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An Exploratory View on Relationship between Space Dimensionality and Interaction Force among Objects

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ABSTRACT

To thoroughly explore and analyze the space dimensionality as well as the dynamic relationship between itself and the motion of objects, the author of this paper applies the approach of mathematical sets so as to discover the essential discipline of motion and motionlessness in the astrospace, and the author also tries to find perfect answers to the not-yet-satisfactorily-explained questions or phenomena in modern physical theories, providing a new theoretical foundation for the research on uniform force field.

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Introduction

People have long been committing themselves to the exploration on the origin of the interactive forces among objects in the universe, and longing to find an ultimate theory that could reveal the mystery of the universe, which, currently, is referred to the all-inclusive theory of uniform force field (T, O, E). From the law of universal gravitation to the theory of relativity, then to the quantum mechanics and the string theory, every failure or surprise experienced by the physicists had continuously expanded human beings' understanding of the universe structure. However, when the physicists are approaching to the disclosure of the mysterious mask of the universe, the basic principle of whole universe seems more and more unclear. Till today it still seems far away from the ultimate theory of physics.

People can not help asking: is there on earth an ultimate rule of the universe? Could it be recognized? The author believes that the answer is yes. But the problem is: have the new theories and findings springing up in modern physics made our contemplation towards the universe more complicated? In the past all a physicist would like to pursue as the ultimate purpose was just simplicity, no matter it was "the research on magnetic field by Faraday" or "the cogitation on the falling apples by Newton"! But for the time being many physicists are still addicted to occult theories and are ignoring a seemingly simple question: Is the universe the entire space itself or something separated from the whole space? While the relative changes of space could not be explained with Newton's concept of "absolute space", Einstein's concept of "curved space" seemingly acknowledges that the space is separated from the whole space because there must be other "spaces" beyond the boundary of the curve. The premise for this dissertation is to suppose that the universe is just the entire space itself.

The Basics and Analysis of the Theoretical Research

The Geometrical Essence of the Space Dimensionality

Suppose the space point set extending unlimitedly in the one-dimension(1-D) flat direction is N(N = 1,2...∞, then the space point sets extending unlimitedly and simultaneously in the two-dimension(2-D) or three-dimension(3-D) directions could be regarded as N^2 or N^3. It could be obtained after the comparison that although the point sets in the 1-D, 2-D or 3-D flat space are unlimited, N^2 is the infinity one order higher than N in addition that the infinity of is also one order higher than N^2. This means if the point set in which the number of dots is N^2 cannot extend unlimitedly in a 2-D flat space but choose to extend unlimitedly in a certain 1-D flat space. Therefore, as shown in Figure 1a, the point set of the space has actually been changed from $N X N$ to $N X N^2$. Identically, suppose the point set in which the number of dots is N^3 can only choose to extend unlimitedly in a certain 2-D or 1-D flat space, and can not extend unlimitedly in a 3-D flat space, then, as shown in Figure 1b, the point set in the 2-D or 1-D flat space has actually been changed from N X $N X N$ to 1 X $N X N^2$ or 1 X $1 X N^3$.

