Re: A funny kind of rectilinearity

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- *From*: msadkins04@xxxxxxxxx

- *Date*: 1 Aug 2005 18:01:58 −0700

Tom Roberts wrote:
> msadkins04@xxxxxxxxx wrote:
> > In SR, light propagates in a vacuum in a straight line and does not
> > share the velocity of the source (i.e., additive velocities do not
> > apply to c regardless of the motion of the source).
>
> Not quite. The light always propagates with SPEED c in any inertial
> frame, but its direction in any frame clearly depends on the orientation
> of the source in that frame.

I hope you're not suggesting that in one frame the laser is pointed toward the detector, whereas in another frame the laser is pointing toward an empty section of space where the detector will be in future, and that the empty section of space the detector points toward is different for every such frame.

Because so far as I know, Lorentz transformations may shorten rectangles but they don't skew them. Either the laser is pointing toward the detector, in which case it does so in every frame, or else the laser is pointed into space (but then we have the absurd conclusion that the angle between laser and detector is different for every frame).

So, if S assumes that S' is moving, and therefore that the laser/detector apparatus in S' is moving, then the light must travel toward where the detector *will be* (according to S, but not according to S') because light shares the directional component of the velocity vector of the light source. (But not the scalar component, ha ha!)

>
>
> > But clearly it
> > does share the velocity −− at least, the directional component of the
> > velocity vector. And the angle of this "straight line" is something
> > different for every frame.
>
> Sure −− because the light source has in general a different orientation
> in different frames.
>

> BTW this is true in Newtonian physics for light or any object
> with finite speed, such as cannonballs −− drive past a cannon
> firing vertically, and in the frame of your car the cannon is
> not aimed straight up (where "aimed" is defined by where the
> cannonball goes, not necessarily the orientation of the cannon
> itself).
>

Yes, but in Newtonian physics velocities are additive and it makes perfect sense that something sharing the scalar component of a velocity vector should share the directional component as well. When the scalar component isn't shared, as in SR, it's rather puzzling that the directional component is shared.

>
> > Since the path of the light as assumed by S is longer than the path
> > assumed by S', then assuming (as both do) that the scalar component of
> > c is absolute regardless of the velocity of the source, light must take
> > longer to cover the path assumed by S than to cover the path assumed by
> > S'. Hence the time light takes to cross this path will be asserted by
> > S' to have a value less than that asserted by S.
>
> Sure.
>
>
> > However, each frame's assumptions about the path light takes (and they
> > are just that, assumptions)
>
> No, they are MEASUREMENTS. That is, in S' when one measures the distance
> from source (at emission time) to detector (at detection time) one gets
> a smaller value than when S measures the distance from source (at
> emission time) to detector (at detection time). This is just simple
> Euclidean geometry plus the fact that in S the source and detector are
> moving.

The relative motion is observed, but the attribution of that motion to either of the two frames is an assumption. That is, it is an *assumption* that frame S' is moving (the assumption of S), and it is an *assumption* that frame S' is at rest (the assumption of S'). Since that assumption is, ipso facto, an *assumption* about the distance light travels between two clocks to be synchronized in S', this results in different conclusions about the time it takes light to travel this assumed distance (at an absolute speed of c in all frames).

So, when S' believes that a pair of clocks have been properly synchronized (i.e., that they simultaneously have the same reading), S perceives that they have not. Of course, S' has the same perception about the clocks of S, and therefore when S says that the clocks of S' do not "simultaneously" possess identical readings, S' is perfectly within his rights to insist that this is because S has mis−synchronized *his* clocks. That is to say, simultaneity is relative.

Either a frame is moving, or it is not. If it is moving, then it
should incorporate this assumption (about the distance that light
travels between synchronized clocks) into its calculations and
procedures. If it instead incorporates a distance based on the
assumption that it is at rest, when it is not at rest, then it is in
error and its calculations must involve logically inconsistent
premises. If then, according to S, S' is moving, yet S' assumes itself
at rest and therefore assumes (from the viewpoint of S) an incorrect
distance that light has traveled between clocks that it is
synchronizing, then S must regard these calculations of S' as erroneous
and logically inconsistent. Yet, in SR, absurdly, S accepts them.

>
>
> > Thus, it can be seen that the "dilation"
> > is really an artifact of different assumptions about the length of the
> > path light takes when S' synchronizes his clocks.
>
> With "assumptions" => "measurements" this is sort−of correct; there is
> an aditional contibution from "time dilation" (but that, too, is related
> to your basic point).

Your rephrasings are ignorant. And you're missing my basic point: the
mathematical basis for "time dilation" disappears altogether when the
principle of the relativity of simultaneity is properly (universally)
applied, that is to say, applied to include (rather than exclude as a
special case) the clock synchronization procedure. If simultaneity is
relative in the general case, then it should be also in the specific
case of whether two clocks possess an identical reading simultaneously
(i.e., whether they are properly synchronized); and clearly no two
frames should regard each other's clocks as properly synchronized if
this principle is universally applied. Of course, that immediately and
obviously demonstrates the principle to be ridiculous, which is no
doubt why SR quietly excludes clock synchronization procedures from the
principle of the relativity of simultaneity.

>
>
> > If the principle of the relativity of simultaneity were applied
> > universally in SR, S would have to conclude that S' mis−synchronized
> > his clocks,
>
> There is no "principle of the relativity of simultaneity".

There is. See for example, Albert Einstein, "Relativity: The Special
and the General Theory", 1920, Chapter IX. The Relativity of
Simultaneity.

>
> S concludes that S' uses a different method to synchronize clocks that

> are at rest in S' than S uses for clocks at rest in S. This is
> manifestly so, of course.
>
>
> > it isn't the
> > mechanical prowess of S' that is at issue, but his *assumptions* about
> > the length of the path taken by light traveling between his clocks
> > during his synchronization procedure.
>
> No, it is MEASUREMENTS, not assumptions.

Clearly, whether a frame is "moving" or "at rest" is regarded *by SR
itself* as an assumption; and so, therefore, is the distance that light
is regarded as moving between two clocks in a frame.

>
>
> > Why S should be free to insist
> > on the validity of his own observations with respect to every other
> > event other than the clock synchronization procedure of S', but not in
> > the latter case, is a mystery whose answer is not to be found in the
> > literature of SR.
>
> Your question does not make sense, once you realize the mistakes pointed
> out above. S' uses a different synchronization procedure than S, so of
> course S' gets different answers for measurements in which
> synchronization is important. Nothing strange or unexpected there....
>
>
> Tom Roberts tjroberts@xxxxxxxxxx

What mistakes?

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- ***Follow−Ups***:
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