A Euclidean Approach to Overcoming Conceptual Problems in Special and General Relativity

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ABSTRACT

A fresh look at the geometric underpinnings of Einstein's Special and General Relativity has been driven by the ongoing conceptual difficulties with these theories, including simultaneity, curvature of spacetime, time dilation, and length contraction. For the purpose of addressing the Minkowskian model's inherent inconsistencies and interpretational challenges, this research suggests a Euclidean framework as an alternate formulation. This work shows that one need not invoke non-Euclidean spacetime curvature in order for relativistic effects to arise naturally from geometric relations by reinstating absolute Euclidean space and genuine temporal progression. The Euclidean method reconciles observed results like orbital precession and GPS synchronization with a consistent and logical explanation for relativistic phenomena by means of mathematical reconstruction and comparison with experimental data from gravitational and kinematic experiments. By providing conceptual clarity and enhanced computational stability, the model streamlines the integration of inertial and gravitational reference frames even further. As a result, this research presents Euclidean Relativity as a viable alternative to the standard relativistic paradigm, with the potential to resolve the philosophical and structural uncertainties that have plagued it for so long.

Keywords: *Relativity, Euclidean, Quantum, Space, Geometry.*

1. Introduction

Currently, time and place are handled differently in conventional and quantum physics, which is one of the key differences between the two. Einstein said that his technique still couldn't account for every natural event, even after including electrodynamics and optics. The primary goal of this article is to help readers model matter (orthogonal planes), space (extensions of relative distance), time (extensions of duration or duration between cyclic signals), and discrete translational motion using dimensional quantities and spatiotemporal units. Not only that, but dimensional analysis is given a new option. Using a causal system to gather inputs from the past and present, we construct models that can post-process and retrospectively validate future predictions (a recorded future) in certain N-body dynamical systems. Many different methods exist for determining the same dimensional measures.

Present methods include what seems to be a quantum rejection of Einsteinian spacetime, as Brumfield explains, in which quantum physics provides another mechanism for coordinating data. "May be responsible for the widely held implicit assumption that'real' observer effects are exhibited only by quantum objects and not by classical objects," Baclawski said, referring to the observer effect. Therefore, any suggested system would benefit from being compatible with both conventional and quantum physics if it were to have wider use.

The study of dynamical systems revealed a consistent assumption in physics: Within a quantum state, such amounts of matter are continuous. While using discrete signals in a modeling approach, this assumption became obvious. Loop Quantum Gravity is one such model that tweaks spacetime to fit discrete observations of matter, predicated on the idea of a continuous matter state. This article allows for new perspectives and introduces new methods for dimensional analysis and mechanical modeling in classical and quantum physics. New opportunities for thought experiments on the quantum state of matter (or particles) emerge when space and time are separated by discrete signals, beyond the limitations of existing principles and equations. The capacity to develop models in a space-time frame of reference, for instance, or to use object-relational dimensional attributes in geometric modeling based on the Euclidean principle are both examples.

There are two main schools of thought when it comes to how ancient cultures understood time: linear and cyclic. Both linear time and cyclic time are defined as "a forward, straight sequence of steps or stages" that repeat themselves at predetermined intervals. Recurring cycles of time were called neheh in Egyptian, djet, which means "immutable permanence" or "zero-time" when t=0, was used to describe non-cyclic time. Prior to the suggestion that time may be a measure of motion; ancient civilizations used a cyclic signal system to measure time. According to the author's research, ancient societies had the belief that celestial messages occurred at regular intervals. That would explain why metrologists don't always utilize the same intervals (or base units) of time from one cycle to the next. Scholarly examinations of ancient calendars, comparing them to the present-day Julian type calendar, put findings from Neolithic architecture to records kept by Mesoamerican missionaries into context. Mathematical studies of calendar systems testing the idea that signals are not periodic could not be located by the author. We lend credence to the idea that "our ignorance of the ancient astronomical methods" suggests that ancient societies' timekeeping technologies might have been distinct.

