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Interpretation of Length Contraction by Vision of Light, Photon Inertia Transformation and Equation of Light Speed

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[Abstract]
Length Contraction is a phenomenon interpreted all along by Einstein's special relativity. However, it has never been explained explicitly. In this paper, the visual path of the photon traveling from the end of the object to the observer which defines the visual distance (observed by observer's eyes) between the object and the observer is proved equal to the vision of light from the observer to the end of the object. As a result, both Length Contraction and Expansion can be expected subject to observer's traveling direction and speed with respect to the object.
[Keywords]
Length Contraction, Special Relativity, Velocity Time Dilation, Vision of Object, Vision of Light, Principle of Vision, Theory of Vision, Photon Inertia Transformation, Absolute Light Speed, Inertia Speed, Equation of Light Speed,

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I. Length Contraction

The length of an object measured by an observer, along the direction of motion, is shorter than the length measured by another observer at rest with the object. This phenomenon is known as "Length Contraction" [1]. It is caused by the difference of Visions of Light between a moving observer and a ground observer, rather than the Velocity Time Dilation [2] that is derived from Einstein's Special Relativity [3] based on constant light speed which actually never exists.

II. Absolute Space System

In the universe, everything moves with respect to each others. There is no fixed reference. However, when a photon is emitted from a light source it generates a straight optical path from its light origin (not light source) into space. The light origin has an absolute fixed position in space that doesn't move with the light source, nor earth or anything else. Therefore, an Absolute Space System can be defined by three fixed perpendicular axes (each point to a far distance star such as North Star) at the light origin.

III. Vision of Object

The "Vision of Object" [4] is an object observed by an observer at a reference point (system) during a period of time. The object is correlated to the reference point (system) by distance and direction (or coordination). The reference point (system) has a fixed origin and three perpendicular axes.

In fact, any reference point (system) can be used to build the coordination of all objects in space. Then, a standard procedure (Theory of Vision) can be applied to transform the coordination from the old reference point (system) to that of a new reference point (system).

IV. Principle of Vision

It is believed that the relative positions and directions between two objects shall maintain unchanged no matter of the reference points (systems). In other words, one object observed by the observer on the other object maintains the same distance and direction (or coordination) no matter of the observation of the two objects carried out by the observers on any third object. This phenomenon is named "Principle of Vision" [4].

V. Theory of Vision

Based on Principle of Vision, a vision of object, in spite of observed directly at a reference point (system), can be constructed from the correlations between the object and the reference point (system) in each time frame observed at the third reference point (system). A vision of object can be produced by superimposing the object observed in each time frame at the third reference point (system) by overlapping the reference point (system) observed in each time frame at the third reference point (system) perfectly on top of each other while

keeping the same relative position and direction between the object and the reference point (system) as that observed at the third reference point (system). This is named "Theory of Vision" [4].
Two schematic diagrams are illustrated here to explain the construction process of vision of object from one reference point (system) to another reference point (system):

Fig. 1 shows the vision of an object observed at reference point O. Object t_1, Object t_2 and Object t_3 represent the positions and directions of the object; and Observer t_1, Observer t_2 and Observer t_3 represent the positions and directions of the observer, observed at the reference point O in the time frame t_1, t_2 and t_3 respectively. The curve from Object t_1 to Object t_2 and Object t_3 represents the vision of the object observed at reference point O during the time period from t_1 to t_3.

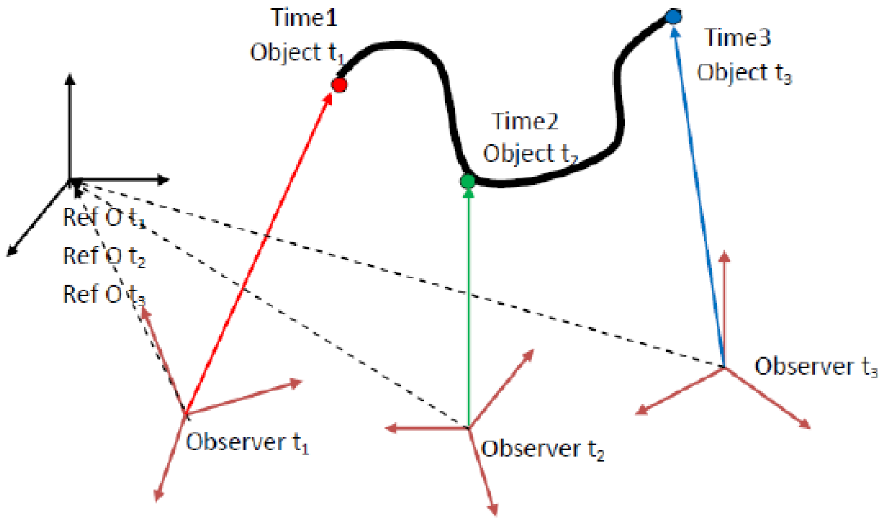

Fig. 1 Vision of an object observed at a reference point.

