Unified Theory of Natural Science so far and FTL Problems

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Abstract: The strict "unified theory" cannot be existed. Applying least square method, "partial and temporary unified theory of natural science so far" including all the equations of natural science so far can be established. In this way, the theory of everything to express all of natural laws, described by Hawking that a single equation could be written on a T-shirt, is partially and temporarily realized in the form of "partial and temporary unified variational principle of natural science so far". With the help of "partial and temporary unified theory of natural science so far", this paper successfully deals with some faster-than-light (FTL) problems. From a ray of light to observe another ray of light, the variation range of the speed of another light equals 0 to 2c (c=300,000 km/s). When the speed of an object is close or equal to the speed of light, for breaking the light barrier, the speed of this object could be faster than light as it passes through the Sun's gravitational field. According to Hubble's law, the value of far away speed of a galaxy is the exponential function of time, and therefore it can be faster-than-light.

Key words: Unified theory, partial and temporary unified theory of natural science so far, partial and temporary unified variational principle of natural science so far, Hawking, T-shirt, Hubble's law, faster-than-light (FTL)

Introduction

One of the reasons for 1979 Nobel Prize for physics is "for their contributions to the theory of the unified weak and electromagnetic interaction between elementary particles". While there is a conceptual mistake: the strict "unified theory" cannot be existed, there is only "partial and temporary unified theory so far" (sometimes it may be simplified as "unified theory so far"). In other words, "the theory of the unified weak and electromagnetic interaction" cannot be existed, and there is only "partial and temporary theory of the unified weak and electromagnetic interaction so far". In fact, not only the "unified theory" of two or more than two interactions cannot be existed, but also the "unified theory" of any kind of interaction cannot be existed. In other words, the "unified electromagnetic theory" cannot be existed, so do the "unified gravitational theory", the "unified strong interaction theory", and the "unified weak interaction theory". However, if the "unified theory" is changed into "partial and temporary unified theory so far", then it can be existed. What is the "unified theory"? In 1980, Stephen Hawking once claimed, physicists have seen the outline of "final theory", this theory of everything can express all laws of nature with a single and beautiful mathematical model, perhaps that it is so simple and can be written on a T-shirt.

In other words, for any field, the strict "unified theory" refers to that all the laws of this field can be expressed in a single mathematical model.

If following this concept to understand the strict "unified theory", we have to say, such a "unified theory" is simply cannot be existed. In other words, there is only "partial and temporary unified theory so far".

Now we discuss that the strict "unified electromagnetic theory" cannot be existed.

1 Why the strict "unified electromagnetic theory" cannot be existed and applying least square method to establish "partial and temporary unified electromagnetic theory so far"

It might be argued that Maxwell's equations are "unified electromagnetic theory". Facing with this argument, we ask three questions. First, whether or not all the electromagnetic laws can be included or derived by Maxwell's equations? Second, whether or not the later appeared high temperature superconductivity problem and the like can be solved by Maxwell's equations? Third, whether or not the faster-than-light （FTL） problems can be solved by Maxwell's equations? If negative answers were given to these three questions, then it should be acknowledged that Maxwell's equations are not strict "unified electromagnetic theory", but only "partial and temporary unified electromagnetic theory".

Based on the same reason, the "theory of the unified weak and electromagnetic interaction" cannot be existed, and there is only "partial and temporary theory of the unified weak and electromagnetic interaction so far".

Now we establish the "partial and temporary unified electromagnetic theory so far".

First of all, for any field, applying least square method to establish this field's "partial and temporary unified theory so far" (the corresponding expression is "partial and temporary unified variational principle so far").