"It is the cessation of motion that divides a line," Aristotle said, referring to the fundamental feature of the cosmos that time flows continuously and evenly at a fixed pace. Any two points, A and B, may be modelled continuously without regard to midpoints using this technique. Conversely, the study argues that given defined non-dimensional point signals and a function that satisfies the vertical line test, mid-points may be achieved. Up to and including a point mass, contemporary models can only describe spacetime by merging continuous spatial and temporal variables.

Contemporary ideas about time associate it with expanding space and timelessness, which causes problems at the quantum level. There are a number of theories that attempt to explain motion in quantum physics, making it more complicated to examine. These theories include the theory of hidden variables, many possible world’s theory, random variables theory, and particle discontinuous motion theory. The BIPM have standardized time today as one of seven dimensional fundamental units. The primary concept underlying dimensional analysis is to choose phenomena, give it some physical fundamental values, and then use formulas to generate base units. Since it uses not one but two measurements—an agreed upon interval and a count to signify that interval—the second, the SI unit for time, is a "derived" dimensions-based unit. The idea of homogeneity in dimensional analysis allows us to quantify object-specific spatial and temporal dimensional properties in SI units and then equalize them.

The scientific community relies heavily on dimensional quantities and units because they are inflexible, defined measurements for a certain privileged reference frame. One dimensional number in quantum physics is the Planck time (tP), which may be expressed as 5.391247(60) × 10−44 seconds. One example is how astronomy uses the Sun's mass, M⊛, and Earth's average orbital distance to the sun, 1 AU = 149,597,870,700 m (±3 m), to standardize the astronomical unit of mass. Quantities in canonical references may vary over time, which is particularly true in dynamical systems. When we look at the universe through a window, the changes may be little, but they do occur, and we have to make adjustments. Take into consideration that the Sun did not always exist; hence, our present methods are constrained by the temporal and spatial resolutions of our data.

Einstein and Hamilton's works have had a significant impact on the subject of basic physics, which makes use of dimensional analysis, canonical references, and natural symmetries. Several symmetry invariances have been shown by mathematicians for a vast class of models. The author proposed that Dihedral symmetry groups have been in use since the beginning of time after studying some famous ancient symmetry measures. These include the now-accepted symmetries of scale (D10), rotation (D24), time (D12), and space (relative distances) (D360). The article's dimensional analysis adheres to divisional and subdivisional structures of dimensional variables from the past, due to its foundation in ancient symmetry groups. We re-establish our adherence to these groups for object-oriented quantity base unit conversion that is compatible with dimensional analysis.

Many ideas, some of which transcend the very notion of time, have attempted to explain the stellar velocities. In addition to Copernicus's and Ptolemy of Alexandria's heliocentric ideas, we also have Kepler's descriptions of the movement of the planets. Each of these models offers inadequate data and assumptions. Planetary orbits resemble ellipses when the Sun is shown as a stationary point on a two-dimensional (2D) plane, as the Earth-Sun distance changes at each recurrent aphelion location. A one-dimensional (1D) orbital model that would provide information on a single object in a single orbit has not been developed or implemented as of yet. The current understanding of star motion inside a galaxy produces a helical model in three dimensions; the theory of relativity put forth by Einstein is the primary instrument for conceptualizing, simulating, and accurately forecasting events and motion in this simulated four-dimensional Minkowski space. Based on his approach for modeling spacetime motion, it is plausible to conclude that Euclidean geometry cannot be used, as Einstein questioned the validity of its axioms and notions with respect to the plane, the point (zero-mass), and the straight line (Ch1). Even though it is very powerful, Einstein's theory has acknowledged limitations, such its relevance to quantum mechanics.

To accurately represent the movement and location of spatial objects, a precise frame of reference is required. Aristotle posits that time may be seen via an absolute framework. An absolute (continuous) temporal frame cannot account for relativity, thereby providing an inadequate explanation. Any inertial frame will do for the laws of motion according to Galilean relativity. Another thing to keep in mind is that in continuous time, there isn't a privileged frame that can be used to determine whether objects are really at rest; rather, there isn't even a single valid frame. While another possible reference frame that adheres to relationalist theory might be workable, it would only allow for relational mobility and not inertial frames. If there was a solution, it would address the problems. Leibniz had to come up with a different approach to describe motion apart from velocity since calculating motion states using the time-derivative of displacement requires individual reference.