Fig. 2 shows the vision of object constructed at the final position of the observer (Observer t_3 in Fig. 1). In which, Observer t_1, Observer t_2 and Observer t_3 and their coordination systems are completely matched and overlapped on top of Observer t_3. The same relative positions and directions of the Object t_1, Object t_2 and Object t_3 with respect to Observer t_1, Observer t_2 and Observer t_3 are maintained as is observed at reference point O in Fig. 1. Thus a curve from Object t_1 to Object t_2 and Object t_3 representing the vision of object observed by the observer during the time period from t_1 to t_3 can be constructed.

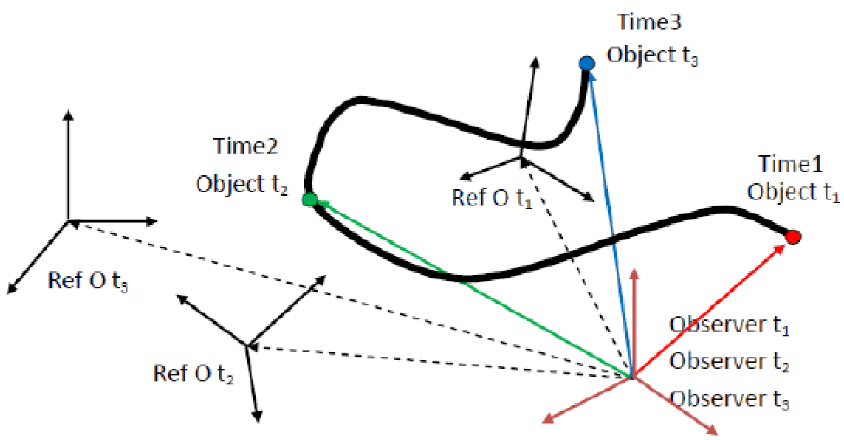

Fig. 2 Vision of an object observed at an observation point constructed from a reference point.

VI. Vision of Light

Like vision of object, "Vision of Light" [4] is a photon observed at a reference point (system) during a period of time. The photon is correlated to the reference point (system) by distance and direction (or coordination).

Similar to vision of object, in spite of observed directly by the observer at the reference point (system), Vision of Light can be constructed by superimposing the images of the photon and the reference point (system) observed at the light origin in the Absolute Space System. The reference point (system) of each time frame is overlapped on that of the final time frame. Also, the relative positions and directions between the photon and the reference point (system) are maintained as is observed at the light origin in the Absolute Space System.

Speed of object (photon) is defined by the traveling distance of an object (photon) divided by the traveling time of the object (photon) measured at the reference point (system). Because the traveling distance of an object (photon) is measured based on the Vision of Object (Vision of Light) observed by the observer during a period of time at the reference point (system), therefore, like speed of an object is calculated by Vision of Object divided by the traveling time of the object, light speed can also be calculated as the Vision of Light divided by the traveling time of the photon measured at the reference point (system).

Fig. 3 shows a schematic diagram of the Visions of Light of an emitted photon with respect to the observers at the light origin, ground and light source in Absolute Space System at light origin (reference point). Ground and light source drift apart from the light origin due to the motions of earth ($\mathbf{V_E}$) and the light source ($\mathbf{V_C}$) respectively. After a time interval Δt, assuming all motions are at constant speeds, the visions of light of those observers can be represented by the following straight lines: **AP**–the Vision of Light observed at light origin (black line), **BP**–the Vision of Light observed at ground (red line) and **CP**–the Vision of Light observed at the light source (green line) respectively. They all have the same final position (point **P**) of the emitted photon.

