On the Logical Inconsistency of Einstein's Time Dilation

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ABSTRACT

Time dilation is a principal feature of the Special Theory of Relativity. It is purported to be independent of position, being a function only of uniform relative velocity, via the Lorentz Transformation. However, it is not possible for a 'stationary system' of observers K to assign a definite time to any 'event' relative to a 'moving system' k using the Lorentz Transformation. Consequently, the Theory of Relativity is false due to an insurmountable intrinsic logical contradiction.

1 Introduction

In a previous paper [1] I proved that clock synchronisation and the Lorentz Transformation are incompatible. Assuming both leads to a contradiction. Herein I synchronise clocks in Einstein's 'stationary system' K by mathematical construction and prove that the 'stationary system' K cannot then assign any definite time τ anywhere in Einstein's 'moving system' k for any given position x and time t in the 'stationary system' K. From this it follows immediately that Einstein's 'time dilation' is false because there is no common determinable time dilation for the 'stationary system' K.

2 Stationary and moving clocks

In §4 of his 1905 paper, Einstein [2] compared one clock 'at rest' relative to the 'moving system' k, with all the synchronised identical clocks 'at rest' relative to the 'stationary system' K:

> "*...we imagine one of the clocks which are qualified to mark the time t when at rest relatively to the stationary system, and the time τ when at rest relatively to the moving system, to be located at the origin of the co-ordinates of k, and so adjusted that it marks the time τ. What is the rate of this clock, when viewed from the stationary system?*
>
> "*Between the quantities x, t, and τ, which refer to the position of the clock, we have, evidently, x = vt and*
>
> $$\tau = \frac{1}{\sqrt{1 - v^2/c^2}}\left(t - vx/c^2\right).$$
>
> "*Therefore,*
>
> $$\tau = t\sqrt{1 - v^2/c^2} = t - \left(1 - \sqrt{1 - v^2/c^2}\right)t$$
>
> "*whence it follows that the time marked by the clock (viewed in the stationary system) is slow by* $1 - \sqrt{1 - v^2/c^2}$ *seconds per second, ...*" [2, §4]

In Einstein's notation the coordinates of the 'stationary system' K are x, y, z, t, those corresponding to the 'moving system' k are ξ, η, ζ, τ, illustrated in figure 1, for his initial conditions.

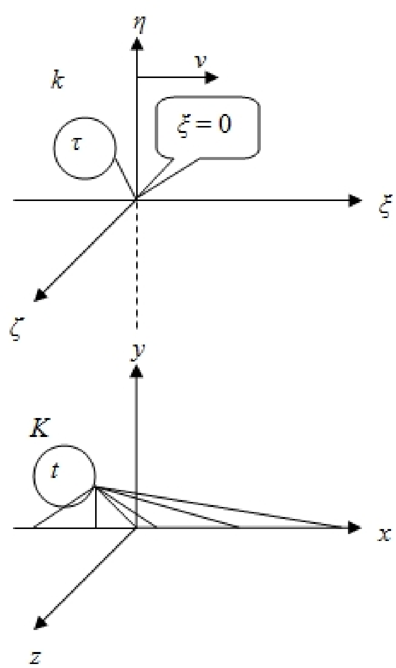

Fig. 1: All the synchronised clocks in the 'stationary system' K read the same time t at all positions x in the K system. The clock at the origin of the 'moving system' k, where $\xi = 0$, reads $\tau = 0$ when the y and η axes coincide, so $t = 0$ and $x = 0$ too.

The Lorentz Transformation is,

$$\begin{aligned} &\tau = \beta\left(t - vx/c^2\right), && \xi = \beta\left(x - vt\right), \\ &\eta = y, && \zeta = z, \\ &\beta = 1/\sqrt{1 - v^2/c^2}. \end{aligned} \qquad (1)$$

Note that according to the Lorentz Transformation the time τ depends upon both t and x. Einstein specifically set $x = 0 = \xi$ for $\tau = t = 0$, shown in figure 1.

After a time $t > 0$ the origin of the 'moving system' k has advanced a distance $x = vt$, illustrated in figure 2. At this time t all the clocks in the 'stationary system' K read the same time t no matter where they are located (i.e. irrespective of position x therein), because they are synchronised. The clock at $\xi = 0$ of the 'moving system' k reads time $\tau > 0$. According to Einstein's time dilation, $\tau = \beta t$.

