the general science journal

Summary: Corrected Galilean Transformation equations are the same as corrected Lorentz transformation equations

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This article starts off based on summarising work carried out in previous articles, most notably criticism of Lorentz transformation as derived in "Introduction to Modern Physics", F K Richtmyer, E H Kennard, John N Cooper, [1] and dealt with in my article "The errors in the derivation of Lorentz Transform". [2]

It has been pointed out to me that Special Relativity is in the process of being revised. But the criticisms of Richtmyer-Kennard-Cooper is still valid, because that derivation is incorrect mathematically, and the new derivations are based up adding extra assumptions to try to force the Lorentz transform out as a derivation.

i.e. Relativity without its revision and based on its two assumptions (not lots of extra assumptions) cannot properly derive the Lorentz transformation, and the transformation then needs correcting.

SR is the two assumptions (Principle of Relativity and constancy of light speed), Richtmyer-Kennard-Cooper seek to start from these 2 assumptions and derive the Lorentz transformation. And that amounts to the basic setup for SR as dealt with in previous papers seems to amount to how to relate the two equations:

$$x^2 + y^2 + z^2 - c_1^2 t^2 = 0 \quad (1)$$

and

$$x'^2 + y'^2 + z'^2 - c_2^2 t'^2 = 0 \quad (2)$$

The issue is how to interpret this. I shall interpret as-

That is light travelling in a unprimed frame and a primed frame. (i.e. two light waves) An observer is observing a light wave travelling in unprimed frame described by (1). He is also observing a light wave travelling in primed frame described by (2).

There are other possible ways of interpretation, such as – there is only one light wave instead of two, observed by a unprimed observer and a primed observer. One of the many errors of various relativists is a failure to realise that the equations (1)-(2) can have several different physical meanings.

If we decide to set c1 = c2 =c, (ignoring other problems dealt with in previous papers) then (1) and (2) become:

$x^2 + y^2 + z^2 - c^2 t^2 = 0$ (3)

and

$x'^2 + y'^2 + z'^2 - c^2 t'^2 = 0$ (4)

One of the many errors of various relativists is to think that (3) and (4) should represent the same set of events in two different (inertial) frames of reference (unprimed and primed frames). But first -

If we relate these equations by $x' = x - Vt$, setting $y=y'=z=z'=0$, then (3) and (4) are:

$x^2 - c^2 t^2 = 0$ (5)

and

$x'^2 - c^2 t'^2 = 0$ (6)

Now picking up the issue that many relativists confuse themselves on- if for instance x were say one unit distance and x' were two units, then t and t' would not be equal. If we expand this more with numbers let x = 1 unit distance, x' = 2 unit distance, c = one unit of speed, t = one unit of time interval and t' = two unit of time interval, so that (5) and (6) are:

1-1 =0
2-2 =0

1 does not equal 2

x does not equal x'
t does not equal t'

(5) describes a distance x traversed in time interval t
(6) describes a distance x' traversed in time interval t'.

x need not equal x', and t need not equal t'.

This is hopefully clearer if we write: $x^2= c^2t^2$ and $x'^2=c^2t'^2$, some relativists have confused themselves that by writing them as the form (5) and (6) that they are the same event. But that is not the case – the unprimed observation of time interval t is not equal in general to the primed observation time interval t'. i.e. they are different time intervals. Confusing themselves on this issue, those relativists then think that the unprimed observation time interval occurs at the same time as the primed observation time interval, then having time measurement different for different observers.

However the correct interpretation I re-emphasise is that as unprimed observation has distance x traversed by light in time interval t, the primed observation has a different distance traversed in time interval t'.

Taking the positive solution of $x^2 =c^2t^2$ (it should be fairly obvious how to proceed for the reverse case of negative solution), so considering just:

x = ct (positive solution),

Now the issue of Galilean transformation has been dealt with in previous papers and it is easier to deal with the x'=x-Vt transformation in equations (3)-(6) when we have c1=c2=c. (Galilean time transformation is easier to deal with in equations (1)-(2).)