AP (Vision of Light observed at light origin) is the vector summation of **CP** (Vision of Light observed at the light source) and **AC** (moving path of the light source from light origin). Also, $\mathbf{C_O}$ (light speed observed at light origin) is the vector summation of $\mathbf{C_S}$ (light speed observed at the light source) and $\mathbf{V_C}$ (moving speed of the light source from light origin).

$$\mathbf{AP} = \mathbf{CP} + \mathbf{AC}$$
$$\mathbf{C_O} = \mathbf{C_S} + \mathbf{V_C}$$

Similarly, **BP** (Vision of Light observed at ground) is the vector summation of **CP** (Vision of Light observed at the light source) and **BC** (moving path of the light source from ground). Also, $\mathbf{C_E}$ (light speed observed at ground) is the vector summation of $\mathbf{C_S}$ (light speed observed at the light source) and $\mathbf{V_S}$ (moving speed of the light source from ground).

$$\mathbf{BP} = \mathbf{CP} + \mathbf{BC}$$
$$\mathbf{C_E} = \mathbf{C_S} + \mathbf{V_S}$$

Because of the constant repulsive force generated between photon and the adjacent Wu's Pairs on the surface of the light source in the photon emission process, a constant light speed $\mathbf{C_S}$ (Absolute Light Speed 3×10^8 m/s) in the photon ejection direction [5] can always be observed at the light source regardless of the frequency of the photon neither $\mathbf{V_C}$ and $\mathbf{V_S}$.

When a photon observed at different observation points, the traveling times of the photon are the same ($\Delta t_E = \Delta t_S = \Delta t_O$), but the Visions of Light are different (**AP** ≠ **BP** ≠ **CP**). Since light speed is measured as the Vision of Light divided by the photon traveling time observed at the observation point, therefore the light speeds are different ($\mathbf{C_E} \neq \mathbf{C_S} \neq \mathbf{C_O}$) at different observation positions. These oppose to Einstein's Special Relativity wherein he claimed that light speed is always constant no matter of light source and observer.

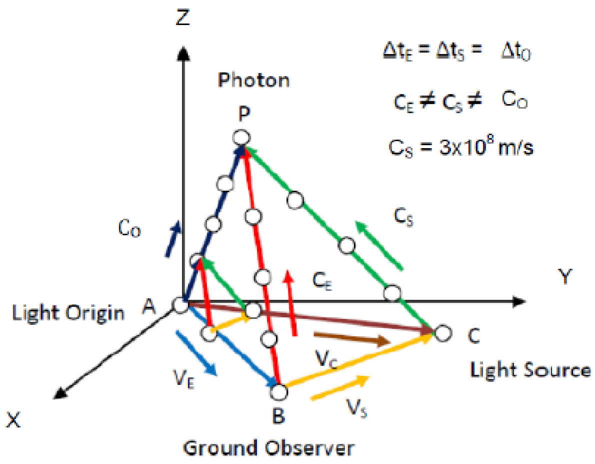

Fig. 3 Visions of Light of an emitted photon observed at the light origin (black line), ground (red line) and light source (green line) in Absolute Space System.

VII. Photon Inertia Transformation and Equation of Light Speed

When a photon emitted from a light source, because of Photon Inertia Transformation [4], it travels under two influences, ejection motion and inertia motion. In other words, the light speed observed by the observer at any observation point (C') is a vector summation of the Absolute Light Speed 3 x 10^8 m/s [5], the moving speed of the photon away from the light source observed at the light source (C), and the "Inertia Light Speed", the moving speed of the light source away from the observer (or his inertia system) at the reference point (V). This theory is named "Equation of Light Speed" [4][5][6].

$$\mathbf{C' = C + V}$$

Where **C** is the Absolute Light Speed 3 x 10^8 m/s and **V** is the Inertia Light Speed (moving speed of the light source away from the observer).

VIII. Length Contraction and Vision of Light

The length of an object measured by an observer, along the direction of motion, is shorter than the length measured by another observer at rest with the object. This is caused by the difference of Visions of Light between a moving observer and a ground observer. A detailed analysis is shown as follows:

Fig. 4 shows a schematic diagram with a reference point at the light source (the beginning of the object). The distance $\mathbf{L_E}$ (black line) is a vector from light source towards the end of the object and the Vision of Light $\mathbf{L_S}$ (red line) is a vector from moving observer towards the end of the object. Assume it takes time Δt for a photon to travel from the beginning to the end of the object. Also, the light speeds measured by the moving observer and ground observer are $\mathbf{C_S}$ and $\mathbf{C_E}$ respectively.

