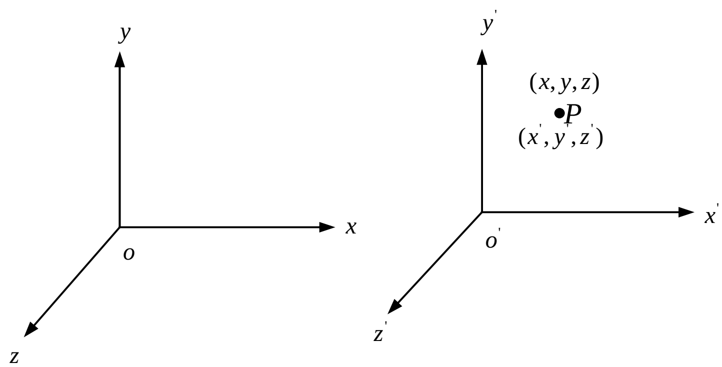


Fig. 1 Two Axis Frames with Relative Speed V

Einstein’s transformation is based on the same light velocity in different axis frames. The relativity theory assumes the following experiments: there will be a flash at the moment when two axis frames coincide; then, observing wave movements in two frames before the flash. In two axis frames, optical pulse is a spherical wave from the origin to the surrounding. The pre-wave movement of flash should not have any different impacts on two axis frames. So, the pre-wave movement equation in $S'$ system is:

$$x'^2 + y'^2 + z'^2 = (c_0 t')^2 \qquad (1)$$

To maintain the same speed of light, the pre-wave movement equation in S system is:

$$x^2 + y^2 + z^2 = (c_0 t)^2 \qquad (2)$$

So, in Lorentz transformation of relativity theory, on the one hand, Einstein maked $y = y'$ and $z = z'$; that is, he believed the coordinate position was not affected because it was perpendicular to relative movement direction. On the other hand, he treated x and t as the linear function of $x'$ and $t'$. That is:

$$y = y', \quad z = z', \quad x = ax' + bt', \quad t = ex' + ft' \qquad (3)$$

Now, we substitute (3) formula to (2) formula, and there will be:

$$(a^2 - c_0^2 e^2)x'^2 + y'^2 + z'^2 = (c_0^2 f^2 - b^2)t'^2 + (2c_0^2 ef - 2ab)x't' \tag{4}$$

Comparing (4) formula with (1) formula, we can find:

$$a^2 - c_0^2 e^2 = 1\,, \quad c_0^2 f^2 - b^2 = c_0^2\,, \quad c_0^2 ef - ab = 0 \tag{5}$$

Because we have known that the origin $(x = 0)$ in $S$ is the $x' = -vt'$ in $S'$, so, we substitute it to (3) formula, and the following result can be obtained

$$b = av \tag{6}$$

Then we substitute (6) formula to (5) formula, the following equations set can be found

$$\left.\begin{aligned} &a^2 - c_0^2 e^2 = 1 \\ &c_0^2 ef - a^2 v = 0 \end{aligned}\right\} c_0^2 f^2 - a^2 v^2 = c_0^2 \tag{7}$$

We can conclude the following results through equation combination

$$a = f = \pm\frac{1}{\sqrt{1-\beta^2}}\,, \quad e = \pm\frac{\beta/c_0}{\sqrt{1-\beta^2}}\,, \quad b = \pm\frac{v}{\sqrt{1-\beta^2}} \tag{8}$$

Then we can get new transformation equation through substituting (8) formula to (3) formula

$$\left.\begin{aligned} &y = y' \\ &z = z' \\ &x = \frac{\pm x' \pm vt'}{\sqrt{1-\beta^2}} \\ &t = \frac{\pm t' \pm (\beta/c_0)x'}{\sqrt{1-\beta^2}} \end{aligned}\right\} \tag{9}$$

There are the positive and negative symbols here. How do we definite the symbol? When $v \ll c_0$, $\beta \approx 0$. And the above formulas should be reduced to the Galilean transformation, so the issue of positive and negative symbols can be resolved. The last results are as follows:

$$\left.\begin{aligned} &y = y' \\ &z = z' \\ &x = \gamma(x' + vt') \\ &t = \gamma\left(t' + \frac{\beta x'}{c_0}\right) \end{aligned}\right\} \tag{10}$$

This is Einstein's Lorentz **+transformation** in formula $\beta = \dfrac{v}{c_0}$, $\gamma = \dfrac{1}{\sqrt{1-\beta^2}}$.

