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***Corresponding author:** Huaan Zhang, Family Research Group on Superluminal Phenomena and Communications, Apt. 22-441, No. 10 Xi Tu Cheng Lu, Haidian District, Beijing 100088, China, Tel: 86-1062281482; E-mail: huaanzhang@yahoo.com

ORCID: <https://orcid.org/0000-0002-6041-8869>

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Research Article

Research of superluminal phenomena revealed the essence and limitation of the relativity

Huaan Zhang* and Zihua Zhang

Family Research Group on Superluminal Phenomena and Communications, PR China

Abstract

Superluminal phenomena have been viewed as a contradiction to the Special Relativity, the in-variance principle of light velocity. This paper proposed the theory of the two kinds of epistemology and world, to explain the contradiction between the Special Relativity (SR) and Superluminal phenomena. It also discussed the influence of superluminal research on other science and technology, such as information science and superluminal communications.

Introduction

The observation of superluminal phenomena [1] contradicts Special Relativity and has caused debate and confusion in the Physics community. This article summarizes our research and understanding of this matter.

Relativity is considered one of the two greatest achievements in the 20th century which presents the four-dimension time-space view different from the classical mechanics, and some results are also confirmed by observation, so The Relativity is temporarily mistaken for universal truth. Einstein also extended some conclusions of the Special Relativity (SR) to the objective World and believed that: all movement of bodies should obey the conclusion of SR; all physics theorem and law should obey the invariance under the Lorentz transformation; nobody (including the signal) can move faster than c ; light velocity is constant and is same for all observers. Some people even think the four-dimension view of time-space is higher than that in classical mechanics and can dominate the latter. Out of respect, People always thought what Einstein said was the absolute truth.

Recently, superluminal phenomena have been observed [1,2] more often. This has caused debate and confusion in the Physics community, in begin of this era, The experiment result of the WKD experiment was suspected and in 2011 European scientists found that the neutrino velocity slightly larger than c [3] was rejected by some. The research of superluminal phenomena and communications proposed by us be refused since some leader said, you are anti-Einstein so can't talk to you. Our project proposal and application to all levels have not been answered. In pursuit of truth, we have to form a family research group supported by our family to insist on this research. We believe that the misunderstanding of the Relativity has seriously hindered the development and in-depth study of science and technology, for this reason, we have made a preliminary discussion of the essence of the Relativity and its scope of e application. How to treat the existing theories especially the theory of the celebrities will be a test of our scientific research quality and research level. Meanwhile, we have studied the influence of the superluminal research on Physics, informatics, and other science and technology. We now introduce part of it here, hoping to attract the attention



and comments of the world, which is beneficial to the in-depth development of research work. Criticism and correction are welcome.

Preliminary discussion of the essence of the relativity

In the 19th century, Classical mechanics was quite mature, but the calculated result of celestial movement was not consistent with the observation and became a big problem in physics. For this reason, in 1905 Einstein introduced the observation effect and four-dimensional view of time and space, and created the Special Relativity, which has two basic principles, the special relative principle and the principle of light-speed invariance. He thought that light velocity is the solution to the Maxwell equation and should be independent of the state of the light source and observer. He has a famous idea: If you advance with one light beam go forward at speed c and see that another light beam is also transmitted at speed c . hence he thinks the light velocity for the carriage is the same for the roadbed [4], we think that is wrong. For the essence of the Relativity, we have to understand epistemology:

Epistemology [5,6]

In the long-term social practice, people have created two ways to recognize the external world, i.e. two kinds of epistemology: objective and subjective (visual) epistemology which corresponds to two kinds of the world: objective and subjective world.

A. Objective epistemology

The body exists in the outside world objectively and has nothing to do with observation, all of the outside body form an objective world. The subjects unrelated to observation such as classical mechanics, physics, quantum mechanics, etc. belong to this category. These subjects study the practice law of change and movement of the body in the objective world, all of these subjects recognize the presence of superluminal motion, this is the reason why classical and quantum mechanics contradict the Relativity in superluminal problem.

