

TOWARDS A DISCRETE RELATIVITY

Antonio León Sánchez

Retired Professor. Independent researcher in the foundations of science.

Abstract.-A new discrete relativism is proposed here, based on universal prekinesis and the discrete nature of space, time, and, consequently, motion. A new relativism that will also be inevitable due to the formal inconsistency of the actual infinity and, therefore, of the space-time continuum that underpins classical special relativity. And also due to certain insoluble problems of classical special relativity. In the new discrete relativity, however, relative velocities and the need for a relativistic sum of velocities required by the existence of discrete and absolute units of space (qusits) and time (qutits), persist. As a consequence, there is also a maximum velocity of 1 qusit per 1 qutit.

Keywords: prekinesis, discrete physical space, discrete time, discrete motion, discrete relativity, relative velocities, absolute velocities, maximum velocity, relativistic addition of velocities, absolute simultaneity.

1. Reasons for a new discrete relativism

I will begin by indicating the main reasons why it is necessary to propose a new discrete theory of special relativity:

- R1.- The physical reality of physical space deduced from the empirical detection of gravitational waves. In fact, what does not physically exist cannot vibrate, transmit its own vibrations, or interact with the real physical instruments that detect those vibrations (interferometers). Although these vibrations of space were detected 15 years ago, and around a hundred times since then, the idea of the spacetime continuum continues to dominate physics more as a theoretical scenario than as a physical reality. But since space is a real physical object, ***all physical objects necessarily move through that real physical space***, even if that motion is currently unobservable to us. Only the relative motion of one object with respect to another is observable, but both objects necessarily move through the same real physical space. It cannot be otherwise.
- R2.- The absolute nature of all rotations. It can be demonstrated with complete formal rigor that, despite E. Mach, the rotational motions of celestial bodies can only be absolute motions ***around absolute elements (centers and axes) of rotation***. As an example, consider the rotational motion of the Earth. Each point of the planet describes a single and unique circle around a single and unique point of the single and unique internal axis of rotation of the Earth. Otherwise, if that point were to rotate simultaneously around more than one center of rotation, it would have to be in two places at once. The same argument applies to rotations around external centers (loci) of rotation, as in the case of the Earth's translational motion around the Sun. Since a huge number of celestial objects, such as the Earth, are subject to one or more simultaneous rotations, it can be said that absolute motions are the most common motions in the observable universe.
- R3.- The absolute nature of uniform motion. From a perspective different from Zeno's paradoxes on the impossibility of change, and therefore of motion (successive changes of position), it can be formally demonstrated that uniform motion in the spacetime continuum is inconsistent. The proof is so simple and compelling [3] that no other solution seems possible than to consider the discrete reality of space, time, and motion itself, all of which are absolute, not relative. The relativity of motion is actually an inevitable consequence of the fact that, at least for now, ***we cannot observe or measure the motion of real physical objects through the real physical space***; only the motion of physical objects relative to other physical objects is observable and measurable.

- R4.- Real physical motions would therefore be absolute motions around unique and absolute axes or centers of rotation; or absolute motions **through the real physical space**. The relative motions of some physical objects with respect to others physical objects would be the consequences of the different absolute, and unobservable, motions of all real physical objects through the real, unique, and absolute physical space, which is also unobservable (at least for now).
- R5.- **The three-vector problem and the four-body problem** [14, 12] make it impossible to extend special relativity beyond the simultaneous consideration of motions observed from three different inertial reference frames. For more than three inertial reference frames, insurmountable difficulties arise within the framework of special relativity. To these problems must be added the dozens of conflicting situations and contradictions that the reader can find in [4] on the consequences of special relativity, considered there as an apparent relativity, if not contradictory.
- R6.- The universal prekinetic of all physical objects (previously called preinertia by the author) discovered by Galileo in 1632 [1, p. 228] and ignored by all subsequent physicists. In effect, this universal property of all physical objects—even photons are prekinetic—introduces a novelty in kinematics: all physical objects set in motion from other physical objects inherit the velocity vector of those physical objects from which they are set in motion. **This inheritance makes it impossible to detect the absolute motion of any physical object A by setting other physical objects in motion from object A.**
- R7.- The discrete nature of space and time imposes an insurmountable restriction on the motion of all physical objects: there is an inevitable maximum velocity of one unit of space (qusit, quantum space unit) per unit of time (qutit, quantum time unit), because **it is impossible to travel a distance shorter than a qusit, or for a physical motion to last less than a qutit**. This may be the speed of light and gravitational waves, and it will be if Planck's length and Planck's time define those discrete units of space and time. And, as will be seen here, the reason for a discrete relativism related to the velocities observed in different reference frames and to the sum of those velocities.

