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Rotational Effects in Moving Systems

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Abstract: When the Galilean transformation failed to extend the relativity principle from mechanics to electrodynamics, Einstein used Lorentz transformation equations to extend and establish the relativity principle. But it failed to extend it to all states of motion as a general co-ordinate transformation, i.e gravitational acceleration. All physicists, even Einstein could not find the real reason why Galilean and Lorentz transformations failed to fulfill all physical processes. If they are correctly constructed on correct physical concepts, why do they failed? In this paper we discuss a new physical effect - the directional change, a twist or rotation in the transformation process, described from page1 to 4. From the physical effect, we arrive at a new transformation, which is described from page 4 to 10 which is suitable for all states of motion and all of physics. Pages 11 to 20 describe the physical significances of the new transformation.

Key words: Relativity principle, Galilean transformation, Lorentz transformation:

1. Introduction:

In this paper we discuss a directional change in moving systems, which has been unnoticed from Galilean times to this date. I submit it for consideration by the research community.

2. Restricted relativity principle:

We start our discussion from Einstein's argument. This helps us understand the restricted relativity principle

"In order to attain the greatest possible clearness, let us return to our, example of the railway carriage supposed to be traveling uniformly. We call its motion a <u>uniform translation</u> ("uniform" because it is of <u>constant velocity and direction</u>, "translation" because although the carriage changes its position relative to the embankment yet it does not rotate in so doing) Let us imagine a raven flying through the air in such a manner that its motion, as observed from the embankment, is uniform and in a straight line. If we were to observe the flying raven from the moving railway carriage, we should find that the motion of the raven would <u>be one of different velocity</u> and <u>direction</u>, but that it would <u>still be uniform and in a straight line</u>. Expressed in an abstract manner. We may say, If a mass m is moving uniformly in a straight line with respect to a co-ordinate system K, then it will also be moving uniformly and in a straight line relative to a second co-ordinate system K', provided that the later is executing a uniform translator motion with respect to k. In accordance with the discussion contained in the preceding section, it follows that.

If K is a Galilean co-ordinate system, then every other co-ordinate system K' is a Galilean one, when in relation to K, it is in a condition of uniform motion of translation. Relative to K' the mechanical laws of Galilean – Newton hold good exactly as they do with respect to K.

We advance a step further in our generalization when we express the tenet thus, If relatively to K, K' is a uniformly moving co-ordinate [1]system devoid of rotation, then natural phenomena run their course with respect to K'

[1] EINSTEIN : "Relativity: the special and General Theory." Translated by R.W.Lawson, 1921. Page 14.

exactly according to the same general laws as with respect K. This statement is called the principle of relativity in the restricted sense."[1]

3. Physical effects in Galilean systems:

From the above-described restricted relativity principle, anyone can derive following results. When we transfer the physical measurement processes of the raven's motion from one state of motion (embankment) to another state of motion (railway carriage), there occurs two physical effects in the Galilean co-ordinate systems.

1There is a directional change in the raven's motion.
2 In both system the raven's motion is uniform and in a straight line.

The above-described two physical effects are indicated in the sentence "If we were to observe the flying raven from the moving railway carriage, we should find that the motion of the raven would be one of different velocity and direction but that it would still be uniform and in a straight line". To arrive at general physical laws which hold good in the Galilean co-ordinate systems, Galileo, Newton and Einstein used the second physical effect only in their transformation. Unfortunately they left untouched the first physical effect in their consideration. The Galilean and Lorentz transformations are derived without directional change, so they cannot express all physical effects in the Galilean systems.

4 Rotational effects in Galilean co-ordinate systems

To find out the directional effect in the Galilean system, we again come to the raven example.. Construct two co-ordinate systems k and K'. One is on the embankment and the other is on the railway carriage. For our clear understanding, if the raven's flying direction is orthogonal (i.e., Y' direction in the railway carriage,) co-ordinate system K' it is viewed and physically measured in the xy direction (i.e., non orthogonal direction) by an embankment co-ordinate.

