Re: Rigid rod problem

Source: http://sci.tech−archive.net/Archive/sci.physics.relativity/2005−09/msg00633.html

- *From*: russell@xxxxxxxx
- *Date*: 7 Sep 2005 11:51:46 −0700

Kim B wrote:
> On 7 Sep 2005 10:54:47 −0700, russell@xxxxxxxx wrote:
>
> >Spoonfed wrote:
> >> russ...@xxxxxxxx wrote:
> >> > Kim B wrote:
> >> >
> >> > [snip]
> >> >
> >> > > If you choose a point on the rod a use its current speed as your FOR,
> >> > > the the rest of the rod will fit nicely in this FOR (along the FOR's
> >> > > line of simultaneity) ... with the same speed all along and the
> >> > > correct proper length, exactly as it fits in our "rest" frame at the
> >> > > base line ... all frames are equal, assuming the rod has accelerated
> >> > > and will accelerate forever.
> >> >
> >> > Thanks. Of course you are quite right about that, and I
> >> > apologize for my many mistakes here.
> >>
> >> I believe it when I hear it, but it's a little tricky to figure out.
> >>
> >> It seems surprising that no matter what reference frame you are in, all
> >> parts of the rod will pass v=0 at the same time. I'm not in the mood
> >> to develop a proof, but it seems right.
> >
> >I won't prove it here either; I'll just give some
> >further motivation.
> >
> >If you imagine Born−rigid acceleration over a finite
> >time, and then ending, it must be the case that in the
> >end, no part of the rod is moving relative to any other
> >part (otherwise the rod would not be rigid). So, in
> >that sense it's not a surprising result at all.
> >
> >On the other hand, given the complications that occur
> >with acceleration, I agree it's a bit surprising that
> >Born−rigid acceleration is possible at all, even in
> >theory.
> >

> >You can see what's happening if you take Kim B's
> >diagram and, say, pick some point on the leftmost
> >hyperbola and draw the tangent there. Then draw
> >parallel tangents on the other hyperbolas, at whatever
> >points are determined by the parallel requirement.
> >Then notice that the points you have picked all lie
> >on the same straight line, tilted slightly upward to
> >the right. This is a line of simultaneity in the
> >frame that is moving at the speed given by the tangent
> >slope, and (recognizing that our diagram is drawn in
> >Euclidean rather than Minkowskian space) we see that
> >this line would actually be perpendicular to the tangent
> >if we redrew the diagram in the coordinates of that
> >frame. Thus, as Kim B says, the diagram looks the same
> >no matter what frame we draw it in.
>
> All lines of simultaneities in my diagram, drawn this way, pass
> through (0,0).

Thanks, yes, that helps with the visualization. It agrees
with our intuition that the one special event (the location
of the bear when he starts chasing us) can't depend on how
we draw the diagram.

The 45−degree line through (0,0) is a degenerate hyperbola
where *all* of the change in slope happens, as it were,
exactly at (0,0). So, no matter what slope one chooses
for the tangent, (0,0) must be on the line of simultaneity
determined by that choice.

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- ***Follow−Ups***:
  - ♦ ***Re: Rigid rod problem***
    - ◊ *From:* Kim B

- ***References***:
  - ♦ ***Re: Rigid rod problem***
    - ◊ *From:* Spoonfed
  - ♦ ***Re: Rigid rod problem***
    - ◊ *From:* Kim B
  - ♦ ***Re: Rigid rod problem***
    - ◊ *From:* Spoonfed
  - ♦ ***Re: Rigid rod problem***
    - ◊ *From:* russell
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