

A different view to concepts of time, space and energy

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(Received 28 September 2017; revised manuscript received 2017; published 2017)

In this article, we will state equivalency of time space and energy on basis of vector attribution of time and space, special relativity principle, and electrodynamics. Also, we will state the relation of electromagnetic radiation which has emerged from acceleration of charged particle as a result of change in time and space orthogonality. We will indicate that acceleration of charged particle makes places with equal energy and these places have equal angles in time and space direction.

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Albert Einstein in his especial relativity theory indicated that time and space are relative quantities and defined in relation to relative velocity of two observers [1]. He defined conceptions of time dilation and length contraction on basis of light speed constant for two observers who are moving with constant speed in relation to each other [2, 3].

We will explain that how change in magnitude and direction of time and space axes can emerge energy. In another words the same as the equivalency between mass and energy there is equivalency of time, space and energy.

First part: Here we will explore only on basis of especial relativity with constancy of light speed c and in a model which time and space are orthogonal.

Suppose a coordinate plane (plane A) with a point O as a time and space beginning (Fig. 1). An observer having a laser pointer on point O can emit light in plane A in any direction with c speed. (Here time and space are orthogonal in addition to constancy of light speed which is $c=3\times 10^8$ m/s.). Therefore, light can move c distance in any direction after passing a second of time. As a result, all the points with c distance from point O are in equal time distance.

We have to remember that time and space are two independent quantities and they are orthogonal in any point of plane A.

Subject Area:

Light emitting in any direction must follow $\Delta r = c\Delta t$, for the observer at beginning point of time and space. So points with the same time distance are on the circle perimeter while the center is O.

Undoubtedly speed of light in vacuum is only constant and equals c when the direction of emission is orthogonal to the circle tangent to the points with equal time distance from point O.(In another word orthogonality of time and space must exist.)

Definition:

Here, a new definition of time and space is necessary.

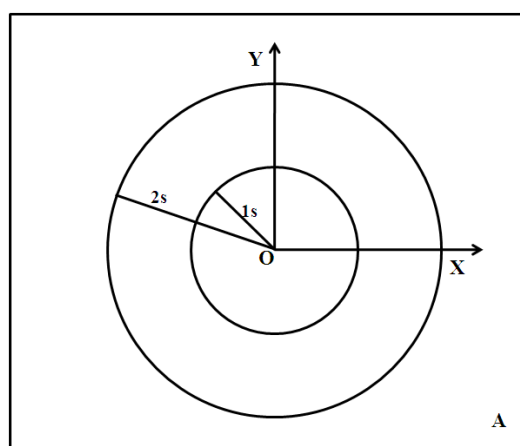


FIG.1. Plane A with beginning point of time and space at point O. equal time distance from point O located on perimeter of circles.

1. Space Distance Vector \vec{r} : a vector which its length is equal to space distance between location of object and observation point, and its direction from object location towards observation point (Fig. 2).
2. Time Distance Vector \vec{t} : a vector which its length is equal to time which light travels between location of object and observation point, and its direction from object location towards observation point. Constantly, time is orthogonal to Time Distance Vector in all points
3. Space Distance Difference Vector ($\vec{\Delta r}$): a vector which is produced of difference between two Space Distance Vectors (which shows location of two different events, we will call it space).

Its length is the distance between two events and its direction is from the first event towards the second.

4. Time Distance Difference Vector ($\vec{\Delta t}$): a vector which is produced of difference between two Time Distance Vector (which shows difference between time distance of two events, we will call it time)

Its length is the time between two events and its direction is from the first event towards the second.

As we know especial relativity works for zero acceleration or inertial frame, so if we use internal direct product of **Space Distance Difference Vector** of two events in their **Time Distance Difference Vector** in any frame of them, we see the following equation:

$$\frac{\vec{\Delta r} \cdot \vec{\Delta t}}{\Delta r' \cdot \Delta t'} = \frac{\Delta r \Delta t \cos 0}{\Delta r' \Delta t' \cos 0} = \gamma^2 \quad (1)$$

$$\text{and } \gamma = \frac{1}{(1-v^2/c^2)^{1/2}} \quad (2)$$

We will call $\vec{\Delta r} \cdot \vec{\Delta t}$, as **Time-Space Length** from now on in this article. This equation indicates the observer moving with speed of v experience **Time-Space Length** as much as γ^2 less than the

observer in the constant frame. Besides energy for the mass move with relativistic speed is achieved in eq.3

$$\mathbf{E}_k = mc^2(\gamma - 1) \quad (3)$$

As result of 2 and 3 we have 4

$$\mathbf{E}_k = mc^2 \left(\sqrt{\frac{\Delta r \Delta t}{\Delta r' \Delta t'}} - 1 \right) \quad (4)$$

Change of Time-Space Length is equivalent with energy. New equivalency among time-space, mass and energy is stated in eq.4.