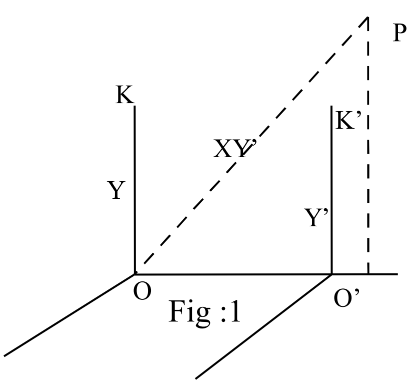


Fig :1

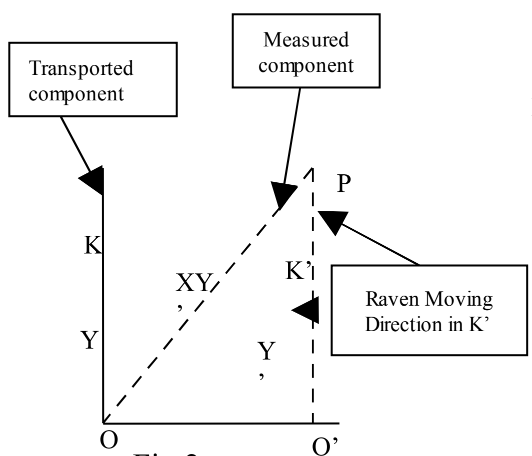


Fig:2

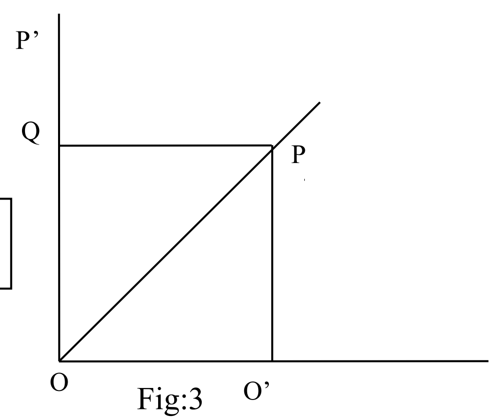


Fig:3

To calculate the directional change, transfer the raven flying 'Y' component from K' to K without component change. This process is called the parallel displacement principle.

The transported component and measured component are in a different direction (Fig2).

There arises a directional change (a twist) or short rotation in the transverse component, when passing from one state of motion to another. **This physical effect takes place during the transformation processes**, which create two different co-ordinate natures, the transported component is in a Cartesian co-ordinate system. (i.e. inertial system.). The measured component is affected by a short rotation, so it is in a circular (rotated) co-ordinate frame. (i.e. non inertial systems). There is a geometrical distinction between the two components

To compare the two co-ordinate systems, select a point P (Fig3) on the measured component. Draw a circle with radius OP, which cuts the transported component at P'. The magnitude value of the two components is equal - OP=OP', but its direction is unequal. The non intergrability of direction indicates that the two components are placed in different co-ordinate systems.

To express the measured component by Cartesian coordinates, draw two orthogonal straight lines from point P. Now the measured component OP is decomposed by two components: One O'P is parallel to OQ', and the other component PQ, is parallel to OO'. When transferring the above two components by the parallel displacement principle, O'P coincides with OQ, PQ coincide with OO'. There is no directional change. The component OO' is created in a radial direction by the Galilean uniform velocity; it appears in the embankment co-ordinate system K and disappears in the moving railway carriage system K'. Now the transported component and the measured component OP', OQ are in the same direction i.e., same Cartesian co-ordinate system. The other component OO' disappears due to uniform velocity. The magnitude value of the two components OP'OQ are unequal - OP'≠ OQ. The non integrability of magnitudes indicate that the two components are placed in the same direction. To find out the difference, we use the Pythagorean principle.

We have

$$(OO')^2 = (OP')^2 - (OQ)^2 \text{ ---------------1} \qquad (OP=OP')$$

$$OQ = OP'\sqrt{1 - \frac{(OO')^2}{(OP')^2}} \text{ ----------------(2)}$$

The component OO' is first-order in the newly arising translated component in the radial direction by theGalilean constant non-rotated velocity. It produces first and second-order effects in the radial and transverse direction. In the first-order effect, the component OO' appears and disappears it's first order form. In the second-order effect, the component OO' appears and disappears with it's second order form. It creates an invariant magnitude OP=OP, in different directions (different co-ordinate systems) and variant magnitude OP'≠ OQ in the same direction (same co-ordinate system) if OO'=zero. There is no relative velocity between k and K' and no directional change, no rotation, no co-ordinate change. If 00' > zero: There is relative velocity between k and K', which produces the directional change in the transverse direction It creates a different geometry by rotation. If we measured the directional change in the same geometry (i.e same direction), it affects the transverse component by a second-order factor.

From the above expression we have following results.

1)The component change in the radial direction produced directional change (or) rotation in the transverse direction, which yield different geometrical nature. The difference of two geometry produced second order effect.

2) The component change in the radial direction produces its first and second order effect in the radial and the transverse direction.

The Galilean and Lorentz transformation equations are derived without directional effect. If we impose the directional change in the Lorentz transformation equation, we have its new form.

5. New transformation equation:

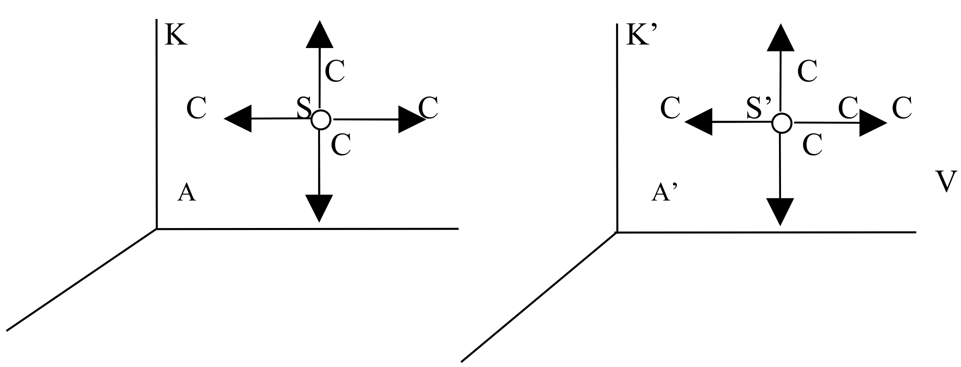
$$x^1 = x - vt, \quad y^1 = y\sqrt{1 - \frac{v^2}{c^2}} \quad z^1 = z\sqrt{1 - \frac{v^2}{c^2}} \quad , \quad t^1 = t - \frac{vx}{c^2} \quad \text{---------------3}$$

