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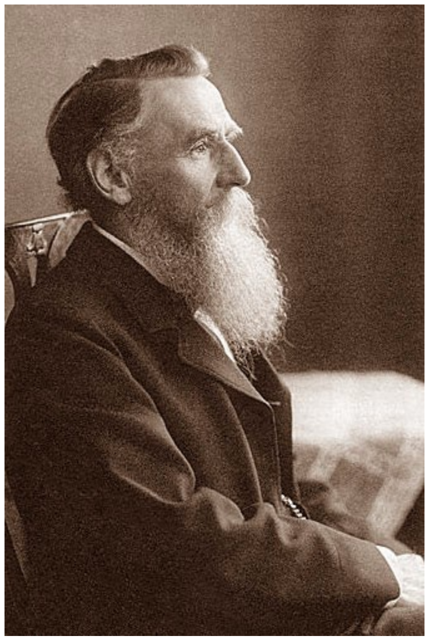
My Relativity Corrections Simplified Once More

taking the mistake all the way back to Voigt, 1887



I already solved this problem years ago, but any time I see a chance to simplify it or state it in a way I haven't previously stated it, I do so. So here goes.

It is known that Einstein borrowed his initial math from Lorentz. That is where his first equations came from. I have asked before where the equation x' = x – vt came from, and we know it came from Lorentz. This is important because Einstein's entire derivation of *gamma* depends on that first equation, and yet his 1905 paper neither justifies the equation nor gives a provenance. It just appears as given. And in no later updates did Einstein ever have anything more to say about it.

Well, it turns out that Lorentz also borrowed that equation without justification or provenance. We now know it came from Woldemar Voigt (*pictured above*). Where did Voigt get it? I haven't been able to trace Voigt's initial derivation, but it seems that he simply rewrote the old equation x' = x – d, where d is the x-separation of two co-ordinate systems. It is the distance from one origin to another. [*See diagram below.*] Since that is a distance, Voigt assumed it could be written like any other distance, d = vt.

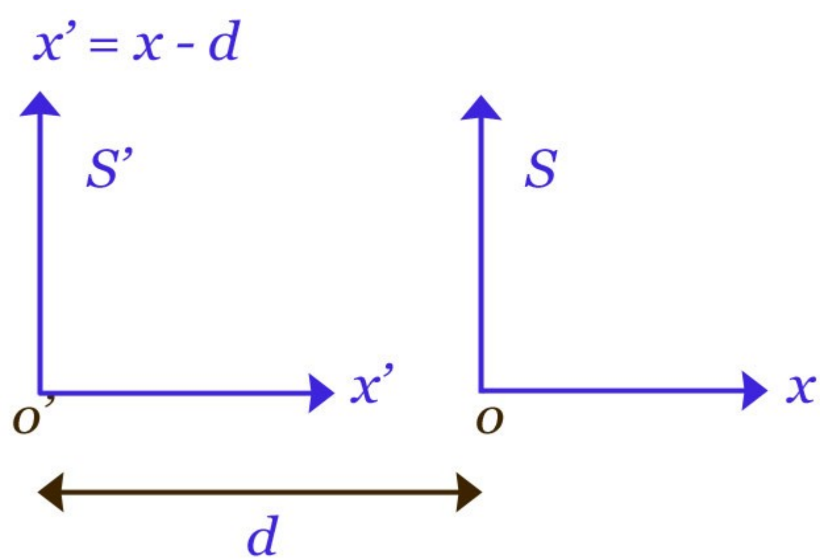
Unfortunately, that bad assumption has corrupted the math of Relativity for about 125 years now. Let's follow Voigt's simple derivation:

Assume x' = x – vt
divide through by c
x'/c = x/c – vt/c
Since x = ct and x' = ct'
we have
t' = t – vx/c^2

That last equation is the so-called local time t' that we still hear so much about. It is generally attributed to Lorentz, but it actually belongs to Voigt. It still stands. All the textbooks and internet sites simply start with the two equations x' = x – vt and t' = t – vx/c^2 when deriving *gamma*. **But both of them are wrong.**

Others besides me have seen this and tried to point it out to the mainstream. For instance, there is this discussion at physicsforums.com, where someone named *cryptic* is trying to get a *JesseM* to see sense. *Cryptic* says that Einstein's derivation has no mathematical justification, and *JesseM* responds, "Please point out the specific step that is not mathematically justified." *Cryptic* doesn't do that, and he should have. I will do it now.

The equation x' = x – vt is not mathematically justified because it is not applicable to the problem. As I just showed, Voigt assumes that x' = x – d is the same as x' = x – vt. It isn't, because the two equations are applied to completely different problems. The equation x' = x – d applies to a simple co-ordinate system transform of x, caused by moving the origin of the system, and therefore the entire system. This is a simple x-translation—a length or distance translation only—with no velocity implied or given.



Again, no velocity implied or given. S' is not moving relative to S; both are stationary. But in the problem Voigt, Lorentz, and Einstein were working on, we have a velocity. S' is moving v relative to S. In that case, can we just substitute vt for d? Although everyone since Voigt has just assumed the answer is yes, on closer examination the answer is no.

I can show you this most clearly by drawing your attention to t, which has just entered the equation along with v. Notice that we have x and x', but not t and t'. You will say that is because we haven't derived *gamma* yet, so we don't have a time transform yet. The times are still equivalent at this point, you will tell me. So my question to you is, **Then how did Voigt get a t' before he derived *gamma*?** Remember, he let x' = ct', to get $t' = t - vx/c^2$. We are still pre-*gamma*, but we now have a t and t'. Why should a co-ordinate system S' moving at v have no t', but c does have a t'? Light moving in two co-ordinate systems creates two times, but anything else moving in two co-ordinate systems has one time? How can that be? This despite the fact that we are told light is measured the same from all co-ordinate systems. That is postulate 2 of Relativity. If light is measured the same from all co-ordinate systems, why would it need two times?

