Special Relativity Being from Misunderstanding of Principle of Constant Speed of Light

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Abstract Introduces basic hypotheses and basic viewpoint of space-time in special relativity. Analyzes derivation processes and questions of Lorentz transformation. Makes derivation of transformation between two coordinate systems which moving uniformly along beeline one to another. Finds that special relativity based upon Lorentz transformation is not correct, and relative speed between two objects may be faster than speed of light.

Keywords Special relativity, Misunderstanding, Fast than light

1. Introduction

Special relativity has been established for a century. Special relativity and its author Albert Einstein are well known. Special relativity is a university course that students must study. But, the rationality of establishing process and conclusions of special relativity are still under suspicion.

This paper introduces basic hypotheses and viewpoint of space-time in special relativity simply, analyze derivation processes and questions of Lorentz transformation, makes derivation of transformation between two coordinate systems moving uniformly along beeline one to another, finds that special relativity based upon Lorentz transformation is not correct, and relative speed between two objects may be faster than speed of light.

2. Summarize of Special Relativity[1]

2.1 Basic hypotheses in special relativity

(1) Principle of relativity. For describing the whole laws of moving, all inertial coordinate systems moving uniformly along beeline one to another are equal.

(2) Principle of constant speed of light. Speed of light in vacuum measured in all inertial coordinate systems moving uniformly along beeline one to another are equal.

2.2 Lorentz transformation

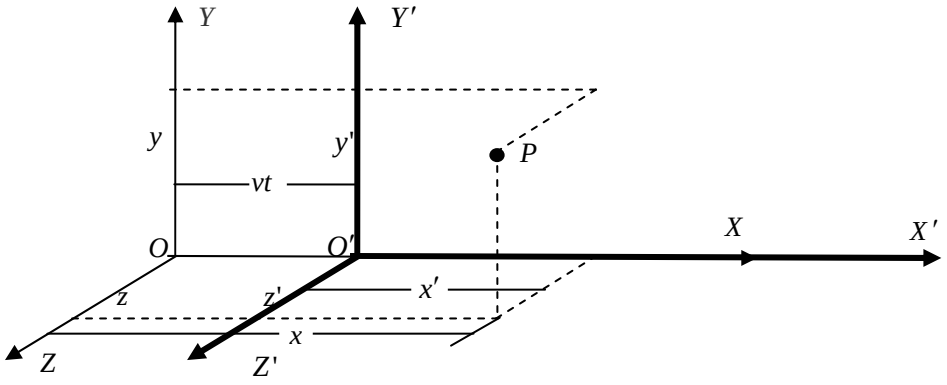

Fig1 Coordinate system 1

Two coordinate systems *K* and K' (*OXYZ* and $O'X'Y'Z'$), every axis parallels one to the other respectively, move uniformly along beeline one to the other, speed of K' is *v* respect to *K* along *X*-axis. Time count starts when *O* and O' at the same point.

Use (*x, y, z, t*) describe an event appeared in *K* at time *t*, the same event appeared in K' is (x', y', z') at time t'. Time-space coordinate (x, y, z, t) and (x', y', z', t') which describe the same event are of Lorentz transformation

$$\left.\begin{aligned} x' &= \frac{x - vt}{\sqrt{1-\left(\frac{v}{c}\right)^2}} \\ y' &= y \\ z' &= z \\ t' &= \frac{t - \frac{vx}{c^2}}{\sqrt{1-\left(\frac{v}{c}\right)^2}} \end{aligned}\right\} \quad \text{.....(1)} \qquad \left.\begin{aligned} x &= \frac{x'+vt'}{\sqrt{1-\left(\frac{v}{c}\right)^2}} \\ y &= y' \\ z &= z' \\ t &= \frac{t'+\frac{vx'}{c^2}}{\sqrt{1-\left(\frac{v}{c}\right)^2}} \end{aligned}\right\} \quad \text{.....(2)}$$

In which *c* is speed of light.

Derivation of Lorentz transformation is as follows.

For the point of *O*, $x = 0$ observed in *K* all the time; but $x' = -vt'$ observed in K' at time t', viz. $x'+vt' = 0$. Thus it can be seen that *x* and $x'+vt'$ became zero at the same time for the point. Then, let that there is a direct ratio between x and $x'+vt'$ all the time, and let the direct ratio is k,

$$x = k(x'+vt') \quad \text{.....(3)}$$

Study point O' using the same method,

$$x' = k'(x - vt) \quad \text{.....(4)}$$

Based upon principle of relativity, *K* is equal to K'. The two equations above must be of the same form. k must be equal to k'

$$k = k' \quad \text{.....(5)}$$

Thus

$$x' = k(x - vt) \quad \text{.....(6)}$$

To finish the transformation, constant k must be given. Based upon principle of constant speed of light, if light signal go alone *OX* when *O* and O' at the same point ($t = t' = 0$), at any time t (t' in K'), positions at these two coordinate systems are as follows respectively

$$x = ct, x' = ct' \quad \text{.....(7)}$$

Substitute equation (7) into the product of Equation (3) and equation (6)

$$k = \frac{c}{\sqrt{c^2 - v^2}} = \frac{1}{\sqrt{1-\left(\frac{v}{c}\right)^2}} \quad \text{.....(8)}$$