In the transformation equation (x,y,z,t) and (x',y',z',t') are space-time co-ordinates of a physical event in two different states of motion. The event's velocity 'C' connects $\left(c = \sqrt{x^2 + y^2 + z^2}/t\right)$ the space–time co-ordinate of a physical event. In the transformation equation, the event velocity "c" has an important role, its properties defined by the following basic physical concept.

6. Basic Physical concept:

All physical events velocity c (mechanical electrodynamics and optics) is not altered by its frame velocity V; we can express it by following a simple consideration. Chose two frames K and K'. One moves with constant uniform velocity v with respect to the other, the forward and its reverse processes have the same physical nature. Set two observers A in K and A' in K'. Observer A throws a stone with the same force in all directions which will travel with constant mechanical event velocity C in all directions. In a similar way, if we use a light signal, it also travels in a constant electrodynamical event velocity C in all directions. In both cases the events spread in all directions with constant mechanical and electrodynamical event velocity. Observer A is at the center

$$x^2 + y^2 + z^2 - c^2t^2 = 0 \text{ -----------4}$$



(Fig4)

K and K" are two frames. One is moving with respect to other with velocity V in the x direction.
A and A" are two local observers in K and K" frames.
S and S are two identical mechanical or electrodynamical events which are occurring in the K and K" frames.
The event velocity C= <u>Event's space coordinate</u>

Event's time coordinate

Is constant in all directions which are measured by the local observer.

The same mechanical and electrodynamical experiments are conducted in K', which moves with constant uniform velocity v with respect to K. According to K' observer A' the both events spread in constant mechanical and electrodynamical event velocity in all directions. The frame velocity v does not produced any change in both event velocities. (To easily understand, if we conduct the same mechanical and electrodynamical events on earth, the earth velocity 30km/sc cannot affect the above event's velocity.) With respect to A' the two events spread in spherical form and the observer A' is at the center.

$$x'^2 + y'^2 + z'^2 - c'^2t'^2 = 0 \text{-------------------} 5$$

In both cases in all physical events, the velocity c has a constant nature. They spread in all directions with constant velocity. Its frame velocity v does not affect it. This is common for all physical events. We use this principle in the above transformation equation.

Our present physics described the above common physical nature in two different ways - by Galilean and Lorenz transformation equations. According to the Galilean transformation, the mechanical event velocity "C" has additive possibilities (c + v) in other words, the frame velocity v affects the mechanical event velocity. To arrive at these results, Galileo and Newton used the (absolute) invariant nature of space-time co-ordinates. In the Lorentz transformation for a electrodynamical event, the electrodynamical event velocity "C" has no such additive possibility (c + v). The frame velocity v cannot affect the event velocity; to arrive at this result, Lorentz and Einstein used the principle of variant (relative) nature of space-time co-ordinates.

The mechanical and electro dynamical events are basically physical events. Why do we use different principled (additive non additive) to describe it? Why do the electrodynamical event velocities only affect its space-time co-ordinate? Why do we not use the (relative) variant nature of space-time to describe the mechanical event velocity to preserve the invariant nature? Why do we not use the common principle for mechanics and electrodynamics? These questions indicate, that the two transformation equations have some flaw and also they cannot help us unify electrodynamics, gravitation and Quantum mechanics. To remove the above conflicts, we use a common principle. Event velocity C spreads in all directions with a constant nature. The same constant nature of the event velocity is used to measure and transfer the events space–time–co-ordinates from one sate of motion to another. So the space-time co-ordinate of a physical event is affected by event velocity 'c' when transferred from one state of motion to another. The above principle is common for mechanical and electrodynamical events. This physical process is the basic principle of the new transformation equations.

7. Basic Mathematical Concept:

7.1. Translation :

Choose two frames k and k' with relative velocity V=O, meaning that all mass points inside the two frames have zero relative velocity between one-another. The same type of physical event is in k and in k'. According to the above principle, the two events spread the with same constant event velocity in all direction in both frames, we use the same constant event velocity to transfer i.e., measure both events space–time co-ordinates. In this process, the origin of the both event is not shifted by the zero relative velocity. The physical measurement gives the following relation,

$$x - x' = 0 \qquad x = x'$$
$$y - y' = 0 \qquad y' = y$$

$$z - z' = 0 \qquad z' = z$$
$$t - t' = 0 \qquad t' = t \quad \text{---------------}6$$

if the two frames k and k; have constant relative Velocity, v>o between one another. Now the origin of the two events shift a small distance vt during the measurement processes. This small distance vt produces the first-order translational effect in the moving direction. So we have

$$x - x' = vt, \qquad x' = x - vt \quad \text{----------------------}7$$

in the reverie processes $$x = x' + vt' \quad \text{-----------------------}8$$

From the above two equation we have time relation by dividing the constant event velocity c' in both side.

