Critique of “Experiment 2” in Ufuk Denizyar’s paper

=== START QUOTATION FROM   http://www.geocities.com/udenizyar/lt3.pdf

3.2.2 Experiment 2

The above experiment can be modified to have zero acceleration affects. This time, assume the clocks of A and B can be started and stopped by radio signals. After A and B get off and reach a constant speed, let C broadcast a radio signal to start clocks. After a while, C broadcasts another radio signal to stop the clocks. After A and B have returned to the home, the clocks are compared. Again the clocks must be the same according to C since the speed of the radio signals is isotropic and the distances to A and B are the same.

Now investigate the situation from the point of view of A. In Lorentz transformation, the velocity addition rule in a direction is given as

$$\frac{v+w}{1+v.w/c^2}$$

where w is the velocity of an object in a system with a relative speed v such that w is in the direction of v. Let the speed of A according to C is $-v$ and the speed of B is v. Then, according to A, the speed of C is v. Therefore, the speed of B according to A would be

$$v_B = \frac{v+v}{1+v^2/c^2}$$

Now find the interval between the reach times of the starting and stopping radio signals. Assume the starting signal is broadcasted at t_0 and the stopping signal is at $t_0+\delta$. Let x_{AC} and x_{CB} is the distance between A and C and the distance between C and B at time t_0 respectively. The speed

Figure 3: The speed of A and B with respect to C

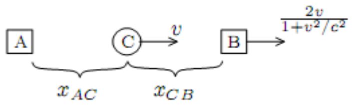

Figure 4: The speeds with respect to A

of light is c in empty space and the same in every direction. Let s_1 and s_2 be the interval between the emitting time and the arrival time of the starting signal and the stopping signal respectively. Therefore

$$s_1 = \frac{x_{AC}}{c}$$

and

$$s_2 = \frac{x_{AC}+\delta.v}{c}$$

would be true. Thus the interval between the arrival times of these two signals is found as

$$\begin{aligned}\delta_A &= (t_0+\delta+s_2)-(t_0+s_1)\\ &= \delta+s_2-s_1\\ &= \delta+\frac{x_{AC}+\delta.v}{c}-\frac{x_{AC}}{c}\\ &= \frac{\delta.(c+v)}{c}\end{aligned}$$

==== END QUOTATION ==

My comments:
According to the definition of the scenario, the interval between the emission of the start signal and the stop signal is δ *as measured on C's clock*. Measured in A's rest frame, this interval will be:

$$\delta' = \frac{\delta}{\sqrt{1-\frac{v^2}{c^2}}}$$

So the correct expression for the interval between A's receptions of the start and stop signal, as measured on A's clock, should be:

$$\delta_A = \frac{\delta'(c-v)}{c} = \sqrt{\frac{c+v}{c-v}} \cdot \delta$$

=== CONTINUE QUOTATION FROM http://www.geocities.com/udenizyar/lt3.pdf

Now let's find the interval between the reaching times of these two signals for B. Let s_3 and s_4 be the interval between the emitting time and the arrival time of the starting signal and the stopping signal respectively for B. Then s_3 can be found as

$$\begin{aligned} s_3 &= \frac{x_{CB} + s_3.v_B}{c} \\ \Rightarrow s_3 &= \frac{x_{CB}}{c - v_B} \end{aligned}$$

Before the broadcasting of the second signal, the distance between C and B increases by a factor $\delta.(v_B - v)$. Therefore

$$\begin{aligned} s_4 &= \frac{x_{CB} + \delta.(v_B - v) + s_4.v_B}{c} \\ \Rightarrow s_4 &= \frac{x_{CB} + \delta.(v_B - v)}{c - v_B} \end{aligned}$$

From here the interval in which B's clock runs is found as

$$\begin{aligned} \delta_B &= t_0 + \delta + s_4 - t_0 - s_3 \\ &= \delta + \frac{x_{CB} + \delta.(v_B - v)}{c - v_B} - \frac{x_{CB}}{c - v_B} \\ &= \frac{\delta.(c - v)}{c - v_B} \end{aligned}$$

==== END QUOTATION =======================================

My comment:
Of the same reason as above, the correct expression for the interval between B's receptions of the start and stop signal, *as measured in frame A*, should be:

$$\delta_{AB} = \frac{\delta'(c-v)}{c-v_B} = \frac{\sqrt{c^2-v^2}}{c-v_B} \cdot \delta$$

=== CONTINUE QUOTATION FROM http://www.geocities.com/udenizyar/lt3.pdf

Assume the duration of a standard clock tick is $\triangle$ in any frame wrt to an observer in that frame. Then the clock of A ticks

$$n = \delta_A/\triangle = \frac{\delta.(c+v)}{c.\triangle}$$

times. On the other hand the tick period of the B's clock would be $\triangle/\beta(v)$ wrt A. So the B's clock ticks

$$m = \delta_B.\beta(v)/\triangle = \frac{\delta.(c-v).\beta(v)}{(c-v_B).\triangle}$$

times wrt A. m and n are not equal and thus a paradox appears.

==== END QUOTATION ======================================

My comment:

This is horribly wrong!

Ufuk Denizyar *guesses* that: "The tick period of the B's clock would be $\Delta/\beta(v)$ wrt A.

This is wrong. To find how this interval transform to frame B, the Lorentz transform must used. If this is done properly, the result is that the interval between B's receptions of the start and stop signal, *as measured on B's clock*, will be:

$$\delta_B = \left(1-\frac{v}{c}\right)\sqrt{\frac{1-\frac{v_B}{c}}{1+\frac{v_B}{c}}}\cdot\delta' = \sqrt{\frac{c+v}{c-v}}\cdot\delta = \delta_A$$

A's clock and B's clock will measure exactly the same interval!

The Lorentz transform is consistent.

For the detailed derivation, see: https://paulba.no/div/LTconsistent.pdf

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