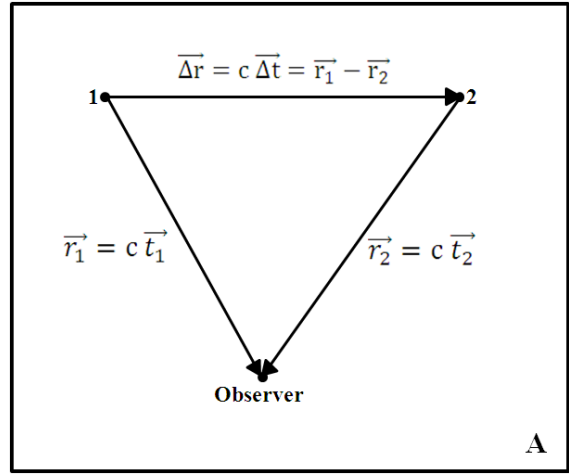


FIG.2. Definition of time and space distance vectors and difference between them.

Second part: we will explore acceleration of a charged particle in relation to change of time and space orthogonality.

Similar to part one consider plane A with space and time beginning point as O.

Now we suppose a Hypothesis in which charged particle q accelerate from point O (beginning point of time and space) in x direction.

Hypothesis:

Suppose when charged particle q is accelerating, the beginning point of space frame moves with charged particle q to extent of Δ from point O in direction of x and lies in point P_1 while beginning point of time is still on point O (so \vec{t}_1 equal zero)

As a result, if laser light in point P_1 emit in direction of point P_2 , Phenomenon is the laser light which moves from P_1 to P_2 , while P_1 is space beginning point and O is time beginning point.

Space Distance difference Vector (space) and Time Distance Different Vector (time) are shown in Fig. 3

Since in all of points between P_1 , P_2 , and P_2 itself orthogonality of laser emission direction to circle is tangent to the points with equal time distance from point O do not exist. $\vec{\Delta r} = c\vec{\Delta t}$, does not work here; therefore, the speed of light changes. One should note that orthogonality of laser light emission direction to the points of the circle (such as P_1) exists in direction of x . So the speed of light is constant in x direction.

Also, for points in far distances from the beginning point of time and space orthogonality exist.

Light has the same speed in all the points with equal angles in time ($\vec{\Delta t}$) and space ($\vec{\Delta r}$) cross. Now we can find points with equal angles of time and space cross. To find the points with the same speed of light we use a geometry law. In geometry we know all circumferential angles to an arc of a circle are the same (Fig.4). So if we suppose a as beginning point of time and b as beginning point of space, all the points with the equal angles are on the circumference of a circle.

Also consider two beginning point of time and space. Then suppose we draw lines from each of the beginning points in radial direction with equal angles. Now we separate the beginning points of time and space, interference of these lines give us Kappa pattern which is familiar in *Moiré* discussion (Fig.5). By geometrical calculation we can find place of these points are in adjustment with place of circumference angles to an arc in a circle.

According to Larmor law [4], if charged particle q accelerates to the extent of Δ in direction of x (Fig.6) electromagnetic radiation happens and electric filed is as below

$$E_{\perp} = \frac{q\dot{v} \sin\theta}{c \frac{r}{r}}, \quad (5)$$

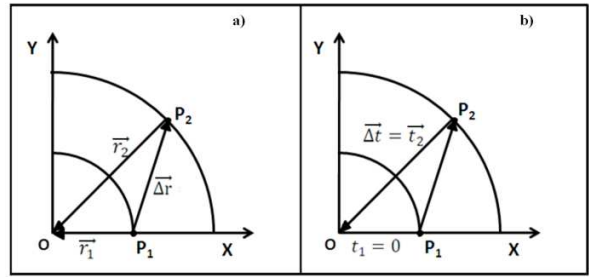


FIG.3.a) Space Distance Vectors and the difference between them from the observation point O , b) Time Distance Vectors and the difference between them from the observation point O which is in the time beginning point.

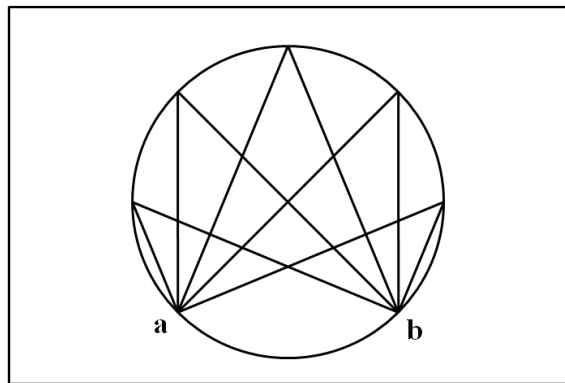


FIG.4.All circumferential angles to an arc of a circle are the same

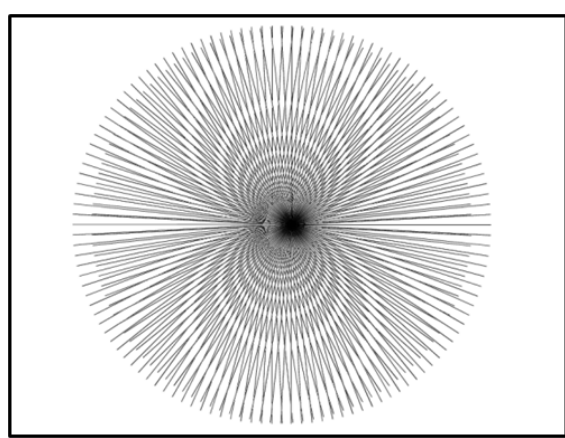


FIG.5.Show Kappa pattern of interference, the beginning points of time and space are separated and fringes show the place equal angles.