2. Fundamentals for a discrete relativity

The formal demonstration of the inconsistent nature of the actual infinity does not require any special principles. Only the fundamental laws of logic and some preliminary definitions are needed, such as those of potential infinity, actual infinity, infinite set, and a few others [11]. An immediate consequence of this inconsistency is the inconsistency of the spacetime continuum [11]. Therefore, space and time must be finite and discrete, with indivisible minimum units of space (qusits) and time (qutits) [7, 9, 10, 11]. On the other hand, the Principle of Directional Evolution of the universe (see for instance [17]) establishes:

Principle 1 (of the Directional Evolution) *The universe evolves independently of its observers and always in the same direction of increasing its global entropy.*

And from that principle, which applies to all physics and all experimental sciences, several very important results can be formally deduced to explain the physical world. Among them (see for example [17]):

Theorem 1 (of the Consistent Universe) *The universe evolves under the control of a unique set of invariant and consistent physical laws.*

The Theorem 1 of the Consistent Universe renders the Principle of Relativity unnecessary in discrete relativity. Furthermore, the existence of a minimum unit of space (qusit) and a minimum unit of time (qutit) makes the existence of a maximum velocity of 1 qusit per qutit inevitable. If the minimum lineal unit of space is l_p and the minimum unit of time is t_p , where l_p and t_p are respectively Planck's length and Planck's distance, then the speed of

light through physical space and the velocity of propagation of gravitational waves through the same physical space correspond to that maximum possible velocity through real physical space. In this case, the Second Principle of special relativity would also not be necessary in discrete relativity. Therefore, in this discrete version of relativity, no particular principle is needed, as is the case with the two fundamental principles of special relativity.

3. Prekinesis

Although under the name of preinertia, I have devoted several works to the physical concept of prekinesis (see, for example, [4, Chp. 33-45], [5, 6, 13, 15, 16, 2]). This is a universal property of all physical objects that was discovered by Galileo in 1632 [1, p. 171-371] and ignored by all subsequent physicists. It is an almost obvious property that becomes apparent every time, for example, here in the Earth an object falls on its surface just below the place from which it begins its fall. The same thing happens if the object falls inside a vehicle moving on the Earth's surface: it falls inside the vehicle just below the place in the vehicle from where it began its fall. It can be defined as follows:

Definition 1 (of Prekinesis) *Universal property of every physical object by virtue of which it inherits the absolute **VELOCITY VECTOR** of the physical object from which it is set in motion.*

Even photons would be prekinetic [4, Chp. 36]. This may seem like an irrelevant property, but it is not: prekinesis is the reason why it is not possible (at least for now) to detect the absolute motion of any physical object A by setting other physical objects in motion from A . It is also a property that allows us to demonstrate in formal terms (and surely also in experimental terms, as I will soon report) that in reality all motions are absolute, and through the real and absolute physical space [8, 2]. As I have proposed on other occasions, it seems reasonable and advisable to include prekinesis in the Principle of Inertia:

Principle 2 (of Inertia) *All physical objects are prekinetic and remain at rest or in uniform motion as long as no external force acts upon them.*

As we will see in the following sections, prekinesis is the mechanical reason why different velocities can be observed and measured in different reference frames, and the reason why the sum of velocities cannot be a simple algebraic sum.

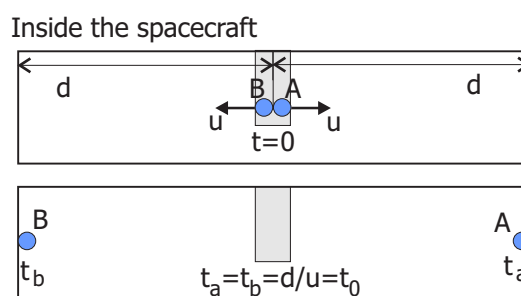


Figure 1 – Uniform motion of balls A and B observed from inside the spacecraft.

4. Prekinesis and relative velocity

For the reason given in the above item R1 of the first section, physical space is real, and consequently all objects move **THROUGH** that real physical space, even if that motion is not currently observable or measurable. What we can obviously do is reflect on that motion in logical and physical terms. That is what we will do in this section and the next. Consequently, let us consider the following scenario to discuss prekinesis, relative uniform motion, and absolute uniform motion:

In the spacecraft shown schematically in Figure 1, a mechanism has been installed that allows two identical balls A and B to move without mechanical contact with the spacecraft

from the center of the spacecraft to its ends, both at the same uniform velocity u . Assuming that the two balls begin their respective motions at time $t = 0$, they will arrive simultaneously at their respective ends after a time $t_0 = d/u$. Obviously, the following is verified:

$$t_a = t_b = d/u = t_0 \quad (1)$$

where t_a and t_b are respectively the times taken by A and B to complete their respective motions.