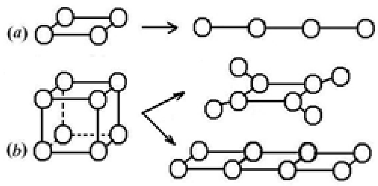

Figure 1: The essence of spatial variation

Since there are at most 3 geometric dimensionalities perpendicular to each other in the cosmic space extending infinitely toward any straight direction, assuming that a three-dimensional rectangular coordinate system '$\mathrm{o}-xyz$' is established in the cosmic space, as shown in Fig 2a, though space point set with a quantity of N^n ($n \geq 4$) can choose to extend infinitely within one-dimensional straight space '$\mathrm{o}-y$' in whole, or within the other one-dimensional straight space $z_i - y$ (i = 1,2,3...) spreading along 'z' direction of two-dimensional straight space '$\mathrm{o}-yz$' outside '$\mathrm{o}-y$' in part, or within the other two-dimensional straight space $x_i - yz$ (i=1,2,3...) spreading along 'x' direction of three-dimensional straight space '$\mathrm{o}-xyz$' outside '$\mathrm{o}-yz$' in part; However, in fact, it cannot further choose to extend infinitely within other three-dimensional straight space spreading along any direction in straight space with four and more dimensions outside '$\mathrm{o}-xyz$'. This determines that all points sets with a quantity of N^n ($n \geq 4$) in the cosmic space can actually only overlap each point within a three-dimensional straight space and change alternately, i.e. change from N x N x N x N x... N to N^g x N^h x N^{n-g-h} x1 x...x1 (g, $h < n$).

Geometric properties of space dimensionality mean that when people use three-dimensional rectangular coordinate system '$\mathrm{o}-xyz$' to describe the position of any point in the cosmic space, they are actually describing the position of the point stationary in the coordinate system in space. However, for a point in space relative to the position change of the coordinate system, when it passes i (x_i, y_i, z_i) of the coordinate system at a standard time 't' its instantaneous velocity can be any point in

$\left\{(\Delta x_{ij}, \Delta y_{ij}, \Delta z_{ij}) \middle| \sqrt{\Delta x_{ij}^2 + \Delta y_{ij}^2 + \Delta z_{ij}^2} \leq v_{ij}(C_{ij}^{(1)})\right\}$; while in each point with the instantaneous velocity, its instantaneous acceleration can be any point in $\left\{(\Delta x_{jk}, \Delta y_{jk}, \Delta z_{jk}) \middle| \sqrt{\Delta x_{jk}^2 + \Delta y_{jk}^2 + \Delta z_{jk}^2} \leq a_{jk}(C_{jk}^{(2)})\right\}$; thus, in each point with instantaneous acceleration, its instantaneous variable acceleration can also be any point in

$\left\{(\Delta x_{kl}, \Delta y_{kl}, \Delta z_{kl}) \middle| \sqrt{\Delta x_{kl}^2 + \Delta y_{kl}^2 + \Delta z_{kl}^2} \leq C_{kl}^{(3)}\right\}$; ……; till the end, for a moving point at 'i', its spatial position at any time 't' actually includes 'n' orders of varying coordinate values related to time in each direction of the space besides three stationary coordinate values irrelevant to time in the three-dimensional direction, as shown in Fig 2b, that is

$$\left\{\begin{array}{l} i'(x_i, y_i, z_i, \Delta x_{ij}, \Delta y_{ij}, \Delta z_{ij})_t \\ i''(x_i, y_i, z_i, \Delta x_{ij}, \Delta y_{ij}, \Delta z_{ij}, \Delta x_{jk}, \Delta y_{jk}, \Delta z_{jk})_t \\ \ldots\ldots \quad \ldots\ldots \quad \ldots\ldots \quad \ldots\ldots \\ i^{(n)}(x_i, y_i, z_i, \Delta x_{ij}, \Delta y_{ij}, \Delta z_{ij}, \Delta x_{jk}, \Delta y_{jk}, \Delta z_{jk}, \Delta x_{kl}, \Delta y_{kl}, \Delta z_{kl}, \cdots, \cdots, \cdots,)_t \end{array}\right\}$$

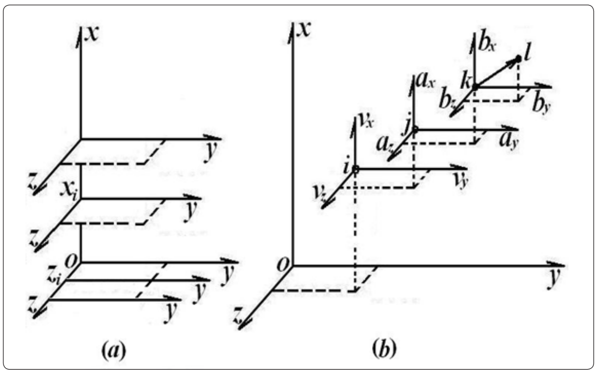

Figure 2: The essence of space coordinate

If the point set stationary in three-dimensional rectangular coordinate axes is set as zero order, the point set within a certain local space 'V' should actually include 0~ n orders at the instant of any standard time 't' in the three-dimensional rectangular coordinate system, that is to say, the volume of the local space 'V' should be