Supposing that for a certain domain Ω, we already establish the following general equations

$$F_i = 0 \qquad (i = 1,2 \to n) \tag{1}$$

On boundary V, the boundary conditions are as follows

$$B_j = 0 \qquad (j = 1,2 \to m) \tag{2}$$

Applying least square method, for this field and the domains and boundary conditions the "partial and temporary unified theory so far" can be expressed in the following form of "partial and temporary unified variational principle so far"

$$\Pi = \sum_1^n W_i \int_\Omega F_i^2 d\Omega + \sum_1^m W_j' \int_V B_j^2 dV = \min_0 \tag{3}$$

where: $\min_0$ **was introduced in reference [1], indicating the minimum and its value should be equal to zero.** W_i **and** W_j' **are suitable positive weighted constants; for the simplest cases, all of these weighted constants can be taken as 1. If only a**

certain equation is considered, we can only make its corresponding weighted constant is equal to 1 and the other weighted constants are all equal to 0.

By using this method, we already established the "partial and temporary unified water gravity wave theory so far" and the corresponding "partial and temporary unified water gravity wave variational principle so far" in reference [2]; and established the "partial and temporary unified theory of fluid mechanics so far" and the corresponding "partial and temporary unified variational principle of fluid mechanics so far" in reference [3].

Some scholars may said, this is simply the application of least square method, our answer is: the simplest way may be the most effective way.

It should be noted that, due to that time we cannot realize that the strict "unified theory" cannot be existed, therefore in references [2] and [3], the wrong ideas that "unified water gravity wave theory", "unified water gravity wave variational principle", "unified theory of fluid mechanics" and "unified variational principle of fluid mechanics" were appeared. Now we correct these mistakes in this paper.

It should also be noted that, Eq.(2) can be included in Eq.(1), therefore we will only discuss Eq.(1), rather than discuss Eq.(2).

Now we write Maxwell's equations as follows

$F_1 = 0$, **in domain** Ω_1

where: $F_1 = \nabla \bullet D - \rho$

$F_2 = 0$, **in domain** Ω_2

where: $F_2 = \nabla \times E + \partial B / \partial t$

$F_3 = 0$, **in domain** Ω_3

where: $F_3 = \nabla \bullet B$

$F_4 = 0$, **in domain** Ω_4

where: $F_4 = \nabla \times H - j - \partial D / \partial t$

In addition, for isotropic medium, the following equations should be added

$F_5 = 0$, **in domain** Ω_5

where: $F_5 = D - \varepsilon_0 \varepsilon_r E$

$F_6 = 0$, **in domain** Ω_6

where: $F_6 = B - \mu_0 \mu_r H$

$F_7 = 0$, **in domain** Ω_7

where： $F_7 = j - \gamma E$

Besides these equations, the Coulomb's law reads

$F_8 = 0$, in domain Ω_8

where： $F_8 = f - \frac{kq_1q_2}{r^2}$, according to the experimental data, k =9.0×10^{9}N·m²/C².

Due to the limited space, other equations of electromagnetism are no longer listed. Also, a number of conservation equations (such as the equation of conservation of energy), and a number of laws (such as the law of composition of velocities), are also no longer listed. All of them will be discussed below.

In addition, some solitary equations established only for the solitary points or special cases can be written as follows

$$S_j = 0 \qquad (j = 1,2 \to m) \qquad (4)$$

For example, the scale factor in the Coulomb's law can be written as the following solitary equation

$S_1 = 0$

where： $S_1 = k -$ 9.0×10^{9}N·m²/C²。

Another example is that, in plasma problem, the shielding distance (Debye distance) can be written as the following solitary equation

$S_2 = 0$

where： $S_2 = D - \sqrt{\varepsilon_0 kT / ne^2}$.

Also due to limited space, other electromagnetic solitary equations are no longer listed.

For the reason that some solitary equations cannot be run the integral process, they will be run the square sum process.

Applying least square method, "partial and temporary unified electromagnetic theory so far" can be expressed in the following form of "partial and temporary unified electromagnetic variational principle so far"

$$\Pi_{\mathrm{EM}} = \sum_1^n W_i \int_{\Omega_i} F_i^2 d\Omega_i + \sum_1^m W_j' S_j^2 = \min_0 \qquad (5)$$

where: the subscript EM denotes that the suitable scope is the electromagnetism, all of the equations $F_i = 0$ denote so far discovered (derived) all of the equations related to electromagnetism, all of the equations $S_i = 0$ denote so far discovered (derived) all of the solitary equations related to electromagnetism, and W_i and

W_j' are suitable positive weighted constants.

