the general science journal

Einstein's Relativistic Error

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Einstein made so many maths mistakes that it is difficult to know where to start. In this article I will only be dealing with one, with his derivation of Lorentz transforms. I had need of the Lorentz transform in the maths that I was investigating regarding its relationship to Newtonian physics. After not being impressed with the derivation of Lorentz transforms in standard texts, I went back to the supposed master of relativity- Einstein's derivation, and I was even less impressed- indeed shocked by what I read.

From Einstein (1920) [1] he starts:

"FOR the relative orientation of the co-ordinate systems indicated in Fig. 2, the *x*-axes of both systems permanently coincide. In the present case we can divide the problem into parts by considering first only events which are localised on the *x*-axis. Any such event is represented with respect to the co-ordinate system *K* by the abscissa *x* and the time *t,* and with respect to the system *k′* by the abscissa *x′* and the time *t′*. When *x* and *t* are given."

"A light-signal, which is proceeding along the positive axis of *x,* is transmitted according to the equation x = ct"

$$x - ct = 0 \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (1).$$

"Since the same light-signal has to be transmitted relative to *k′* with the velocity *c,* the propagation relative to the system *k′* will be represented by the analogous formula"

$$x' - ct' = 0 \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (2).$$

"Those space-time points (events) which satisfy (1) must also satisfy (2). Obviously this will be the case when the relation"

$$(x' - ct') = \lambda(x - ct) \quad . \; . \; . \; . \; . \; . \; . \quad (3)$$

me: Einstein in equation (3) has zero = zero.

It does not matter what lambda equals, the equation is 0=0.

Lambda may as well be zero; a possibility we need to look at.

Einstein tries to partially hide this by saying

"[equation (3)] is fulfilled in general, where λ indicates a constant; for, according to (3), the disappearance of ($x - ct$) involves the disappearance of ($x' - ct'$)."

me: Of course equation (3) is fulfilled it is 0 =0.
He continues:

"If we apply quite similar considerations to light rays which are being transmitted along the negative *x*-axis, we obtain the condition "

$$(x' + ct') = \mu(x + ct) \quad . \quad . \quad . \quad . \quad . \quad . \quad (4).$$

me: It has been pointed out to me that maybe Einstein means here that t and t' take the values 0 to +infinity while x and x' take the values 0 to –infinity. i.e. x and x' count the opposite way to t and t'. This would be for the graph of this function just being on the –x side of the x axis. If we extend to both sides of –x side and +x side of the x axis, instead of (4) what could have been meant was (-x' + ct') = mu (-x + ct) for x, x', t, t' taking values from -infinity to +infinity. If that were the case then this would mean what he meant by (4) was the same as (3) namely 0= 0, and mu might as well be zero. There is no useful information from Einstein's maths that follows for such a case; so I will try taking the equation (4) at face value. *

me: Now by (1) we have x = ct and by (2) we have x = ct', we substitute this into (4) gives:

2ct' = 2 mu ct

which is

ct' = mu ct

Einstein continues:

"By adding (or subtracting) equations (3) and (4), and introducing for convenience the constants *a* and *b* in place of the constants λ and μ where "

$$a = \frac{\lambda + \mu}{2}$$

and

$$b = \frac{\lambda - \mu}{2}$$

we obtain the equations

$$\left.\begin{aligned} x' &= ax - bct \\ ct' &= act - bx \end{aligned}\right\} \quad . \; . \; . \; . \; . \; . \; . \; . \quad (5).$$

me: Now the possibility we need to look at is that lambda = 0, then equations for a and b are: a = mu/2 and b = - mu/2, so a = -b

Substitute in (5) gives:

.x' = ax + act
ct' = act + ax

Einstein continues:

"We should thus have the solution of our problem, if the constants a and b were known. These result from the following discussion.
For the origin of *k'* we have permanently *x'* = 0, and hence according to the first of the equations (5)

$$x = \frac{bc}{a}t.$$

me: Einstein (or the article) missed out the minus sign and it should be x = -bct/a.

Substitute for a = -b and it becomes x = ct which is the same as what (1) gives us.
We have gone through a lot of manipulation and only still have our starting equation x = ct.

Einstein continues:

"If we call *v* the velocity with which the origin of *k'* is moving relative to *K,* we then have

$$v = \frac{bc}{a} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (6).$$

me: Substitute for a = -b, we have v = -c. It is minus c, maybe he made a mistake here again with the sign, and maybe what he means is +ct.