We have

$$t' = t - \frac{vx}{c^2}, \qquad t = t' + \frac{vx'}{c^2} \quad \text{----------------------}9$$

7.2. Rotation:

Our present physics has a common notion that the first-order translational effect does not produced any change in the perpendicular direction. This principle is used in Galilean and Lorentz transformations and is only true for infinite velocity measurement and measurement in the same geometrical structure. But these types of conceptual measurements are only conventional, and not physical. If we use the constant event velocity to measure the perpendicular direction in different states of motion, there is a directional change (a twist). If a physical event spreads in the y component (Perpendicular direction), in the moving frames it is physically measured in the xy component (xy direction) of the rest frame.

The additional translational component 'vt' produces directional change in the transverse direction. It appears in one frame (rest) and disappears in another frame (moving) with a second-order form.

$$y'^2 - y^2 = v^2 t^2$$

If the translational component vt=o there is no directional change, no rotation, no curl.

$$y'^2 = y^2 = 0$$
$$y' = y$$

When vt>0 there is a directional change. The second order relation is

$$y^2 - y'^2 = v^2 t^2$$
$$y' = y\sqrt{1 - \frac{v^2}{c^2}}$$

y = ct constant event velocity used to measure the y component.
The reverse process gives

$$y = y'\sqrt{1 - \frac{v^2}{c^2}} \quad \text{------------------------10}$$

Similar change takes place in the z direction also

$$z' = z\sqrt{1 - \frac{v^2}{c^2}} \quad \text{-------------------------11}$$

Finally we arrive the new transformation equations.

x' = x - vt		x = x'+vt'
$y' = y\sqrt{1 - \frac{v^2}{c^2}}$		$y = y'\sqrt{1 - \frac{v^2}{c^2}}$
$z' = z\sqrt{1 - \frac{v^2}{c^2}}$	For reverse processes	$z = z'\sqrt{1 - \frac{v^2}{c^2}}$
$t' = t - \frac{vx}{c^2}$		$t = t' + \frac{vx'}{c^2}$

8. Some Restricted Conditions:

8.1. Galilean Newton's Transformation c $\to \infty$:

According to Galileo and Newton's concept, the event velocity 'c can reach infinity range. So they used that infinite velocity to measure the space co-ordinate. This condition cannot help us express all physical effects. If we impose this condition in the new transformation equations they become Galilean transformation equations.

x' = x - vt		x' = x – v
$y' = y\sqrt{1 - \frac{v^2}{c^2}}$		y ' = y
$z' = z\sqrt{1 - \frac{v^2}{c^2}}$	**Put c =∞ we have**	z' = z
$t' = t - \frac{vx}{c^2}$		t' = t

From the above condition we have all Newtonian's results in classical mechanics.

8.2. Lorentz, Einstein's transformation y'=y, z'=z (Invariant condition)

The new transformation equation is covariant in nature in a different geometry. But the Lorentz transformation equations are derived by the invariant nature in a different geometry. To arrive at that invariant condition, equate the perpendicular direction i.e. y'=y, z'=z. This condition also fails to express all physical effects. If we impose this condition in the new transformation equation, it becomes the Lorentz Einstein transformation.

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

$$(x - vt)^2 + y^2\left(1 - \frac{v^2}{c^2}\right) + z^2\left(1 - \frac{v^2}{c^2}\right) - c^2\left(t - \frac{vx}{c^2}\right)^2 = 0$$

$$y'^2 + z'^2 = c^2t'^2 - x'^2$$

$$y'^2 + z'^2 = -\frac{(x - vt)^2}{1 - \frac{v^2}{c^2}} + \frac{c^2\left(t - \frac{vx}{c^2}\right)}{1 - \frac{v^2}{c^2}}$$

Equating each component to arrive at an invariant condition, we have

$$t' = \frac{\left(t - \frac{vx}{c^2}\right)}{\sqrt{1 - \frac{v^2}{c^2}}}, \qquad x' = \frac{(x - vt)}{\sqrt{1 - \frac{v^2}{c^2}}}$$

after imposing the restricted condition y'=y, z'=z, the new transformation becomes the Lorentz and Einstein transformation.

$$x' = \frac{(x - vt)}{\sqrt{1 - \frac{v^2}{c^2}}}, \quad y' = y, \quad z' = z, \quad t' = \frac{\left(t - \frac{vx}{c^2}\right)}{\sqrt{1 - \frac{v^2}{c^2}}}$$

From this condition, we have all the Einstein's relativistic effects for mechanical and electrodynamical events. In the new transformation equation, 'C' denotes the event's velocity. It may be electrodynamic or mechanical, but in the Lorentz transformation equation, 'C' denotes light velocity, so it gives the relativistic effect for high speed electrodynamic events only, but the new transformation equations express the relativistic effect for all physical events when the restricted condition y'=y, z'=z is imposed.