Clearly, here n and m are all very large integers.

2 Applying least square method to establish "partial and temporary unified gravitational theory so far"

Firstly, it should be noted that, for different gravitational problems, the different formulas or different gravitational theories should be applied. The "universal gravitational formulas or equations" actually cannot be existed. For this conclusion, many scholars do not realize it. In addition, all of the different gravitational formulas can be written as the form of Eq.(1) (namely the form that the right side of the expression is equal to zero).

The first formula should be mentioned is Newton's universal gravitational formula

$$F = -\frac{GMn}{r^2} \qquad (6)$$

It can be written as the following form

$$F_1 = 0 \qquad (6')$$

where: $F_1 = F + \frac{GMm}{r^2}$

Prof. Hu Ning derived an equation according to general relativity, with the help of Hu's equation and Binet's formula, in reference [4] we derived the following improved Newton's formula of universal gravitation

$$F = -\frac{GMm}{r^2} - \frac{3G^2M^2mp}{c^2r^4} \qquad (7)$$

where: G is gravitational constant, M and m are the masses of the two objects, r is the distance between the two objects, c is the speed of light, p is the half normal chord for the object m moving around the object M along with a curve, and the value of p is given by: $p = a(1-e^2)$ (for ellipse), $p = a(e^2-1)$ (for hyperbola), $p = y^2/2x$ (for parabola).

This formula can give the same results as given by general relativity for the problem of planetary advance of perihelion and the problem of gravitational defection of a photon orbit around the Sun.

It can be written as the following form

$$F_2 = 0 \qquad (7')$$

where: $F_2 = F + \frac{GMm}{r^2} + \frac{3G^2M^2mp}{c^2r^4}$

It should be noted that, according to Eq.(6) and Eq.(7) the FTL can be existed.

In some cases, we should also consider the following gravitational formula

including three terms

$$F = -\frac{GMm}{r^2}(1+\frac{3GMp}{c^2r^2}+\frac{wG^2M^2p^2}{c^4r^4}) \qquad (8)$$

where: w is a constant to be determined.

It can be written as the following form

$$F_3 = 0 \qquad (8')$$

where: $F_3 = F + \frac{GMm}{r^2}(1+\frac{3GMp}{c^2r^2}+\frac{wG^2M^2p^2}{c^4r^4})$

But for the example that a small ball rolls along the inclined plane in the gravitational field of the Earth, all of the above mentioned formulas cannot be applied. In reference [5], we present the following gravitational formula with the variable dimension fractal form (the fractal dimension is variable, instead of constant).

$$F = -GMm/r^{2-\delta} \qquad (9)$$

where: $\delta = 1.206\times10^{-12}u$, u **is the horizon distance that the small ball rolls.**

It can be written as the following form

$$F_4 = 0 \qquad (9')$$

where: $F_4 = F + GMm/r^{2-\delta}$

In addition, the gravitational field equations of Einstein's theory of general relativity, and the gravitational formula and gravitational equations derived by other scholars, can also be written as the form of Eq.(1) (namely the form that the right side of the expression is equal to zero).

In some cases, when dealing with gravitational problem, we should also consider some principle of conservation, such as the principle of conservation of energy. Here we write the principle of conservation of energy as the form of Eq.(1) (namely the form that the right side of the expression is equal to zero). So do the other principles of conservation.

In references [5], we discussed two cases to apply the principle of conservation of energy directly and indirectly.

To apply the principle of conservation of energy directly is as follows.

Supposing that the initial total energy of a closed system is equal to $W(0)$**, and for time** t **the total energy is equal to** $W(t)$**, then according to the principle of conservation of energy, it gives**

$$W(0) = W(t) \qquad (10)$$

It can be written as the following form

$$F_5 = \frac{W(t)}{W(0)} - 1 = 0 \qquad (11)$$

To apply the principle of conservation of energy indirectly is as follows.

