Discrete and Continuous Realities According to Fundamental Laws of Nature

Rafael Emmanuel Castel

SDI, B2L8A Gardenville, Bacolod City, Neg. Occ., 6100 Philippines
(Email: kinematicrelativity@gmail.com)

Abstract: The analysis of the all-encompassing existence, broken down to the level of the most fundamental, clarifies fundamental laws of nature that describe a generalized picture of the synthesis of the discrete and the continuous realities brought about by the transformation processes that fundamentally occur in nature.

Introduction

Human consciousness observes both the discrete and the continuous aspects of reality. So, there is evidence of the discrete and the continuous. But what aspects of reality are discrete and what are continuous? How are these aspects discrete or continuous?

These questions require the identification of the fundamental components of reality. These also call for explanations regarding the synthesis of the complex reality.

In this essay, the fundamental components of reality are identified, named, and described via an analysis of the essence of reality in which a simplified encompassing view is presented and then broken down to fundamentals with distinctive characteristics. The synthesis from the fundamentals to the complexity is herein explained by a scrutiny of the transformation processes that occur in nature.

This essay will show that all the qualified theories regarding the phenomena in nature have one common underlying idea. This essay will present a view of reality that illustrates the laws of nature that define the discrete and continuous aspects of reality.

The Fundamental Essences

The totality of the existence is all-encompassing. As identified by the author in his book,[1] the fundamental essences in the existence may be categorized as that of (1) the *noumena*—the abstract realities, or (2) the *phenomena*—the tangible realities.

The *noumena* are the abstracts (the ideas), which are perceived by the mind. The abstracts may be *imaginary* or *real*. The *imaginary* are abstract realities, but are illusions that can never be embodied in the phenomena because they do not conform to the laws of the phenomena in nature. Conversely, the *real* can be embodied in the phenomena.

The *phenomena* are the tangibles (e.g., mass, energy, electromagnetism, gravitation, space, substance), which are perceived by the body. The tangibles are characteristic of

the material according to the idea that *space gets occupied, substance occupies space, and motion defines mass-energy on the substance*. This is of course akin to the classical idea that *matter occupies space and has mass*.

The noumena and phenomena may further be categorized as fundamental *passive* essences and fundamental *active* occurrences. The time dimension, instance of existence, space dimension, and substance in space are the fundamental *passive* essences. The fundamental *active* occurrences are duration and motion.

The *active occurrence in the noumena* is the duration transformation process that renders the definitions on the instance of existence along the time dimension. The time dimension is a one-dimensional continuum that can be illustrated using an endless line. The past, present and future of the ephemeral instance of existence may be represented along that line. The duration transformation process defines on the instance of existence the instants or moments, and the like, that span segments of the time dimension.

The *active occurrence in the phenomena* is the motion transformation process that renders the definitions on the substance of existence within the space dimension. The substance of existence fundamentally occupies space and motion fundamentally renders on the substance of existence the phenomena of nature. The space dimension is a three-dimensional continuum, a volumetric expanse, which can be illustrated by a sphere having an infinite radius. The ethereal substance of existence occupies the volumetric expanse. And the motion transformation process defines the mass and energy on the substance of existence that occupy the three-dimensional space dimension.

The fundamental *passive* essences simply exist. There is little that can be said about the *passive* essences. We say "instance in time" because time is the suitable background of the instance. We say "substance in space" because fundamentally space gets occupied by the substance. But there is not much that can be said regarding laws of nature that govern and define the order and organization of the *passive* essences. However, there is so much about the fundamental *active* occurrences, because the transformations brought about by the *active* occurrences involve laws of nature that govern and define the order and organization of the realities in the existence.