We can get Lorentz reverse transformation from the solving of $x'$ and $t'$ in (10) formula

$$\left.\begin{aligned} y' &= y \\ z' &= z \\ x' &= \gamma(x - vt) \\ t' &= \gamma\left(t - \frac{\beta x}{c_0}\right) \end{aligned}\right\} \tag{11}$$

The above equation set is Einstein's Lorentz reverse transformation.

① If we put the light source on the $z'$ point in $S'$ axis frame, and it flashes each one time at $t_1'$ and $t_2'$; then the flash time interval observed in $S'$ axis frame is $\Delta t' = t_2' - t_1'$

We can get $t_2 = \gamma\left(t_2' + \frac{\beta x}{c_0}\right)$ and $t_1 = \gamma\left(t_1' + \frac{\beta x}{c_0}\right)$ according to $t = \gamma\left(t' + \frac{\beta x}{c_0}\right)$ in (10) formula. So, the time interval which static system person see is:

$$\Delta t = t_2 - t_1 = \gamma\left(t_2' + \frac{\beta x}{c_0}\right) - \gamma\left(t_1' + \frac{\beta x}{c_0}\right) = \gamma(t_2' - t_1') = \frac{\Delta t'}{\sqrt{1-\beta^2}} \tag{12}$$

This is the derivation of time dilation formula of relativity theory.

② If there is a stick placed along the $x$ axis, and position of both sides are $x_1'$ and $x_2'$, we can get the length of the stick: $\Delta l' = x_2' - x_1'$. Now, there is an observer in $S$ axis frame measuring the length of the stick. When the stick passes the observer along the axis at the speed of $v$, and the observer marks down the arrival time of the both sides $t_1$ and $t_2$, we can definite the length of the stick is $\Delta l = vt_2 - vt_1 = x_2 - x_1$.

We can get $x = \frac{x'}{\gamma} + vt$ from (11) formula and then get $x_2 = \frac{x_2'}{\gamma} + vt$ and $x_1 = \frac{x_1'}{\gamma} + vt$. So the length which the static system person sees is:

$$\Delta l = x_2 - x_1 = \left(\frac{x_2'}{\gamma} + vt\right) - \left(\frac{x_1'}{\gamma} + vt\right) = \frac{x_2' - x_1'}{\gamma} = \Delta l' \sqrt{1-\beta^2} \tag{13}$$

This is the derivation of length contraction of relativity theory. The access of this formula is different from (12) formula. So, the trick of Einstein is: using Lorentz transformation (10) formula to get time dilation result and then using Lorentz reverse transformation (11) formula to get length contraction result.

## 3. Einstein's Lorentz Transformation is a Magic

We find four defects in Lorentz transformation of relativity theory.

**First**, be lack of mathematical logic.

The calculation of the length contraction in relativity theory is as the calculation of $x$ from 'reverse transformation'; while, the calculation of the time dilation is directly calculated from ‘positive transformation’. From the mathematical point, it is without logical reasoning; from the physical point, it is without concept meaning. If we reverse the methods, there will be time contraction and length dilation. If both are calculated $x$ and $t$ from ‘reverse transformation’, there will be time and length contraction. Otherwise, there will be time and length dilation. This belongs to the bases of the relativity theory. In other words, the bases of the relativity theory are not only without mathematical logic reasoning, but also without physical conception meaning. Since different solving methods have different time and space views, this just indicates that Einstein’s relativity theory is random and optional. In addition, it also indicates Lorentz transformation without fixed physical meaning, and it is just pure mathematical transformation.

**Second,** vague conception.

Light wave is sent out in dynamic system or static system is still a question which Einstein did not explain clearly. If it is sent out in dynamic system, the light source is athletic, otherwise, it is still. If there is fire flash because of the collision between the origins, there will be two light sources at the same time, one in static system and the other in dynamic system. The wave equations in two axis frames are different because of three cases. As shown in Figure 2-4, the full lines represent true spherical waves, and the broken lines represent spherical waves which another observer has seen.