Supposing that we are interested in a special physical quantity Q, not only it can be calculated by using the principle of conservation of energy, but also can be calculated by using other gravitational formula. For distinguishing the values, let's denote the value given by other laws as Q, while denote the value given by the principle of conservation of energy as Q', then the equation to apply the principle of conservation of energy indirectly is as follows

$$F_6 = \frac{Q}{Q'} - 1 = 0 \qquad (12)$$

Now we discuss some solitary equations established only for the solitary points or special cases.

The first one is the solitary equation about the gravitational constant.

$$S_1 = G - 6.67 \times 10^{-11}\ \mathrm{N \cdot m^2/kg^2} = 0 \qquad (13)$$

The second one is considering the deflection angle for the problem of gravitational defection of a photon orbit around the Sun.

By using general relativity or improved Newton's formula of universal gravitation (namely Eq.(7)), the deflection angle ϕ_0 reads

ϕ_0 =1.75”

However, according to the experiment, we should have ϕ =1.77±0.20, taking the average, it gives

ϕ =1.77”

According to this expression, the corresponding solitary equation is as follows

$$S_2 = \phi - 1.77'' = 0 \qquad (14)$$

Other solitary equations include: the solitary equations established by the values of planetary advance of perihelion, the solitary equations established by the unusual values of gravity at different times during total solar eclipse, and the like. Due to the limited space, they are no longer listed.

Applying least square method, "partial and temporary unified gravitational theory so far" can be expressed in the following form of "partial and temporary unified gravitational variational principle so far"

$$\Pi_{\mathrm{GRAVITY}} = \sum_1^n W_i \int_{\Omega_i} F_i^2 d\Omega_i + \sum_1^m W_j' S_j^2 = \min_0 \qquad (15)$$

where: the subscript GRAVITY denotes that the suitable scope is the gravity, all of

the equations $F_i = 0$ denote so far discovered (derived) all of the equations related to gravity, all of the equations $S_i = 0$ denote so far discovered (derived) all of the solitary equations related to gravity, and W_i and W_j' are suitable positive weighted constants.

It should be noted that, as we establish "partial and temporary unified theory so far" and the corresponding "partial and temporary unified variational principle so far", the including phenomenon is allowed. For example, the three terms gravitational formula Eq.(8) includes Eq.(7), while Eq.(7) includes Eq.(6). But we still consider these three equations simultaneously. This is because that, in some cases Eq.(7) is more convenient; as for Eq.(6), it is enough in most cases, moreover, putting Eq.(6) at the most prominent position, express our respect to Newton who is the greatest scientist in the history. In addition, the coexisting phenomenon is also allowed. For example, the gravitational formulas of classical mechanics, the gravitational field equations of Einstein's theory of general relativity, and the equations of other gravitational theories are coexisting. For the solution that is satisfying two or more than two theories simultaneously, or solving the problems in different fields simultaneously, and the like, we will discuss them in other papers (such solutions may only be reached with the method of variational principle).

Now we discuss the applications of variational principle Eq.(15).

Example 1. Setting $W_2 = 1$ and $W_1' = 1$ in variational principle Eq.(15), and other weighted constants are all equal to 0, namely applying Eq.(7) and Eq.(13) to derive the changing rule for the gravitational coefficient G' (instead of the gravitational constant G) and make the gravitational formula in accordance with the inverse square law.

