Re: time dilation

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- *From*: rbwinn <rbwinn3@xxxxxxxx>
- *Date*: Fri, 11 Apr 2008 22:28:21 −0700 (PDT)

On Apr 11, 7:36 pm, tussock <sc...@xxxxxxxxxxxx> wrote:

> rbwinn wrote:
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>> On Apr 11, 8:29ýam, tussock <sc...@xxxxxxxxxxxx> wrote:
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>>> rbwinn wrote:
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>>>> ý ý ý ý This brings us to another question
>>>> about falling objects
>>>> which arises from the idea of dropping an
>>>> object in a moving train
>>>> car, which writers of textbooks about
>>>> relativity often use to show
>>>> how the Lorentz equations work. ýIf a
>>>> weight is dropped from the top
>>>> of a train car to the floor, [...].
>>>
>>> ý ý You've really got three identical experiments there, the
>>> first one
>>> on the train, a second that released where and when the train
>>> weight
>>> was released, and a third that impacted where and when the
>>> train weight
>>> impacted.
>>> ý ý Stationary observers measure the second experiment as
>>> having
>>> started before the third. The relitivistic observer measures the
>>> third
>>> one starting before the second. There's no agreement on how
>>> the
>>> stationary observers should measure the time taken for the
>>> train
>>> experiment relative to their own, because they naturally
>>> disagree on
>>> the syncronicity of events at a distance.

ý ý A nuetral observer could move so as to syncronise all three drops;
doing so would also syncronise all three impacts.

tussock
Thank you for your analysis. We have the experiment down to this now. We are using cesium clocks as weights , and we are using two clocks, one in the train car and one dropping an identical distance beside the track.

Your experiment is running across 1 second at ~.0179c, with the S' clock covering 5371 km (in S) before it impacts.

We have hired a photographer to take pictures at rapid intervals of the two clocks as they drop.

Compensating for time delay for the distance the information has to travel afterward. Speed of light and all.

The train comes by on the track, and the clocks are released at t'=t=0.

But rapidly moving apart thereafter.

The last picture taken by the photographer shows the two clocks hitting the floor.

Well, no, it shows the more distant clock hitting quite a bit later (if you can somehow pick it out at several thousand km, big face obviously), but we can calcutate the effect of light delay away.

Several thousand km.? How fast do you have this train going?

The clock in S reads 1 sec, and the clock in S' reads .99984 sec.

Both clocks read the same at impact. They are, after all, performing

> the same experiment.

That sounds very official, so how does it happen that a moving clock in all of these scientific experiments comes back with less time than an identical clock that did not move. Weren't they performing the same experiment?

> The stationary observer will say the S' clock impacted at 1.00016 seconds by the S clock's time (but 5371km away), after accounting for the 0.0179 second light delay (assuming a vacuum).

Tell me something. Why would the stationary observer say that if he knew that the S' clock was performing the same experiment as the S clock?

> > Now we put the photographer on the train, and run the experiment again.

> Do it at the same time, it's the same answer.

> > The last picture taken by the photographer shows the two clocks hitting the floor, but this time the clock in the train reads 1 sec, and the clock in S reads .99984 sec.

> Again, they both read 1 second at impact (the S' reference moves 5370km in 1 second, traversing 5371km in S). The S' observer will calculate (after removing the 0.0179 second light delay) that the S impact happened at 1.00016 seconds by the S' clock's time.

Once again, why would the S' observer do that if he knows the S clock is conducting the same experiment? The experiment started when t'=t=0.

> See, they agree. Both experiments are calculated to take 1 second in their own time, while the other's takes 1.00016 seconds. Both agree the S' clock is 5371km distant (in S) when it impacts, though they disagree how far away the S' experiment was when the S clock impacted.

Well, the way I do it is t'=t. The two clocks hit the floor at the same time. The S clock reads 1 sec, the S' clock reads .99984 sec. The S' clock is running slower than a t' clock. t'=t in the Galilean transformation equations. Scientists do not like it if the S' clock does not get called t'.

> Do you see anything wrong with this picture?

> Not at all, once you get the picture right. You can't compare relativistic clocks while they're at a distance and get a meaningful answer, time being relative and all, and those two clocks are a long way apart.

I think you have them a little further apart than I do, but I get the idea of what you are saying. However, I believe I will stay with the Galilean transformation equations, keep t'=t, and have the clocks hit the floor at the same time. I like Galileo's idea about equivalence.

Robert B. Winn
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