In other words, the light equations can be written like this:

c = x'/t' and c = x/t

As you see, light is being given two times of travel in two coordinate systems. But that is a direct contradiction of Einstein's postulate 2: light itself *doesn't* travel differently in different coordinates systems. Light doesn't travel in a coordinate system at all. Coordinate systems are applied to everything *except* light. In this way, Einstein has contradicted himself. His equations are inconsistent and thereby false. The light equations contradict a first postulate, and therefore cannot be used in a consistent derivation.

Let's continue to study t. Each t should go with some x, by the normal assignments, right? If we have an event in either system, we can assign a 4-vector to that event. And so that event will have an x and a t. Let's see if that works. At $t_0' = t_0$, Einstein let his origins overlap. He then lets the systems move relative to one another at v in the x-direction. So, let us move S some distance relative to S'. We then assume the systems S' and S would look somewhat like the illustration above, with a separation d that we could also write as vt. But is that the case? To find out, let us ask where t_0 is now. Well, it must still be connected to x_0, right? But where is x_0? It can't be before the origin *o*, can it? If it were, it would have to be -x. We don't want that. No, x_0 has to be at *o*. But t_0 can't be at *o*. Since t_0 must always be connected to t_0', t_0 must still be back at *o*'. How can t_0 and x_0 be separated like that?

You see, the diagram and equation x' = x – vt don't work. What Voigt assumed he could do, he cannot do. Once we import a velocity into the problem, the co-ordinate systems don't work as before. The entire visualization is off, which throws off the math. If we have co-ordinate systems with x, t, and v, we can't draw them like that and move them relative to one another like that. It isn't that simple. Voigt's whole solution is naïve, both mathematically and kinematically. The equation x' = x – vt is not applicable to the problem. It is false. It is not a Galilean transform, and Relativity does not resolve to that equation at low speeds. Nor does it resolve to that equation if c is infinite.

But that is only half the problem. As I have already shown, we have problems with the light equations as well. They don't make any kinematic sense. So I can show *JesseM* at physicsforums another mathematical step that is not mathematically justified.

Voigt takes the light equations as given, in the form

x = ct
x' = ct'

Those two equations seem so basic that no one before me analyzed them. How could they be wrong?

Well, besides the fact that they contradict the first postulate of Relativity, they are wrong because they also contradict the primary result of Relativity. The first postulate of Relativity is that light travels the same in all systems. Light is defined as the special case, to which Relativity does not apply. We don't do transforms on light itself, because light *causes* the transforms. Obviously, if light travels the same in all systems, we don't need prime variables when talking about light. This forbids the equation $x'=ct'$.

But those equations also contradict the primary result of Relativity, which is the time and distance transforms. Einstein found time dilation and length contraction. Since dilation is a getting bigger and contraction is a getting smaller, x and t are in inverse proportion in the current transforms. They must be, because x and t were already in inverse proportion in the pre-Einstein equations of motion. By the very definition of velocity, x/t, they are inverse. The x variable goes in the numerator while the t variable goes in the denominator. That is an inverse relationship right there. So both the Newtonian equations and Relativity equations of motion require an inverse relationship between x and t.

Unfortunately, that isn't what the light equations imply. If we set c=c, we get

$$x'/t' = x/t$$

In those two equations, x and t are directly proportional. As x gets bigger, so must t. If t dilates, so must x. If x contracts, so must t. That equation cannot be right.

So, as I have shown, Voigt was wrong about everything. In a simple 4 line derivation, he made two huge errors of assumption. Lorentz then borrowed those equations from him without pulling them apart, and Einstein borrowed them from Lorentz. No one in the past 125 years has noticed the error, except me (as far as I know).

Correcting these errors gives us a local time equation in the form

$$t' = t - x'/c$$

not $t' = t - xv/c^2$

That second equation would be true only if $x' = xv/c$. But I have shown that the correct x-transform is

$$x' = x(1 - v/c)$$

Therefore, $t' = t - xv/c^2$ is false.

We can also write our new time equation as

$t' = t\,(1 - v/c)$ or
$t = t'\,(1 + v'/c)$

That's already a time transform, and we don't need to bring in *gamma* to make it one. Anytime you have v/c in an equation, you already have a Relativity transform. This includes the old pre-Einstein equation for frequency, $f' = f(1 - v/c)$. That is already a Relativity equation, and we don't need *gamma* to make it one. [See my paper on the Pound/Rebka experiment for more on this.]

The reason Relativity becomes more complicated is because Einstein was really calculating two degrees of Relativity, without knowing it. In his 1905 paper, this isn't clear, but he clarifies it somewhat by later talking of a train and a man walking inside the train. That is two degrees of Relativity. All motion causes the need for transforms, so the train by itself will require transforms, with no talk of a man inside. If the man moves as well, we have the man relative to the train and the train relative to the platform. A doubled Relativity. *Gamma* is actually the attempt to represent this doubled Relativity. Because of the mistakes of Voigt, *gamma* fails to properly represent doubled Relativity. The time transform for two degrees of Relativity is

$$t/t'' = \frac{c^2 - wv}{(c - w)(c - v)} = \frac{1 - wv/c^2}{(1 - w/c)(1 - v/c)}$$

For the full derivation of that, you may consult my previous papers.