***The a*bove result indicates there is a second order transverse Doppler effect for sound waves. We can arrive at this, if we use the Ives experiment method for a sound source.**

PART II

II (1) Physical significances of the new transformation:

.The Galilean non-rotated constant uniform velocity produces a first-order translation component 'vt' in the direction of motion. It is described in the 1st and 4th equation of the new transformation.

$$x' = x \quad vt \qquad x \rightarrow x' \quad vt - \frac{v}{c}x$$

$$t' = t \quad \frac{xv}{c^2} \qquad ct \rightarrow ct' \quad vt - \frac{v}{c}x$$

The component 'vt' is space-time in nature, which appears and disappears in the physical measurement process, when passing from one constant uniform motion to another. So it is dynamic in nature. The change of the space-time component within first-order form, indicates a velocity change that yields a force loss or gain from the inner system to the outer system or outer system to inner system. This type of force is mechanical in nature, which depends on matter.

The above described first-order component 'vt' creates a direction change, which produces a short rotation in the transverse direction when passing from one state of motion to another. It is described mathematically in quadratic Pythagorean form. The factor $\sqrt{1 - \frac{v^2}{c^2}}$ is derived from it. This second-order factor indicates a direction change, which is described in two ways,

(1) A change in co ordinate system
(2) A change in the magnitude value of the space-time component. This phenomenon is indicated in the 2nd and 3rd equation of the new transformation

$$y' = y\sqrt{1 \quad \frac{v^2}{c^2}}$$

$$z' = z\sqrt{1 \quad \frac{v^2}{c^2}}$$

The second-order form has an important role in describing the directional change

So the second order form of a physical event is necessary for our discussion. It is expressed by following mathematical relation

$$ds^2 = g_{ij}dx_i dx_j \text{--------------------------(12)}$$

$$= g_{11}dx^2 \quad g_{12}dx_1 dx_2 \ldots\ldots g_{44}dx^2$$

In the above expression, $dx_i dx_j$ is the space-time interval of a physical event and is in second order form. The metric g_{ij} tells us the information of the physical and geometrical nature is also in second order form. Further details of g_{ij} we can see from the following arguments.

JHON BAZE:

2.[1] " the metric is the star of general relativity. It describes everything about the geometry of space time, since it lets us measure angle and distance. Einstein equation describes how the flow of energy and momentum through space-time affects the metric. What it affects is some thing about the metric called the curvature. The biggest job in learning general relativity is learning to understand curvature.

Mathematically, the metric of rank (02) is a tensor. It eats two tangent vector v,w and spits out a number g(v,w) which we think of as the dot product or inner product of the vectors v and w. This lets us compute the length of any tangent vectors or the angle between two tangent vectors. Since we are talking about space-time, the metric need not satisfy g(v,w)>0 for all non-zero vectors vis space-like if g(v,w)>0 time like ifg(v,w)<0and light like is g(v,w)=0the inner product g(v,w)of two tangent vectors is given by g(v,w)= $g_{ab}v^a w^b$ foursome matrix of numbers g_{ab} .where we sum over the repeated indices a,b (this being the so called Einstein summation convention) another way to think of it is that our co-ordinates gives us a basis of tangent vectors at p and g_{ab} amd is the inner product of the basis vector pointing in the x^a direction and the basis vector pointing in the x^b direction"

A.S.EDDINGTON:

3."The double aspect of these coefficients g_{11} ,should be noted (1)They express the metrical properties of the co-ordinates. This is the official standpoint of the principle of relativity, which scarcely recognizes the term force (2) They express the potentials of field of force. This is the unofficial interpretation, which we use when we want to translate our results in terms of more familiar conceptions "

For a simple consideration use a Cartesian coordinate system

$$g_{ij} = 1(i \quad j = 1,2,3)$$

$$g_{ij} = -1(i \quad j = 4) \quad =$$

$$g_{ij} = o(i \quad j \neq 1,2,3,4)$$

$$ds^2 = dx^2 \quad dy^2 + \quad dz^2 \quad c^2 dt^2 \text{---------------}(13)$$

For ds=0 $ct = \sqrt{dx^2 \quad dy^2 + \quad dz^2} \quad l\cdot$

1

1

‘Ct’ is the physical event’s time co-ordinate, product of physical event’s velocity with event’s time interval. Every physical event has this phenomenon. It has magnitude value only, no specific direction, with dynamical nature.

$\sqrt{dx^2 + dy^2 + dz^2} = l$ is the space co-ordinate of the physical event. It has magnitude and direction with a static (rigid) nature. The time co-ordinate ‘ct’ plays exactly the same role as the space co-ordinate, we can convert from rigid interval to dynamic interval (i.e) we can measure the rigid space coordinate by dynamic time coordinate for any range of world regions, (very small and large distances.) When the quantity $ds^2 = g_{ij}dx_i dx_j$ is transferred from one state of motion to another, there occurs a direction change, or a short rotation. To arrive at this effect; impose the new transformation results in equation (13), and replace g_{ij} for g'_{ij} whose nature is determined by following consideration

We have $$ds'^2 = g'_{ij}dx'_i dx'_j = \left(1 - \frac{v^2}{c^2}\right) g_{ij}dx_i dx_j \text{ -----------(14)}$$

When ds=0

We have $$g'_{ij}dx'_i dx'_j = \left(1 - \frac{v^2}{c^2}\right) g_{ij}dx_i dx_j \text{ ....(14a}$$