Substitute equation (8) into (3) and (4)

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

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

2.3 Viewpoints of space-time in special relativity

Based upon Lorentz transformation, special relativity finds out:

(1) Question of simultaneity. If two events appear at two points in a coordinate system synchronously, times that these two events appear measured in another coordinate system are not equal.

(2) Question of contraction in length. In a coordinate system be of relative speed, the length of an object measured along the speed direction of the system is shorter than that measured in another coordinate system in which the object is at rest.

(3) Question of extend of time. The time measured in a coordinate system being of relative speed with the place an event appears is longer than that measured in another coordinate system in which the place is at rest.

2.4 Dynamics of special relativity

(1) Mass of an object measured in coordinate system being of relative speed with the object is larger than that measured in another coordinate system in which the object is at rest.

(2) Energy of an object equals its mass multiply square of light speed.

3. Some Mistakes in Special Relativity

3.1 Wrong comprehending principle of constant speed of light.

Principle of constant speed of light can be explained as follows.

(1) For lights in vacuum radiated from lamp-houses that are fixed on any inertial coordinate systems, measured speeds of these lights relative to their lamp-houses (or coordinate systems) respectively are equal.

(2) For light in vacuum radiated from a definite lamp-house, light speeds measured in coordinate systems moving uniformly along beeline one to another are equal.

Lorentz transformation explains principle of constant speed of light as that for light in vacuum radiated from a definite lamp-house, light speeds relative to any coordinates system are the same. This is wrong. This neglects relative movements between coordinate systems.

3.2 Coordinate in moving direction of Lorentz transformation is 0=0

In $x'=\frac{x-vt}{\sqrt{1-\left(\frac{v}{c}\right)^2}}$, $x-vt\equiv 0$. Thus, $x'\equiv 0$。 In $x=\frac{x'+vt'}{\sqrt{1-\left(\frac{v}{c}\right)^2}}$, $x'+vt'\equiv 0$. Thus, $x\equiv 0$。

3.3 Wrong derivation of equations

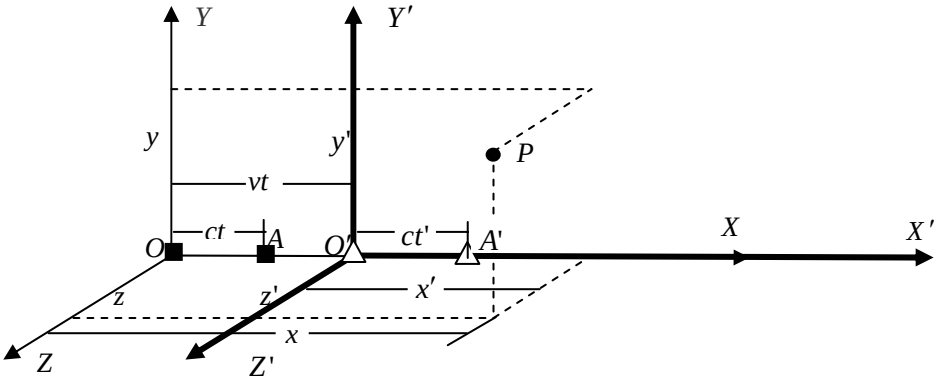

Fig 2 Coordinate system 2

3.3.1 Description of an event replacing description of another event.

Equation(3)～equation(6) describe point *O* in two coordinate systems. Equation (7) describes positions of two photons radiated from lamp-houses fixed on two coordinate systems at origins respectively, not positions of one photon. By substitution of equation (7) into equation (3)～(6), description of an event replaces description of another event. Substitution mistake occurs.

Depend upon equation (7), in *OXYZ* of Fig.2, a photon starts form point *O* at time *t*=0, arrives at point *A* at time *t*; in $O'X'Y'Z'$, another photon starts form point O' at time t' =0, arrives at point A' at time t'. It is obviously that these are two events of two

photons respectively. This is more clear if these two origins do not at the same point, having original displacement *S*, when time *t*=0, Fig.3.

