与中文翻译: 洛伦兹变换是非物理的

THE LORENTZ TRANSFORMATION CANNOT BE PHYSICAL

CHAN RASJID KAH CHEW

14 June 2017

ABSTRACT. The Lorentz transformation will always remain only as an abstract mathematical transformation that cannot be incorporated into any theory of physics. The reason being there is no natural principle that a mathematical transformation carries over association of physical units with real numbers from the domain space to the image space. Any application of the Lorentz transformation will only result in space and time that have no relation to our physical world. On the other hand, there is no such issue with the Galilean transformation as the rulers and clocks calibrated at time zero reads in the same undistorted units at all times. All physical theories founded on the Lorentz transformation are invalid. These include Einstein's special relativity, particle physics, electromagnetism of the Maxwell-Heaviside equations.

1. INTRODUCTION

[1] [Version 2.1]. The Lorentz Transformation was known before Einstein publish his 1905 paper which introduced his Special Theory of Relativity. In it, he derived the same transformation based on the two postulates of special relativity:

> Postulate I.*The laws of physics are the same in all inertial reference frames*.
> Postulate II.*The speed of light in vacuum is a universal constant*.

In Newtonian mechanics, the kinematic transformation of coordinates between inertial frames is the Galilean transformation where speeds may be added or subtracted in the ordinary common-sense manner to give a relative speed. Assume an observer moves with speed w with respect to a fixed source of light and c is the light speed; if this "common-sense" approach is also applied to derive a "relative" speed of light with respect to the observer, then he would find that light would have a velocity $c+w$, or $c-w$. This would mean a violation of the second postulate of special relativity as the Michelson-Morley experiment of 1887 was interpreted to mean that light has a constant

Key words and phrases. Einstein, relativity, special relativity, Lorentz transformation, derivation, invalid, wrong, refuted, repudiated.

[1]original date: 15 Jan 2015

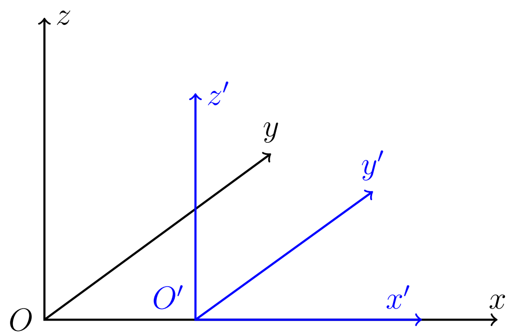

FIGURE 1. S frame black, origin O; S' frame blue, origin O' moves with uniform velocity v along x direction.

universal speed -it is a law of nature.It was this experiment that encouraged Einstein to proposed the universality of the speed of light. To accommodate it, the Galilean transformation had to be replaced; it was replaced by the Lorentz transformation which is today accepted as the true correct coordinate transformation in agreement with the physical laws of nature.

See Fig (1). Assume two inertial frames S, S' with origins O, O' where the frames are similarly oriented and S' moves with a uniform velocity of v in the x-direction of S. When the origins O, O' coincide, let the times of the frames be $t' = t = 0$. The Lorentz transform of the frames is given by the following coordinates and time transformations:

$$\begin{aligned} x' &= \gamma(x - vt) \\ y' &= y \\ z' &= z \\ t' &= \gamma(t - vx/c^2) \end{aligned} \tag{1}$$

where $\gamma = 1/\sqrt{1 - v^2/c^2}$; c being the constant speed of light.

2. RELATIVISTIC LENGTH CONTRACTION

According to the theory of special relativity, an object that has a motion relative to an observer would have its length contracted in the direction of the motion when referenced from the observers frame. It is supposed to be a true physical phenomenon implying the contraction could somehow be experimentally verified if need be. This contraction could be derived from the Lorentz transformation as shown below.

It is customary to represent a position at a certain time moment as an "*event*" in special relativity with a 4-vector combining the position coordinates with the time in the frame as: $E(x, y, z, t)$. When dealing with the common Lorentz transformation as in equation (1), we would only use the shortened notation with only the x coordinates with t as event: $E(x_1, t_1)$,etc.