B. Subjective (visual) epistemology

We recognize the existence of the outside body through observation. Only the body that emits light (or electromagnetic radiation) received by our eye or other instrument produces a vision on the retina is recognized. Because the light speed is limited, it takes time $\Delta t = L/c$ to reach the human eyes. L is the distance between the body and the observer. For a moving body, we only observed its image A' (Figure 1), since the body observed has moved to a new place from its original location a distance $\Delta L = v \times \Delta t$ or $\Delta L = \int_0^{\Delta t} \vec{v} \times dt$. Here v is the body's velocity. So that the body you have seen only is the image (t ago) or the virtual body, not the body itself. As we see the Sun was 2.5-4 minutes ago and is thousands of kilometers from the real position. Relativity and astronomy just belong to subjective epistemology. All the images or virtual bodies also constitute a virtual (visual) world. In such a case the observer is at the center of the events and all observed results are relative.

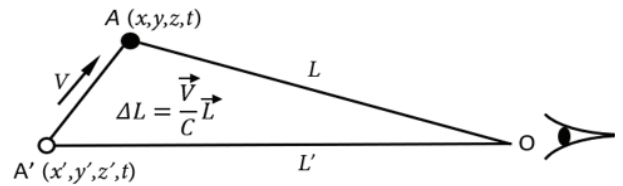


Figure 1: The relationship between body and imagine.

Relativity and astronomy belong to the Subjective (visual) epistemology, and they discuss the visual problem related to the observation, the result of observation connected with the state of the observer. All of its research work is tied to the light velocity c . because light speed is limited, so the observed result is much different from the real situation of the body (difference between image and body), it is the visual error. The faster the body moves, the farther away from the observer, the greater difference. So, we say the celestial structure map is far from the real celestial structure map and aerospace needs the latter.

Visual mechanics

Corresponding to the classical mechanics that study the motion law of the body in the objective world, we called the science that studies the visual motion law of the body in the virtual world the visual mechanics. Usually, we have two kinds of visual mechanics to study.

1. Observer studies the visual motion law of the body in different inertial systems.
2. Observer in different inertial systems studies the motion law of the same body.

For distinction, we called that study the first kind of phenomenon real visual mechanics, and the second pseudo visual mechanics; For real visual mechanics we have deduced the time-space transformation between different inertial systems [7].

$$y' = y, z' = z, x' = x - vt, t' = (1 - v/c)t, \tag{1}$$

$$y = y', z = z', x = x' - vt', t = (1 - v/c')t';$$

It corresponds to the Galileo transformation in classical mechanics. Now the co-variance of time-space quantities between the different coordinate systems should be

$$x^2 + y^2 + z^2 - c^2 t^2 = x'^2 + y'^2 + z'^2 - c'^2 t'^2 \tag{2}$$

Because for an observer the value of the light speed is different in a different system, due to $c \neq c'$, equation (2) no solution, however, from equation (1) we can get

$$c' = c - v \text{ and } c = c' + v, \tag{3}$$

Obviously, for the carriage and roadbed, the light velocity is different even if this difference is small. Einstein made mistake to think the light speed for the carriage was the same as for the roadbed. Real visual mechanics has no limit on the velocity value, which can investigate the superluminal phenomena and explain a series of celestial phenomena such as: "black hole", flares, and the variance of starlight Brightness.



For the pseudo visual mechanics that study motion law of the same body for two observers in the different inertial systems, since for the still observer in any system, the light velocity is c . Defined [8].

$$S^2 = x^2 + y^2 + z^2 - c^2 t^2, \quad S'^2 = x'^2 + y'^2 + z'^2 - c^2 t'^2. \quad (4)$$

as the event interval in each system, let $S^2 = S'^2$, i.e. the covariance of two systems is

$$x^2 + y^2 + z^2 - c^2 t^2 = x'^2 + y'^2 + z'^2 - c^2 t'^2, \quad (5)$$

From equation (5) Einstein got the time-space transformation between two systems is Lorentz transformation.

$$x' = \frac{x - vt}{\sqrt{1 - (v/c)^2}}, \quad t' = \frac{t - vx/c^2}{\sqrt{1 - (v/c)^2}}, \quad y' = y, \quad z' = z. \quad (6)$$