So substituting x = ct into x' = x-Vt = (c-V)t and then substitute into (6):

$(c-V)^2t^2 - c^2t'^2 = 0$ (7)

from this we have:

$t'^2 = (c – V)^2 t^2/c^2$

t' = (c-V)t/c (positive solution)

So the transformation equations are:

$x' = x - Vt = (c-V)t$ (8)

$t' = (c-V)t/c = (t - Vx/c^2)$ (9)

Compare this to the Lorentz transformations:

$x' = (x - Vt)/\sqrt{1-V^2/c^2}$ (10)
$t' = (t - (Vx/c^2))/\sqrt{1-V^2/c^2}$ (11)

They are the same thing except for being multiplied by relativistic factor.

And the relativistic factor is superfluous. Once (10) and (11) are substituted into (6) we have:

relativistic factor squared multiplied by $(x^2 - c^2t^2) = 0$

So there is no need of the relativistic factor!

The transformation equations are (8) –(9) not (10)-(11).

Equations (8)-(9) are effectively the updated Galilean transformation equations and are equal to the Lorentz transformation equations once the superfluous relativistic factor is discarded.

The Introduction of the superfluous relativistic factor by standard SR texts is as follows:

Richtmyer-Kennard-Cooper's derivation of the Lorentz transformations (as an example of standard SR text) is:

They get to equations (5) and (6)

$x^2 - c^2t^2 = 0$ (5)

and

$x'^2 - c^2t'^2 = 0$ (6)

Then proceed by saying:

“Therefore we seek compatible relations between x’, x, t’, and t. As the origins pass, x = x’, and we choose t = 0 = t’. Because of the homogeneity of space and of the uniformity of natural laws in time we assume the relationships are linear and try”:

x’ = alpha x + eta t (2.3a)
t’ = epsilon x + gamma t (2.3b)

“where alpha, eta, epsilon, and gamma are constants to be determined.”

“At the origin of S’, x’ =0 and x = Vt, so by (2.3a)”

0 = alpha Vt + eta t

This is where the subtle error occurs. If we ignore all the problems they create up to here and accept what they have been saying, they create now a subtle error, namely they say for x’= 0 that x= Vt.

They have:

“At the origin of S’, x’ =0 and x = Vt”

But they give us at the origin “x = x’, and we choose t = 0 = t’.”

So by x = Vt they mean at t=0, so they are saying 0=0. It’s back to nonsense about talking about 0=0.

They give us the general equation of x’ as:

x’ = alpha x + eta t (2.3a)

so x = Vt is not even the general equation.

If we equate x = Vt to (2.3a) we can do it several ways as-

x’ = alpha x + eta t = Vt (a)

Or we could accept what they say about x being zero then write:

eta t = Vt (b)

The difference between (a) and (b) is important!

From (a) we would deduce that alpha = 0, from (b) we would not deduce that.

So the authors are hiding a mess with saying x = Vt at the origin with their t=0, so that x = 0. They are introducing an error with their 0 =0.

The general equation they gave for x was:

x' = alpha x + eta t

When they choose the condition "x = x', and we choose t = 0 = t'." and decide x'=Vt they are messing that up. They are just mathematically incompetent. Now I refer you to:

x^2 - c^2t^2 = 0

from which we can get as positive solution x = ct. But the authors have totally messed it up with their 0=0 nonsense because from using 0=0 they suddenly want to switch from using c=ct to using x = Vt .

So, they are mixing equations up.

One minute it suits them to have x = ct, the next it suits them to have x = Vt. They use the mess with 0=0 to do whatever they like. Effectively 1=2 when it suits them and 1=1 when it suits them. Their maths is just a mess of contradictions.

So we have the introduction of the relativistic factor by their incompetence with handling 0 =0.

That would be ideally where I would finish my conclusion. But now I want to take up the issue of group properties.

As pointed out the derivation of the Lorentz transformation by mainstream relativity maths as presented by the likes of Richtmyer-Kennard-Cooper is incorrect. Now with the derivation of this incorrect Lorentz transformation the mainstream then discovers it has certain group properties.

So rather than derive the Lorentz transformation by two assumptions as the likes of Richtmyer-Kennard-Cooper attempt to do (and fail because it is not possible); the revised relativity seeks to define the derivation of the Lorentz transformation by the two usual assumption (Principle of Relativity and constancy of light speed) plus the group properties that it wants the Lorentz transformation to obey.

