

## **Relativistic Velocity addition analysis,**

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People are doing different versions of what should do for relativistic velocity addition; that's because the maths of Special Relativity (SRT) is inconsistent. But many people don't see the inconsistency instead they insist their way of doing relativistic velocity addition is the correct way, and if others are doing it a different way, they say the others are doing it wrong. Its not in their psychological makeup to (1) admit that they are doing it wrong, its always the other person, or (2) admit that they are working from an inconsistent belief that allows different ways of doing things, and (3) their belief is firmly rooted in theirs must be the correct way, and what they believe is not inconsistent. Hence checking if their thinking is inconsistent is not part of their thinking process. They will instead try to alter the facts to fit with their inconsistent thinking processes.

I shall look at a simple supposed relativistic velocity addition case, from John M Bailey [1] :

Observer S is on earth and S' roars by in a rocket ship travelling at a relative velocity  $v = \frac{3}{4} c$ . They both look up and see a meteor shooting to the right at an even higher speed. S' measures its speed as being  $u' = \frac{3}{4} c$ . Then if we use the Galilean velocity addition formula we obtain:

$$u = u' - (-v) = u' + v = \frac{3}{4} c + \frac{3}{4} c = \frac{3}{2} c$$

This is greater than the velocity of light ! What went wrong?

[n.b. John Bailey considers faster than the speed of light is not allowed.]

The pictures are:

.....meteor.\*  $\rightarrow$  velocity  $u$  (to be determined)

$S'$

\* $\rightarrow v = \frac{3}{4} c$

$S$  frame (stationary) observes this

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.....\*  $\rightarrow u' = \frac{3}{4} c$

$S'$  frame (stationary) observes this

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We need to take a closer look at the relation between  $u$  and  $u'$ . Remember that  $u = \Delta x / \Delta t$  and  $u' = \Delta x' / \Delta t'$ . Using the Lorentz transformations:

$$x = \gamma (x' + vt')$$
 so  $\Delta x = \gamma (\Delta x' + v \Delta t')$

and

$$t = \gamma (t' + x' v/c^2)$$
 so  $\Delta t = \gamma (\Delta t' + \Delta x' v/c^2)$

To get  $u$ , divide one by the other.

$$u = \Delta x / \Delta t$$

$$= (\gamma(\Delta x' + v \Delta t')) / (\gamma (\Delta t' + \Delta x' v/c^2))$$

$$= (\Delta x' + v \Delta t') / (\Delta t' + \Delta x' v/c^2)$$

If the numerator and denominator are next divided by  $\Delta t$ , we obtain :

$$u = (\Delta x'/\Delta t' + v \Delta t'/\Delta t')/(\Delta t'/\Delta t' + (\Delta x'/\Delta t')(v/c^2))$$

$$= (\Delta x'/\Delta t' + v)/(1 + (\Delta x'/\Delta t')(v/c^2))$$

But note that  $\Delta x'/\Delta t'$  is just  $u'$ , the speed of the meteor relative to  $S'$ . By substitution:

$$u = (u' + v)/(1 + u'v/c^2)$$

Similarly,

$$u' = (u-v)/(1 - uv/c^2)$$

Now according to the relativistic velocity addition rules, what is the velocity of the meteor relative to frame  $S$ ?

$$\text{From } u = (u' + v)/(1 + u'v/c^2)$$

We obtain :

$$( \frac{3}{4} c + \frac{3}{4} c ) ( 1 + ( \frac{3}{4} c ) ( \frac{3}{4} c )/c^2 )$$

$$= \frac{3}{2} c / \frac{25}{16} = 0.96 c$$

This velocity is less than the velocity of light!

Me: John Bailey is happy about this and continues:

Our length and time measurements conspire to keep the meteor moving past us at a speed less than that of light.

Me: He then interprets this as-

Special relativity says no object can move past another at a speed greater than  $c$ . In fact ordinary massive objects cannot be accelerated up to the velocity of light, if Einstein's postulate (of constancy of lightspeed) is true.

Me: That might be arguable even among those believing SRT. He continues-

Suppose that instead of a meteor, a beam of light moved past the rocket ship so that  $u'$  is now equal to  $c$ . What is  $u$ ?

$$u = (c + \frac{3}{4}c) / (1 + (\frac{3}{4}c)(c) / c^2) = c$$

Therefore  $u = u'$  if  $u' = c$ ! We have completed a logical circle, coming back to Einstein's postulate: light has the same velocity in all frames of reference.

Me: Some people complain when there is a logical circle. But John Bailey is happy with a logical circle; he thinks probably that because the result he derived from the assumption agrees with the postulate that derived the result, that it is then logically consistent, and it is all proven logically. However, what he does not pay attention to is that although the result follows from his stating postulate, there might be other results which also follow from the same postulate and which are contradictory. If contradictory results are derived from the same stating point then the theory is logically inconsistent—and that is the possibility overlooked!