Now the question is Einstein wants to join two spherical waves. For instance, in figure 4, two origins have sparkles because of the coincidence or friction. In fact, two origins are both light source, and they are with the same frequency and status. How did Einstein join two spherical waves? That is so-called ‘flashy pre-wave movement should not have any different impacts on two axis frames’. The fact of the combination is the combination of the pre-wave space position echoing to the length contraction, and it has nothing to do with the light velocity. Though he added ‘in $S'$ system, the equation of the pre-wave is $x'^2 + y'^2 + z'^2 = (c_0 t')^2$ ; to maintain the light velocity, the equation of the pre-wave is $x^2 + y^2 + z^2 = (c_0 t)^2$ in $S$ system’.

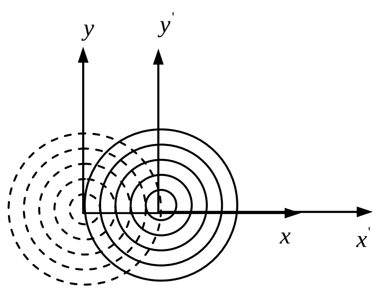


Fig.2 Light Source in Dynamic System

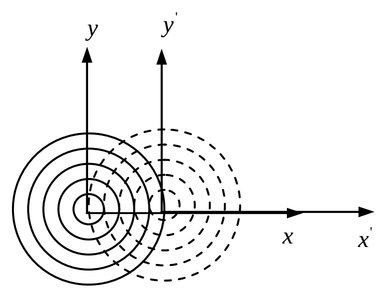


Fig.3 Light Source in Static System

But this has nothing to do with the hypothetic precondition. In other words, we can narrate like this ‘the space position of pre-wave movement of light wave should not have different impacts on two axis frames ’ and ‘in $S'$ system, the equation of the pre-wave is $x'^2 + y'^2 + z'^2 = (c_0 t')^2$ ; to maintain the variability of the light velocity, the equation of the pre-wave is $x^2 + y^2 + z^2 = (wt)^2$ in $S$ system. In this case, we can also deduce the results of Lorentz transformation. In other words, with respect to the mathematical derivation of Lorentz transformation, it has nothing to do with the variability of the light velocity. In the final analysis, Lorentz transformation is the solving of the following equation set. When $x't'$ function appears, we make the parameters as zero.

$$\begin{cases} x'^2 = (c_1 t')^2 \\ x^2 = (c_2 t)^2 \\ x = ax' + bt' \qquad t = ex' + ft \\ b = av \end{cases}$$

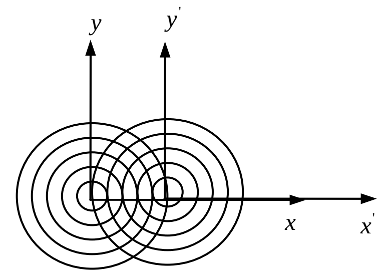

**Fig.4 Two axis frames flash simultaneously**

The so-called 'transformation' is substituting a linear function to a chi square function, then for calculation. You can make $c_1 = c_2$ or $c_1 \neq c_2$ for calculation. When appearing $x't'$ function, we make parameters as zero. The derived results have different numbers but with the same forms. That is so-called 'the unchangeable forms under Lorentz transformation '. Because the equation set has been given, the structure form of the results is 'unchangeable form' and only parameter $c_1$ or $c_2$ is changeable. You can add $y = gy' + ht'$, $t = ex' + ft'$ and $z = iz' + jt'$, $t = ex' + ft'$ on the basis of one dimension transformation. This type of 3D transformation is unchangeable in structure forms, which is inevitable in mathematical calculation.

As a mathematician, Lorentz knew it was the inevitable results of the mathematical calculation. So, he did not give any physical meaning, just a type of mathematical transformation which just as he said 'local time is just a mathematical hypothesis without true physical meaning '. The person who expanded, rose, 'carried it to the sky' even 'borrowed to utilize' Lorentz transformation was Einstein. Just like the introductions of the relativity theory books, Lorentz was not clear about the physical meaning of $t'$ and its transformation. In fact, in my opinion, Lorentz is not 'unclear'. As a mathematicians and physicists, he deeply knew that transformation was just a mathematical game without any physical meaning. So, he did not give any physical meaning. And Lorentz stressed that local time $\boldsymbol{t'}$ was just a mathematical assumption without any true physical meaning.

