Review of: "A Mathematical Contradiction in the Special Theory of Relativity"

Fernando Minotti[1]

1 University of Buenos Aires

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The author points to an apparent contradiction in the special theory of relativity (SRT). Unfortunately, the contradiction results from the incorrect use of the concept of “time dilation” (the author refers to it as “time contraction”).

Time dilation corresponds to the relation, in two different reference systems, of time intervals between two events that take place in a SINGLE FIXED spatial point in one of the systems. The usual example is the time interval between two successive observations, in a given system, of the time indicated by the SAME clock, AT REST in the other system.

Time intervals corresponding to events that occur in TWO DIFFERENT spatial points in BOTH SYSTEMS are not related by a dilation (or contraction) factor, as considered by the author. The simplest counter-example is that of two events at different space points that occur simultaneously in one system. As observed from another system, they occur in general also at different points, and not simultaneously. It is clear that both time intervals are not related by a finite factor, being one of them equal to zero, while the other is finite. The only way to relate a generic time interval in different systems is by using the Lorentz transformation formulas.

The example considered by the author is precisely one in which both events occur at different spatial points in both systems: the emission of a light pulse by the source at the origin of S, and the reception of that pulse at the object M that moves with speed –v in S, and is at position D when the pulse is emitted. As observed in system S’, in which M is at rest and the source moves with velocity v, both events occur at different spatial points. The Lorentz transformations between S and S’, with the usual condition that both origins coincide at the respective zero times, are (S’ moves with speed –v relative to S)

$$x' = \gamma(x + vt)$$

$$t' = \gamma\left(t + \frac{vx}{c^2}\right)$$

In S, the emission event corresponds to

$$t_E = 0, \quad x_E = 0$$

and the reception event to

$$t_R = \frac{D}{(c+v)}, \quad x_R = D - vt_R = cD/(c+v)$$

.

In S', the emission event corresponds to

$$t'_E = 0, \;\; x'_E = 0$$

and the reception event to

$$t'_R = \gamma\left(t_R + \frac{vx_R}{c^2}\right) = \frac{\gamma D}{c}, \quad x'_R = \gamma(x_R + vt_R) = \gamma D$$

.

The intervals

$$\Delta t = \frac{D}{(c+v)}$$

and

$$\Delta t' = \frac{\gamma D}{c}$$

are thus related by

$$\Delta t' = \gamma(1 + v/c)\Delta t$$

which differs from the usual time-dilation relation by the factor

$$(1 + v/c)$$

and which is not a contradiction of SRT, but the expression of the assumption of the velocity of light being the same in both systems.