$$V = \overbrace{\iiint \cdots \int_V}^{(3n+3)} dxdydzd(\Delta x^{(1)}t)d(\Delta y^{(1)}t)d(\Delta z^{(1)}t)\cdots d(\frac{1}{n!}\Delta y^{(n)}t^n)d(\frac{1}{n!}\Delta z^{(n)}t^n) \qquad (1)$$

Where, $(\Delta x^{(1)}, \Delta y^{(1)}, \Delta z^{(1)})$, $(\Delta x^{(2)}, \Delta y^{(2)}, \Delta z^{(2)})$, ……, and $(\Delta x^{(n)}, \Delta y^{(n)}, \Delta z^{(n)})$ are coordinate values of each order of respectively uniform change, uniform acceleration change, ……, and n -order uniform variable acceleration change.

Essential Relationship of Coordinate Transformation between any Two Reference Frames in Cosmic Space

Obviously, if it is considered that one-dimensional space represents the continuity of zero-dimensional points, two-dimensional space represents the continuity of one-dimensional lines and three-dimensional space represents the continuity of two-dimensional plane, similarly, it can also be considered that the object with uniform motion represents the continuity of a three-dimensional space composed of all points keeping stationary relative to the object, centering on the object on the horizon, in whole on one-dimensional line; the object with uniform accelerated motion represents the continuity of a four-to-six-dimensional space composed of all points centering on the object and keeping stationary and relative uniform motion relative to the object in whole on two-dimensional plane; similarly, the object with uniform variable accelerated motion represents the continuity of a seven-to-nine-dimensional space composed of all points centering on the object and keeping stationary and relative uniform motion or relative uniform accelerated motion relative to the object in whole in three-dimensional space; ……. The difference is that the continuity of multi-dimensional space with three and more dimensions is still conducted in a three-dimensional straight cubical space extending infinitely in essence. In other words, for any two independent spaces with three and more dimensions keeping relative motion, the point at 't_2' (or "now") within one space always overlap the point at 't_1' (or "in the past") within the other space in essence. This means that the relationship of coordinate transformation established between any two reference frames with relative motion in the cosmic space can neither be Galilean transformation or Newton transformation based on "velocity relativity", nor Einstein transformation or Lorentz transformation based on "time relativity". It must be a relationship of coordinate transformation based on "spatial distance absoluteness". Here, the so-called "spatial distance absoluteness" concept, on the one hand, includes the absoluteness that the spatial distance between any two relatively stationary points in space always keep a constant value, namely the constant value is the same for any reference frame; and, on the other hand, also includes the absoluteness that the change of spatial distance between any two points keeping relative uniform motion or uniform accelerated motion and uniform variable accelerated motion in space always keeps a same ratio, namely the ratio is the same for any reference frame.

Therefore, assuming that a three-dimensional rectangular coordinate system $P - x^{P\ P\ } z^P$ is established at any mass point P in space, which is fixedly connected with the mass point with P as the origin and always keeps relatively stationary with it, and that three coordinate axes take the same variable 't' as the time parameter, now, if another mass point Q passes a coordinate position point $(x_i^P y_i^P y_i^P)$ of the coordinate system at P at a speed of 'v' relative to the mass point P, as shown in Fig 3, there must be a point passing the other $N^3 - 1$ coordinate position points (including the origin) on the horizon of the coordinate system at P at the same speed correspondingly. In essence, these points always keep a stationary state relative to the mass point Q and constitute another three-dimensional rectangular coordinate system space $Q - x^Q x^Q z^Q$ ((here, assuming that axes x,y, and z of the coordinate system at Q are respectively parallel to axes x, y and z of the coordinate system at P and it also takes the same variable 't' as the time parameter). Obviously, though positions in the coordinate system at Q corresponding to each coordinate point of the coordinate system at P are stationary when seen at P, they vary with time from the perspective of P. If assuming that the coordinate in the coordinate system at P corresponding to a coordinate point $x_1^Q y_1^Q z_1^Q$ on the horizon of the coordinate system at Q at a certain moment 't_1' is (x_1^P, y_1^P, y_1^P), the coordinate in the coordinate system at P corresponding to the coordinate point $(x_1^Q\ y_1^Q\ z_1^Q)$ on the horizon of the coordinate system at Q at 't_2' will turn into