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

The difference between equations (2) and (5) is that in equation (2) one observer and two systems, but equation (5), two observers and two systems. Due to the researched problem being different, the time-space transformation is different too. The Lorentz transformation is the time-space transformation for the observers in different inertial systems observing the same body. Therefore, Special Relativity is only pseudo visual mechanics and is different from the real one. Only in the $c \gg v$ situation, the light velocity can consider as in-variance approximately, the Special Relativity is close to the real visual mechanics and coordinate transformation also approach to Galileo transformation. But we have to point out that the condition for equation (5) is $c \geq v$, if $v > c$ the coordinates are virtual, $v = c$ is a singularity. The General Relativity has only introduced the general relative (equivalence) principle and gravitational field theory based on the Special Relativity and does not exceed the scope of the pseudo visual mechanics. The Relativity limited the velocity value $v < c$, therefore can't study superluminal phenomena that is the limitation of the Relativity, not means the superluminal does not exist. So that the Relativity can't be used to deny the superluminal phenomena.

Relativity as pseudo visual mechanics that study some motion law of body in virtual space is different from the classical mechanics that study the motion law of body in real space completely. Seen by you may not be true, just as the observer on the forward train sees the body outside the window seem to rotate, but in fact outside bodies are parallel motion with the train, so that the time-space bending only is a visual phenomenon due to the change of coordinate is limited by the following equation.

$$x^2 + y^2 + z^2 - c^2 t^2 = 0 \quad (7)$$

The real time-space may not be curved. This is the difference between visual phenomena and actual situations. What you see may not be true, it is a visual error. Relativity is an imaginary theory, in particular, the Relativity isn't the real visual mechanics, but provides a method for the observer

in different systems to study the same things. The idea that the Relativity is superior to even can dominate the Classical mechanics is wrong. The idea that all physic laws should be co-variance under the Lorentz transformation and the body motion speed can't be faster than c is also wrong naturally. Although Einstein contributed greatly and provide so many glorious ideas to physics he confused two kinds of epistemology and the world and made many mistakes in physics. Relativity isn't a universal truth and can't be used as a criterion to judge the natural law and explain objective phenomena.

Classical mechanics and quantum mechanics belong to objective epistemology, recognizing the superluminal phenomena and the Relativity belongs to visual epistemology that denies the superluminal phenomena, but the real visual mechanics recognize the superluminal. We believe that the superluminal is a natural phenomenon that has been adopted by the Encyclopedia of China [9]. We also think that the velocity of the electromagnetic wave is determined by the electromagnetic property of the medium, and the velocity of the body is determined by their motion law and no matter of the Relativity. The superluminal propagation of the information must be possible.

The defect of the SR

Many people think that Relativity is a truth. After research, we find that is not the case, but there are some shortcomings and serious mistakes. Some are discussed below.

The conclusion of the rule contraction and clock retardation may not be correct

An important conclusion obtained by the Lorentz transformation is the contraction of the rule and the retardation of the clock in a moving system [10] which some books believe occurs. But in our opinion, this conclusion isn't self-consistent and maybe not be correct. Let system $A(x,y,z)$ and $A'(x', y', z')$ do the relative motion, the relative velocity is v . According to the Lorentz transformation we can get

$$x_2 - x_1 = (x_2 - x_1)\sqrt{1 - (v/c)^2}; \quad t_2 - t_1 = (t_2 - t_1)/\sqrt{1 - (v/c)^2}. \quad (8)$$

But from the reverse Lorentz transformation, we also can get

$$x_2 - x_1 = (x'_2 - x'_1)\sqrt{1 - (v/c)^2}; \quad t_2 - t_1 = (t'_2 - t'_1)/\sqrt{1 - (v/c)^2}. \quad (9)$$

From equations (14), and (15) the observer A in system $A(x,y,z)$ and A' in system $A'(x',y',z')$ consider the rule contradict and clock retard happen in the opposite system. Which one is correct? What is the matter? We think these contradictions and retardation may have no real meaning only are "apparent" phenomena. Just as two observers with equal height, who think each other is shorter than himself, the farther the more so. It just is a visual mistake.