**Third**, a mathematical game

If we adopt the above methods of Einstein, and reverse the calculation methods of ① and ②, we will get the conclusion of time contraction and length dilation. If both are used 'reverse transformation', there will be time and length contraction. Otherwise, if both are used 'positive transformation', there will be time and length dilation. The calculations are as follows:

① If we put a light source on the $z'$ point in $S'$ axis frame, and it flashes each one time at $t'_1$ and $t'_2$, then the measured flash time interval is $\Delta t' = t'_2 - t'_1$.

[**Imitation**] We can get $t = \frac{t'}{\gamma} - \frac{\beta x}{c_0}$ from Lorentz transformation formula (11) by imitating the length solving method of relativity theory. Then we can get $t_2 = \frac{t'_2}{\gamma} - \frac{\beta x}{c_0}$ and $t_1 = \frac{t'_1}{\gamma} - \frac{\beta x}{c_0}$, so the time which the static system person has seen is :

$$\Delta t = t_2 - t_1 = \left(\frac{t_2^{'}}{\gamma} - \frac{\beta x}{c_0}\right) - \left(\frac{t_1^{'}}{\gamma} - \frac{\beta x}{c_0}\right) = \frac{t_2^{'} - t_1^{'}}{\gamma} = \sqrt{1-\beta^2}\,\Delta t^{'} \tag{12)'}$$

This is the derivation of the derivation of the time compression formula

②'If there is a stick placed along the $x$ axis, and position of both sides are $x_1^{'}$ and $x_2^{'}$, we can get the length of the stick: $\Delta l^{'} = x_2^{'} - x_1^{'}$. Now, there is an observer in $S$ axis frame measuring the length of the stick.. When the stick passes the observer along the axis at the speed of $v$, and the observer marks down the arrival time of the both sides $t_1$ and $t_2$, we can definite the length of the stick is $\Delta l = vt_2 - vt_1 = x_2 - x_1$.

[**Imitation**] We can directly get $x = \gamma(x^{'} + vt^{'})$ from positive transformation (10) formula by imitating time variability solving trick of relativity theory. So, we can also get $x_2 = \gamma(x_2^{'} + vt^{'})$ and $x_1 = \gamma(x_1^{'} + vt^{'})$. So, the length of what the static system person seeing is:

$$\Delta x = x_2 - x_1 = \gamma(x_2^{'} + vt^{'}) - \gamma(x_1^{'} + vt^{'}) = \gamma\Delta x^{'} = \frac{\Delta x^{'}}{\sqrt{1-\beta^2}} \tag{13)'}$$

This is a derivation of length dilation formula.

We can find from the above analysis that relativity theory is magic, and it is just a mathematical game. It is without confirmed physical meaning.

**Fourth**, the creation of infinite relativity theories.

[**Imitation**] Adopting the magic trick of Einstein, the 'w Lorentz transformation' is deduced on the basis of different observed light velocity in different axis frames. We assume the light source is in the dynamic system $S^{'}$, the observer in $S^{'}$ measuring the radiation velocity of light wave which is with respect to light source is $c_0$, and the observer in $S$ measuring the light velocity is an optional value '$w$'. Now let us assume the following experiments: when the moment that two axis frames coincide, there will be light wave emission at the common origin, and then we can observe the pre-wave movement of the light wave in two axis frames. Obviously, light waves should be spherical waves which are origin-centered in two axis frames. And the pre-wave movement should not make different impacts on different frames. So, in $S^{'}$ frame, the equation of the pre-wave should be:

$$x^{'2} + y^{'2} + z^{'2} = (c_0 t^{'})^2 \tag{1g}$$

To maintain the variability of the light velocity, the equation of the pre-wave in $S$ frame should be:

$$x^2 + y^2 + z^2 = (wt)^2 \tag{2g}$$

Now, we adopt Einstein's calculation methods of formulas from (1) to (11) and the following equation set can be easily gotten:

$$
\left.\begin{aligned}
y &= y' \\
z &= z' \\
x &= \frac{x' + vt'}{\sqrt{1-\beta^2}} \\
t &= \frac{c_0 t' + \beta x'}{w\sqrt{1-\beta^2}}
\end{aligned}\right\} \qquad (10)'
$$

This is ‘ $w$ Lorentz positive transformation’ stated in the paper, and $\beta = \frac{v}{c}$ . Compared with ‘Einstein’s Lorentz transformation’, $\frac{c_0 t' + \beta x'}{w\sqrt{1-\beta^2}} = \frac{c_0}{w} \cdot \gamma \cdot \left( t' + \frac{\beta}{c_0} x' \right)$ has only high-order infinite small amount of differences in time transformation, that is $\frac{c_0}{w} = \frac{c_0}{c_0 + v} \approx 1$, and the structure is unchangeable. The formula of length transformation is fully equal to that of Einstein.