$$(x_2^P, y_2^P, z_2^P) = (x_1^P, y_1^P, z_1^P)\left[\pm\sum_{i=1}^{n}\frac{1}{i!}(\Delta x^{(i)}, \Delta y^{(i)}, \Delta z^{(i)})^P (t_2 - t_1)^i\right] + v_{(x,y,z)}(t_2 - t_1) \quad (2)$$

In turn, the coordinate in the coordinate system at Q corresponding to the coordinate point (x_1^P, y_1^P, y_1^P) on the horizon of the coordinate system at P will also turn into

$$(x_2^Q, y_2^Q, z_2^Q) = (x_1^Q, y_1^Q, z_1^Q)\left[\pm\sum_{i=1}^{n}\frac{1}{i!}(\Delta x^{(i)}, \Delta y^{(i)}, \Delta z^{(i)})^P (t_2 - t_1)^i\right] - v_{(x,y,z)}(t_2 - t_1) \quad (3)$$

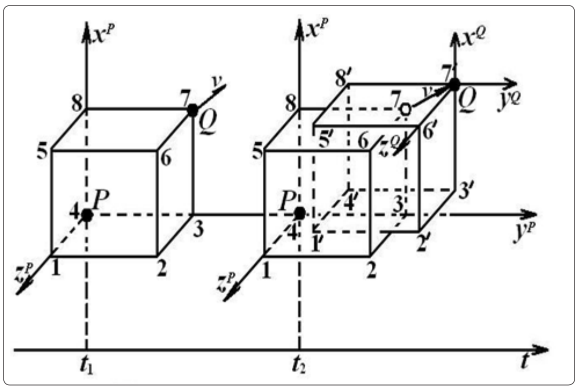

Figure 3: The coordinate transform of past and now

However, if the mass point Q passes (x_1^P, y_1^P, y_1^P) at an acceleration 'a' relative to mass point P, there will be a corresponding point, the position and speed of which change at the same acceleration, at the other $N^3 - 1$ coordinate points in the coordinate system at P and speed points $v^P_{(xj,\ yj,\ zj)}$ at each level which always keep a uniform linear motion relative to these points. These points and mass point Q always keep a relative stationary and uniform linear motion state and constitute another six-dimensional coordinate system space $Q - x^Q y^Q z^Q v^Q_{(xj,yj,zj)}$ including velocity change. Therefore, the coordinate transformation between this coordinate system and coordinate system $P - x^P, y^P, z^P v^P_{(xj,\ yj,\ zj)}$ includes two parts, that is

$$\begin{cases} (x_2^P, y_2^P, z_2^P)_{t_2} = (x_1^P, y_1^P, z_1^P)_{t_1}\left[\pm\sum_{i=1}^{n}\frac{1}{i!}(\Delta x^{(i)}, \Delta y^{(i)}, \Delta z^{(i)})^P \Delta t^i\right] + \frac{1}{2}a_{(x,y,z)}\Delta t^2 \\ (v^P_{(xj,yj,zj)})_{t_2} = (v^P_{(xj,yj,zj)})_{t_1}\left[\pm\sum_{i=2}^{n}\frac{1}{(i-1)!}(\Delta x^{(i)}, \Delta y^{(i)}, \Delta z^{(i)})^P \Delta t^{i-1}\right] + a_{(x,y,z)}\Delta t \end{cases} \quad (4)$$