Einstein continues:

"The same value *v* can be obtained from equation (5), if we calculate the velocity of another point of *k'* relative to *K,* or the velocity (directed towards the negative *x*-axis) of a point of *K* with respect to *K'.* In short, we can designate v as the relative velocity of the two systems."

me: Einstein gives us x’ =0, substitute this into x’ = ax + act, and we have 0= ax+ act,

.a(x+ct) = 0

Substitute for x = ct and we have:

.a(2ct) = 0

Therefore a = 0

That in the other equation : ct’ = act + ax

Means ct’ = 0, and since we are given above x’ = 0 that into (2) of x’- ct’ =0 would give us ct’ = 0 as we should expect.

Einstein continues:

“Furthermore, the principle of relativity teaches us that, as judged from K, the length of a unit measuring-rod which is at rest with reference to k' must be exactly the same as the length, as judged from K', of a unit measuring-rod which is at rest relative to K. In order to see how the points of the x'-axis appear as viewed from K, we only require to take a “snapshot” of k' from K; this means that we have to insert a particular value of t (time of K), e.g. $t = 0$. For this value of t we then obtain from the first of the equations (5) “

x’ = ax

me: And we have x’ = 0 and obtained a =0, what Einstein is talking about here is still 0=0.

Einstein continues:

“Two points of the x'-axis which are separated by the distance x'=1 when measured in the k' system are thus separated in our instantaneous photograph by the distance

$$\Delta x = \frac{1}{a} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (7).$$

me: Einstein earlier was using x’ =0, now suddenly he is using x’ =1. He means two different x’, an x’1 = 0 and an x’2 = 1. The whole thing is degenerating even further. After saying nothing more than 0=0 for the previous pages, he suddenly jumps into territory that he does not make clear what he is doing.

This delta x must be an interval of distance and he has it as 1/0 so it’s infinite.

He continues:

"But if the snapshot be taken from *K'*(*t'* = 0), and if we eliminate *t* from the equations (5), taking into account the expression (6), we obtain

$$x' = a\left(1 - \frac{v^2}{c^2}\right)x.$$

me: And since a = 0 and x = infinity, he has 0 multiplied by infinity, its just nonsense.

Einstein then proceeds to derive the Lorentz transformation equations, but he got to this point of 0 multiplied by infinity and anything after that is just deriving from nonsense. The derivation he gives for Lorentz transformation is just totally invalid; it's just an exercise in bodging, devoid of any real mathematical meaning.

Einstein continues:

"From this we conclude that two points on the *x*-axis and separated by the distance 1 (relative to *K*) will be represented on our snapshot by the distance

$$\Delta x' = a\left(1 - \frac{v^2}{c^2}\right) \quad . \quad . \quad . \quad . \quad . \quad . \quad (7a).$$

me: In this equation he misses out delta x, it should be:

delta x' = a (1- v^2/c^2) delta x

me: But the steps leading up to this equation are incorrect. Einstein concludes equation (7a) from earlier but the steps leading up to that equation are totally false. If we were to continue then we would have to take (7a) as a starting point assumption.

Einstein continues:

"But from what has been said, the two snapshots must be identical; hence Δx in (7) must be equal to $\Delta x'$ in (7*a*), so that we obtain

$$a^2 = \frac{1}{1 - \frac{v^2}{c^2}} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7b).$$

me: But now that (7a) is not justified, we can't have (7b) justified.

He continues:

"The equations (6) and (7*b*) determine the constants *a* and *b*. By inserting the values of these constants in (5), we obtain the first and the fourth of the equations given in Section XI."

"Thus we have obtained the Lorentz transformation for events on the *x*-axis. It satisfies the condition

$$x'^2 - c^2t'^2 = x^2 - c^2t^2 \quad . \; . \; . \; . \; . \; . \; . \quad (8a).$$

me: Equation (8a) is saying equate (1) to (2) and square both sides. It is the 0=0 case, now we square zero, still leaving us 0=0. Einstein just carries on playing with 0=0.

Einstein continues:

“The extension of this result, to include events which take place outside the *x*-axis, is obtained by retaining equations (8) and supplementing them by the relations

$$\left.\begin{aligned} y' &= y \\ z' &= z \end{aligned}\right\} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (9).$$

me: Now that all the previous steps leaving up to (9) are unjustified, this equation (9) might not be true, it might be that y does not equal y’, and z’ does not equal z’.

Einstein continues:

“In this way we satisfy the postulate of the constancy of the velocity of light *in vacuo* for rays of light of arbitrary direction, both for the system *K* and for the system *K'*. This may be shown in the following manner.