According to the Equation of Light Speed, the velocity of the photon observed by the observer $\mathbf{C_S}$ is the vector summation of the velocity of the photon observed at the light source $\mathbf{C_E}$ (3x10^8 m/s), and the velocity of the light source moves away from the observer $\mathbf{V_s}$ (the negative velocity of the observer moves away from the light source earth **-V**). Therefore,

$\mathbf{C_S = C_E + V_s}$

$\mathbf{C_S = C_E + (-V)}$

Also,

$$\mathbf{L_S = L_E + D}$$

Where $\mathbf{L_S}$ is the vision of light from observer to object, $\mathbf{L_E}$ is the vision of light from light source (ground observer) to object and **D** is the distance from observer to light source (ground observer).

In case the observer is moving parallel to the object with unit vector towards the object,

Because

$L_E = C_E \Delta t$ & $L_S = C_S \Delta t$

And

$D = (-V) \Delta t$

Therefore,

$L_S = L_E + (-V) \Delta t$

$L_S/L_E = (L_E\text{-}V\Delta t)/L_E$
$L_S/L_E = (C_E\text{-}V)\ \Delta t/C_E\Delta t = (C_E\text{-}V)/C_E$
$L_S = (1\text{-}V/C_E)\ L_E$
In case $0 < V < C_E$ (moving towards the object)
Then $1 > (1\text{-}V/C_E) > 0$
And

$$L_s < L_E$$

When the observer is moving towards the object, the length of the object is shrinking ($L_s < L_E$).
In case $V < 0$ (moving away from the object)
Then $1\text{-}V/C_E > 1$
And

$$L_s > L_E$$

When the observer is moving away from the object, the length of the object is expanding ($L_s > L_E$).
Depending on the moving speed and direction of the observer, the length of an object, which is equal to the Vision of Light observed by the moving observer, can either shrink or expand. In other words, either Length Contraction or Length Expansion can happen subject to the moving speeds and directions of the observers with respect to the object (Fig. 4).

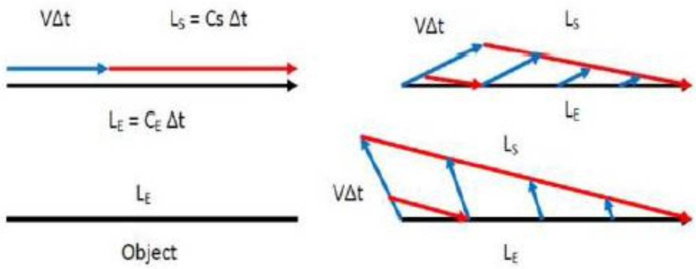

Fig. 4 The Visions of Light (red lines) observed at different moving speeds and directions (blue lines), with respect to the Vision of Light (black line) observed at ground.

The visual path of a photon traveling from the end of the object to the observer defines the visual distance (observed by observer's eyes) between the object and the observer. Since the vision of light from observer to the end of the object $\mathbf{L_E}$ has the same distance as the vision of light from the end of the object to the observer $\mathbf{-L_E}$ (Fig. 5) except in opposite directions, therefore, the visual distance of an object can be measured by vision of light from observer to the end of the object. Also, both Length Contraction and Expansion are expected subject to the relative directions and speeds between the observer and the object.

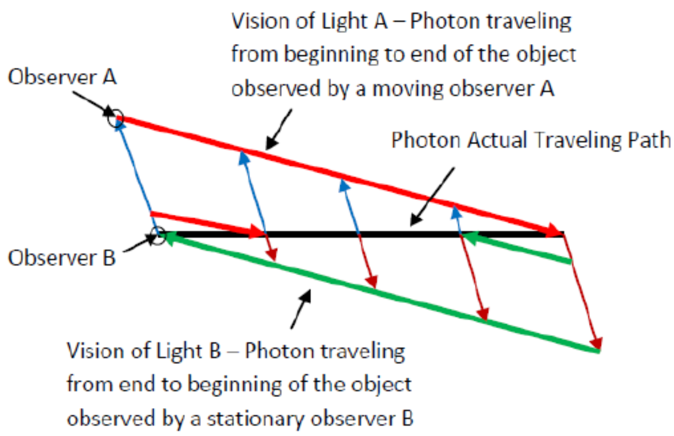

Fig. 5 The vision of light A from observer to the end of the object has the same distance as the vision of light B from the end of object to observer except in opposite directions.

IX. Conclusion

Length Contraction is a phenomenon interpreted all along by Einstein's special relativity. However, it has never been explained explicitly. In this paper, the visual path of the photon traveling from the end of the object to the observer which defines the visual distance (observed by observer's eyes) between the object and the observer is proved equal to the vision of light from the observer to the end of the object. As a result, both Length Contraction and Expansion can be expected subject to observer's traveling direction and speed with respect to the object.

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