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Galilean Physics Restored

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There has been confusion made by relativists over coordinate systems and observers. I seek now to correct that problem and restore Galilean Physics.

1. Coordinate systems

Consider an inertial observer in unprimed frame, observes x = ct

distance x traversed by light with speed c in time t

This is on his coordinate system, has origin on x axis when t= 0 distance travelled along x axis is x = 0. While the general case distance travelled is x = ct.

Now he moves his coordinate system a distance L, the light now starts travelling from distance L along this new coordinate system, let us call it primed coordinate system

so that x' = x+L

at time = 0 the light is at x' = L, at general case x' = ct +L because x = ct

The transformations for this is:

x' = x + L
t'=t

i.e. the transformation between the unprimed coordinate system and the primed coordinate system.

We note that t = t' i.e. time measurements in both coordinate systems is the same. This show be no surprise because both coordinate systems are in the same inertial system.

i.e. primed and unprimed coordinate systems are at rest with respect to each other.

Now lets consider the case that the primed coordinate system is moving.

In SR the usual thing is to consider an observer in the moving coordinate system. But there is no need for this at this stage; we can consider the observer as having two coordinate systems as previously – namely the primed and unprimed coordinate systems but now the primed coordinate system is moving.

Let us say the primed coordinate system is moving at velocity v, further let us say L = vt.

So that x' = x+L is now x' = x + vt

for x = ct we have x' = (c+v)t

The speed is greater than c if v is non-zero, because it is c+v.

This is no problem, it is allowed; the coordinate system has no mass so can travel at any speed. SR limits things if they have mass. What we are moving is a coordinate system that has no mass.

So x' = x+vt = (c+v)t

At t = 0 on the x axis at x = 0 i.e. the light is at the origin of that coordinate system.

At t non-zero, the light travels a distance ct, but the coordinate system is moving so that now the light is distance (c+v) t from the origin of the x axis.

i.e. light has travelled ct, and just taking into account moving coordinate system as well the light is now (c+v)t from the origin of the coordinate system.

Our transformations are thus:

x' = x +vt = (c+v)t
t' = t

We note again that the time interval between the coordinate systems is the same ; this should be no surprise because the observer is not moving just using different coordinate systems.

Now let us put an observer in the moving coordinate system, what is supposed to change with this transformation?

Answer is --- nothing should change by the Principle of Relativity both observers should obey the same laws of physics; it is merely a change in sign of velocity v; if one observer observes v in positive direction then the other observes negative v.

For the observer in the primed frame, the velocity is –v, and the observer observes from a rest frame. The observer observes the unprimed coordinate system moving and the primed coordinate system as stationary from their rest frame. Let us call this observer * (star-symbol), so x'* = ct* and x* = (c-v)t*

x'* is the star- symbol * observer observation of x' coordinate system (of the un-star-symbol observer).

x* is the star-symbol * observer observation of the x coordinate system (of the un-star-symbol observer).

There is none of this nonsense maths derived by Einstein's SR; and the reason there is none of it is because of the correct application of the Principle of Relativity.

And by the Principle of Relativity we have Galilean Physics.

2. Galilean transformation works okay

$x = ct$ (1)
$x' = ct'$ (2)

rewriting (1) and (2) as:

$x-ct = 0$ (3)
$x'-ct' =0$ (4)

use Galilean transformation:

$x'=x-vt$

Substitute in (4)

$(x-vt) - ct = 0$

use $x = ct$ from (1) gives:

$ct - vt - ct =0$

$-vt = 0$

t in general non-zero therefore $v = 0$

Galilean transformation works okay.

The error that Einstein makes is to think (1) and (2) are different, but what we get by Galilean transformation is that $x = x'$.

i.e. the primed and unprimed coordinate systems are the same.

For them being different it would be as follows:

given

$x = ct$ (1)

now using Galilean transformation $x' = x - vt$

substitute in (1) gives:

x' + vt = ct

write this as:

x' – (c-v)t =0

So Galilean transformation on

x-ct =0

and

x' – (c-v)t' =0

is x' = x-vt

t' =t

And this works for v as non-zero.

While Einstein and his relativists look at:

x = ct (1)
x' = ct' (2)

and falsely claim that the Galilean transformation does not work for them.

Now onto the Lorentz transform:

3. Lorentz transform

For

x-ct = 0 (3)
x'-ct' =0 (4)

the Lorentz transform that is supposed to apply is:

x' = gamma (x – vt), t' = gamma (t – vx/c^2)

subst in (4)

gamma (x – vt) - c gamma (t – vx/c^2) = 0

gamma not really necessary, so divide through by gamma

$(x – vt)$ - $c t + vx/c = 0$

now $x = ct$ subst this gives:

$ct- vt – ct +vt$ is zero as required

So really have modified LT as

$x' = (x – vt)$, $t' = (t – vt/c)$

this acts on (3) and (4)

put $t' = (t – vt/c)$ into (4) :

$x' – (ct –vt) = 0$

$x' – (c-v)t = 0$ (equation (a))

this equation (a) we have seen before for Galilean transform.

GT = Galilean transform
LT = Lorentz transform

<u>GT is:</u>

$x-ct = 0$
$x' – (c-v) t' = 0$
acted on by GT $x' = x-vt$, $t = t'$

<u>GT alternative form is:</u>

can write as: $x-ct=0$
$x' – (c-v)t =0$
acted on by GT of $x'= x-vt$

<u>Modified LT</u>

$x-ct=0$
$x'-ct'=0$
acted on by modified LT $x'= x-vt$, $t' = (t- vt/c)$

<u>Connection between modified LT and GT:</u>

For modified LT, if subst $t' = (t-vt/c)$ into $x'-ct' = 0$ then obtain
$x'- (c-v)t = 0$

and we then have
$x-ct=0$

$x'-(c-v)t = 0$ acted by on modified LT of $x'=x-vt$

so both GT and modified LT are really the same thing.

The relativistic factor was superfluous, and the time dilation disappears as we are back to Galilean relativity.

4. Summary

In the case of Relativity we are considering an inertial observer; and an observer can observe different coordinate systems. Applying the Principle of Relativity to this and we have Galilean Physics.

*updated for addition of modified LT 2009-06-10