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Proofs of Absolute Motion 1/3 (Links to part 2/3, 3/3)

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Abstract.-The empirical detection of gravitational waves leads to the conclusion that physical space must be a real physical object. And from this reality it is concluded that motion through physical space must be absolute, being possible to deduce vectorially the absolute velocities from the observed relative velocities.

Keywords: Gravitational waves, physical space, uniform motion, relative velocity vector, absolute velocity vector.

1 Physical space: fiction or reality?

The dominant idea throughout the twentieth century, and so far in the twenty-first, about the nature of physical space has been that such space is not real, that it is only a fiction useful to represent theoretically some relationships between real physical objects. In this sense, and in 1902, E.Mach wrote (quoted in [2, p. 142]):

> Concerning the conceptual monstrosities of absolute space and absolute time, I could take nothing back.

Nowadays, the same idea is defended and popularized through the Internet, where expert physicists write:

> Spacetime is not a fabric, it is not material. Space is just an illusion, time is just an illusion therefore spacetime is just an illusion and a good way of simplifying the concept of general relativity to the public.

The same idea has been defended by numerous well-known thinkers (particularly empiricists) over the last two centuries. This is the case, for example, of: G. Leibniz, D. Hume, C. Huygens, E. Mach, H. Poincaré, E. Borel, L. Wittgenstein etc. And of the vast majority of contemporary physicists. For example [5, p. 266]:

> ... space and time, like society, are in the end also empty conceptions. They have meaning only to the extent that they stand for the complexity of the relationships between the things that happen in the world.

At the same time, those same contemporary physicists defend that physical space expands, deforms, vibrates and is the transmitting medium of its own vibrations. So many abilities for something that does not really exist according to those thinkers.

2 The reality of physical space

The experimental detection of gravitational waves from 2014 will change the majority opinion on the ontological nature of physical space, and the reality of physical space will be universally accepted, since observation and experimentation are the only valid ways to confirm scientific theories. Certain gravitational interactions of the highest intensity (black hole collisions, binary pulsars, supernova explosions, etc.) cause, in effect, space itself to vibrate in transverse waves of the quadrupole type that propagate through space itself at the speed of light. These vibrations are known as gravitational waves.

It is these gravitational waves that have been empirically detected here on Earth. Where empirical detection implies the physical interaction of those vibrations with ordinary matter, it implies the change of size (however minimal) of the arms of the interferometers (of ordinary matter) that detect them. And that is only possible if the vibrating medium is a real physical medium, the systems of equations by themselves are not able to make ordinary matter vibrate. Or as Galileo said [1, p. 223]:

> non entium nullae sunt operationes (what does not exist does not act)

Thus, the empirical detection of gravitational waves proves the physical reality of space: physical space is a real entity, as real as ordinary matter. A statement that will undoubtedly have very significant consequences in the development of future physics.

3 Motion THROUGH physical space

As far as we know, gravitational waves propagate in all directions throughout the space of the observable universe. The idea of a unique space containing all celestial objects makes sense. As a real physical object, space should have a certain substantiality, which for simplicity I will call space matter. Basic knowledge of the ordinary physical world allows us to make some predictions about this space matter, such as that it must have physical properties suitable for transmitting quadrupole transverse waves at the speed of light; that it must be different from ordinary matter and possible dark matter; that it might have some relation to dark energy; that it must be transparent to the motion of ordinary matter; that it must also be sensitive to the presence of ordinary matter and dark matter (gravitational fields); and that it must also be the medium of interaction at a distance between objects of ordinary matter (gravitational interaction) [4, Pdf].

The motion of material objects (ordinary matter) is, therefore, a motion THROUGH the absolute physical space. It would be an absolute motion. The fact that we cannot (for the moment) observe physical space means that we cannot (for the moment) describe the motion of objects THROUGH physical space. Moreover, preinertia (see paper 3 in this series) makes it impossible to detect the absolute motion of a reference frame using only the objects in that reference frame, including photons emitted in that frame. But it cannot be inferred from this impossibility that absolute motion does not exist.

In a fictitious space where only relative positions and relative motions exist, the relative motion of an object with respect to different reference frames can be described from each of those different reference frames, and the description can be such that the object in relative motion is observed following at the same time different relative trajectories. For the reason that follows, those different simultaneous descriptions are not possible with motion through the real physical space, i.e. through the real space matter.