Dimensional quantities are eliminated in relational point space modeling, which uses a non-dimensional signal to designate a relational position at a zero-dimensional (zero-D) moment in time. We show, by use of two-dimensional geometrical components, how to find relational places in the plane of geometry to which one may apply dimensional values to things. Absement and absity, rather than velocity and acceleration in time-integrals of displacement and spatiotemporal units, may be used to express motion if object-oriented metrics for space and time (intrinsic and extrinsic) are separated from spacetime.

2. Review of Literature

Niemz, Markolf & Stein, Siegfried. (2022) Einstein's special relativity (SR) hypothesis is the ancestor of our modern understanding of time. In SR, he demonstrates the interconnections between inertial systems. He views gravity as a characteristic of curving spacetime in general relativity (GR). We establish: When it comes to time, Einstein messes up twice. (1) According to him, clocks in a system K', which is related to K, might synchronize with clocks in K at any given moment. There would be no clockwork if that were to happen. (2) Rather of tagging the measuring observer with time variables, he labels K' (or K) instead. Einstein commits a third error after being misled by SR: Once again, he chooses an arbitrary measure in GR. An euclidean metric is the basis of our "Euclidean relativity" (ER). Our premise is: Every particle of energy in ES is accelerating radially with respect to a source at the speed of light. In every reality (ES projected onto an observer's 3D space), the physical rules have the same shape. Three, all energy exists as "wavematter"—a combination of electromagnetic wave packets and matter. Paradoxes arise when prior ER models consider ES to be genuine. It is demonstrated: According to ER, the Lorentz transformation from SR may be retrieved; ER is consistent with quantum physics; and gravity is related to rotation. While GR is simply a rough estimate for certain observers, Einstein's errors in SR have no quantifiable impact. Twelve basic puzzles are solved, including the current value of the Hubble constant, dark energy, wave-particle duality, and quantum entanglement, among others.

Biswas, Abhijit & Mani, Krishnan. (2019) By using three separate approaches, the precision of computing the different components of planetary orbital precession was enhanced by five orders of magnitude in EGR (Evolved General Relativity), which allowed for the establishment of a Prototype of future Ephemerides. Furthermore, one may use the approach to "Generation of High-precision Future Ephemerides has Accuracy level at Sub-microarcsecond" without ever leaving the confines of GR. Please go to the Abstract page of the main article for additional information and for easier reading.

Liu, Gordon. (2014) All physical equations must satisfy the Lorentz covariance condition for special relativity (SR) to be successful. As for the Lorentz covariance, it is postulated that two things—the special relativity principle and the constancy of the speed of light—will provide an answer. The formulations of special relativity's principle, however, are varied and difficult to understand. The equivalence of inertial reference frames and the covariance of physical equations are confused. It is a more sophisticated criterion than the equality of inertial frames of reference to have the physical equations covariant. Furthermore, the placement of the propagation property of light at the core of SR has led to confusion about space-time, and there is a logical loophole connecting the measurement of light speed to the synchronization of clocks. The accurate extension of space-time theory from an inertial to a noninertial frame of reference has been hindered by these. For these and other reasons, SR has a lot of detractors. A new requirement to the equations of physics is offered and the two hypotheses are examined in depth in this work. If the physical equations describing the dynamics of matter and/or fields are to be considered complete, they must account for the fact that these entities are both at rest and in motion with respect to an inertial frame of reference. This criterion, along with the fact that the inertial frames of reference are equal, allows us to approach SR.

Fiscaletti, Davide. (2012) A space-time manifold, a basic arena in which everything occurs, was conceptualized by physicists in the twentieth century as the result of the coupling of space and time. The traditional view was that space-time consisted of three spatial dimensions plus a single temporal dimension. Time, as measured by clocks, is really merely a numerical order of duration of motion, or material change in three-dimensional space, according to the experimental facts. Electromagnetic phenomena may be described in a three-dimensional Euclidean space according to this perspective.