A rigid rod AB of length L lies stationary on the ground aligned along the x-axis; the frame of the ground being S. A frame S', oriented similar to S, moves at a uniform speed v relative to S in the x direction. The end points of the rod AB are the events $A(x_1, t_1)$ and $B(x_2, t_2)$ in S. We have:

$$L = x_2 - x_1 \tag{2}$$

The events A and B under the Lorentz transformation would become events $A'(x'_1, t'_1)$ and $B'(x'_2, t'_2)$ in frame S' where:

$$\begin{aligned} x'_2 &= \gamma(x_2 - vt_2) \\ x'_1 &= \gamma(x_1 - vt_1) \\ t'_2 &= \gamma(t_2 - vx_2/c^2) \\ t'_1 &= \gamma(t_1 - vx_1/c^2) \end{aligned} \tag{3}$$

Let $L' = (x'_2 - x'_1)$. Thus, we have:

$$L' = \gamma L - \gamma v(t_2 - t_1) \tag{4}$$

$$t'_2 - t'_1 = \gamma(t_2 - t_1) - \gamma v/c^2(x_2 - x_1) \tag{5}$$

Now, t_2 and t_1 in the above equations may be any two random values as they represent the moments of "*reading*" off of the coordinates of the ends of the rod AB; the points A and B may be separately read at any time and their difference will still give the same constant length L of rod AB. We will select t_2, t_1 in equation (5) such that $t'_2 - t'_1 = 0$. In this manner and from equation(4) and (5), we will get:

$$\begin{aligned} L' &= \gamma L - \gamma v^2/c^2(x_2 - x_1); \\ L' &= \gamma L(1 - v^2/c^2); \\ L' &= L\sqrt{1 - v^2/c^2} \end{aligned} \tag{6}$$

Now, L' in equation (6) is the difference in the space coordinates of the two events $A'(x'_1, t'_1)$ and $B'(x'_2, t'_2)$ in frame S'. Because the times t'_2 and t'_1 have been chosen to be the same, L' has the meaning of the length of the rod AB on the ground as viewed by a stationary observer in S' at a specific moment in time of the frame S'. From equation (6), we can see that if $v < c$, then $L' < L$. It is presently well accepted that nothing has been empirically observed to be able to travel faster than the speed of light c; so it can be said the relative velocity between inertial frames v can never exceed c. So $L' < L$ is considered a fact of the physical world.

In our derivation, although it is the observer which is moving observing the rod stationary on the ground, the convention of special relativity considers the rod to be moving as the "*observation*" in frame

S' has to be represented by events $B'(x'_2, t'_2)$ and $A'(x'_1, t'_1)$ at the same time moment in S'; this is satisfied as $t'_2 = t'_1$. We have here derived the formula for the Lorentz-FitzGerald contraction:

> *An object in motion has its length contracted in the direction of its motion.*

Despite the fact that special relativity has now been fully accepted as a pillar of modern physics, it will be shown here why it is only an abstract mathematical model unrelated to our empirical physical world.

3. The Lorentz Transformation Is Only Abstract

The Lorentz transformation is formally a mathematical linear transformation where the 4-vectors of the domain space are mapped onto the 4-vector range space. The 4-vector components are all pure scalars - in this case, real numbers. Real numbers do not have units. It is only when real numbers are used to represent physical quantities that they have have association with real units of measure. So scalar variables or the components of any 4-vectors are only a pure numbers until there is a proper association of the numbers with real physical measures in which case they have proper association with physical units(such as the SI units of meter, kilogram or second).

We started off with a rigid rod AB on the ground in frame S with length L; L is length in real physical units. This is so only because the rod may actually be physically measured by comparing with a measuring ruler. It is because of this "*real physical ruler*" - such as represented by a standard prototype - that L is not just a pure scalar, but has associated with it a physical length unit. Such an association of pure mathematical scalars with physical units is only possible through an implementation of a system of standard measures for a reference frame.

