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New Method to Obtain the Lorentz Transformation Equations by Partial Derivative

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ABSTRACT
The transformation of length and time is important in SR. We can write the transformation by a partial derivative. We will begin with the introduction of co-ordinates k and k'. We assume the speed light c, is constant in all reference frames and derive the functional co-ordination with respect to time and by analysis, will prove the γ in SR

Introduction:

The Galilean system assumes the system Between k and K' is given by the relationship

$$y = y', t = t', z = z'$$

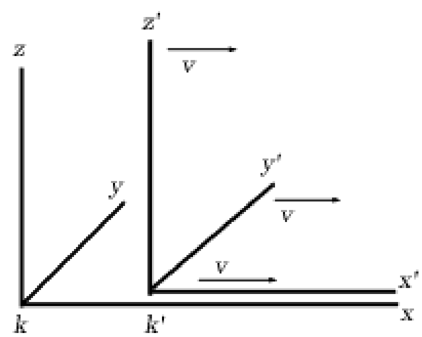

Fig. 2

In the x cordinate we can write,

$$x = x' + vt', x' = x - vt$$

This does not indicate a difference in length and time. We must find a constant to transform events in K and K'. The transformation can be effected by introducing γ

$$x = \gamma(x' + vt'), x' = \gamma(x - vt)$$

Now we will assume the function for co-ordination in x,x' is,

$$X = (x', t') \qquad\qquad X' = X'(x, t)$$

The two last functions can be derived by

$$\frac{dX}{dt} = \frac{\partial X}{\partial x'}\frac{dx'}{dt'}\frac{dt'}{dt} + \frac{\partial X}{\partial t'}\frac{dt'}{dt}$$

And we can find the transformation,

$$\frac{dX}{dt} = \left(\frac{\partial X}{\partial x'}\frac{dx'}{dt'} + \frac{\partial X}{\partial t'}\right)\frac{dt'}{dt}$$

This give -1-

$$c = (\gamma c + \gamma v)\frac{dt'}{dt}$$

The same transformation in X' is given by

$$\frac{dX'}{dt'} = \frac{\partial X'}{\partial x}\frac{dx'}{dt}\frac{dt}{dt'} + \frac{\partial X'}{\partial t}\frac{dt}{dt'}$$

And so

$$\frac{dX'}{dt'} = \left(\frac{\partial X'}{\partial x}\frac{dx'}{dt} + \frac{\partial X'}{\partial t}\right)\frac{dt}{dt'}$$

This give -2-

$$c = (\gamma c - \gamma v)\frac{dt}{dt'}$$

From 1 and 2 we can find

$$c^2 = (\gamma c + \gamma v)(\gamma c - \gamma v)$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

<u>REFERENCES</u>

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