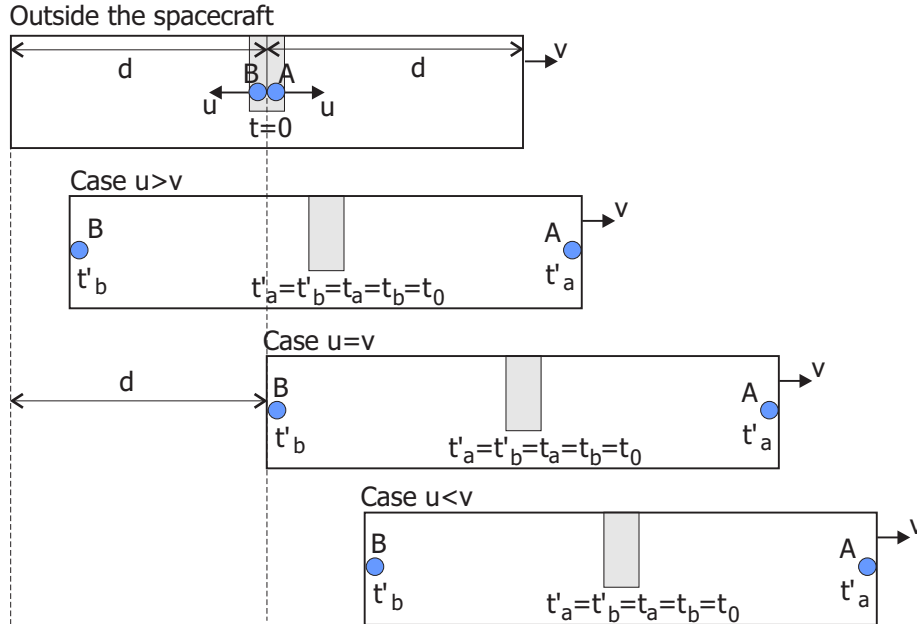


Figure 2 – Uniform motion of balls A and B observed from outside the spacecraft.

From the point of view of the real physical space through which the spacecraft moves at a uniform velocity v , we must consider three cases: $u > v$, $u = v$, and $u < v$ (Figure 2). For the first case, and taking into account precession, the ball A moves at a uniform velocity $u + v$ and travels a distance $d + vt_a$. Therefore:

$$t'_a = \frac{d + vt_a}{u + v} = \frac{d(1 + vt_a/d)}{u(1 + v/u)} = \frac{d(1 + v/u)}{u(1 + v/u)} = \frac{d}{u} = t_a = t_0 \quad (2)$$

Due to the same precession, the ball B moves at a uniform velocity $u - v$ and travels a distance $d - vt_b$. Therefore:

$$t'_b = \frac{d - vt_b}{u - v} = \frac{d(1 - vt_b/d)}{u(1 - v/u)} = \frac{d(1 - v/u)}{u(1 - v/u)} = \frac{d}{u} = t_b = t_0 \quad (3)$$

Therefore:

$$t'_a = t'_b = t_a = t_b = t_0 \quad (4)$$

For the case $u = v$, the same argument for ball A leads to:

$$t'_a = \frac{d + vt_a}{u + v} = \frac{d(1 + vt_a/d)}{u(1 + v/u)} = \frac{d(1 + v/u)}{u(1 + v/u)} = \frac{d}{u} = t_a = t_0 \quad (5)$$

For ball B , its velocity will be $u - v = 0$, and it is the spacecraft that moves toward ball B with velocity $v = u$, so that the following is verified:

$$v = \frac{d}{t'_b}; t'_b = \frac{d}{v} \quad (6)$$

And being $v = u$:

$$t'_b = \frac{d}{v} = \frac{d}{u} = t_a = t_0 \quad (7)$$

Therefore, in this case we will also have:

$$t'_a = t'_b = t_a = t_b = t_0 \quad (8)$$

Finally, for the case $u < v$, again the same argument for the ball A leads to:

$$t'_a = \frac{d + vt_a}{u + v} = \frac{d(1 + vt_a/d)}{u(1 + v/u)} = \frac{d(1 + v/u)}{u(1 + v/u)} = \frac{d}{u} = t_a = t_0 \quad (9)$$

And for the ball B :

$$t'_b = \frac{d - vt_a}{u - v} = \frac{d(1 - vt_a/d)}{u(1 - v/u)} = \frac{d(1 - v/u)}{u(1 - v/u)} = \frac{d}{u} = t_b = t_0 \quad (10)$$

Although in this case $1 - v/u$ is a negative number.