As all inertial frames are equivalent in classical mechanics, all such frames, such as S and S' have implementations of physical length unit for the respective coordinates systems. But these units for length may theoretically be used only where both the observer and the target object of measure are both fixed or, as under the Galilean transformation, object length does not distort and change.

From equation (6), we have $L' = L\sqrt{1 - v^2/c^2}$. So it seems we also have L' in the same unit of length as associated with L. It may come as a great surprise to many that L' is not in the unit of length - it is only a pure real number. A great part of modern physics theories today are founded on the Lorentz transformation and it is assumed that all variables in the Lorentz transformation are representing real physical quantities without anyone calling into question if there is any justification for such an assumption. Not one physicist has ever given an explanation why the pure scalars in the image space S' too may take on the same physical units as in the domain space.

Mathematical mappings only relate abstract objects from the domain space to the image space. It is irrelevant in mathematics whether the objects in a mathematical treatment have any physical association. It is only in physics that mathematical objects used must have physical significance as physical theories deal only with quantities that may be measured and examined experimentally. So when the Lorentz transformation is applied to arrived at $L' = L\sqrt{1 - v^2/c^2}$, any association of L with a physical unit become irrelevant. All the mathematics in the above derivations work only on the pure mathematical objects stripped of any association of any with physical units. So the variable L' in equation $L' = L\sqrt{1 - v^2/c^2}$ is only a pure real number with no association whatever with any standard unit of measure.

> *There is no natural principle that mathematical linear transformations also carry over associations of scalars with real physical units from the domain to the image space of the transformation.*

Length contraction and time dilation are not real physical phenomenon as taught in the special relativity theory, but are only predictions from its abstract mathematical model which do not exist in the real physical world.

4. Conclusion

This paper shows that the Lorentz transformation is only of an accidental historical interest more than a hundred years ago when it was found as a way to resolve the impasse presented by the Michelson-Morley experiment. It should not have been incorporated into any physics which deal only with measurable and verifiable quantities. Any application of the Lorentz transformation will only result in space and time that are distorted and which cannot be related to our physical world. All physical theories founded on the Lorentz transformation are therefore invalid. These include Einstein's special relativity, high energy physics, particle physics and electromagnetism of the Maxwell-Heaviside equations.

ABSTRACT. 文摘:洛伦兹变换将始终只能作为一种抽象的数学变换，不能纳入任何物理论。 原因是在数学变换，没有自然原理 使纯数字与实际物理单位之间的相关联也能引入到变换的图像系。洛伦兹变革的任何应用只会导致与对我们的物理世界无关的空间和时间。另一方面，伽利略式的转换没有这样的问题，因为在时间零点校准的尺子和时钟在任何时候都以相同的无失真单位读取。基于洛伦兹转型的所有物理理论无效。这些包括爱因斯坦的狭义相对论，所有高能物理学，粒子物理学，麦克斯韦－海维塞方程的电磁学。

1. 介绍

[版本2.1]。当爱因斯坦出版他的1905年介绍他的狭义相对论时，洛伦兹变换已经是已知的。他根据他的理论内的两个假设得出了同样的变换。

假设I：所有惯性参考系中的物理定律是相同的。

假设II：真空中的光速是一个通用常数。

在牛顿力学中，惯性框架之间坐标的运动学变换是伽利略变换，其中可以以通常的常识方式加速或减去速度以给出相对速度。

设 c 是光速 而观察者相对于固定光源以速度 w 移动。如果这种常识方法也被应用于导出相对于观察者的“相对”的光速，则他会发现光将具有速度 $c+w$ 或 $c-w$。 这意味着违反狭义相对论的第二个假设，因为1887年的迈克尔逊 - 莫利实验被解释为意味着光具有不变的普遍速度 - 这是一种自然规律。 正是这个实验鼓励爱因斯坦提出光速的普遍性。 为了适应它，伽利略转型必须被替代; 它被洛伦兹变换所取代，现在被认为是与自然物理定律一致的真正正确的坐标变换。