By parity of reasoning, if mass point Q makes k-order uniform variable accelerated linear motion with a constant $C^{(k)}$ toward a direction relative to mass point P, there must be a point making a uniform variable accelerated motion with the same constant $C^{(k)}$ toward the same direction and including changes of the position, speed and acceleration etc. at coordinate position points and coordinate position change points of each order in the k-order

coordinate system $P - x^P y^P z^P (C^{(1)}_{(xj,yj,zj)} \cdots C^{(k-1)}_{(xj,yj,zj)})^P$

corresponding to P at mass point Q, that is

$$\begin{cases} (x_2^P, y_2^P, z_2^P)_{t_2} = (x_1^P, y_1^P, z_1^P)_{t_1}\left[\pm\sum_{i=1}^{n}\frac{1}{i!}(\Delta x^{(i)}, \Delta y^{(i)}, \Delta z^{(i)})^P t^i\right] + \frac{1}{k!}C^{(k)}_{(x,y,z)}t^k \\ (C^{(1)}_{(xj,yj,zj)})^P_{t_2} = (C^{(1)}_{(xj,yj,zj)})^P_{t_1}\left[\pm\sum_{i=2}^{n}\frac{1}{(i-1)!}(\Delta x^{(i)}, \Delta y^{(i)}, \Delta z^{(i)})^P t^{i-1}\right] + \frac{1}{(k-1)!}C^{(k)}_{(x,y,z)}t^{k-1} \\ \cdots\cdots\cdots \quad \cdots\cdots\cdots \quad \cdots\cdots\cdots \quad \cdots\cdots\cdots \quad \cdots\cdots\cdots \quad \cdots\cdots\cdots \quad \cdots\cdots\cdots \\ (C^{(k-1)}_{(xj,yj,zj)})^P_{t_2} = (C^{(k-1)}_{(xj,yj,zj)})^P_{t_1}\left[\pm\sum_{i=k}^{n}\frac{1}{(i-k+1)!}(\Delta x^{(i)}, \Delta y^{(i)}, \Delta z^{(i)})^P t^{i-k+1}\right] + C^{(k)}_{(x,y,z)}t \end{cases} \quad (5)$$

Here, assuming that the instantaneous velocity of its position change is $v = \Delta s$ when mass point Q passes the coordinate point (x_1^P, y_1^P, y_1^P) in the coordinate system at P when $(t_2 - t_1) \to 0$ at this time, if it is assumed that mass point 'q' with an instantaneous velocity > Δs intercepts mass point Q transversely at the instant when (that is, a mass point with a higher frequency of position change), mass point Q is either located at point (x_1^P, y_1^P, y_1^P) or point $(x_1^P, y_1^P, y_1^P) + \Delta s_{(x,y,z)}$. If the length and direction of arrow "→" are used to represent the magnitude and direction of variable quantity or rate of change of the spatial position point, when the position change points $Q^{(k)}_{(x,y,z)}$ with different frequencies in various directions converge at the point (x_1^P, y_1^P, z_1^P) simultaneously at a certain time 't', a vector field will form around it, where arrows indicating the change of spatial position point converge inward or outward. The velocity vector field only has two cases of position point change; the acceleration vector field has both position change and velocity change; therefore, it has four cases, as shown in Fig 4a; ……; By parity of reasoning, the vector field of n-order uniform variable acceleration will have 2^n cases. If assuming that the central point in a vector field with the radius R corresponding to (x_1^P, y_1^P, z_1^P) is O, as shown in Fig 4b, all point sets within the local space are actually

$$\left\{(x_{Oj}, y_{Oj}, z_{Oj}) \middle| \sqrt{x_{Oj}^2 + y_{Oj}^2 + z_{Oj}^2} \le R_{Oj}\right\} \quad (6)$$

Where

$$(x_{Oj}, y_{Oj}, z_{Oj})_{t_2} = \sum_{k=1}^{n}\frac{1}{k!}(C_x^{(k)}, C_y^{(k)}, C_z^{(k)})_{t_1}(t_2 - t_1)^k \quad (7)$$

