Re: Principle of equivalence

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- *From*: PD <TheDraperFamily@xxxxxxxxx>
- *Date*: Fri, 18 Apr 2008 06:03:47 −0700 (PDT)

On Apr 17, 8:20 pm, rbwinn <rbwi...@xxxxxxxx> wrote:

> On Apr 17, 6:56ýam, PD <TheDraperFam...@xxxxxxxxx> wrote:
>
> > On Apr 15, 10:55ýpm, rbwinn <rbwi...@xxxxxxxx> wrote:
> >
> > > ý ýThe basic problem with current interpretation of relativity
> > > can be
> > > seen from considering two frames of reference S and S' and
> > > how they
> > > relate to the principle of equivalence.
> > > ý ýS is a set of coordinates at rest and S' is a set of
> > > coordinates in
> > > motion in the x direction relative to S with a velocity of v.
> > > ýLet S'
> > > represent a train car in which we will drop a cesium clock at
> > > t'=t=0
> > > from the roof. ýIn S we construct an apparatus on a floor
> > > level with
> > > the train car floor at x=0 from which we will drop an
> > > identical cesium
> > > clock from a height equal to the height of the train car roof.
> >
> > This is different than what physicists mean by the principle of relativity (which you call the principle of equivalence, which in turn means something completely different). The principle of relativity considers a SINGLE sequence of events and asks about the physical description of that single sequence as seen from two reference frames, rather than considering two similar sequences of events in two different reference frames.

For example, let's take a SINGLE rock dropped from a SINGLE elevated cup into a SINGLE bucket on the floor, and let's just do that drop ONCE, but we'll look at that same sequence of events (from the event marking the drop of the rock from the cup to the event of the rock landing in the bucket) from reference frames S and S'.

We can arrange the instruments in S and S' such that x=0 and t=0 as *measured* in S at the event of the release, and such that x'=0 and t'=0 as *measured* in S' at the same event. The question then arises whether x and x' will be the same when the ONE rock lands in the bucket, and whether t and t' will be the same at that same event.

Galilean relativity says that t *measured* in the second event will be the same as t' *measured*. Relativity says they will not. Then it is a simple matter of making the measurement and seeing what is right. It turns out that the *measured* t and the *measured* t' are not the same, despite the precision of the clocks being more than adequate.

Now, if you'd like to suppose that there is a *mythical* but *unmeasured* t' that is equal to t and that the *measured* time in S' is something other than this mythical t', I suppose that's your perogative. But Galilean relativity makes a statement about *measured* t and t', as does special relativity. And the measured numbers bear out relativity.

PD

Well, so what is the problem, PD?   You drop a rock into a bucket of water and "measure" the events according to what is seen by an observer in S and an observer in S'. Event one is when the rock is released and t'=t=0.

Right. So let's be sure what that means. That means that by *one* clock in S and *another* clock in S', the first event takes place with both clocks reading zero. That's easy to arrange.

Event two is when the rock hits the water in the bucket. Both events are timed by a clock on the floor in S which shows t'=t.

No, not quite, Bobby. Event two is when the rock hits the bucket, right. But there is a clock in S that tells you what time t that happened (in the S frame), and there is another clock in S' that tells you what time t' that happened (in the S' frame). Galilean relativity says that, with perfect clocks, t on one clock will equal t' on the other clock. Special relativity says that, with perfect clocks, t on one clock will not equal t' on the other clock, and moreover, it tells you *exactly* what the relationship between the t on one clock and the t' on the other clock will be. And, as demonstrated by actually measuring with very precise clocks (where the imprecision is much, much less than the predicted difference between t and t'), the difference between t and t' is *exactly* as predicted.

> The observer in S sees the rock hit the water when t=t.
> The observer in S' sees the rock hit the water when t'=t.
> The clock on the floor in S reads the same as seen by either observer when the rock hits the water. What is the problem you see?
> Robert B. Winn

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