参见图 (1)。 设两个惯性帧 S, S' 与 O, O' 为起点，其中帧类似地定向，S' 以 S 的 x 方向上的均匀速度移动。当起点 O, O' 重合时，帧时间为 $t'=t=0$。 帧的洛伦兹变换由以下坐标和时间变换给出：

$$
\begin{aligned}
x' &= \gamma(x - vt)\\
y' &= y\\
z' &= z\\
t' &= \gamma(t - vx/c^2)
\end{aligned}
\tag{1}
$$

其中 $\gamma = 1/\sqrt{1-v^2/c^2}$; c 是恒定的光速。

2. 相对论长度收缩效应

根据狭义相对论的理论，当从观察者框架引用时，具有相对于观察者的运动的对象将在运动方向上具有缩小的长度。 这应该是一个真实的物理现象，这意味着收缩可以以某种方式被实验验证。 这种收缩效应可以从洛伦兹变换得到，如下所示。 通常，将特定时刻的位置表示为与事件相关的“事件”，其中 4-向量将位置坐标与帧中的时间组合为： $E(x,y,z,t)$。 当处理方程式 (1) 中的常见的洛伦兹

变换时，我们将仅使用具有时间 t 的 x 坐标的缩短符号作为事件：$E(x_1,t_1)$ 等。长度为 L 的刚性杆 AB 固定在沿x轴对准的地面上; 地面的框架为 S。具有相似取向的框架 S' 以相对于 S 在 x 方向上的均匀速度 v 移动。杆 AB 的端点是 S 中的事件 $A(x_1,t_1)$ 和 $B(x_2,t_2)$。我们有：

$$L = x_2 - x_1 \tag{2}$$

洛伦兹变换下的事件 A 和 B 将成为帧 S' 中的事件 $A'(x_1',t_1')$ 和 $B'(x_2',t_2')$, 其中：

$$\begin{aligned} x_2' &= \gamma(x_2 - vt_2) \\ x_1' &= \gamma(x_1 - vt_1) \\ t_2' &= \gamma(t_2 - vx_2/c^2) \\ t_1' &= \gamma(t_1 - vx_1/c^2) \end{aligned} \tag{3}$$

设 $L' = (x_2' - x_1')$。因此，我们有：

$$L' = \gamma L - \gamma v(t_2 - t_1) \tag{4}$$

$$t_2' - t_1' = \gamma(t_2 - t_1) - \gamma v/c^2(x_2 - x_1) \tag{5}$$

在上述等式中的 $t2$ 和 $t1$ 可以是任何两个随机间值，因为读取 AB 的结束坐标的时间并不重要,点 A 和 B 可以随时分开读取。它们的差异仍然给出杆 AB 相同的长度。我们将在等式 (5) 中选择 t_2，t_1 使得 $t_2' - t_1' = 0$。以这种方式，从等式 (4) 和 (5)，我们将得到：

$$\begin{aligned} L' &= \gamma L - \gamma v^2/c^2(x_2 - x_1); \\ L' &= \gamma L(1 - v^2/c^2); \\ L' &= L\sqrt{1 - v^2/c^2} \end{aligned} \tag{6}$$

在等式 (6) 中的 L' 是帧 S' 中的两个事件 A' 和 B' 的空间坐标的差。因为时间 t_2' 和 t_1' 被选择为相同，所以 L' 的意思是观察者在一个特定的时刻在 S' 中所观察到在地面上的杆 AB 的长度。从等式 (6) 可以看出，如果 $v < c$，则 $L' < L$。目前普遍接受的是，没有证据表明任何物体可能比光速更快地移动。所以惯性框架 v 之间的相对速度永远不会超于 c。$L' < L$ 被认为是物理世界的一个事实。

在我们的推导中，虽然观察者正在观察杆在地面上的静止状态，但狭义相对论的惯例认为杆在移动，因为帧 S' 中的"观察"必须由事件 $B'(x_2',t_2')$ 和 $A'(x_1',t_1')$ 在 S' 的同一时刻; 这样的条件已经满足因为 $t_2' = t_1'$。我们在这里得出了洛伦兹 - 菲茨杰拉德 (Lorentz-Fitzgerald) 收缩的公式:

运动中的物体的长度在其运动方向收缩.