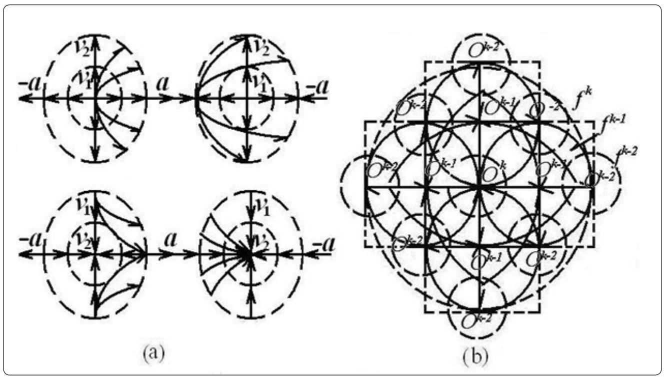

Figure 4: The essence of space field

Value and Conclusion of Theoretical Investigation

Point sets in the whole multi-dimensional cosmic space are spread in three-dimensional straight cubical space extending infinitely in essence, meaning that we can have a relatively simple but more definite expression and more reasonable explanation for the distance of the cosmic space, the effect of force of substance, the size of energy and source of motion etc.

Essence of Distance of Cosmic Space

Assume that a three-dimensional rectangular coordinate system o – *xyz* is established with a reference point '*o*' in the cosmic space as the origin, which extends infinitely, uniformly and straightly toward each direction all around, and that axes *x*, *y* and *z* of the coordinate system take the same standard time '*t*' as the parameter, now, if the coordinate of a mass point '*A*' in space that is stationary relative to point '*o*' is measured to be (x_A, y_A, z_A), as shown in Fig 5, the spatial distance between point '*o*' and point '*A*' is not necessarily $l_{oA}\left(=\sqrt{x_A^2+y_A^2+z_A^2}\right)$ in essence, but depends on the space dimensionality of point '*A*'. If assuming that the speed, acceleration, variable acceleration, ……and *n*-order variable acceleration of change of spatial position of point '*A*' are respectively $v = C^{(1)}$, $a = C^{(2)}$, $C^{(3)}$, ……and $C^{(n)}$, the theoretical value of actual spatial distance between point '*o*' and point '*A*' should be

$$s_{oA}=\sqrt{(x_A+\Delta x_{Ai})^2+(y_A+\Delta y_{Ai})^2+(z_A+\Delta z_{Ai})^2} \tag{8}$$

Where

$$\begin{cases}(\Delta x_{Ai})_{t_2}=(v_x)_{t_1}\Delta t+\frac{1}{2}(a_x)_{t_1}\Delta t^2+\cdots+\frac{1}{n!}(C_x)_{t_1}\Delta t^n\\(\Delta y_{Ai})_{t_2}=(v_y)_{t_1}\Delta t+\frac{1}{2}(a_y)_{t_1}\Delta t^2+\cdots+\frac{1}{n!}(C_y)_{t_1}\Delta t^n\\(\Delta z_{Ai})_{t_2}=(v_z)_{t_1}\Delta t+\frac{1}{2}(v_z)_{t_1}\Delta t^2+\cdots+\frac{1}{n!}(C_z)_{t_1}\Delta t^n\end{cases} \tag{9}$$

And

$$(C_x^{(k)},C_y^{(k)},C_z^{(k)})_{t_2}=(C_x^{(k)},C_y^{(k)},C_z^{(k)})_{t_1}+\sum_{k=1}^{n}\frac{1}{k!}(C_x^{(k+1)},C_y^{(k+1)},C_z^{(k+1)})_{t_1}\Delta t^k \tag{10}$$