The Fundamental Laws of Transformation

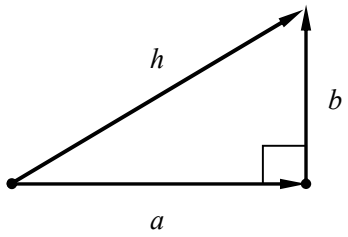
The idea of velocity transformations (i.e., velocity additions) in classical mechanics foreshadowed the idea of the transformations of motion. But, Galileo's transformation equations were inadequate for Maxwell's electromagnetic theory. As evidenced by the Lorentz's transformation factor for merely the two-dimensional translations, the Lorentz-Einstein modified transformation equations were also inadequate for the observed three-dimensional translations in nature. These confused the interpretations regarding the transformations in the phenomena in nature.

Among the interpretations about the transformations in nature is the idea of space-time transformations. The idea of space-time transformations deemed space and time as movable, transformable essences. This confused the fundamentals, because the space dimension that gets occupied also became the substance that occupies and the time

dimension also became the instance in the time dimension. Space-time transformations asserted the idea of movable, transformable space and time, and arbitrarily at that. And thus, the pure kinematics—that describes only the motion of motions, that stipulates that only the motions interact and resolve into resultant motions—got terribly abandoned. The departure from pure kinematics brought about the confused views at the foundational level—specifically regarding time, space, instance, substance, duration and motion.

The main idea in pure kinematics is the idea that fundamentally motions interact and resolve. Figure 1 illustrates the idea of the kinematic interaction as represented by the vectors of motion *a* and *b* that resolve into the vector *h*. The idea is valid for all kinematic interactions within the fundamentally three-dimensional space. The basic formulation for this idea is established according to the Phytagorean theorem.

Figure 1



Pure kinematics describes only the motion of motions—only the transformations of motion. The motion and duration occurrences do not interact because the essence of motion is of the tangible reality while that of duration is purely of the abstract reality.

A duration transformation always corresponds to a motion transformation. They occur in unison. But they never interact because, according to the proper perception of reality, the noumena and the phenomena occur in separate background dimensions.

The duration transformation is fundamentally the change wrought on the instance of existence described in terms of the passage along the time dimension. The rate at which this change occurs is in terms of a corresponding duration per unit time—e.g., moment per moment, second per second, and the like.

The motion transformations are fundamentally the change wrought on the substance of existence which is describable in terms of the translation within space per unit time—e.g., meter per second, and the like. Furthermore, the rate at which the change on the change that occurs may also be expressed in terms of the translation within space per unit time per unit time—e.g., meter per second per second, and the like.

The nature of the duration transformation is simply that it is the constant change that carries the instance of existence a moment every moment along the time dimension. But the nature of the transformations of motion is more complicated because the motion transformations can be expressed in terms of the phenomena of mass or energy according to the laws of nature—specifically, the laws of the transformations of motion.

Basically, the modern physics history is that: the laws of motion, that included the

gravitation idea and the original relativity (velocity transformation) idea, got formulated; then the electromagnetic theory got formulated; and then the classical transformation equations got modified for the electromagnetic theory; and the modified transformation equations got interpreted to mean the arbitrary transformations of space and time, along with the discovery of the $E=mc^2$ interpretation. The mass-energy relation awed us. But the idea of the arbitrary transformations of space and time confused our views.

After the refined understanding of the fundamentals, the proper interpretation of the transformation equations yields a more sensible view that is clarified in the following.

The classical Galilean transformation equations are of the following form.

$x'=x-vt$

$y'=y$

$z'=z$

$t'=t$

Figure 2, which shows relative frames of reference S and S', illustrates the ideas underlying these equations.