In references [6], changing Eq.(7) into the following form in accordance with the inverse square law

$$F = -\frac{G'Mm}{r^2}$$

It gives

$$-\frac{G'Mm}{r^2} = -\frac{GMm}{r^2} - \frac{3G^2M^2mp}{c^2r^4}$$

Then we have the changing rule for the gravitational coefficient G' as follows

$$G' = G(1 + \frac{3GMp}{c^2r^2}) \qquad (16)$$

For problem of Mercury's advance of perihelion, we have

$$(1 + 5.038109 \times 10^{-8})G \le G' \le (1 + 1.162308 \times 10^{-7})G$$

For problem of gravitational defection of a photon orbit around the Sun, we have

$$G \le G' \le 2.5G$$

Example 2. Setting $W_4 = 1$ and $W_6 = 1$ in variational principle Eq.(15), and other weighted constants are all equal to 0, namely applying Eq.(9) and Eq.(12) to determine the unknown δ in Eq.(9).

According to Eq.(12), variational principle Eq.(15) can be simplified into the following form applied the law of conservation of energy indirectly

$$\Pi = \int_{x_1}^{x_2} (\frac{Q}{Q'} - 1)^2 dx = \min_0 \qquad (17)$$

The solution procedure can be found in reference [5]. For the final optimum approximate solution, the value of Π calculated by the improved universal gravitational formula and improved Newton's second law is equal to 0.1906446, it is only 0.033% of the value of Π_0 calculated by the original universal gravitational formula and original Newton's second law.

Example 3. Setting $W_3 = 1$ and $W_2' = 1$ in variational principle Eq.(15), and other weighted constants are all equal to 0, namely applying Eq.(8) and Eq.(14) to determine the unknown w in Eq.(8).

The solution procedure can be found in reference [6], the final result is as follows.

The range of value of w is as follows

0.08571≤ w ≤0.42857

Taking the average, it gives

w =0.25714

For the problem of gravitational defection of a photon orbit around the Sun, the general relativity cannot give the solution that is exactly equal to the experimental value, while the method presented in this paper can do so.

It should be noted that, for variation principle Eq.(15), if there is an exact solution, then its right side can be equal to 0, here the variational principle Eq.(15) is exactly equivalent to $F_i = 0$ and $S_i = 0$ (see example 1 and example 3). If there is only an approximate solution, the right side of variational principles Eq.(15) can only be approximately equal to 0, at this moment we can apply the appropriate optimization method to seek the best approximate solution, and the effect of the solution can be judged according to the extent that the value of Π is close to 0 (see example 2).

3 Other "partial and temporary unified theory so far", especially "partial and

temporary unified theory of natural science so far"

To extend the above mentioned method, we can get various "partial and temporary unified theory so far".

For unified dealing with the problems of four fundamental interactions, applying least square method, "partial and temporary unified theory of four fundamental interactions so far" can be expressed in the following form of "partial and temporary unified variational principle of four fundamental interactions so far"

$$\Pi_{G.E.S.W}=\sum_{1}^{n}W_i\int_{\Omega_i}F_i^2d\Omega_i+\sum_{1}^{m}W_j'S_j^2=\min_0 \qquad (18)$$

where: the subscript G.E.S.W denotes that the suitable scope is the four fundamental interactions, all of the equations $F_i=0$ denote so far discovered (derived) all of the equations related to four fundamental interactions, all of the equations $S_i=0$ denote so far discovered (derived) all of the solitary equations related to four fundamental interactions, and W_i and W_j' are suitable positive weighted constants.

For unified dealing with the problems of natural science, applying least square method, "partial and temporary unified theory of natural science so far" can be expressed in the following form of "partial and temporary unified variational principle of natural science so far"

$$\Pi_{NATURE}=\sum_{1}^{n}W_i\int_{\Omega_i}F_i^2d\Omega_i+\sum_{1}^{m}W_j'S_j^2=\min_0 \qquad (19)$$

where: the subscript NATURE denotes that the suitable scope is all of the problems of natural science, all of the equations $F_i=0$ denote so far discovered (derived) all of the equations related to natural science, all of the equations $S_i=0$ denote so far discovered (derived) all of the solitary equations related to natural science, and W_i and W_j' are suitable positive weighted constants.

In this way, the theory of everything to express all of natural laws, described by Hawking that a single equation could be written on a T-shirt, is partially and temporarily realized in the form of "partial and temporary unified variational principle of natural science so far".