The understanding of the Addition theorem of velocity may incorrect

From the Lorentz transformation, Einstein got the Following equation [10]

$$u = \frac{u' + v}{1 + \frac{u'v}{c^2}} \quad (10)$$

This is the well-known velocity addition theorem, unlike in Classical mechanics, if $u' = c$, and $v = c$, can still have $u = c$. which is the reason why Einstein asserted that the velocity value of the body can't be faster than c . The problem is that here v is the relative velocity of two systems, but u and u' is the velocity values in a different system. According to Lorentz transformation, the units of time and length for u , u' are different. Who can put the velocities with a different unit and indifferent system together to plus or minus? Who can do that? Anyone with even a modicum of intelligence would suspect this action. We think perhaps the formula (16) should be called the corresponding principle of velocity. i.e. the velocity u in system A corresponds to a velocity u' in system A', they have different units, in the different systems too, are different quantities. Between them, there only has a corresponding relation and can't put them together to plus or minus. Therefore the conclusion the velocity can't be faster than c also fails.

The principle of light speed in-variance is incorrect

Special Relativity is the basis of General Relativity [4] and contains two basic principles. 1, (narrow sense) the Relativity principle; 2, the principle of light-speed invariance. The principle of light speed in-variance is the basis of the whole theory of Relativity. Einstein considered that the light speed in a vacuum is the solution of the Maxwell equation, and should be independent of the state of the observer and the light source [10], he had a famous idea: As you follow a light beam go forward at speed c to see that another light beam is still transmitted at the speed c , that is the rudiment of the invariance of light speed. In fact, in the medium, the light velocity is related to the state of the observer due to the dragging effect. Even if in the vacuum, the interference of two light beams also proves that the two beams are relatively stationary, otherwise the interference stripe will not occur. The conclusion, that the speed of light is independent of the observer state, is incorrect. On the other hand, for solving the Maxwell equation the reference frame is the vacuum itself, the light velocity only for the observer rest to vacuum system equal to c . Einstein's idea the light velocity for the carriage is the same as that for the roadbed is wrong. Strictly the light velocity is c only for the observer rest in a vacuum. The principle of light speed in-variance also violates the basic principle of all observed result is relative and it makes the Relativity theory itself not self-consistent. We think the light velocity depends on the state of the observer certainly, and the in-variance of the light speed only means in any vacuum system the light velocity is c respect to an observer rest in the system, not as Einstein thought for anybody.

We still can list more questions in SR which means some contents and conclusions of SR may incorrect. Special Relativity isn't a universal truth some conclusions obtained from it also may be not valid in any case.

The content and meaning of the research of the super-luminal phenomena and communications

The research of superluminal phenomena makes a great influence on the development of science and technology, now we introduce some of them as follows.

The influence on physics

Superluminal research reveals the existence of two epistemology and two worlds, which will inevitably promote the development of physics and resolve the confusion between the two epistemology and the problems of the two worlds. Classical mechanics and most science study the body's motion and change law in the objective world; Relativity and astronomy study the motion or change law of bodies in the virtual world, i.e. the visual movement law of bodies. They belong to different categories. Our study also reveals that the Relativity is only a branch of visual mechanics, and can explain only partial visual phenomena. Some conclusions of the Relativity do not apply to the motion of the body in the objective world. Einstein confused the boundaries between two epistemology and two worlds, and it was wrong to push the limit velocity theory in special Relativity to the objective world. We believe that the speed of the body in the objective world has nothing to do with the Relativity. Superluminal is a natural phenomenon, and four-dimensional and three-dimensional views of time-space are the property of two epistemology. No one is superior, and the idea that a four-dimensional space-time view is superior to three dimensions or even can rule the latter is not correct. We also believed that the idea that Relativity studies the rapid motion of the body, and the classical mechanics studies the slow-motion of the body is incorrect too, actually one studies the visual motion, and the other study the real motion of the body, which is the qualitative difference between them. There is a big difference between the virtual worlds and the objective worlds, which is the visual error. The astronomy celestial structures map is very different from the real celestial structures map. The space-time bending in the Relativity is due to the limitation of the change of space-time coordinates in the virtual space by formula (7), and there is no such limitation in the real space. Therefore, space-time bending does not apply to the real world. At present, the physics community confuses these two spaces, causing a lot of misunderstandings. Therefore, we suggest that physics should be introduced in the content of two epistemology and recognize the existence of two kinds of worlds; discuss the Physics in the objective world and virtual (visual) world separately, one study the real law of body motion or change in subjective (macro and micro) world, and another study the motion or change law of body in the virtual world, i.e. the visual law of body motion or change, The Relativity and astronomy belong to the later. Does The real Relativity kinetic only introduce the Lorentz transformation into the classical kinetic? [11], because the Lorentz transformation only is for the observers in two systems. We think the real visual dynamic system still needs to be further studied and established. Relativity still needs further understanding and explanation, and can't confuse the Relativity with the phenomena and law in the objective world. So that superluminal research impact