It can be seen that only when all coordinate values of each order such as speed, acceleration and variable acceleration of the change of spatial position of point '*A*' are zero at any time, the spatial distance s_{OA} between point '*o*' and point '*A*' is the geometric spatial distance l_{OA} between two coordinate position points in space of the three-dimensional rectangular coordinate system o – *xyz*. This value is always a constant value. When the coordinate value of position change of any order of point '*A*' is not zero at any time t_1, s_{OA} is actually the geometric spatial distance between two points in a space with four or more dimensions, which equals l_{OA} plus the space d_{Ai} between the three-dimensional space where the horizon of point '*A*' is located and o – *xyz* coordinate system space, both of which are located in spaces with different frequency of position change, that is

$$s_{oA}^2=l_{oA}^2+d_{Ai}^2-2l_{oA}d_{Ai}\cos\theta \tag{11}$$

Where

$$\begin{aligned}(d_{Ai})_t&=\sqrt{(\Delta x_{Ai})_t^2+(\Delta y_{Ai})_t^2+(\Delta z_{Ai})_t^2}\\&=\sqrt{((x_i)_t-x_A)^2+((y_i)_t-y_A)^2+((z_i)_t-z_A)^2}\end{aligned} \tag{12}$$

Obviously, the value of d_{Ai} varies with time. This means that when any substance (including particle or matter wave) delivered from point '*o*' at t_1 arrives at mass point '*A*' at t_2, or any substance delivered from mass point '*A*' arrives at point '*o*' of the reference frame at t_2, if it is assumed that this substance has adequate energy to arrive at the destination, regardless of the reacting force of the substance, we can surely know that the theoretical value of spatial distance actually covered by the substance during $t_2 - t_1$ should be s_{OA}, definitely not l_{OA}. Moreover, even when the substance is delivered from point '*o*' and arrives at mass point '*A*' or is delivered from mass point '*A*' and arrives at point '*o*', it can only cross point '*A*' or point '*o*' in essence, but cannot exactly arrive at point '*A*' or point '*o*', unless it constantly changes its space dimensionality at this time (that is, it constantly changes the speed or acceleration etc.)

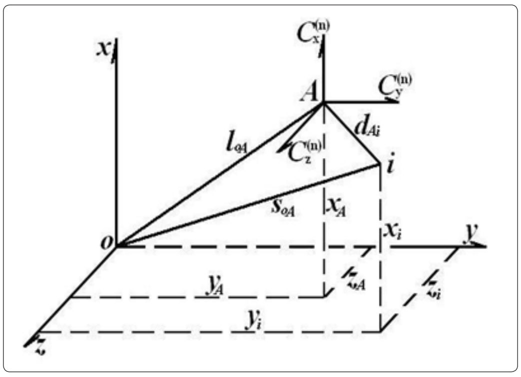

Figure 5: The essence of space dimension

Essence of Interaction Force among Cosmic Objects

Then, in fact, when point '*A*' is subject to actions of vectors F_{A1} and F_{A2} from two directions simultaneously, the sum of both vectors is not simply equal to the resultant vector F_{A3}, but to the resultant vector F_{A3} multiplying a pair of balance tensor or compression $(F_{02} - F_{01})$ perpendicular to the direction of resultant vector, as shown in Fig 6, that is

$$F_{A1}+F_{A2}=F_{A3}\times\frac{1}{2}(F_{02}-F_{01}) \tag{13}$$

If it is assumed that the coordinate components of vectors F_{A1} and F_{A2} in two directions in the coordinate system o – *xyz* are respectively $(X_{A1}^{(k)},Y_{A1}^{(k)},Z_{A1}^{(k)})$ and $(X_{A2}^{(k)},Y_{A2}^{(k)},Z_{A2}^{(k)})$, then

$$\begin{cases}F_{A3}=\sqrt{(X_{A1}^{(k)}+X_{A2}^{(k)})^2+(Y_{A1}^{(k)}+Y_{A2}^{(k)})^2+(Z_{A1}^{(k)}+Z_{A2}^{(k)})^2}\\F_{02}-F_{01}=\sqrt{(X_{A1}^{(k)}-X_{A2}^{(k)})^2+(Y_{A1}^{(k)}-Y_{A2}^{(k)})^2+(Z_{A1}^{(k)}-Z_{A2}^{(k)})^2}\end{cases} \tag{14}$$

Obviously, the action F_{A3} in the single resultant vector direction is a one-dimensional action as F_A and F_{A2} and is therefore long-range; while a pair of balance tensor or compression ($F_{02} - F_{01}$) perpendicular to the direction of resultant vector is a two-dimensional action and is therefore short-range. That is to say, once mass point '*A*' is separated by two actions F_{A1} and F_{A2} the pair of balance tensor or compression will disappear immediately.