Where θ is the angle between the acceleration vector and the line from the charged particle to the observer. r is a distance from the charged particle e to the observer point. \dot{v} is charge acceleration and E is a vector that is perpendicular to r and \dot{v} .

Place of points which have the same electrical field are as below

$$E_{\perp}, q \text{ and } \dot{v} = \text{const}, \quad (6)$$

$$\rightarrow r = \text{const} \sin\theta, \quad (7)$$

In Fig.7 place of these points are drawn in Cartesian coordinate.

In comparison with Larmor law and equation of a circle ($r=2a\sin\theta$) we can find

$$a = \frac{q\dot{v}}{2cE_{\perp}}, \quad (8)$$

According to Larmor law there is no radiation in the direction which the charged particle accelerates (x axis).

We can achieve by calculation that place of points with the same radiational energy is as place of the points which are encircle on ab arc in the circle, and place of these points are the same as those achieved in Kappa pattern.

In conclusion, any change in orthogonality of time and space is corresponded to a change in the speed of light.

$$c \cdot \frac{|\overrightarrow{\Delta r} \times \overrightarrow{\Delta t}|}{|\overrightarrow{\Delta r}| |\overrightarrow{\Delta t}|} = \text{speed of light}, \quad (9)$$

$$c \cdot \text{Sin}\alpha_0 = \text{speed of light}, \quad (10)$$

Where α_0 is the angle between Time Distance Difference and Space Distance Difference vectors. The points with equal angle of time and space have the same electric field. And this field is proportional to the difference of speed of light with c constant.

$$E_{\perp} \propto c\text{Sin}90 - c \cdot \text{Sin}\alpha_0, \quad (11)$$

$$\rightarrow E_{\perp} \propto c(1 - \text{sin}\alpha_0), \quad (12)$$

In part one; we knew how time and space can be equivalent with energy.

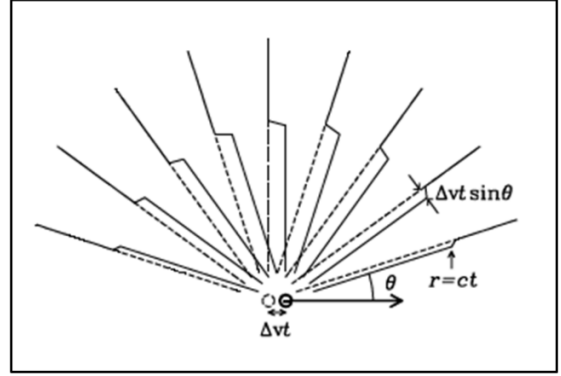


FIG. 6. This figure shows the electric fields from an accelerated electron.

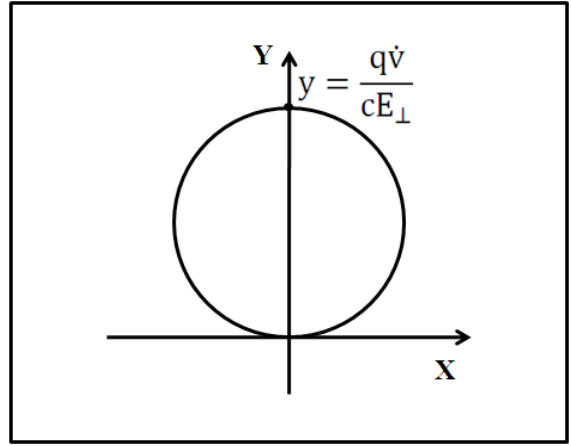


FIG. 7. Show the equation of $r = \text{const} \sin\theta$

On basis of internal product we explained different length of time and space in an event can be equivalent with energy for two observers who move with constant speed in relation to each other.

Also we explained in part two that there is an independent beginning point of time in acceleration of charged particle q and observers cannot choose independent beginning points of time in different frames.

Acceleration of charged particle makes places with equal energy and these places have equal angles in time and space direction.

This new description of time and space indicates that as a result of acceleration of charged particle electromagnetic radiation can be created simultaneously because acceleration of particle change orthogonality of time and space directly.

As you know former theories could not explain simultaneous creation of electromagnetic radiation with acceleration of particle.

This conception influences our perceptions of photon creation, wave function, parity, creation and annihilation operators in quantum mechanics.

Domain of wave function can be explained by domain of change in time and space orthogonality and time and space energy level.

It seems that new equations in laws of motion will be needed which include levels of time and space energy.

I acknowledge my B.Sc. professor Majid Rahnama that inspired me in concepts of time and space. Also I am so grateful that my wife, Somaye Karamzade, helped me with translation of this article.

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