Indeed, if the motion of an object through the real physical space could be described as following different trajectories at the same time, then that object would have to be at the same time in different parts of the same physical reality, i.e. in different parts of the same real physical space, which is impossible. Thus the observed different relative trajectories can only be apparent, as apparent as refractive deformations. This brief argument proves the following:

Theorem of Absolute Motion: Physical objects cannot move through real physical space following different trajectories at the same time.

The next section proves this simple theorem makes it possible to prove other results which, in turn, make possible the determination of absolute velocity vectors from the observed relative velocity vectors.

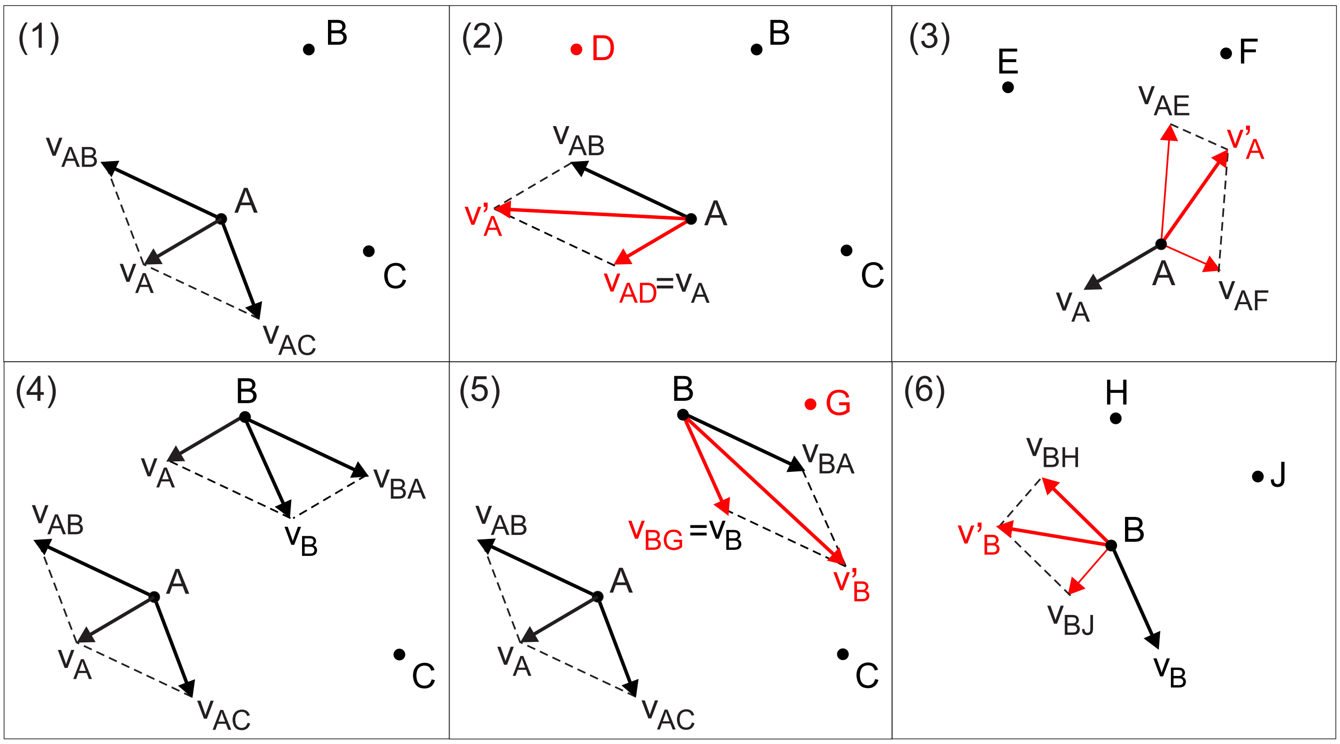

Figure 1

4 Three-Points Theorem

Let us consider three coplanar points A, B and C uniformly moving along three different directions along the same plane of the real physical space. Suppose that, relative to B, point A moves with relative velocity $\vec{v}_{AB}$, and relative to point C with a relative velocity $\vec{v}_{AC}$. The parallelogram rule allows us to construct the resultant vector $\vec{v}_{A}$, which is the unique vector resulting from the vector sum of $\vec{v}_{AB}$ and $\vec{v}_{AC}$ (Figure 1 (1)). That is, the only vector whose components are precisely $\vec{v}_{AB}$ and $\vec{v}_{AC}$. Let now D be any point in uniform motion relative to A, and suppose that $\vec{v}_{A}$ is the relative velocity vector of A with respect to D (Figure 1 (2)). The relative velocity of A with respect to B, i.e., the velocity