As already noted, for "partial and temporary unified theory so far" and the corresponding "partial and temporary unified variational principle so far", the including phenomenon and coexisting phenomenon are allowed. Here we would like to point out that, besides the including process and coexisting process, the simplifying process is also allowed. For example, the first simplifying result of "partial and temporary unified theory of natural science so far" is "theory of

conservation of energy", it can be expressed in the following form of "first simplifying variational principle for partial and temporary unified theory of natural science so far" (it is shorted as "variational principle of conservation of energy").

$$\Pi_{\text{NATURE}}^{\text{SIMPLE–1}} = \int_{t_1}^{t_2} (W(t)/W(0) - 1)^2 dt = \min_0 \qquad (20)$$

This "variational principle of conservation of energy" can be applied for unified dealing with many problems in physics, mechanics, astronomy, biology, engineering, and even many issues in social science. For example, in reference [7], based on "theory of conservation of energy", for some cases we derived Newton's second law, the law of universal gravitation, and the like.

Further topics are finding more simplifying processes (simplifying variational principles) and their combinations. These will make "partial and temporary unified theory of natural science so far" simpler, clearer, more perfect, and more practical.

4 Applying "partial and temporary unified theory of natural science so far" to deal with a number of FTL problems

As well-known, principle of constant speed of light is one of the two basic principles of special relativity. According to this principle, light travels in straight line in vacuum at a speed of c=300,000 km/s.

Now we explain that principle of constant speed of light is wrong, and as light traveling in vacuum, the direction and the value of its speed are all variable. The changing range of its direction is between 0º to 180º, and the changing range of its value is between 0 to 2c (c=300,000 km/s). As for the speeds of other matters (bodies) and particles, the author agrees with Prof. Smarandache's viewpoint in reference [8] that there is not the upper limit of speed in the universe. The hypothesis that there is the upper limit of speed will be contradicted to the principle of conservation of energy.

Because the speed of light is a vector, therefore as discussing that whether or not the speed of light is variable, we should consider two aspects of the direction and the value.

Now we illustrate the speed of light is variable from two aspects of the direction and the value.

Firstly, Einstein also recognized that the speed of light is variable in direction.

In reference [9], Einstein pointed out that, one of the meaningful inferences and conclusions of the general principle of relativity is: commonly light travels along a curve in gravitational field. Due to the bending of light can only be happened as the speed of light is changing along with the changing of the position, so we have to make this conclusion: the effectiveness of special principle of relativity cannot be considered as endless, the result of special principle of relativity is tenable only in the case that we cannot consider the influence of gravitational field to the phenomenon (such as the light phenomenon).

Einstein said here very clearly that the direction of speed of light is variable in gravitational field, therefore the speed of light is variable.

Immediately a question that Einstein might not consider is appeared: will light

be bending only in gravitational field?

But this is not correct. In June, 2007, an article published in science and technology daily and other media reported that, a new material making light to be bended can be applied to produce the invisibility cloak. Although Einstein's research work did not demonstrate that light can be bended in this way, the scientists of Duke University, United States announced a few weeks ago that, they unveiled the mystery of "invisibility cloak", and succeeded in covering an area of 5 square inches of object to avoid for the microwave detection. This material can change the direction of microwave so that it bypasses the object. The researchers of Duke University said that they hope to develop other types of invisibility cloak that can even survive the visible light.

Another very obvious fact is that, when the light is projected to a mirror with an angle that is not equal to zero, after reflecting its direction will be changed. In this case, the changing range of its direction is between 0º to 180º.

Now we discuss the changing range of the value of speed of light.

In reference [9], Einstein firstly noticed the exterior contradiction between the law of light propagation and the principle of relativity. The main content is as follows.