The mathematical form is same in both state of motion; the newly appearing factor $(1 - \frac{v^2}{c^2})$ is due to the cause of direction change or short rotation. In present physics this effect is expressed in the following three ways

(a) A change in space- time component
(b) A change in geometry
(c) A change in unit of measure

(a) A change in space-time component

When we compare the space-time component of a physical event with the same measure determination $g'_{ij} = g_{ij}$ (i.e the same co-ordinate basis) in different states of motion, the second order rotational factor $(1 - \frac{v^2}{c^2})$ affects the magnitude value of the space-time component.

$$g'_{ij}dx'_i dx'_j = \left(1 - \frac{v^2}{c^2}\right) g_{ij}dx_i dx_j \text{ ....(14a)}$$

If $g'_{ij} = g_{ij}$

$$dx'_i dx'_j = \left(1 - \frac{v^2}{c^2}\right) dx_i dx_j \text{ ----------------(15)}$$

$$\sqrt{dx'_i dx'_j} - \sqrt{dx_i d_j x_j} = -\frac{1}{2}\frac{v^2}{c^2}\sqrt{dx_i dx_j}$$

This relation indicates some part of the space-time component appears and disappears in the physical measurement processes, when transferred from one constant uniform motion to another It is dynamic in nature. The change of component with a second order form ($\frac{1}{2}\frac{v^2}{c^2}\sqrt{dx_i dx_j}$) indicates a direction change or short rotation which yields a force. This type of force is a geometrical field in nature and independent of matter .

Fromequation (15) we have

$$dx'^2 + dy'^2 \quad dz'^2 \quad cdt'^2 - (dx^2 \quad dy^2 = dz^2 \quad cdt^2)(1 \quad \frac{v^2}{c^2})$$

To compare the space and time co ordinate separately, impose a condition

$$dx'^2 + dy'^2 \quad dz'^2 \quad dx^2 \quad dy^2 \quad dz \quad 0$$

We have

$$c^2 dt'^2 = c^2 dt^2 \left(1 \quad \frac{v^2}{c^2} \right)$$

$$cdt' = cdt\sqrt{1 \quad \frac{v^2}{c^2}} \text{--------------(16)}$$

This factor $\sqrt{1 - \frac{v^2}{c^2}}$ produced by a short rotation, affects the magnitude value of time

$$\frac{dt - dt'}{dt} = \frac{1}{2}\frac{v^2}{c^2} \quad .....+..... \qquad \text{-----------(17)}$$

Imposing another condition, $c^2 dt'^2 = c^2 dt^2 \quad 0$

We have

$$dl' = dl\sqrt{1 \quad \frac{v^2}{c^2} e^2} \text{----------------(18)}$$

This factor $\sqrt{1 - \frac{v^2}{c^2}}$ produced by short rotation, affects the direction of the space coordinate or it's magnitude, because the space coordinate has magnitude and direction.

$$\frac{dl - dl'}{dl} = \frac{1}{2}\frac{v^2}{c^2} \quad \frac{3}{8}\frac{v^4}{c^4} + \text{----------------(19)}$$

The direction change or short rotation in the Galilean co ordinate system, affects the magnitude and direction of the space-time component with the same ratio. Above arrived results are experimentally verified in special relativity results rod shrunk, clock slowed and mass varies with velocity

From the mathematical relation of the above three results

We have

$$l' = l\sqrt{1-\frac{v^2}{c^2}} \qquad l - l' = \delta l = \frac{1}{2}\frac{v^2}{c^2}l$$

$$m' = \frac{m}{\sqrt{1-\frac{v^2}{c^2}}} \qquad m' - m = \delta m = \frac{1}{2}\frac{v^2}{c^2}m \qquad \text{……………(20)}$$

$$t' = \frac{t}{\sqrt{1-\frac{v^2}{c^2}}} \qquad t' - t = \delta t = \frac{1}{2}\frac{v^2}{c^2}t$$

when we transfer a space interval, time interval and mass quantity from one state of motion to another state of motion, it’s value is changed with its dynamical nature.

$$l' = l\sqrt{1-\frac{v^2}{c^2}} \qquad \frac{l - l'}{l} = \frac{\delta l}{l} = \frac{1}{2}\frac{v^2}{c^2}$$

$$m' = \frac{m}{\sqrt{1-\frac{v^2}{c^2}}} \qquad \frac{m' - m}{m} = \frac{\delta m}{m} = \frac{1}{2}\frac{v^2}{c^2} \qquad \text{…………(21)}$$

$$t' = \frac{t}{\sqrt{1-\frac{v^2}{c^2}}} \qquad \frac{t' - t}{t} = \frac{\delta t}{t} = \frac{1}{2}\frac{v^2}{c^2}$$

From(21)we have

$$\frac{\delta l}{l} = \frac{\delta t}{t} = \frac{\delta m}{m} = \frac{1}{2}\frac{v^2}{c^2} \qquad \text{……………(22)}$$