on physics. So many problems still need to be studied further, we have to treat the greatest physicist such as Einstein in the right way, his correct theory should be carried forward and his wrong theory should be resolutely corrected. We have corrected many important mistakes in physical concepts in our research work [12]. We think that any person's ideas are limited by time and life experience. No matter how great scientists are, they will make mistakes. Only by correcting their mistakes, the science and technology can advance. The practice of defying some people, without doing in-depth research and echo what the books say publicizing it without allowing them to correct theirs, and not allowing others to correct their mistakes is anti-scientific. It is useless to lead scientific and technological activities. Any physical theorem and law have certain derivation conditions, and it must also be a certain scope of application. It is important to determine its boundaries, and Zhang's research methods are not allowed to apply to Li.

Influence of superluminal research on other science

The vacuum light speed c is considered a constant in the Metrology. At present, the length measurement is mostly conducted by $L = ct$, c is the light speed in a vacuum, its value is 2.99792458×10^8 m/s, measuring light transmission time t can get the length value, measurement of time t can be with high precision, the accuracy of time-frequency reaches 10^{-14} , and the frequency stability of the laser can also reach the same order of magnitude. Therefore, the accuracy of the length measurement is determined by c . If light speed isn't constant, we have to know what influence the measurement of the length. We suppose the velocity of the surveyor respect to measured body O in air (ignoring the difference between vacuum and air) is v (Figure 2), the measured result in the condition of light speed in-variance is: $t_1 = L_1/c$; $t_2 = L_2/c$; $t = t_1 + t_2 = (L_1 + L_2)/c$; $L_1 - L_2 = vt$; therefore we can get: $L_1 = (c + v)t / 2$; $L_2 = (c - v)t / 2$;

When the light speed depends on the state of the observer above calculation need to be corrected. Since the surveyor is moving, so that the light velocity in back and forth direction is different, we have $t_1 = L_1/(c - v)$; $t_2 = L_2/(c + v)$; $t = t_1 + t_2$; $L_1 - L_2 = vt$; therefore we can get: $L_1 = (c + v)t / 2 - t(v^2/c)$; $L_2 = (c - v)t / 2 - t(v^2/c)$;

Because light velocity depends on the state of the observer, measured lengths become short $(L_1 - L_2)(v/c)$

Einstein thought that the speed of light c is unrelated not only to the state of the light source but also to the observer's state and is the same for any observer, that is wrong the speed of light depends on the state of the observer. The light velocity for a carriage is different from that for the roadbed although this difference is small. Two-beam interference experiments demonstrate that the two beams are relatively stationary. At present, the observer (spacecraft) speed can reach 10^4 m/s,

while the accuracy of time measurement and laser stability reach 10^{-14} , interferometry can also reach 10^{-9} accuracy, and the speed of light is 2.99792458×10^8 m/s, so it is not difficult to design the experiment to prove the speed of light depends on the observer state. It will change people's ideas and prove that Einstein's view is not all true, which will be an important task for future superluminal research. From the perspective of remote control and positioning, the accuracy of the vacuum speed of light as the base of the length measurement may still need to be improved, which requires the efforts of metrologists.