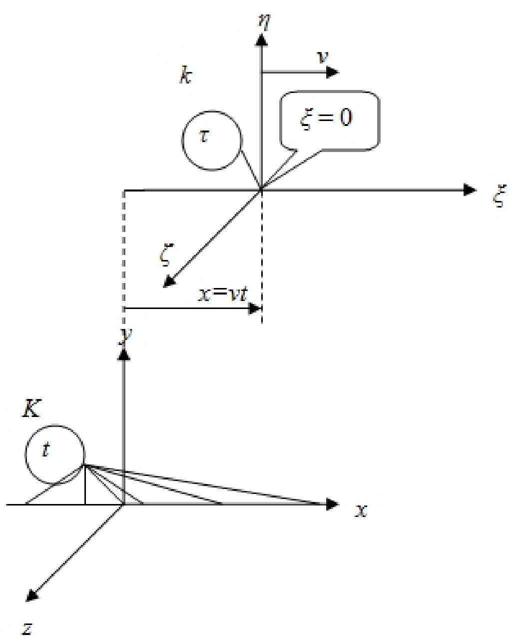

Fig. 2: After a time $t > 0$ all the synchronised clocks in the 'stationary system' K read the same time t at all positions x in the K system. The clock at the origin of the 'moving system' k, where $\xi = 0$, reads $\tau > 0$. The origin ξ has advanced a distance $x = vt$.

Solving the first of the Lorentz Transformation equations for t gives,

$$t = \frac{\tau}{\beta} + \frac{vx}{c^2}. \qquad (2)$$

Clocks at all positions x in the 'stationary system' K read the same time t because they are synchronised. An observer located at any x in the 'stationary system' K can observe the clock at ξ in the 'moving system' k at any time t in the 'stationary system' K to see what the clock at ξ reads. Set,

$$\tau^* = \kappa\tau,$$

$$t = \frac{\tau}{\beta} + \frac{vx}{c^2} = \frac{\tau^*}{\beta} + \frac{vx^*}{c^2} = \frac{\kappa\tau}{\beta} + \frac{vx^*}{c^2}, \qquad (3)$$

where $0 \le \kappa$. Solving (3) for x^* gives,

$$x^* = \frac{(1-\kappa)\, c^2\tau}{v\beta} + x. \qquad (4)$$

From this it follows that no two observers in the 'stationary system' K read the same time τ on the 'moving' clock at any position ξ in the 'moving system' k, as examples tabulated:

κ	x^*	τ^*	τ
0	$c^2\tau/v\beta + x$	0	$\beta\left(t - vx/c^2\right)$
$1/2$	$c^2\tau/2v\beta + x$	$\tau/2$	$\beta\left(t - vx/c^2\right)$
1	x	τ	$\beta\left(t - vx/c^2\right)$
2	$-c^2\tau/v\beta + x$	2τ	$\beta\left(t - vx/c^2\right)$
3	$-2c^2\tau/v\beta + x$	3τ	$\beta\left(t - vx/c^2\right)$
$1/\beta$	$c^2\left(\beta - 1\right)\tau/v\beta^2 + x$	τ/β	$\beta\left(t - vx/c^2\right)$

For any time $t > 0$ and any x of the 'stationary system' K, there are always places $x^* \neq x$ according to which the observed time $\tau^* \neq \tau$. Thus, for any time $t > 0$ no two observers in the 'stationary system' agree on the time τ on the clock at any ξ in the 'moving system' k. Therefore the 'stationary system' K cannot assign a definite time τ to any place ξ in the 'moving system' k. Consequently, there is no common determinable time dilation for any two observers in the 'stationary system' K. Einstein's 'time dilation' equation applies at only one point in K, which is not the whole of the 'stationary system' K, clearly seen at $\kappa = 1$ in the table: Observed from x^*, $\Delta\tau^* = \kappa\Delta\tau = \kappa\beta\Delta t \neq \Delta\tau = \beta\Delta t$ unless $\kappa = 1$. The observer x^* for $\kappa = 1/\beta$ observes no time dilation: $\Delta\tau^* = \Delta\tau/\beta = \beta\Delta t/\beta = \Delta t$.

3 Conclusions

For $t > 0$ the 'stationary system' K cannot assign any definite time τ at any place ξ in the 'moving system' k. Consequently there is no common determinable time dilation for the 'stationary system' K. Einstein's time dilation is inconsistent with the Lorentz Transformation. It is therefore false. Hence, the Theory of Relativity is false.

References

[1] Crothers, S.J., On the Logical Inconsistency of the Special Theory of Relativity, 6th March 2017, http://vixra.org/abs/1703.0047

[2] Einstein, A., On the electrodynamics of moving bodies, *Annalen der Physik*, 17, 1905