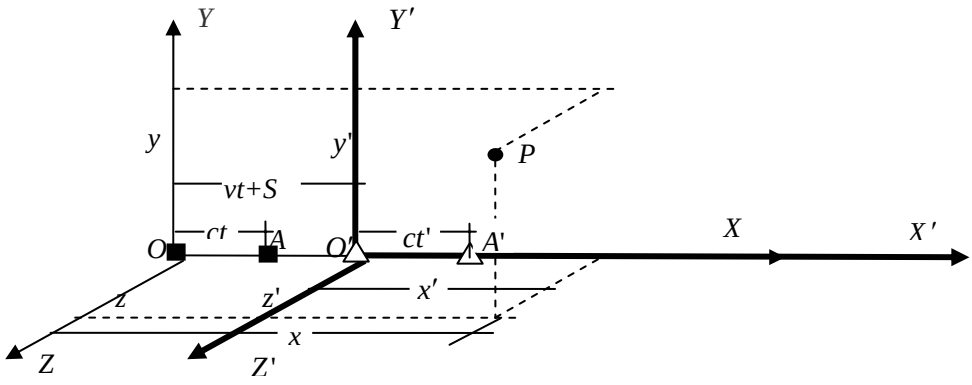

Fig.3 Coordinate system 3

Let's follows derivation of Lorentz transformation.

Two coordinate systems *K* and K' (*OXYZ* and $O'X'Y'Z'$), every axis parallels one to the other respectively, move uniformly along beeline one to the other, speed of K' is *v* respect to *K* along *X*-axis. Time count starts when O' is *S* from *O* in right direction.

For the point of *O*, $x=0$ observed in *K* all the time; but $x'=-vt'-S$ observed in K' at time t', viz. $x'+vt'+S=0$. Thus it can be seen that *x* and $x'+vt'+S$ became zero at the same time for the point. Then, let that there is a direct ratio between *x* and $x'+vt'$ all the time, and let the direct ratio is *k*,

$$x=k(x'+vt'+S) \quad \text{.....(3a)}$$

Study point O' using the same method,

$$x'=k'(x-vt-S) \quad \text{.....(4a)}$$

Based upon principle of relativity, *K* is equal to K'. The two equations above must be of the same form. So, *k* must be equal to k'

$$k=k' \quad \text{.....(5a)}$$

Thus

$$x'=k(x-vt-S) \quad \text{.....(6a)}$$

To finish the transformation, constant *k* must be given.

Absurdity1. Based upon principle of constant speed of light, if light signal go alone *OX* when *O* and O' at the same point ($t=t'=0$), at any time *t* (t' in K'), positions at these two coordinate systems are as follows respectively

$$x=ct, x'=ct' \quad \text{.....(7a)}$$

It is evident that these are two events of two lamp-houses.

Substitute equation (7a) into the product of Equation (3a) and equation (6a)

$$xx'=k^2(x'+vt'+S)(x-vt-S)$$
$$c^2tt'=k^2(ct'+vt'+S)(ct-vt-S)$$

k can not be solved.

Absurdity2. Based upon principle of constant speed of light, if light signal go alone *OX* when *O* and O' at the same point ($t=t'=0$), at any time *t* (t' in K'), positions at these two coordinate systems are as follows respectively

$$x=ct, x'=ct'-S \quad \text{.....(7b)}$$

It is evident that these are two events of two lamp-houses.

Substitute equation (7b) into the product of Equation (3a) and equation (6a)

$$xx' = k^2(x'+vt'+S)(x-vt-S)$$
$$c^2t(t'-S) = k^2(ct'+vt'+S)(ct-vt-S)$$

k can not be solved.

3.3.2 Direct transformation is not equal to indirect transformation

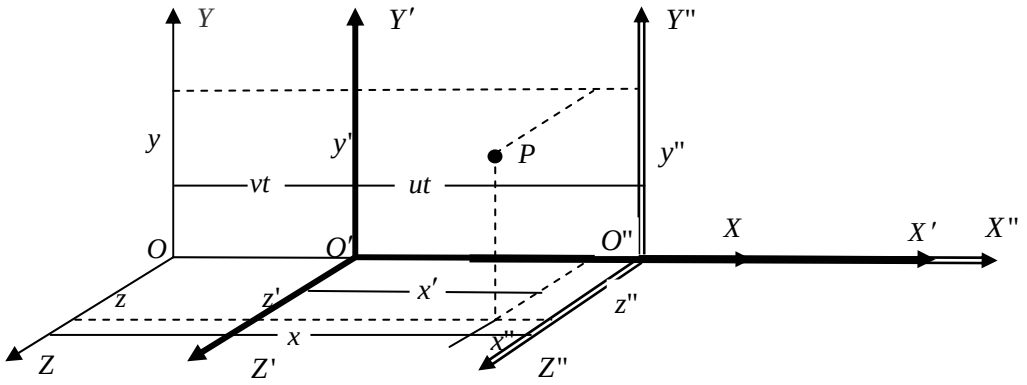

Fig.4 Coordinate system 4

Three coordinate systems K, K' and K'' (*OXYZ*, $O'X'Y'Z'$ and $O''X''Y''Z''$), every axis parallels one to another respectively, move uniformly along beeline one to another, speed of K' is *v* respect to *K* along *X*-axis, speed of K'' is *u* respect to K' along *X*-axis. Time count starts when *O*, O' and O'' at the same point.