$\vec{v}_{AB}$, and the relative velocity of A with respect to D, $\vec{v}_{AD} = \vec{v}_A$, would compose a new vector $\vec{v'}_A$ distinct in direction from $\vec{v}_A$. Consequently, point A would be moving at the same time along two different trajectories, which is impossible (Theorem of Absolute Motion). For the same reason, there cannot be two points E and F such that the relative velocities $\vec{v}_{AE}$ and $\vec{v}_{AF}$ of A with respect to E and F compose a resultant $\vec{v'}_A$ distinct in direction from $\vec{v}_A$ (Figure 1 (3)). Consequently we have to conclude that $\vec{v}_A$ is the absolute velocity vector of point A.

Since the relative velocity of A with respect to B is $\vec{v}_{AB}$, the relative velocity of B with respect to A will be $\vec{v}_{BA}$ (Figure 1 (4)). Moreover, in the direction of $\vec{v}_A$, point B has to move with the same velocity $\vec{v}_A$, otherwise the relative velocity of A with respect to B would not be $\vec{v}_{AB}$. Therefore, $\vec{v}_{AB}$ and $\vec{v}_A$ are the two components of the velocity vector $\vec{v}_B$ with which point B has to move. Obviously, the vector $\vec{v}_B$ can be decomposed into a multitude of pairs of components, but if one of the components is $\vec{v}_{BA}$, the other is necessarily $\vec{v}_A$. Now, and for the same reasons as in the case of A, it is immediate to prove that $\vec{v}_B$ is the absolute velocity vector of B. Indeed, if there existed a point G such that $\vec{v}_B$ was the relative velocity of B with respect to G, then the relative velocity of B with respect to A, $\vec{v}_{BA}$ and the relative velocity of B with respect to G, $\vec{v}_{BG} = \vec{v}_B$, would compose a new vector $\vec{v'}_B$ distinct in direction from $\vec{v}_B$ (Figure 1 (5)). Therefore, point B would be moving at the same time along two different trajectories, which is impossible (Theorem of Absolute Motion). For the same reason, neither could exist two points H and J such that the relative velocities $\vec{v}_{BH}$ and $\vec{v}_{BJ}$ of B with respect to H and J compose a resultant $\vec{v'}_B$ distinct in direction from $\vec{v}_B$ (Figure 1 (6)). Consequently we have to conclude that $\vec{v}_B$ is the absolute velocity of point B through the plane.

Exactly the same argument applied to point B also applies to point C, proving the existence of its absolute velocity vector $\vec{v}_C$ (Figure 2). All of which proves the following theorem:

Three-Point theorem: Given three coplanar points moving uniformly in three different directions on a plane of physical space, the relative velocity vectors of one of them with respect to the other two make it possible to calculate the absolute velocity vector of the three points through the plane.

It is immediate to extend the previous argument from three points in the plane to four points in space:

Four-Point theorem: Given four points in the real physical space uniformly moving along four different spacial directions, the relative velocity vectors of one of them with respect to the other three makes it possible to calculate the absolute velocity vector of the four points through the physical space.

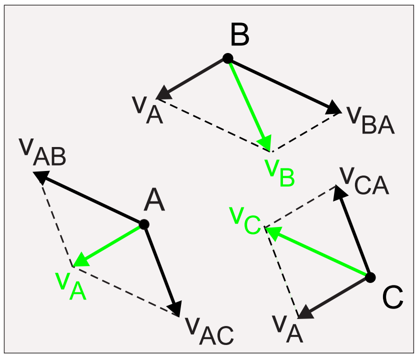

Figure 2 – The relative velocities $\vec{v}_{AB}$ and $\vec{v}_{AC}$ makes it possible to determine the absolute velocities $\vec{v}_A$, $\vec{v}_B$ and $\vec{v}_C$ through the real physical space.

And it is also immediately possible to replace the abstract points of the two previous theorems by the real points or real parts of real physical objects. It is striking that the above two theorems, apart from their simplicity and consequences, are published in the year 2024, and that they will certainly take decades to reach, if they reach, the relativistic officialism.

As indicated above, the relative trajectories observed in some cases may not be real but apparent, and the same may be true for other space-time deformations deduced from special relativity. Although opinion is divided, many physicists think that this is the case for the FitzGerald-Lorentz contraction: it is not possible for an object to have at the same time as many sizes as relative velocities at which it can be observed [3]. But if one of these relativistic deformations is only apparent, which part of the theory decides which are real and which are apparent? Won't they all be as apparent as the refractive deformations?

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