Again, we choose roadbed as the reference system. If a light is projected along with the roadbed, the front end of this light will be spread relative to the roadbed with the speed of light c. Now we assume that our railway carriage is still traveling at speed v on the railway rail, its direction is the same as the direction of the light. We study the propagation speed of this light relative to the railway carriage. Setting W is the speed of light relative to the carriage, we have

$$W=c-v$$

Therefore the speed of light relative to the carriage is less than the value of c. But this result is incompatible with the principle of relativity. Because, according to the principle of relativity, the law of propagation of light in vacuum, just like all of other universal laws of nature, whether taking carriage as reference object, or taking railway rail as reference object, the results must be the same.

For this type of contradiction, Einstein put forward two options: (1) Give up the principle of relativity, or give up the law of propagation of light in vacuum. (2) Systematically follow-up these two laws, and get a logic rigorous theory.

According to the second option, Einstein established the special theory of relativity.

Einstein's meaning is that, in this case, the value of the speed of light is unchanged.

While our problem is that, in other cases, whether or not the value of the speed of light is still unchanged?

The answer is no.

Let us consider the two rays of light, taking a ray of light as the frame of reference to inspect the speed of another ray of light.

Since we can choose the carriage traveling at speed v on the rail as the frame of reference, it should be allowed to choose a ray of light as the frame of reference.

If taking a ray of light as the frame of reference, when the two rays of light are located on the same straight line and have the same direction (the angle between the two rays is equal to 0º), the speed of another ray of light relative to the first ray of light is equal to zero. When the two rays of light are located on the same straight line and have the opposite directions (the angle between the two rays is equal to 180º), the speed of another ray of light relative to the first ray of light is equal to 2c (c=300,000 km/s). When the angle between the two rays of light is equal to other value, the variation range of the speed of another light relative to the first ray of light equals 0 to 2c.

In this case, choosing the law of composition of velocities from "partial and temporary unified variational principle of natural science so far" (Eq.(19)), supposing that two rays of light are projected from a single point at the same time (the angle is equal to θ), from the front end photon of a ray of light to observe the front end photon of another ray of light, the speed of the front end photon of another light is as follows

$$V_{Photon}=2c\sin(\theta/2) \qquad 0\le\theta\le\pi \qquad \textbf{(21)}$$

In other cases, whether or not the value of the speed of light is variable, and whether or not the changing range is still limited in the range of 0 to 2c, these questions are further topics to be discussed.

In addition, for the experimental verification of the principle of constant speed of light, we should say that, all of the experiments are very limited, and a number of factors have not been considered. For example, whether or not the speed of light is variable in the cases that the light is acted by the strong source of heat radiation and the like?

Here, we can point out the wrong results caused by Lorentz transformation.

As we have said, when the two rays of light are located on the same straight line and have the opposite directions, the speed of another ray of light relative to the first ray of light is equal to 2c. But in this case, the Lorentz transformation may give the wrong result that the speed of another ray of light relative to the first ray of light is still equal to c.

In addition, the special theory of relativity and the principle of constant speed of light can also cause other errors.

Now we discuss the phenomenon of "clocks look slower", and the wrong result caused by this phenomenon.

As well-known, the phenomenon of "clocks look slower" causes the twin paradox: according to theory of relativity, supposing there are a pair of twins, the younger brother keeps on the Earth, the elder brother roams through the outer space as a astronaut. As the elder brother returns to the Earth, he will be much younger than his younger brother. The twin paradox means: Because the movement is relative, also may think that the younger brother is carrying on the space navigation, therefore the younger brother should be much younger than the elder brother. Such two conclusions are mutually conflicted.

There are many explanations given by theory of relativity to this twin paradox

(some of them even use general theory of relativity to carry on the complex computation), but their basic starting point is as follows: Two brothers' states of motion are different. Thereupon we may make another special twin paradox that two brothers' states of motion are quite same. If the younger brother doesn't keep on the Earth, but the elder brother and the younger brother all ride their respective high speed airships, facing the completely opposite directions to navigate from the identical time and the identical site with the same speed along a straight line, after a long period they begin to decelerate simultaneously until static state, then they turn around to navigate again along the same straight line with the manner of front end to front end, finally simultaneously return to the starting point. From the younger brother's viewpoint that, according to the theory of relativity, the elder brother should be much younger than the younger brother; Similarly, from the elder brother's viewpoint that, according to the theory of relativity, the younger brother should be much younger than the elder brother. Who is much younger to the end?