So, let us look again at the setup:

From stationary frame of  $S$  observes velocity  $v = \frac{3}{4}c$  for  $S'$  moving to the right

From stationary frame of  $S'$  observes meteor moving to right with velocity  $u' = \frac{3}{4}c$ .

Now consider what else stationary frame of  $S'$  observes; it observes  $S$  frame moving to the left at velocity  $= -\frac{3}{4}c$  (by relativity what  $S$  observes of  $S'$  speed,  $S'$  must observe of  $S$  as same speed in opposite direction).

So, from  $S'$  frame it observes a velocity difference between  $S$  and meteor of  $\frac{3}{4}c + \frac{3}{4}c = \frac{3}{2}c$ . It is thus already used to speed differences greater than  $c$ , and this by Galilean velocity addition.

Are we supposed to use Relativistic velocity addition instead of Galilean velocity addition on these two speeds?

If we did it would come out as  $0.96c$  again. But that does not make sense.  $S'$  observes meteor with speed  $\frac{3}{4}c$  and observes  $S$  with speed  $\frac{3}{4}c$  in opposite direction, and he concludes that the velocity difference is  $0.96c$  not  $\frac{3}{2}c$ , does not make sense!! No way would he conclude  $0.96 = 1.5$ , but this relativistic addition bodge wants us to believe that.

The  $S'$  frame could easily communicate this velocity difference of  $1.5c$ , saying to  $S$  frame - I see the difference between your velocity of  $S$  frame and meteor as  $1.5c$ . What is  $S$  frame then to conclude? Some nonsense of well this  $1.5c$  translates to  $0.96c$ ? No it is just nonsense.

No way can that be concluded! Everything about the calculation degenerates into nonsense. It tries to mix Galilean velocity addition with relativistic velocity addition and it just does not work. It's a farce.

Relativistic velocity addition supposedly can be derived from the postulate of lightspeed constancy \*, but apply it to this setup of two velocities near lightspeed and it just does not work.

[\* - this claim by the mainstream will be looked into by another article.]

In this setup we have a velocity difference greater than  $c$ , and it might be interpreted (as one person has pointed out to me) that velocity differences greater than  $c$  are allowed. That the meteor and the  $S$  frame does not go faster than  $c$  from the  $S'$  frame. And that one has to use the relativistic velocity addition equation to obtain the difference between velocities of meteor and  $S'$  as observed from the  $S$  frame.

Let me summarise this-

He is saying-

From  $S'$  frame, the velocity difference between  $S$  and meteor is  $\frac{3}{2}c$ .

This translates to velocity difference of  $0.96c$  between  $S'$  and meteor in  $S$  frame.

$1.5$  becomes  $0.96$ .

That is as I have pointed out nonsense.

If  $S'$  frame observes velocity difference of  $1.5c$  there is no reason why  $S$  frame should not have the same velocity difference.

And because both results can be obtained from the assumption of supposedly lightspeed constancy by SRT, namely that the velocity difference in the S frame is  $1.5c$  and  $0.96c$  the theory all this is based upon is inconsistent. The theory leads to contradictory results, and its maths needs sorting out.

What the psychology of people is - that they avoid contradictions. The solution that SRT gives is  $1.5$  and  $0.96$ , people refuse to acknowledge such facts. Instead they decide the  $0.96$  answer is correct and the  $1.5$  answer is wrong; or vice versa; and then they argue of who did the calculation correctly—the  $0.96$  calculators versus the  $1.5$  calculators. Or if they are particularly perverse they might argue  $1.5 = 0.96$ .

### **Conclusion**

The derivation of relativistic velocity addition was simply derived above from Lorentz transforms. If the relativistic velocity addition is wrong then there must also be problem with the Lorentz transforms, and that is indeed the case. All of the maths upon which SRT is based on nonsense as my next paper “The errors in the derivation of Lorentz transform” will deal with.

I think part of the situation has been that many have not gone back to the source of the derivations of the basic relativity equations from Einstein. Instead we might start from say the Lorentz transforms and then derive results based upon the Lorentz transforms, without looking at how the Lorentz transforms have been obtained. Indeed a long time ago that was one of my introductions to SRT; starting from the Lorentz transforms as given, work out the rest of the maths of SRT. But going back to the source of SRT and there is nonsense, and when faced with that various people have attempted to correct the problems there; but that has only added to the confusion.

It is upon this nonsense of a theory's maths that allows contradictions which modern physics has been based.

## **Reference**

[1] Liberal Arts Physics: invariance and change, John M Bailey, W. H. Freeman and company, 1972, 1974, USA, ISBN 0-7167-0343-2 p 201-203

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