Solving the equation set of (10), we can get ‘ $w$ Lorentz negative transformation’:

$$
\left.\begin{aligned}
y' &= y \\
z' &= z \\
x' &= \frac{c_0 x - vwt}{c_0\sqrt{1-\beta^2}} \\
t' &= \frac{wt - \beta x}{c_0\sqrt{1-\beta^2}}
\end{aligned}\right\} \qquad (11)'
$$

This is so-called ‘ $w$ Lorentz negative transformation’

①’If we put a light source on the $z'$ point in $S'$ axis frame, and it flashes each one time at $t_1'$ and $t_2'$ , then the measured flash time interval is: $\Delta t' = t_2' - t_1'$.

Adopting the methods of the relativity theory, we can directly calculate the positive transformation formula (10)’and get the following result:

$$
\Delta t = t_2 - t_1 = \frac{c_0 t_2' + \beta x'}{w\sqrt{1-\beta^2}} - \frac{c_0 t_2' + \beta x'}{w\sqrt{1-\beta^2}} = \frac{c_0 \Delta t'}{w\sqrt{1-\beta^2}} \qquad (12)'
$$

②’If there is a stick placed along the $x$ axis, and position of both sides are $x_1'$ and $x_2'$ , we can get the length of the stick: $\Delta l' = x_2' - x_1'$. Now, there is an observer in $S$ axis frame measuring the length of the stick. When the stick passes the observer along the axis at the speed of $v$ , and the observer marks down the arrival time of the both sides $t_1$ and $t_2$ , we can definite the length of the stick is $\Delta l = vt_2 - vt_1 = x_2 - x_1$.

Adopting the methods of Einstein, we can get $x = \sqrt{1-\beta^2}\, x_2' + w\beta t$ from the reverse transformation formula (11)’, then we can get the following result:

$$\Delta l = x_2 - x_1 = (\sqrt{1-\beta^2}\,x_2^{'} + w\beta t) - (\sqrt{1-\beta^2}\,x_1^{'} + w\beta t) = \Delta l^{'}\sqrt{1-\beta^2} \quad (13)'$$

This is the length contraction formula of $w$ relativity theory which adopts relativity transformation methods. The result is fully equal to that of Einstein. You can give evaluate c with $w$ or any value, and you will get $\Delta t = \frac{\Delta t^{'}}{\sqrt{1-\beta^2}}$. What does this mean? This means that the transformation is optional without special physical meaning.

Especially, Einstein used the tricks obtaining the value of the length contraction $l = l^{'}\sqrt{1-\beta^2}$ from the Lorentz transformation which based on the unchangeable light velocity hypothesis. But this paper gets the value of the length contraction $l = l^{'}\sqrt{1-\beta^2}$ which bases on the changeable light velocity hypothesis. The results are fully equal, and there are high-order infinite small amount of differences between time dilations. It is obvious that Lorentz transformation is without physical meaning, just a pure mathematical transformation formula, or, we call it interesting mathematical games. As the mathematical researcher, we can discuss Lorentz's interesting mathematic games.

The above adopts the methods of 'flight fire with fire'. We get the new $w$ relativity theory which bases on the optional value of light velocity hypothesis through using Lorentz transformation and adopting Einstein's magic tricks. Because of the option of the value $w$, when given infinite values, there will be infinite relativity theories.

### 3 Conclusion

The reasons why the paper indicates Einstein 's Lorentz transformation is a interesting mathematical game are that: first, adopting Einstein 's transformation method, assuming the value of $w$ is optional, we can get the length contraction value which is fully equal to that of Einstein and there are only high-order infinite small amount of differences between time dilations. Second, if we reverse Einstein's calculation method, it will be time contraction and length dilation; if both are used 'reverse transformation', it will be time and length contraction. On the other hand, if both are used 'positive transformation', it will be time and length dilation. Third，the key point is no matter how to change the transformation, the solving structure is the same. So, the chapter indicates Lorentz transformation is a interesting mathematical game, which is just like what Lorentz stressed that transformation is without real physical meaning.

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