Re: Accelerating train paradox

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2004−06/2986.html

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Date: 06/15/04

Date: Tue, 15 Jun 2004 16:01:22 GMT

"César Sirvent" <8umucsxySPA@M_MAPSterraReMoVeThIs.es> wrote in message
news:OnEzc.974246$A6.3792956@telenews.teleline.es...
|
| "Androcles" <androc1es@nospamblueyonder.co.uk> escribió en el mensaje
| news:TVxzc.470$KM6.3668027@news−text.cableinet.net...
| >
| > "sal" <believer@nospam.org> wrote in message
| > news:6794a912097ea4e48a66cc14437d3079@news.teranews.com...
| > | On Mon, 14 Jun 2004 21:37:03 +0200, Henri wrote:
| > |
| > | >> > What about GR? In the train frame proper time must slow down even
| > more
| > | >> > than predicted by SR cause acceleration is alike gravity. What
are
| > the
| > | >> > formulas to compute this?
| > | >>
| > | >> Doesn't make any difference −− GR and SR are the same in this case
| > | >> because there isn't any gravity.
| > | >
| > | > I think it does make a difference.
| > | >
| > | > If a train, or a car accelerates at, let's say 10 m/s2 along the
| > | > x−axis, the passengers feel a force like gravity.
| > | >
| > | > Acceleration along the z−axis can cancel out the 'force' of gravity
in
| a
| > | > spaceship frame.
| > | >
| > | > I write 'force' because gravity is the curvature of spacetime, at
| least
| > | > that is what the textbooks want to let me believe.
| > | >
| > | > So acceleration also should lead to a curvature of spacetime, and
| maybe
| > | > a warping of time.

| > |
| > | It does. Acceleration produces exactly the same effect a uniform
| G−field
| > | would produce.
| > |
| > | It is possible to use a metric, and associated coordinates, that
| describes
| > | a uniform gravitational field, and analyze the problem in that way (or
| so
| > | I understand; I haven't done it). That's the "GR solution" −− it uses
a
| > | non−Lorentz metric, and non−flat coordinates.
| > |
| > | But it's not necessary. You can obtain exactly the same results by
| > | analyzing the whole problem using SR from the point of view of the
| tracks,
| > | which are not accelerating.
| > |
| > | To do it the SR way, at each moment we find the instantaneous velocity
| of
| > | each part of the train, as seen by the tracks. From the instantaneous
| > | velocity, we can find an instantaneous value for gamma, and the
Lorentz
| > | transform to an inertial frame which happens, at this exact moment, to
| be
| > | moving at the same speed as the part of the train we're examining.
| That's
| > | the MCRF for that object at that moment.
| > |
| > | In the MCRF, at a particular time, we can find the coordinates of
| > | everything else, and from that we can find the apparent speed _and_
the
| > | apparent time (clock reading) of everything else, from the point of
view
| > | of an accelerating object.
| > |
| > | Once we've done that, we can differentiate the clock rate we found
with
| > | respect to time in the object whose MCRF it was, and hence see "time
| > | dilation" or "time contraction" as an apparent consequence of
| > | acceleration.
| > |
| > | The result of that analysis will be identical with the result of
| > | pretending there's a "uniform gravitational field" filling all space.
| > | And that's what I mean when I say the SR and GR approaches yield the
| same
| > | result.
| > |
| > | Either way, it's a mess.
| > |
| > | One simple consequence is that, while you are accelerating _toward_

| > | something, its clock appears to run fast −− exactly the way clocks
high
| up
| > | in a gravitational potential well run faster than clocks lower down in
| the
| > | well. And when you're accelerating _away_ from something, its clock
| > | appears to run slow −− just as the clock lower down in a gravitational
| > | field runs slower.
| >
| > Assertion carries no weight. If the high clock runs fast, then the SoL
is
| > fast.
| > The idiot that said the SoL was constant in empty space is the same
idiot
| > that says clocks run at different rates at different altitudes.
| > Androcles
|
| And who has been the idiot who told you that SoL must be c in an
accelerated
| system of reference?
| If you take your own ignorance and stupidity, and mix them with wrong
| statements from not−very−clever people, you have a complete mental
disaster
| as a result.
Yes, you do, don't you?

| Please, find another hobby as gardening or cooking, you may have some more
| success on it...
|
| Cesar
That would be my advice to you, since you have no grasp of even the most
basic physics.
Androcles

|
| > |
| > | > The only thing I want to understand is a mathematical connection
| between
| > | > the 'simple' uniformly moving train in SR and the accelerating train
| in
| > | > GR.
| > |
| > | Acceleration is just like a gravitational field, _but_ because space
is
| > | still "flat" in this case it isn't necessary to use GR techniques to
| > | analyze it.
| > |
| > | The hallmark of gravity is that space is (almost) always curved when
| it's
| > | present, and that curvature makes it impossible to find the
momentarily

| > | comoving inertial reference frames which are needed in order to
analyze
| it
| > | using SR and Lorentz transforms.
| > |
| > | > If time slows down in the train frame, due to 'gravity along the
| > | > x−axis', then what do ground observers measure?
| > |
| > | No, it doesn't slow down, not in that sense.
| > |
| > | Time slows down on the train only as a result of the train speeding
| up −−
| > | time relative to time on the tracks goes as 1/gamma where
| > | gamma=1/sqrt(1−v^2) at each moment, just as you would expect(?).
| > |
| > | From the point of view of someone on the train, however, time of a
point
| > | FAR AHEAD of them on the tracks seems to _speed_ _up_ while the train
is
| > | accelerating, and time at a point FAR BEHIND them appears to _slow_
| > | _down_. But note: This "acceleration" effect can't be observed! It
| can
| > | only be calculated!
| > |
| > | Anyway, I think I've contributed enough confusion to the topic for
now,
| > | and I've got to run anyway.
| > |
| > | I hope something I said helped at least a little.
| > |
| > | Cheers...
| > |
| > | >
| > | > The problem might appear easy, but I'm sure it is pretty difficult.
| > |
| > | Yes, it is.
| > |
| > | −−
| > | To email me directly, take out nospam and put back physicsinsights.
| > |
| > |
| >
| >
|
|