Lusanna, Luca. (2006) In light of the consequences of omitting the idea of instantaneous three-space, relativity theories have been revised to center on non-inertial frames that are accelerated arbitrarily. The need for predictability in special relativity that calls for the 3+1 viewpoint gives rise to a well-posed starting value issue for field equations. Positioned inside this framework, this viewpoint allows for the adjustment of the convention for synchronization of remote clocks via the gauge transformation. Canonical method for metric and tetrad gravity in globally hyperbolic asymptotically flat space-times also relies on this viewpoint; in this case, the separation of the physical gravitational field degrees of freedom (the tidal effects) from the arbitrary gauge variables is accomplished by means of Shanmugadhasan canonical transformations. According to a global interpretation of the equivalence principle, only global non-inertial frames may exist, hence fixing the gauge variables is necessary to ensure deterministic development in one of these frames. Thus, in all of these space-times as proposed by Einstein, the whole chrono-geometrical structure, including the clock synchronization convention, is dynamically determined, and a different perspective on the Hole Argument leads to the conclusion that "gravitational field" and "space-time" are essentially synonymous. From this vantage point, we can construct a classical model that incorporates the four interactions into a structure that can be employed to characterize our galaxy or solar system. This model can then be deperametrized to special relativity, and the non-relativistic limit can be derived as an additional outcome.

Gersten, Alexander. (2003) In addition to the standard space-time coordinates, four new coordinates are defined and their relationships are discussed. The square of the interval in Minkowski space is equal to the square of the four-dimensional length in Euclidean space for these coordinates. With the updated coordinates, the Lorentz transformation evolves into an SO(4) rotation. Invariants are replaced with newly derived scalars. The Lorentz transformation is approached from a different angle. When we swap the concepts of real time and relative time in inertial frames, we get a mixed space. The Lorentz transformation, in this context, is a four-dimensional rotation in a Euclidean space, which opens up new avenues of inquiry and potential uses.

3. Euclidean Relativity

Historically, the Minkowski hyperbolic model has been used in relativity theory. An alternate geometry that utilizes proper time τ as the fourth spatial dimension is suggested by Euclidean relativity, which is based on circles. Aside from the fact that all objects in four-dimensional space-time have the same velocity, another common element in Euclidean (++++) relativity is the metric that is based on the work of Galileo rather than the more conventional Minkowski metrics (+---) or (-+++).

It is possible to rewrite the Minkowski metric so that it becomes the Euclidean metric.

$(cd\tau)^2 = (cdt)^2 – dx_2 – dy_2 – dz^2$

to the corresponding

$(cdt)^2 = dx^2 + dy^2 + dz^2 + (cd\tau)^2$

The 4th spatial dimension is now represented by proper time τ, since the roles of time ***t*** and τ have reversed. The regular time derivative yields the universal velocity ***c***.

$$c^2 = (dx/dt)^2 + (dy/dt)^2 + (dz/dt)^2 + (cd\tau/dt)^2$$

Invariants are based on t and vector components representing the fourth dimension are based on τ; the transition similarly impacts all relativistic formulae for displacement, velocity, acceleration, etc. Time t is included as a parameter for monitoring change and velocity in several Euclidean interpretations; in some publications, it is even considered a fifth dimension.

All relativistic formulae for displacement, velocity, acceleration, etc. are similarly impacted by the transition; invariants are derived from ***t***, whereas vector components standing for the fourth dimension are derived from τ. While some publications use time as a fifth dimension, many Euclidean interpretations use time ***t*** as a parameter to measure change and velocity.

"Wick rotation" and complex Euclidean relativity are not applicable to this method. Time is replaced by wick rotation ***t*** by ***it***, it produces a positive definite metric as well, but in contrast to Euclidean relativity, it preserves the proper time τ as the constant value, τ converts it into a coordinate.

