

Are SR effects real or not? Simplified case.

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There is another thread in sci.physics.relativity entitled "Are 'observed' SR effects real?" I have trouble following the discussion, as maybe you do too. I prefer to phrase the question in a way that to me is much clearer.

The following thought experiment is an old problem, not original with me, but I will not give any reference to it just yet. Just think about it and draw your own conclusion. I'll post my explanation in about a week.

Imagine two rocket ships at rest, one behind the other at a distance x_0 , in intergalactic space. Let's tie a light string between the two ships -- so light that it cannot affect the motion of the ships.

Let both ships be aimed at a distant galaxy that is on the line connecting the ships. The ships synchronize watches and fire their identical rocket engines at the same time.

Theorem: According to either classical mechanics or relativistic mechanics, as the two ships accelerate, they keep a constant distance between them with respect to (w.r.t.) their initial rest frames.

Proof:

1) According to Newton, the position of a ship under constant acceleration is given by $x = t^2$ in some units. In an obvious notation, the equations of motion are

$$x_1 = t^2 + x_0,$$

$$x_2 = t^2,$$

so

$$x_1 - x_2 = x_0.$$

2) According to Einstein, the position of a ship under constant proper acceleration is given by $x = \cosh(t)$. The equations of motion will be

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$$x_1 = \cosh(t) + x_0,$$

$$x_2 = \cosh(t).$$

so

$$x_1 - x_2 = x_0.$$

QED

But what about the string? When the ships are moving at almost the speed of light, the string must have tried to contract a lot. But it is constrained to stay at a fixed length x_0 . Sooner or later it will reach its breaking point and will snap!

Do you believe this? Does the string break or not? Is the Lorentz-Fitzgerad contraction real or not real?

Uncle Ben

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