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The proposition that *x = v t* leads to a contradiction with Special Relativity

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ABSTRACT

This short note posits the indisputable physical law prescribing that distance = velocity x time, and shows that this proposition contradicts Special Relativity, such that the above proposition is correct and Special Relativity is incorrect, or *vice versa*.

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INTRODUCTION

(i) PROPOSITION

In an Euclidean space, a body or wave that travels in a straight line with constant velocity *v* with respect to an observer, will cross a distance of $x = v\,t$, where *x* is the observable Euclidean distance of travel, measured by the observer, and *t* is the time that took the body to cross the distance x, as measured by the observer.

(ii) LEMMA

If a proposition is "true" then any conclusion drawn based on it, using valid logic and mathematics, must be "true" as well.

(iii) Consider two observers who synchronize their watches just before one of them starts moving in the +*x* direction in an Euclidean space, with constant velocity *v* relative to the "staying" observer. Assume that at the "moving" frame, a certain event started exactly at the time of departure ($t=t'= 0$). Assume that promptly at the termination of the event, the observer in the "moving" frame measures the time (denote it by t'), and with no delay, sends a signal to the observer in the "staying" frame in order to indicate the termination of the event. Also assume that promptly with the arrival of the signal, the "staying" observer registers his/her termination time (denote it by *t*).

1. The termination time *t*, registered by the "staying" observer is equal to t', the termination time registered by the "moving" observer. **PLUS** the time the wave signal took to cross the distance that the "moving" observer has crossed, relative to the "staying" observer, from the moment the event started ($t=t'= 0$) until it ended. Denote the distance by *x*.

2. The time the wave signal took to cross the distance *x* equals $\frac{x}{c}$, where *c* is the velocity of the wave signal relative to the "staying" observer. In formal notations, from 1 and 2, we have:

$$t = t' + \frac{x}{c} \qquad \text{.... (1)}$$

But from the proposition in (**i**), we have:

$$x = v\,t \qquad \text{.... (2)}$$

Substituting *x* from (2) in (1), we get:

$$t = t' + \frac{vt}{c} \qquad \text{.... (3)}$$

Which could be rewritten as:

$$\frac{t}{t'} = \frac{1}{1-\frac{v}{c}} \qquad \text{.... (4)}$$

But from Special Relativity (Einstein, 1905), we have:

$$\frac{t}{t'} = \frac{1}{\sqrt[2]{1-(\frac{v}{c})^2}} \qquad \text{.... (5)}$$

CONCLUSION

Either equation (5) is correct and the proposition that $x= v\,t$ is incorrect, or *vice versa*. In the latter case, Special Relativity, and the Lorentz invariance principle are incorrect.

REFERENCE

Einstein, Albert. On the electrodynamics of moving bodies (1905). In J. Stachel (Ed.), *The Collected Papers of Albert Einstein*, vol. 2 (pp 304–95), Princeton, NJ: Princeton University Press (1989).