Euclidean space geometry is consistent with Minkowski-based relativity. Hyperbolic Minkowski geometry becomes a revolution in four-dimensional circular geometry when four-dimensional properties are geometrically projected onto our three-dimensional space, leading to length contraction and time dilation.

Two reasons justify using the Euclidean method: first, it makes relativity easy to understand, and second, it paves the road for more research into relativity theory.

4. Special Relativity

The Evaluation

Einstein's original work, with the pertinent sections translated into English:

"If at point A of space there is a clock, an observer at point A can determine the time values of events in the immediate vicinity of point A by finding the positions of the hands which are simultaneous with these events." If there is another clock in space at position B that is quite similar to the one at position A, then someone looking at events from position B may determine when they happened. When comparing two events, one at A and one at B, in terms of time, it's necessary to make extra assumptions. So far, we have just mentioned "A time" and "B time." No universally accepted "time" has been determined for A and B since defining B necessitates demonstrating that the "time" required for light to travel from A to B is identical to the "time" required for light to travel from B to A. The definition of B becomes implausible if this does not hold. From point A to point B, the light beam could start its trip at "A time" t_A, get reflected back toward point A at "B time" t_B, and finally return to point A at "A time" t'_A.

The two clocks will synchronize if, as stated in the definition,

$t_B - t_A = t'_A - t_B$.

We take it as read that this synchronism definition does not include any inconsistencies, …"

As a consequence, it is evident from a physics standpoint that Einstein was wrong to assume that c is constant in any frame. This is very consequential as his notion of a four-dimensional space-time is based on the presumed consistency. Why?

In order to prove that all frames are equal, Einstein had to find a solution to the equation.

$$c + v = c \qquad (1)$$

for any $v \neq 0$.

The rules of Euclidean geometry do not apply to this problem. But Einstein found a solution by introducing a new geometry; that is, in which the concepts of space and time are recast as factors of speed, he was able to resolve the problem:

$x \rightarrow x(v); t \rightarrow t(v).$ (2)

With the goal of achieving the "Lorentz transformation," Einstein created these functions in a way that satisfies equation (1).

To what extent does this cast doubt on Einstein's theory of relativity?

The Sagnac experiment demonstrates that the four-dimensional space-time model is superfluous and that Euclidean geometry may be used to explain physical events.

The "Lorentzian interpretation of the theory of relativity" is an approach to understanding relativity that relies on physical laws rather than principles and makes use of Euclidean geometry. This interpretation will be briefly described below.

The Lorentzian Way

The Lorentzian view of special relativity differs in what ways? The following distinctions define the Lorentzian interpretation:

- The use of geometrical equations
- The assumption that the speed of light, c, is constant across all instances
- The use of classical laws for the addition of velocities
- Fields contract when we say "contraction," and physical processes cause things to contract thereafter.
- Particles' internal oscillations, which move at a velocity c, slow down due to dilation; as a physical consequence, clocks and other physical processes also slow down.

Summation of Velocities

Assuming a reference system has a speed of c for a given light signal and an observer is moving parallel to the light signal with regard to the reference system at a velocity of v, the classical view states that the observer should be able to discern either c + v or c- v, depending on the direction of motion. However, in reality, he will notice the speed c in both scenarios. This is described as a general concept in the theory of relativity as proposed by Einstein. The classical theory of relativity known as Lorentzian relativity provides an explanation for this phenomenon via Einstein's suggested clock synchronization. For this kind of one-way measurement, you'll need two clocks: one at the starting point and one at the finishing point of the measured distance.

The notional value for c must be measured by two synchronized clocks in accordance with Einstein's theory, as previously stated.

A second, unique scenario involves a mirror-reflected signal, known as a two-way measurement. One clock will enough in this instance. Two things happen when a moving observer utilizes this setup: first, the speed of the one clock slows down because it is in motion, and second, the distance measured mechanically shrinks because moving fields contract. - Included in this description is the Michelson-Morley experiment.