尽管事实上，狭义相对论现在已经被完全接受为现代物理学的支柱，但在这里将会显示为什么它只是一个与我们的经验物理世界无关的抽象数学模型。

3. 洛伦兹转型只是纯数学

洛伦兹变换是形式上的数学线性变换，其中域空间的 4-向量被映射到图像的 4-向量。 4矢量分量都是纯标量, 在这种情况下是实数字。 纯数字本身没有单位 。只有通过实际测量，数字才能与物理单位相关联。 因此，任何 4-向量分量只是纯数，直到它们能与实际物理量正确相关才能具有物理单位(如 SI 单位米，千克或秒）。

我们从长度为 L 的一个刚性杆 AB 在地面上开始； L 是实际物理单位的长度。这只是因为棒实际上可以通过与尺子比较来测量。 这是因为这个"真正尺子" - 如标准原型所代表的 - L 不仅仅是一个纯标量，而是与它相关联的物理长度单位。 纯数学标量与物理单位之间的联系只能通过实施标准的措施体系来实现。

由于所有惯性框架在经典力学中是等效的，所以,诸如 S 和 S',所有帧具有用于相应坐标系的物理长度单位的实现。但是，这些长度单位理论上只能在观察者和目标对象物体都是固定的时候使用，或者在伽利略变换下，物体长度不会变形和变化。

从等式 (6)，我们看的到 $L' = L\sqrt{1 - v^2/c^2}$。在 L' 的单位与纯数字之间的关联似乎是与 L 的相同。但并非如此。这对大多数人来说可能是一个惊喜。 L' 只是一个纯数。现在的物理学的一大部分也是基于洛伦兹变换，并假定洛伦兹变换中的所有变量代表实际的物理量。没有人质疑这个假设是否合理。没有一个物理学家能回答为什么图像空间 S' 中的纯标量也可能是域空间中相同的物理单位的解释。

数学映射仅将抽象对象从域空间与图像空间相关联。数学计算中的对象是否具有任何物理关联是无关重要。只有在物理学中，使用的数字必须具有物理意义，因为物理理论只适用于实验可以测量和验证的数字。在 $L' = L\sqrt{1 - v^2/c^2}$ 的洛伦兹变换运算过成中，L 与物理单元的任何关联变得无关紧要。 以上推导中的所有数学仅在纯数字上工作，与物理单位无关。 因此，等式 $L' = L\sqrt{1 - v^2/c^2}$ 中的数量 L' 只是一个纯实数，与任何标准的测量单位无关。

> 在数学变换，没有自然原理使纯数字与实际物理单位
> 之间的相关联也能引入到变换的图像系。

狭义相对论中所教导的长度收缩和时间扩张不是真实物理现象，而只是其真实物理世界中不存在的抽象数学模型的预测。

4. 结论

本文表明，洛伦兹转变只是一百多年前的意外历史利益，当时它被认为是解决 迈克尔逊-莫利实验 (Michelson-Morley experiment) 提出的僵局的一种方式。 它不应该被纳入任何只处理可衡量和可验证数量的物理学。 洛伦兹变革的任何应用只会导致空间和时间扭曲，哪些与我们的物理世界无关。 所有建立在洛伦兹转型上的物理理论因此是无效的。 这些包括爱因斯坦的狭义相对论，高能物理学，粒子物理学，麦克斯韦-赫维西德 (Maxwell-Heaviside) 方程的电磁学。

陈家钊拉希德
E-mail address: `chanrasjid@gmail.com`
URL: `http://www.emc2fails.com`

SINGAPORE