Direct transformation from K to K''

$$x'' = \frac{x-(v+u)t}{\sqrt{1-\left(\frac{v+u}{c}\right)^2}} \quad \text{.....(9)}$$

Indirect transformation from K to K'' via K'

$$x'' = \frac{x'-ut'}{\sqrt{1-\left(\frac{u}{c}\right)^2}} = \frac{x(1+\frac{uv}{c^2})-(u+v)t}{\sqrt{1-\left(\frac{u}{c}\right)^2}\sqrt{1-\left(\frac{v}{c}\right)^2}} \quad \text{.....(10)}$$

It is evident that equation (9) is not equal to equation (10).

3.4 Relative speed between two objects can not reach nor exceed light speed

The process of derivation does not suppose that relative speed between two objects is smaller than light speed, but the result is that relative speed between two objects can not reach nor exceed light speed. Lorentz transformation is self-contradiction. Now, astronomy observations find that many planets move apart faster than light speed.

If principle of constant speed of light is substitute by principle of constant speed of sound: Speeds of sound in a material at definite condition measured in all inertial coordinate systems moving uniformly along beeline one to another are equal. Substitute sound signal for light signal, sound speed for light speed in derivation of equation. The conclusion is that speed of any object should not exceed sound speed. This is absurdity evidently. Speed of bullet exceeds sound speed. Speed of aircraft can exceed sound speed.

People use eyes through light to observe the world. Bats use ears through sound to observe the world. If People think that relative speed between two objects can not reach nor exceed light speed, bats think that relative speed between two objects can not reach nor exceed sound speed.

3.5 There is antinomy between question of contraction in length and principle of relativity

From question of contraction in length, it can be concluded that if a sphere is fixed in a coordinate system, this sphere observed in another coordinate system moving uniformly along beeline respect to the system is ellipsoid; if the relative speed equals light speed,

sphere becomes circle, changes from 3-dimensions to 2-dimensions. There is antinomy between question of contraction in length and principle of relativity.

4. Correct Transformation

4.1 Re-establish transformation

To finish the transformation, constant *k* must be given. Based upon principle of constant speed of light, if light signal go alone *OX* when *O* and O' at the same point ($t = t' = 0$), at any time *t* (t' in K'), positions at these two coordinate systems are as follows respectively

$$x = ct,\ x' = ct' - vt' \quad \text{.....(11)}$$

Substitute equation (11) into the product of Equation (3) and equation (6)

$$k = 1 \quad \text{.....(12)}$$

Substitute equation (12) into (3) and (4)

$$\left.\begin{aligned} x &= x' + vt' \\ x' &= x - vt \\ t &= t' \end{aligned}\right\} \quad \text{.....(13)}$$

There is no light speed in it.

4.2 Equation (11) accords with constant speed of light

In Fig.2, photon starts from *O* at time $t = t' = 0$, arrives *A* at time *t*, then its speed in *OXYZ* is $\frac{\overline{OA}}{t} = \frac{x}{t} = \frac{ct}{t} = c$; its speed in $O'X'Y'Z'$ is $\frac{\overline{OA}}{t'} = \frac{x'(A) - x'(O)}{t'} = \frac{(ct' - vt') - (-vt')}{t'} = c$. This accords with constant speed of light.

4.3 Deduction

Special relativity based upon Lorentz transformation is not correct. As parts of special relativity, question of simultaneity, question of contraction in length, question of extend of time, question of mass increase, question of rest energy and question of light speed are all not correct.

5. Conclusions

(1) Special relativity is from misunderstanding of principle of constant speed of light.

(2) Special relativity based upon Lorentz transformation is not correct.

(3) Descriptions of a definite event in all inertial coordinate systems moving uniformly along beeline one to another are equal.

(4) Relative speed between two objects may exceed light speed.

References

[1] Cheng Shuozhu, Jiang Zhiyong. General physics. Beijing: People's Education Press, 1978: 231～254

[2] M. Bonn. Einstein's relativity. Shijiazhuang: Hebei People Press,1981: 249～264

Authors' Biographies

Li Zifeng is a professor of Yanshan University, China, Vice-Director of Youth Division of Beijing Relativity Theory Research Federation and member of *Matter Regularity* Editorial Committee, SPE member and a member of Petroleum Society of Canada. Before joining Yanshan University, he was first a professor of Daqing Petroleum Institute and then a professor of China University of Geosciences. He has published 70 papers and 4 books on drill string, casing, rod pumping mechanics & well bore stability. He holds a BS degree in drilling engineering and an MS degree in machinery engineering from Daqing Petroleum Institute and a PhD degree in petroleum development engineering from Petroleum University, China.