Generally, the number of directions passing point '*A*' is $4\pi R^2$ in the vector field space centering on point '*A*' with the radius

$R_{t_2}^{(k)} \left[= \sum_{k=1}^{n} \frac{1}{k!}(C_x^{(k)}, C_y^{(k)}, C_z^{(k)})_{t_1}(t_2 - t_1)^k \right]$ corresponding to any

coordinate position point '*h*' in the coordinate system $\mathrm{o}-xyz$, then *m* pairs of balance tensor or compression that might be produced are

$$m = \frac{4\pi R^2(4\pi R^2 - 1)}{2} \tag{15}$$

If assuming that the resultant vector after counting up vectors in each direction is F_{Ai} (i = 1,2,3...), F_{Ai} represents the displacement variable quantity or rate of change of the vector field space centering on point '*A*' in whole at point '*h*' in the coordinate system $\mathrm{o}-xyz$; when m pairs of balance tensor or compression $F_{(x\text{-}x,\, y\text{-}y,\, z\text{-}z)}$ are zero at the same time, point '*A*' equals point '*h*' at this time.

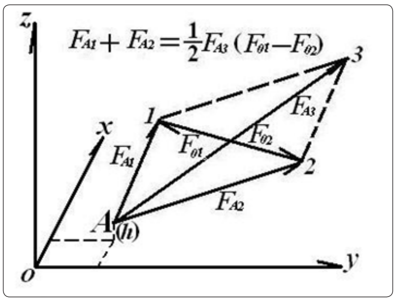

Figure 6: The essence of interaction

Essence of Matter Energy in Universe

The energy state (expressed as *E*) of any mass point '*q*' (which can represent a particle, wave, object or moving system) in the cosmic space when it is at or passes point '*i*' in the coordinate system $\mathrm{o}-xyz$ at '*t*' can be described using two quantities, that is

$$E = S^{(h)} \mathrm{X}\ V^{(l)} \tag{16}$$

Where, ① $S^{(h)}$ represents the absolute spatial distance between the origin point '*o*' of the coordinate system $\mathrm{o}-xyz$ to point '*q*'. It refers to the position level of the whole vector field space centering on mass point '*q*' in the three-dimensional coordinate system $\mathrm{o}-xyz$. It actually measures how much energy (regardless of the reacting force of substance) any substance (including particle and wave) delivered from any point in the coordinate system $\mathrm{o}-xyz$ should have so as to arrive at the track of vector field space of point '*q*' (rather than point '*i*'). It depends on not only the position coordinate (x_1, y_i, z_i) of point '*i*', but also the coordinate value ($C^{(1)}_{(x,y,z)}$, $C^{(2)}_{(x,y,z)}$, $C^{(h)}_{(x,y,z)}$ of position change of point '*q*' at point '*i*'. ② $V^{(1)}$ represents the absolute volume of the whole vector field space centering on mass point '*q*'. It refers to the energy level of internal position change of the vector field space; that is to say, it actually measures how much energy any single substance (including particle and wave) in the whole vector field space centering on point '*q*' should have so as to get rid of space of each order in the system. It depends on both the radius $R_{t2}^{(l)}$ of the change of spatial position and the number $m(l)$ of balance tensor or compression in the vector field space [1, 2].

References

1. Einstein Albert (1961) Relativity [M]. New York: Crown Publishers.
2. Einstein Albert (1988) The Meaning of Relativity [M]. Princeton: Princeton University Press.