“We suppose a light-signal sent out from the origin of *K* at the time *t* = 0. It will be propagated according to the equation

$$r = \sqrt{x^2 + y^2 + z^2} = ct,$$

or, if we square this equation, according to the equation

$$x^2 + y^2 + z^2 - c^2t^2 = 0 \quad . \; . \; . \; . \; . \; . \quad (10).$$

“It is required by the law of propagation of light, in conjunction with the postulate of relativity, that the transmission of the signal in question should take place—as judged from *K'*—in accordance with the corresponding formula

$r' = ct'$

or,

$$x'^2 + y'^2 + z'^2 - c^2t'^2 = 0 \quad . \; . \; . \; . \; . \quad (10a).$$

“In order that equation (10a) may be a consequence of equation (10), we must have

$$x'^2 + y'^2 + z'^2 - c^2t'^2 = 0 \quad . \; . \; . \; . \; . \quad (10a).$$

”In order that equation (10a) may be a consequence of equation (10), we must have

$$x'^2 + y'^2 + z'^2 - c^2t'^2 = \sigma(x^2 + y^2 + z^2 - c^2t^2) \quad (11).$$

me: We are back to 0=0 again.

Einstein:

"Since equation (8*a*) must hold for points on the x-axis, we thus have σ= 1; for (11) is a consequence of (8*a*) and (9), and hence also of (8) and (9). We have thus derived the Lorentz transformation."

me: Einstein thinks sigma must equal 1, but his equation is 0 = sigma *0, for that sigma could be practically any number. And he is under the delusion after all this manipulation of 0=0 that he has derived the Lorentz transforms; it just does not follow!

Einstein finishes off:

"The Lorentz transformation represented by (8) and (9) still requires to be generalised. Obviously it is immaterial whether the axes of *K′* be chosen so that they are spatially parallel to those of *K.* It is also not essential that the velocity of translation of *K′* with respect to *K* should be in the direction of the *x*-axis. A simple consideration shows that we are able to construct the Lorentz transformation in this general sense from two kinds of transformations, viz. from Lorentz transformations in the special sense and from purely spatial transformations, which corresponds to the replacement of the rectangular co-ordinate system by a new system with its axes pointing in other directions.

"Mathematically, we can characterise the generalised Lorentz transformation thus: It expresses *x', y', z', t',* in terms of linear homogeneous functions of *x, y, z, t,* of such a kind that the relation

$$x'^2 + y'^2 + z'^2 - c^2t'^2 = x^2 + y^2 + z^2 - c^2t^2 \ . \quad (11a)$$

is satisfied identically. That is to say: If we substitute their expressions in *x, y, z, t,* in place of *x', y', z', t',* on the left-hand side, then the left-hand side of (11*a*) agrees with the right-hand side. "

me: Einstein still finishes off with 0=0, after all the manipulations he does not go beyond that.

If we were to have proceeded from the other interpretation of equation (4) as (-x' + ct') = mu (-x + ct) for x, x', t, t' taking values from 0 to +infinity, which reduces to 0=0, we would still have Einstein playing around with 0=0. *

Conclusion

A lot of relativity texts is based upon the same lines of bodging it. It was not possible to review all the relativity texts in this article, but they take basically the same line of bodging the mathematics and hidden away in numerous different maths mistakes.

Einstein appears to have set the ‘fashion’ for messing up the maths in physics. Einstein’s theory is supposed to be proved, but when one looks at the maths that Einstein presents, the only possible way it seems to be to proceed with dealing with his theory is to carry on messing up the maths the way he does. Hence physics becomes just built upon an ever-growing mountain of maths mistakes.

It is as Pentcho Valev notes Einstein’s theory of relativity is contradictory [2], it is an inconsistent theory because in a strict logical sense, anything at all can validly be derived from it. At first one is impressed with its predictions that match experiments, but it predicts not just the answer observed, but the opposite as well. I trace this to the postulate of the constancy of light speed; it is not a clearly defined idea and different people have interpreted it differently as to what it means and in so doing calculate different sets of maths. The mess that Einstein makes of his maths just becomes an infection that corrupts all science, as other scientists are trained to follow in it. It is a shock that the supposed greatest scientist of the 20th Century could not do elementary maths, and has set the pattern for scientists to follow his example ever since.

References

[1] Albert Einstein (1879–1955). Relativity: The Special and General Theory. 1920, Appendix I, Simple derivation of the Lorentz Transformation, Supplementary to section XI . http://www.bartleby.com/173/a1.html

[2] http://www.wbabin.net/physics/valev.htm

* added 11Jan2009