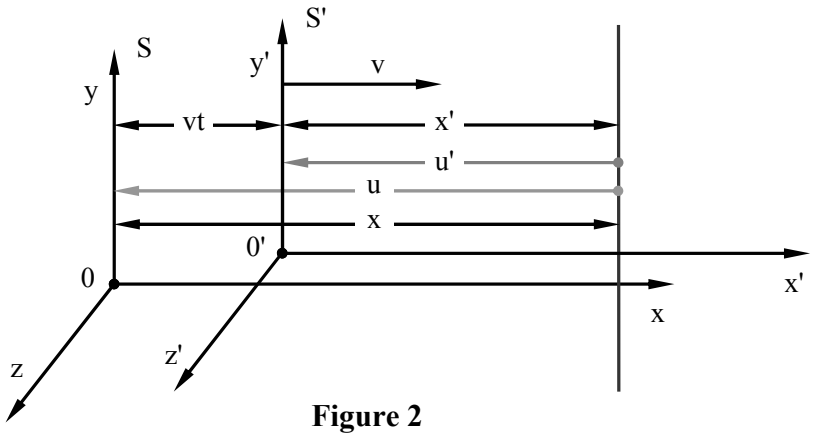


Figure 2

Figure 2 indicates the velocity v for S' relative to S; this is along the x axis with no translations along the y and z axes; the elapsed time is t in S and in S'; the speed of light is c=u=x/t in S, and c=u'=x'/t in S'. And so, *we have* x'=x–vt. Since x=ut, we have x'=ut–vt. Thus, x'/t=u–v. Because c=x'/t, we have c=u–v. Also, *we have* x=x'+vt. Since x'=u't, we have x=u't+vt. Thus, x/t=u'+v. Because c=x/t, we have c=u'+v.

The Galilean transformation equations clearly indicate the velocity additions. But Maxwell's electromagnetic theory showed that $c=\lambda f$. Thus, c should be the same in all frames of reference (i.e., c=u=u') with only the wavelength and frequency varying. Because of the stipulation for an invariable speed of light, the idea of velocity additions became untenable. And so, in order to discover new meanings other than the idea of velocity additions, an invariance factor became necessary in the transformation equations.

To clarify the considerations for the electromagnetic phenomenon, the value c is introduced into the equations. Since t=x/c and x'=(x–vt), we have

$$x'=x(1-v/c)$$

The equation for time is also modified to account for the duration of the occurrence. Since t=x/c and t'=x'/c, we have

$$t'=(x-vt)/c$$

$$t'=t-vx/c^2$$

$$t'=t(1-v/c)$$

The invariance factor $(1-v/c)^{-1}$ is introduced into the equations in order to maintain the equivalence of the frames of reference and thereby identify the transformation factor necessary to show the transformations in the phenomenon. The transformation equations therefore take the following form.

$$x'=x(1-v/c)(1-v/c)^{-1}$$

$$t'=t(1-v/c)(1-v/c)^{-1}$$

The equations indicate a complete transformation by the product of the reciprocals. The approximation to (1+v/c) and the multiplication with (1–v/c) yield the transformation factor $(1-v^2/c^2)^{-1}$. We have

$$x=x'(1-v^2/c^2)^{-1}$$

$$t=t'(1-v^2/c^2)^{-1}$$

The transformation factor $(1-v^2/c^2)^{-1}$ is of the form that indicates a three-dimensional translation. Lorentz used $(1-v^2/c^2)^{-½}$ to account for the two-dimensional translation.

The illustrations of the Lorentz transformation showed circles (spheres) representing the phenomena squeezed to oblongs (ovals) in the two-dimensional translation.

To show transformations other than the velocity additions, the variables m (mass) or E (energy) are substituted either for the space variables (x and x') or the time variables (t and t'). The substitution implies that, instead of the arbitrary transformations of space and time, we actually have the transformations of motion depicted against the space dimension, which may be interpreted in terms of the quantized mass or energy. The actual motion transformations also become representations (clocks) of the duration transformation in the time dimension. The Lorentz transformation factor for the two-dimensional translation prescribes the relativistic mass equation of the following form.

$$m=m_o(1-v^2/c^2)^{-½}$$

The following illustrates Einstein's use of this equation that showed the connection with the classical kinetic energy (K.E.), from which he deduced the formula $E=mc^2$.

$$m=m_o(1-v^2/c^2)^{-½} \approx m_o(1+½v^2/c^2)$$

$$m=m_o+½m_ov^2/c^2$$

$$m-m_o=[½m_ov^2-½m_o(0)^2]/c^2$$

$$\Delta m=\Delta K.E./c^2$$

But the above relates only the transformations according to the two-dimensional translations. Using the full-tensor transformation factor for the three-dimensional translation prescribes the relativistic mass equation of the following form.