Contraction

One philosophical reading of Einstein's theory is that space shrinks. The Lorentzian interpretation states that all mechanical bodies, like all moving fields, undergo contraction. This has been shown in several disciplines and was originally drawn from Maxwell's theory of electric fields. Both theories lead to the same kinds of experimental findings. There is just one space in Einstein's theory, and it contracts for the moving observer but not for the stationary one. This is where the conceptual issue with his theory begins.

Dilation

The abstract concept of "time" exhibits dilation according to Einstein's view. Dilation is a result of fundamental particles' internal oscillations according to Lorentz's physics-related explanation. Louis de Broglie theorized this in 1924, and Erwin Schrödinger derived it from the electron's Dirac function in 1930. Since fermions are building blocks of more complicated particles, there's no reason to think this isn't true for all of them. Particles with electric charges have their spin and magnetic moment explained by assuming this internal oscillation is circular.

Regarding the formal examination of special relativity, the assumptions based on Lorentz provide the same Lorentz transformation as Einstein's space-time assumptions, thereby fulfilling all the requirements of special relativity and yielding the same results as Einstein's.

5. General Relativity

It is also possible to completely describe General Relativity—that is, the relativistic view and handling of gravity—without referring to Einstein's assumptions on space and time. Recognizing that light travels at a different (or slower) speed in a gravitational environment is the first and most basic step in achieving this comprehension. Proper measurements immediately lead to it. According to Einstein, this seemingly different speed is really the result of a reinterpretation of the concept of space-time curvature. These forces the use of a Riemannian geometry based on a curved four-dimensional space to characterize these processes.

Furthermore, this situation may be handled in terms of Euclidean geometry by using the Lorentzian technique, which entails embracing the measured locally changing speed as a consequence.

If this is connected to the previously indicated internal motion of particles at a velocity of c, then all the tools necessary to precisely measure all the processes happening in a gravitational field are available. The well recognized phenomenon of the sun's refraction of incoming light rays is, as is well-established mathematically, a classical refraction mechanism. This is well known since it has been shown by prominent cosmologists such as Roman Sex. We know that what usually occurs is:

$$\alpha = 4.\frac{GM}{c^2 d} \tag{3}$$

where G denotes the gravitational constant, M the mass of the gravitational source, d the distance to the vertex, and α the total deflection angle. A result of both general relativity and the classical refraction process.

In contrast to Einstein's theory, which treats gravity as a geometrical characteristic of space-time in four dimensions, the perspective that follows Lorentz views gravity as a physical phenomenon. Given this, it might be a classical physical force. If we examine two particular aspects of the forces of gravity, namely

- Due to the fact that electric force is more than 30 orders of magnitude stronger than gravity;
- Gravity's only role in attracting objects

Then other forces can be considered to be the primary cause of gravity. The results of this strategy are logical and acceptable. The pathways of light-like particles, such photons or elementary particle components, may be disrupted by exchange particles with underlying charges, leading to reduced effective velocities. In addition to slowing down the resulting photons, this collision also slows down the elementary particle's component sub-particles. The phenomena of time-dependent response dilatations is once again made clear by this, as well as the contraction of gravitational field particles and objects whose form and extension are affected by various fields.

The impact of gravity is independent of the mass of the stuff that generates it, according to this method. The most likely outcome is that all basic particles have an equal contribution to the force of gravity.

6. Conclusion

Relativity from a Euclidean perspective offers an attractive rethinking of space and time that questions the long-established Minkowskian view without sacrificing empirical validity. Resolving many conceptual paradoxes traditionally associated with Einstein's relativity, this perspective restores Euclidean geometry as the fundamental spatial framework and treats time as an independent, measurable dimension. These paradoxes include simultaneity, frame dependence, and the curvature of space-time. The research demonstrates that sophisticated non-Euclidean transformations are unnecessary for the elegant derivation of relativistic effects from geometric relations in an absolute Euclidean framework. Applying the model to fields as diverse as celestial mechanics and satellite navigation improves computational accuracy, mathematical consistency, and physical interpretation clarity. At the end of the day, the Euclidean paradigm does more than only make relativistic motion and gravity easier to grasp; it also paves the way for novel theoretical approaches to unifying quantum mechanics and relativity with unified field models.

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