In the equation, the factor $\frac{1}{2}\frac{v^2}{c^2}$ is arrived at from the direction change or short rotation, so the above-described special relativistic effects are produced by directional change or short rotation in the Galilean co ordinate system, not from the properties of moving clocks and moving rods. From this we come to the following conclusions. When we transfer a space-time interval of a physical event from one state of motion to another state of motion it’s direction is changed. If we measure the above quantities in a different direction or different co-ordinate system they are invariant in nature. If we measure the above quantities in same direction or same geometry, they are variant nature, because some part of the space-time quantity disappears due to coordination change. So the three effects - rod shrinkage, clock slowing and mass varying with velocity are truly dependant on our measuring method. Here I point out Dr HARRY SCHMIDT'S command in his book ‘Relativity and the Universe’

4".For according to Lorentz the shortening is a fundamental property of matter while in Einstein's theory it merely appears as a result of our methods of measuring distance"

Conclusion:
(a) A short rotation or direction change produces a change in the space-time interval with a second-order form. (Con) A change in space–time interval with second order form produces a direction change or short rotation.
(b)Vanishing of a space-time interval change,with a second-order form gives a vanishing of the direction change or short rotation.

(b). A change in geometry

When compare the space-time component of a physical event with invariant magnitude $dx_i' dx_j' = dx_i dx$ in different state of motion the second order rotational factor $(1 - \frac{v^2}{c^2})$ affect the metric, the change of metric create new geometry. Riemannian used this method in his geometry

$$g'_{ij} dx_i' dx_j' = \left(1 \quad \frac{v^2}{c^2}\right) g_{ij} dx_i dx_j \quad \text{……….(14a)}$$

If $dx_i' dx_j' = dx_i dx$ (invariant magnitude with different direction)

$$g'_{ij} = g_{ij} \left(1 \quad \frac{v^2}{c^2}\right)$$

$$\delta g_{ij} = (g_{ij} \quad g'_{\bar{ij}}) \quad \frac{v^2}{c^2} g_{ij} \quad \text{……..(23)}$$

in the equation (23) δg_{ij} described the difference of two metric ,it also expressed difference of co-ordinates. The difference of co-ordinates is interpreted by Eddington as follow.

5."The hypotheses, which was put forward by Einstein is called the principle of Equivalence. It assert that a gravitational field of force is exactly equivalent to a field of force introduced by a transformation of reference so that by no possible experiment can we distinguish between them"

This argument indicates the change of coordinate produce geometrical force. Riemann' expresses the difference of metric as geometrical binding force they represent the inner ground of the metric condition
In Riemann's own words

6."The question of the validity of the hypotheses of geometry in the infinitely small is bound up with the question of the ground of the metrical relation of space. In this question which we may still regard as belonging to the doctrine of space is found the application of the remark made above that in a discrete manifold the principle or character of its metric relation is already given in the notion of the manifold where as in a continues manifold this ground has

> to be found elsewhere i.e has to come form out side Either, therefore the reality which underlies space must form a discrete manifold or we must seek the ground of its metric relation (measure-condition) outside it in binding force which act upon it"

From these two arguments by Riemann and Eddington, the geometrical difference creates physical force. The physical force creates geometry and they are related one to other. Both originate at the same physical ground

Conclusion: (a) A direction change or short rotation produces geometrical change. (Con) A geometrical change produces a short rotation or direction change. (b) Vanishing of direction change or short rotation gives the vanishing of geometrical change.

(c). A change in unit of measure:

In infinitely large world regions, the direction change or short rotation is expressed by the geometrical deviation $\delta g_{ij} = (g'_{ij} \;\; g_{ij}) \;\; \frac{v^2}{c^2} g_{ij}$ with an invariant magnitude of the space-time component. The difference in geometry is expressed by the geometrical binding force. This method is used to describe the gravitational field in the macrocosm. In the microcosm, the directional change or short rotation cannot be expressed sufficiently by geometrical deviation. The difference in geometry disappears in infinitesimal geometry. At the same time, the second-order rotational factor $(1 - \frac{v^2}{c^2})$ affects the unit of measure. It produces a change in the space-time component. Wely used this method in his gauge-invariant principle of world geometry

$$g'_{ij} dx'_i dx'_j = \left(1 \;\; \frac{v^2}{c^2}\right) g_{ij} dx_i dx_j \text{ ....(14a)}$$

If $dx'_i dx'_j = dx_i dx$ (Invariant magnitude) We have

$$g'_{ij} = g_{ij}\left(1 \;\; \frac{v^2}{c^2}\right)$$

$$\delta g_{ij} = (g_{ij} \;\; g'_{ij}) \;\; \frac{v^2}{c^2} g_{ij} \text{ ....(23)}$$

In the large-scale region, equation (23) expresses the geometrical deviation. In the infinitesimal world region, equation (23) expresses the unit change, but the nature of the geometry is unchanged. Here, the unit change affects the magnitude of the space- time component.

$$g'_{ij} dx'_i dx'_j = \left(1 \;\; \frac{v^2}{c^2}\right) g_{ij} dx_i dx_j$$

We have

$$l' = \lambda\, l \text{ Where } \lambda^2 = (1 \;\; \frac{v^2}{c^2}),\; g'_{ij} dx'_i dx'_j = l'^2,\; g_{ij} dx_i dx_j = l^2$$