Old method:
2 assumptions leads to Lorentz (but I show fails) leads to group properties of Lorentz

New method:
2 assumptions + group properties leads to Lorentz transformations.

Now the new method is based itself on error, namely not proper understanding of:

$x^2 - c^2t^2 = 0$ (5)

And

$x'^2 - c^2t'^2 = 0$ (6)

Instead of recognising that 1-1=0 and 2-2=0 so that x and x' can be in general different (also t and t' can be different); it tries to impose artificially the situation that the same event is described by (5) and (6). So in the case of 1-1=0 and 2-2=0 it tries to find a transformation converting 1 to 2 and its inverse of converting 2 to 1.

So, whereas the old method made the error in deriving the Lorentz transform, the new method seeks to correct that derivation problem, but still stick with the interpretation problem which many relativists suffered from when they did the old method.

The group properties of the Lorentz group to be considered are: (i) identity transformation (ii) inverse transformation, (iii) Lorentz transformation of a Lorentz transformation still being a Lorentz transformation.

Reminder of the Lorentz transformation it is:

$x' = (x - Vt)/\sqrt{1-V^2/c^2}$ (10)
$t' = (t - (Vx/c^2))/\sqrt{1-V^2/c^2}$ (11)

The identity would normally in a group be 1, so naively we would think that the Lorentz group was using that identity where

1 times x’ = x’
1 times t’ =t’

so that 1(x’-ct’) = x’-ct’

But we will find that is not quite the case.

The inverse Lorentz transformation is:

x’_inverse = (x + Vt)/sqrt (1-V^2/c^2)
t’_inverse = (t + (Vx/c^2))/sqrt (1-V^2/c^2)

(We could have done things differently and had
x’ = (x – Vt)/sqrt (1-V^2/c^2) (10)
t’ = (t - (Vx/c^2))/sqrt (1-V^2/c^2) (11)
With its inverses being
x = (x’ +Vt’)/sqrt (1-V^2/c^2)
t = (t + (Vx’/c^2))/sqrt (1-V^2/c^2)
There is quite a bit of flexibility in how we can talk about these sort of things. I prefer not to do it that way, and go with the earlier.)

The Lorentz transformation times it inverse = 1, check:

x’ * x’_inverse =((x – Vt)/sqrt (1-V^2/c^2)) (x + Vt)/sqrt (1-V^2/c^2)

= (x^2 –V^2t^2)/((c^2-V^2)/c^2)

We have to use x=ct so

= (c^2 –V^2)t^2/((c^2-V^2)/c^2)

= c^2t^2

t’ t’_inverse =
(t - (Vx/c^2))/sqrt (1-V^2/c^2) (t + (Vx/c^2))/sqrt (1-V^2/c^2)

= (t^2- (V^2x^2/c^4))/(c^2-V^2)/c^2

using x = ct

$(t^2- (V^2c^2t^2/c^4))/(c^2-V^2)/c^2$

$= (t^2- (V^2t^2/c^2))/(c^2-V^2)/c^2$

$= (c^2t^2- V^2t^2)/(c^2-V^2)$

$= (c^2- V^2)t^2/(c^2-V^2)$

$=t^2$

so $(x'-ct')(x'+ct') = x'^2 - c^2t'^2 = c^2t^2 - c^2t^2$ as required

But all this is really equal to zero, and the relativists have confused themselves over the zero issue

The Lorentz group first tries to use 1 as identity, but really it is using 0; Lorentz group is treating 0 as the identity not 1.

so that $x'^2 - c^2t'^2 = c^2t^2 - c^2t^2 = 0$

(But tries to treat this as equal to 1 not 0)

It would have been better if something non-zero had been used as an identity and the equations been written as

$x=ct$
$x' =ct'$

With inverses as $x_{inverse} =1/ct$
$x'_{inverse} = 1/ct'$

With $x * x_{inverse}$ = identity 1
$x' * x'_{inverse}$ = identity 1

But it was not done that way and 0 was used instead, and that confused everything.