$$m=m_o(1-v^2/c^2)^{-1}$$

This allows the following relativistic energy formulation that reflects the change in energy content resulting from a full-tensor, three-dimensional translation.

$$m=m_o(1-v^2/c^2)^{-1} \approx m_o(1+v^2/c^2)$$

$$m=m_o(c^2/c^2+v^2/c^2)$$

$$mc^2=m_oc^2+m_ov^2$$

$$E=E_o+m_ov^2$$

$$E-E_o=m_o[v-0]^2$$

$$\Delta E=m_o[\Delta v]^2$$

This formulation indicates transformations resulting from the three-dimensional translations, instead of the transformations according to merely the two-dimensional translations described by the Lorentz-Einstein formulation.

We have naturally occurring three-dimensional translations—that of the gravitational systems. This evidently indicates naturally occurring transformations according to the three-dimensional translations of gravitational systems. Thus, there is the suggestion of continuous increases in the energy content of gravitational systems according to the formulation $\Delta E=m_o[at]^2$, where the *a* signifies the gravitational acceleration and the *t* denotes the elapsed time according to the natural process of duration.

Because gravitation is evidently fundamental, there is a fundamental bias towards the increasing mass-energy content of the cosmos that could only be duly balanced by the expansion of the cosmos. This suggests a mechanism that establishes the lower and upper limits for the quantization of the nuclear particles and the cosmos as a whole. Tensors describe the kinematic transformations. This suggests that the revolutions of the cosmic systems may facilitate kinematic densifications and attenuations (i.e., the incident quantization) of the phenomena in nature—specifically so if the cosmos is infinitely hierarchical. Moreover, there is the suggestion regarding how the process of gravitation occurs. But the discussions on these are beyond the scope of this essay.

The above formulations for the two-dimensional and the three-dimensional translations illustrate the laws of motion transformations that define the discrete aspects of reality.

Conclusion

The encompassing view presented here shows that we have the realm of noumena and the realm of phenomena in the existence. We have the noumenal and phenomenal realities. The phenomenal realities are more real (so-to-speak) because of their tangibility.

The fundamental essences are the time dimension (a continuum), the instance of existence (a continuum), duration, the space dimension (a continuum), the substance of existence (a continuum), and motion. And they evidently exist in infinite measure.

The duration transformation renders the quantized definitions of noumena in the instance of existence—the abstracts, the mind. The motion transformation renders the quantized definitions of phenomena on the substance of existence—the tangibles, the body, mass, energy, gravity, electromagnetism, fields, forces, chaos, cosmos.

The idea of motion is the common underlying idea in all the qualified theories about the laws of nature.

- Newton's laws of motion and gravitation is about the idea of motion.
- Maxwell's electromagnetic *waves* and *fields* theory is about motions.
- In spite of the idea of the arbitrary transformations of space and time, Einstein's SR and GR are about the relativity and transformations of motion. In SR, the relativistic mass equation and the famous $E=mc^2$ are about the transformations of motion. This claim is supported by the facts regarding the famous formula. For example, nuclear explosions release so much kinetic energy because the nuclear particles are composed of motions (K.E.) confined and condensed in those very small configurations. GR is about the three-dimensional, gravitational motion.
- Quantum theory is about kinetic energy quantization—about motions.
- String theory is about the interaction of vibrating strings—about motions.
- Symmetry theories are about symmetry breaking and currents—about motions.

All the qualified theories principally involve the underlying idea of motion. This suggests that the motion transformation formulations with the suitable modifications may be appropriate in the unified theories.

In sum, the suggestion is that the picture of a kinematic universe appears to be the more clearly logical and rational than the space-time universe picture. But it will take some doing before the idea of the transformations of motion, the idea of kinematic relativity, could shake the present-day science's counter-intuitive establishment.

□

References

[1] Castel R E, "Kinematic Relativity and Continuous Mass Formation in an Accelerating Universe," [http://www.kinematicrelativity.com/].

_____