The difference of the metric $\delta g_{ij} = \frac{v^2}{c^2} g_{ij}$ is described by a unit change in the same geometry. The unequal metric has unequal units The change of unit calibrates the magnitude value of the space-time component from variant nature to invariant nature. In the present physics, the gauge-invariant method is used to describe the phenomena of electrodynamics and quantum mechanics

Weyl's own word

> 7."The postulate determines the quadratic form fully, if factor of proportionality differing from zero be prefixed. the fixing of the latter serves to calibrate the manifold at the point p .we shall then call x^2 the measure of the vector or since it depends only on the distance defined by x, we may call it the measure 1 of this distance, unequal distances have different measure; the distance at a point p. therefore constitutes a one-dimensional totality. If we replace this calibration by another, the new measure l' is derived from the old one l by multiplying it by a constant factor $\lambda \neq 0$ independent of the distance; that is, $l' = \lambda l$. The relations between the measures of the distance are independent of the calibration, so we see that just as the characterization of a vector at p by a system of numbers (its components) depends on the choice of the co ordinate system. So the fixing of a distance by a number depends on the calibration; and just as the components of a vector undergo a homogeneous linear transformation on passing to another coordinate system, so also the measure of an arbitrary distance when the calibration is altered"

Finally we come to the results of the geometry change and chance in the units of measure are observed by same physical effect of direction change or short rotation but we view them by our methods of observation

Conclusion: (a) A direction change or short rotation produces a change in units of measure.(Con) A change in units of measure produce a direction change or short rotation. (b) Vanishing of a change in units of measure gives the vanishing of short rotation or change of direction.

II (2) Inertial and Non Inertial Condition

(i)Inertial condition

The new transformation gives the new definition for inertial and non-inertial frames. When the relative velocity of the two frames v=0, the new transformation equation gives the following space time relation.

$$x' = x \quad (0)t \quad x, y' = y\sqrt{1 \quad \frac{0}{c^2}} = y, z' \quad z\sqrt{1 \quad \frac{0}{c^2}} = z, t' \quad t \quad \frac{0x}{c^2} \quad t \quad \ldots\ldots\ldots\ldots(24)$$

Two frames have zero relative velocity between one to another. This means all mass point inside the two frames have zero relative velocity between one to another. To pass the quantity

$ds'^2 = g'_{ij}dx'_i dx'_j$ from one to another, insert the relation v=0 in equation (14a)

We have $g_{ij}dx_i'dx_j' = g_{ij}dx_idx_j$ ……….(25)

When the relative velocity of the two frames is v=0

We have from (24) $dx_i'dx_j' = dx_idx_j$ ………(26)

Insert the above result in equation (25)

We have $g_{ij}' = g_{ij}$ …………(27)

Equation (26) and (27) give the following results

(a) No change in space- time component
(b) No change in geometry
(c) No change in unit of measure

So the two have an invariant physical and geometrical nature. Frames which satisfy this condition are called inertial frames. The Galilean and Lorentz transformation equation also satisfies the above con.

In a Galilean transformation equation, put v=o

$$x' = x - vt, y' = y, z' = z, t' = t.$$

We have

$$x = x', y = y', z = z', t = t' \text{ inserted in (25)}$$

$$g_{ij}' = g_{ij}$$

In the Lorentz transformation equation, put v=o

$$x' = \frac{x - vt}{\sqrt{1 - \frac{v^2}{c^2}}}, y' = y, z' = z, t' = \frac{t - \frac{vx}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}}$$

we have $x = x', y = y', z = z', t = t' =$ insert in(25)

$$g_{ij}' = g_{ij}$$

(ii) Non inertial condition:

This condition has two types: one is constant uniform velocity and the other is constant uniform acceleration

Constant uniform velocity

The new transformation equation is in this condition -

$$x' = x \quad vt, \; y' = y\sqrt{1 \quad \frac{v^2}{c^2}}, \; z' = z\sqrt{1 \quad \frac{v^2}{c^2}}, \; t' = t \quad \frac{xv}{c^2}$$

From the new transformation equation we have three results

(a) A change in space- time component
(b) A change in geometry
(c) A change in unit of measure

The above-described three results indicate the physical and geometrical change

$$\delta \, g_{ij} dx_i dx_j = \frac{v^2}{c^2} g_{ij} dx_i dx_j$$

The difference of $\delta \, g_{ij} dx_i dx_j = \frac{v^2}{c^2} g_{ij} dx_i dx_j$ indicates a force loss or gain from the inner system to outer system. This effect produces a physical and geometrical change. But this change is an impulse condition because the relative velocity is constant. So the above change is also constant. These type of frames are a non-inertial condition. We have this result from the new transformation equation. The Galilean and Lorentz transformations failed to give this result because they have an invariant metric with an equal nature

$$g'_{ij} = g_{ij}$$

The constant equal metric relation gives great trouble for Einstein to extent the relativity principle by a suitable general transformation from inertial motion to non inertial motion. So he selects another route

9. Conclusion

The above-submitted theory establishes a new foundation for our present basic physics. It will help us unify all physical effecst through a single concept.

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