It can therefore be concluded that the velocities of the balls observed inside and outside the spacecraft, and due to prekinesis, are different. These differences are exactly compensated for by the velocity of the spacecraft through the real physical space, which is precisely the velocity inherited by each ball. But both inside and outside the spacecraft, the events:

- 1.- The ball A reaches its end point.
- 2.- The ball B reaches its end point.

are simultaneous due to prekinesis. Therefore, although they move at different relative velocities inside and outside the spacecraft, they also travel different distances inside and outside the spacecraft, which makes possible the simultaneity of both events.

5. Discrete sum of velocities

As in special relativity, there is also a maximum velocity v_{mx} in discrete relativity, although in this case it is not due to an arbitrary law (as the Second Law of special relativity) but rather to the discrete nature of space and time formally deduced from the fundamental laws of logic and the Principle of Directional Evolution of the universe.

Under these discrete conditions, the sum of velocities cannot be a simple algebraic sum because that sum can never be greater than $v_{mx} = 1 \text{qs/qt}$ (abbreviated as 1qs/qt), simply because distances smaller than a discrete unit of space cannot be traveled, nor can they be traveled in a time shorter than a discrete unit of time. If, as indicated above, the discrete unit of length is the Planck length (l_p) and the discrete unit of time is the Planck time (t_p), then the speed of light and that of gravitational waves are two cases of maximum speed in the observable universe.

Consequently, if the velocity of any physical object A is $v_a = 1/m \text{qs/qt}$ and that of any other physical object B is $v_b = 1/n \text{qs/qt}$ (where m and n are natural numbers), the discrete sum of velocities will coincide, and for the same reasons, with the relativistic sum of velocities:

$$v_a + v_b = \frac{1/m + 1/n}{1 + (1/m1/n)/c^2} \text{qs/qt} = \frac{\frac{m+n}{mn}}{1 + (1/nm)/c^2} \text{qs/qt} = \frac{m+n}{mn + 1/c^2} \text{qs/qt} \quad (11)$$

In the case of the speed of light c (and gravitational waves), we will have $c = 1 \text{qs/qt}$:

$$c + c = \frac{1+1}{1+1/c^2} \text{qs/qt} = 2/2 \text{qs/qt} = 1 \text{qs/qt} = c \quad (12)$$

It is important to note that the numbers m and n in (11) will always be natural numbers,

generally very large ones. For example, for a velocity of 1 m/s, $n \approx 10^9$ quits, which means that at that discrete velocity an object remains 10^9 quits at rest in each quisit of its trajectory; a discrete, jumpy motion, although to our sensory perception it is a continuous motion.

I apologize for the excessive self-references to my own bibliography, but I am a dissident of some areas of contemporary physical orthodoxy and I have no choice but to use them.

Bibliographical References

- [1] G. Galilei. *Diálogo sobre los dos máximos sistemas del mundo ptolemaico y copernicano*. Círculo de Lectores, Barcelona, 1997.
- [2] A. León Sanchez. Why is preinertia so important? *The General Science Journal*, 2025. [PDF](#).
- [3] A. León Sanchez. A brief argument with profound implications for physics. *The General Science Journal*, 2025. [PDF](#).
- [4] A. León Sánchez. *Apparent relativity*. Amazon's Kindle Direct Publishing, 2022. [PDF](#).
- [5] A. León Sánchez. Towards a discrete cosmology: Paper 7: Preinertia. *The General Science Journal*, 2022. [PDF](#).
- [6] A. León Sánchez. Preinertia and absolute motion. *The General Science Journal*, 2023. [PDF](#).
- [7] A. León Sánchez. Gravitational waves as empirical proof of space reality. *The General Science Journal*, 2023. [PDF](#).
- [8] A. León Sánchez. *The discrete reality of physical space*, chapter Newton's bucket and absolute rotations. 2023. [PDF](#).
- [9] A. León Sánchez. The origin of the universe: a formal proof. *The General Science Journal*, 2024. [PDF](#).
- [10] A. León Sánchez. Fundamentals for a Discrete Model of the Universe. *The General Science Journal*, 2024. [PDF](#).
- [11] A. León Sánchez. The Axiom of Infinity Is Inconsistent. *The General Science Journal*, 2024. [PDF](#).
- [12] A. León Sánchez. The four-body problem. *The General Science Journal*, June 2025.
- [13] A. León Sánchez. Galileo Galilei, the true discoverer of preinertia. *The General Science Journal*, April 2025. [PDF](#).
- [14] A. León Sánchez. Relative Motion and the Unexpected Three-Vector Problem. *The General Science Journal*, February 2025. [PDF](#).
- [15] A. León Sánchez. Preinertia and special relativity. *The General Science Journal*, May 2025. [PDF](#).
- [16] A. León Sánchez. Preinertia: Formal proofs. *The General Science Journal*, June 2025. [PDF](#).
- [17] A. León Sánchez. On the role of human observers in the evolution of the universe. *The General Science Journal*, October 2025. [PDF](#).