Influence of superluminal research on informatics [13]

The 21st century is an age of information. Since the development of "optical fiber communication" and the subsequent "mobile communications" in the 1970s, the face of communication has taken a new look. From the direction of communication development, it is mainly around the three aspects: (1) Safe and reliable; (2) large information capacity; available for more users to transmit information; (3) fast transmission speed. In addition to task (1) requiring pulse coding and quantum technology, because the information capacity is proportional to the transmission speed of the signal, the other two tasks need to improve the transmission speed of information. At present, mobile communication belongs to the category of atmospheric transmission, the transmission speed of information just as that of electromagnetic waves in the atmosphere, close to the vacuum light speed c ; the transmission speed of optical fiber communication is only c / n , n_1 is the refractive index of the fiber core, about 1.5, so the information transmission speed of optical communication is about $0.6c$. With the development of internet and extension use and the merger of three networks, as well as considering the future aerospace development require for higher capacity and faster speed of information transmission arises increasingly urgent. Developing superluminal information transmission will be a strategic task for future informatics. We have proved in theory the superluminal transmission of the light pulse is due to the reshaping by the dispersion of the medium [14] and the superluminal pulse can propagate a long distance without distortion [15]. Especially the transmission velocity can be larger than infinite which is impossible for any kind of technique. The superluminal transmission of information can have the following applications:

- 1) Improve the running speed of the computer.
- 2) Realize superluminal communication.
- 3) Improve the accuracy and speed of aerospace remote control, and telemetry especially provides a new means for interstellar communication.

Now we do a simple discussion as follows: the so-called supercomputer is using multiple computers in parallel form computer network, needs a line between each computer for information transmission, a single computer also has information processing and transmission two parts, information transmission speed improved, computer processing speed will improve too, this need note too

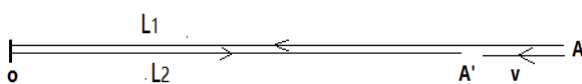


Figure 2: The distance between observer A and body O.



much explanation. As for the realization of superluminal communication, the transmission capacity of the system or line can be improved. The information capacity of the line is a ratio to the transmission speed of the signal so that a single channel can transmit the information of T bits, which can simplify multiplexing, duplexing and dispersion, and nonlinear compensation. What is an information highway? Only after the realization of superluminal information transmission can be talked about the information highway. In the remote control and telemetry of aerospace, the superluminal information transmission technology can improve the accuracy and speed, especially the time compensator that is made with the negative group speed (we call the 3Z compensator), which will shorten the information transmission time and will open up the way for the future interstellar communication. Therefore, we believe that the development of superluminal information transmission is very meaningful for both military and civilian use, and it is still a strategic task for the development of informatics. We theoretically proved that Brillouin's conclusion and derivation of the energy transmission speed cannot be greater than c are wrong. Therefore, the v_e / c curve in the famous Brillouin's figure is the transmission efficiency curve; the signal transmission speed is the phase velocity v_p of the loading wave in analogy communication, while the signal transmission speed in digital communication is the group speed v_g , v_p and v_g are the two basic speeds in two informatics. The value of the group velocity varies with the dispersion of the medium, which can go from 0 to positive infinite, then negative infinite to negative zero. When the group velocity is negative, the time advance phenomenon of the output pulse occurs, the smaller the absolute value, the larger the time advance, and the faster the speed, which obeys the inverse time causal law. We think that only when the superluminal communication system is built can say that the information highway has been built. Information superluminal transmission will promote the birth of superluminal informatics. Therefore, superluminal research has a profound impact on informatics, making informatics go to a higher level [16–20].

Conclusion

We proposed the two–epistemology and two–world theory to help resolve the longstanding debate on the contradiction between superluminal phenomena and special relativity. The impact of superluminal studies on physics, informatics, as well as other science and technologies, will be huge and far-reaching.

The development of superluminal communication is a strategic task of informatics. Only after building a superluminal communication system, we can say that we have built the information highway. Superluminal research will also have a profound impact on computers, aerospace, and the military and civil industry.

We believe there still are some wrong concepts in physics this is our opinion. Hope our research can help the technological development of the world. In particular, many concepts need to be studied in depth. We hereby present our views and some of the results, Welcome criticism and correction, and share our research results.

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