With the theory of relativity, how to explain this special twin paradox that two brothers' states of motion are quite same?

It should be noted that, for the problems associated with energy and speed, if considering the principle of conservation of energy as the only truth, in that way the other so-called "principle", "law", "hypothesis", and so on, are all no longer the truth, therefore the hypothesis that there is the speed limit is not the truth, and it would be a mistake in some cases.

Now we discuss that, when the speed of an object is close or equal to the speed of light, for breaking the light barrier, the speed of this object could be faster than light as it passes through the Sun's gravitational field.

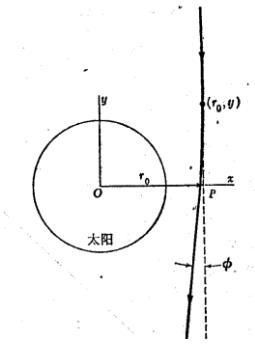

Figure 1. An object passes through the Sun's gravitational field at the speed of light

As shown in Figure 1, an object passes through the Sun's gravitational field at the speed of light from the infinite distance, assuming that its closest distance to the Sun is equal to r_0, if the orbit of this object will be tangent to the Sun, then r_0 is equal to the radius of the Sun. Try to decide this object's maximum speed $v_{\max}$ as its distance to the Sun is equal to r_0.

Choosing the principle of conservation of energy and the improved gravitational formula Eq.(7) from "partial and temporary unified variational principle of natural science so far" (Eq.(19)).

Substituting the half normal chord p given by general relativity or improved gravitational formula into Eq.(7), it gives

$$F = -\frac{GMm}{r^2} - \frac{1.5GMm_0^2}{r^4} \qquad (22)$$

For the reason that, as the object is located at the infinite distance, and the closest distance to the Sun, the energies should be equal, so we have

$$\frac{1}{2}mc^2 = \frac{1}{2}mv_{max}^2 - \frac{1.5GMm}{r_0}$$

It gives

$$v_{max} = \sqrt{c^2 + 3GM/r_0} \qquad (23)$$

Obviously this speed is faster than the speed of light, if the orbit of this object will be tangent to the Sun, after calculating it gives

$$v_{max} = (1 + 3.18 \times 10^{-6})c \qquad (24)$$

Now we discuss the phenomenon caused by Hubble's law.

Choosing the Hubble's law from "partial and temporary unified variational principle of natural science so far" (Eq.(19)).

Hubble's law reads

$$V = H_0 \times D \qquad (25)$$

where：V —（galaxy's） far away speed, unit: km / s；H_0 —Hubble's Constant, unit: km / (s. Mpc)；D —（galaxy's） far away distance, unit: Mpc.

According to Hubble's law, we have

$$V = \frac{dD(t)}{dt} = H_0 \times D(t) \qquad (26)$$

From this differential equation, it gives

$$D = ke^{H_0 t} = k\exp(H_0 t) \qquad (27)$$

where：k — a constant to be determined; if we assume that the distance is positive, then its value is positive too.

It gives the far away speed as follows

$$V = kH_0 \exp(H_0 t) \qquad (28)$$

The far away acceleration is as follows

$$a = dV/dt = kH_0^2 \exp(H_0 t) \qquad (29)$$

According to Newton's second law, the force acted on this galaxy is as follows

$$F = ma = mkH_0^2 \exp(H_0 t) \qquad (30)$$

Based on Eq.(28), apparently we can reach the result that because the value of far away speed of a galaxy is the exponential function of time, therefore it can be faster-than-light.

For more detail about this question, we will discuss it in another paper.

5 Conclusions

Not only "Partial and temporary unified variational principle of natural science so far" can be printed on a T-shirt, but also it can be used to deal with FTL problems.

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