Of course using the transformations without the relativistic factor:

$x' = x-Vt = (c-V)t$ (8)

$t' = (c-V)t/c = (t - Vx/c^2)$ (9)

For $x^2-c^2t^2 =0$ does not initially look like forming a group.

The relativistic factor was used as bodge to get a group working using an identity of 0 instead of 1.

Of course using 0 as an identity element is a mathematical nonsense, because for the Lorentz group we have $x^2-c^2t^2 =0$, so it is multiplying entities like $x^2-c^2t^2$ by zero. Zero times zero is zero, so that is okay. But with groups we also have inverses, so it's asking for zero times its inverse to be zero (i.e. wants 0/0 as zero; but 0/0 is undefined), so cannot really form a group. i.e. the Lorentz group just built on mathematical nonsense of undefined maths. A pure mathematician would look at such things in horror – that such relativists have no comprehension of maths.

The correct group should be using an identity like 1, then it could consider transformations from say $x=ct$ to $x'=ct'$ when $x=x'$. Which would be a rather trivial group. It is only with the complications created by doing the maths wrong with the derivation of the Lorentz transformation that led to what can naively seem an interesting group of Lorentz transformations.

(On another level what is attempted is given L = Lorentz transform, and L_inverse its inverse then its trying to treat L*L_inverse as 1, but the Lorentz transform acts on the distance of $x^2 - y^2 = 0$ and $x'^2 - y'^2 = 0$ transforming one to the other. i.e. trying to treat one moment as identity 1 and next identity as 0.)

(The Lorentz transform does not properly work as a group because of this bodge. If we are using the corrected Lorentz transform (i.e. without gamma factor), and still within the bodge with this 1 and 0 then it too can work as a bad sort of group.)

Avoid the errors with zero, and the maths is much more straightforward.

Going back to equations (1)-(2)

$x^2 +y^2+z^2 - c_1^2t^2 = 0$ (1)

and

$x'^2 +y'^2+z'^2 - c_2^2t'^2 = 0$ (2)

It was the bodge made by Einstein with his assumption of light speed constancy that meant c1 and c2 were being treated as equal that led to the bodged maths.

i.e. the light speed constancy was being forced onto maths which could not handle that assumption, and thus creating all the mistakes.

It is my contention that the light speed constancy assumption did not really mean that c1=c2=c.

That was all a mistake.

The assumption of light speed constancy means that in primed and unprimed observations that a light speed c is observed, but suppose that light is being observing in a box then the observer will add the speed of the box to the observed c.

For instance suppose unprimed observation is for the box for light moving in it then (1) becomes c1=c

While if primed observation observes motion of box as V and motion of light as c, then c2 is the sum of these two velocities.

i.e. the whole of SR maths is built upon mistakes like believing c1=c2=c.

And with mistakes like that, extra mistakes are then added to complicate matters.

Remove all the complications and we are back to Galilean Relativity.

When mistakes like c1=c2=c are made then the Galilean transformation has to be amended (or corrected) to conform to that requirement; which is a type of bodge. And to get the group then a relativistic factor has to be added to that transformation; which is another bodge.

Mathematicians should look in horror as to what relativists do with maths, bodging it like this. But from a physicist perspective of not caring about the maths so long as it fits experiments, they don't mind bodging the maths whatever way they like. But the pure mathematician should protest -what the relativists have done with the maths is nonsense; fitting nonsense to experimental data does not have any mathematical meaning whatsoever.

The person who seemed to set this trend was Einstein- bodging maths trying to make it fit into what he imagined physics should be like, with the maths not really able to cope with those imaginings.

References

[1] Introduction to Modern Physics, F K Richtmyer, E H Kennard, John N Cooper, Tata McGraw- Hill Publishing company ltd., sixth edition, 1982, New Delhi, India p57- 59

[2] The errors in the derivation of Lorentz Transform, http://www.wbabin.net/science/anderton22.pdf

note: 0 can be used as an identity in a group using addition because a+0 =a, but cannot be used in a group using multiplication where elements are zero because have 0*0 = 0 but group needs inverse of 0 which is 1/0 and 0 times its inverse 1/0 = 0(1/0) =0/0 is undefined. Everything in Lorentz group built on nonsense.

25-02-2009