On the Nature of Mechanical Motion and Momentum

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Abstract

There is not a unified answer to the question “is there a physical substrate of motion?”. On one hand, any moving body has a momentum, e.g., amount of motion, whose magnitude is defined by the motion speed and body mass. On the other hand, neither classical nor relativistic physics have a positive answer to the above question and describe the physical substrate of motion or momentum.

According to the author's concept a zone (space area) is formed behind each elementary particle where chaos is disturbed and there is a preferred motion direction (PMD) of graviton- pulses since they are driven to the formed space as a result of a particle movement. The author refers to this zone, which represents a flow of graviton-pulses towards the motion direction, as the acceleration zone. This zone discerns material particles in motion (that obtained an acceleration momentum) from still particles. The magnitude of the latter is directly proportional and corresponds to the speed of motion.

It is commonly known that mechanics is the science of general laws of body motion. All physics literature defines mechanical motion as follows: movement (displacement) of a body in space relative to other bodies over time. Mechanical motion represents a process when body coordinates change in space over a certain time interval.

Primary mechanics laws were first studied, systematized and mathematically described by the great Italian scientist Galileo Galilei and the English scientist and mathematician Isaac Newton who laid the foundation of the classical or Newtonian physics.

Three hundred years later, in the early 20th century, another brilliant physicist Albert Einstein set the scientific world alight by proposing his special relativity theory (SRT). He proved that classical mechanics works only for low speeds while at high, sublight speeds, relativistic mechanics is observed. After the proposal of SRT the following century proved its absolute correctness and which is accepted by anyone. Nevertheless, at a closer look, there are a number of fundamental issues that either have no answer or they are believed to be postulates.

The author considers mechanical motion and related physical quantities based on the proposed concept (1, 2, 3) and explains them in quite a different aspect inconsistent with the generally accepted rules. This article also explains almost all fundamental issues and postulates.

Let us have a closer look at the essence and concept of mechanical motion. As mentioned above, the term of motion or movement is a process of body (point) movement (change of coordinates) in space over a specific time interval. From this point of view, motion as a process has two parameters: a) intensity, e.g., speed; b) direction;

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Fig. 1a

Particle (with a mass *m)* in (space time continuum) chaotic environment in a resting condition

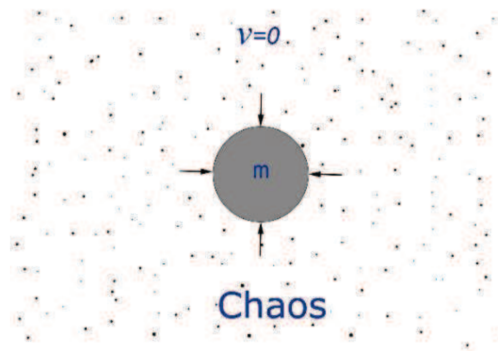


Fig. 1b

The particle is set to motion under the influence of momentum (p) and displaced in distance (Δl)

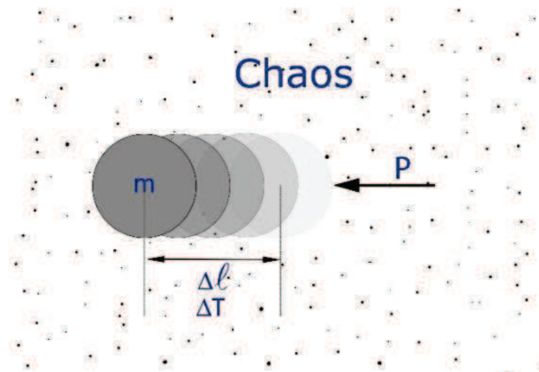
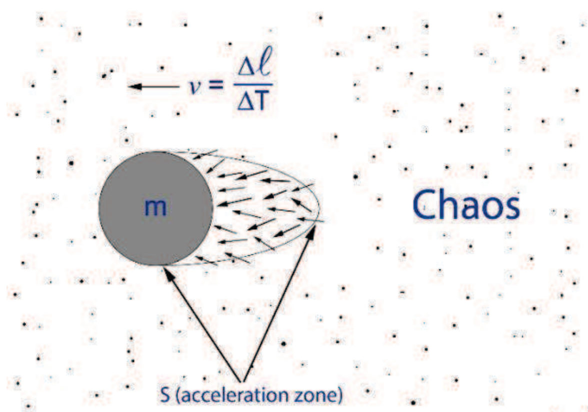


Fig. 1c

The acceleration zone is created after the particle (s), consisting of graviton-impulses stream in the direction of the particle motion with the speed of the particle movement.



The author believes that this mechanism (phenomenon) is a basis of the well-known d'Alembert's paradox as well as the commonly known first law (or postulate) of Newton. This acceleration zone (representing a flow of momentum gravitons) is the physical substrate of motion and momentum, defining the absoluteness of motion. According to the UMT, it is also the physical substrate of inertia and kinetic energy. The author also refers to this zone as "pure motion" or "pure impulse" if it is considered separately from the material body, such as nucleon or atom. Along with the material body (where applied to the material body), it gives the amount of motion or body momentum.

As for the speed of graviton momentum flow within the acceleration zone, it always equals the speed of light (c) as a permanent quantity of momentum movement in the space-time continuum (STC). The motion speed of a material body is also defined by the ratio of the acceleration zone size and material body weight.

It should be noted that when material bodies collide, it is momentum, or motion, that is transmitted, rather than speed. The process of momentum transfer (motion) manifests itself as ACCELERATION. In other words, acceleration is the process of momentum transfer, or motion. Motion speed is secondary relative to momentum. Speed is a scalar quantity. It equals the average quantity of motion on a specific part of the motion path over a certain time interval.

Momentum of a material body is transferred to another body always through contact when they collide (except for elementary particles having electromagnetic fields). It should be noted that when material bodies collide and momentum is transferred (motion), the quantity of motion speed is important rather than the overall amount of MB momentum. Momentum (motion) is always transferred from a fast-moving body to a slow body. Speed is not transferred, because it is acquired during acceleration, e.g., as a result of momentum transfer or motion. It is incorrect to speak of an increase of the material body momentum due to its increased motion speed. It would be correct to say about a growing motion speed of a material body due to momentum transfer. We can state that momentum does not appear, it is transferred. When material bodies collide, both motion momentum and direction movement are transferred. The latter is defined by the configuration of collided MBs and the nature (angle) of collision.

The motion momentum is not transferred instantaneously when MBs collide, but over a certain time interval (ΔT). This quantity defines the impact force ($F = \frac{\Delta P}{\Delta T}$). Therefore, force is a derivative of momentum. The author believes that the Newton (classical) physics incorrectly emphasizes force as a method (or means) of interaction between physical systems leaving momentum behind. It is the momentum and angular momentum that represent a basis of interaction between bodies and physical systems. Force is not an action (or interaction). Force is a measure of action intensity (momentum transfer).

As noted above, the process of momentum transfer from one body to the other represents acceleration (positive or negative). If we bear in mind that momentum is a derivative of two quantities, mass and motion, it would be even more obvious that the action is based on motion transfer.

There is a question: why does the process of momentum transfer require a certain time interval? The answer is that any material body consist of a certain number of component particles (atoms or nucleons) that are interrelated by electromagnetic fields. However, the transferred motion (momentum) is distributed to each of them forming an acceleration zone behind each component particle. The latter requires certain time (ΔT).

As given above, the author believes that in addition to the momentum (amount of motion) applied to the body, there is also a so-called pure momentum not applied to the material body. This is represented by photons (quantum of electromagnetic wave) and physical fields (electromagnetic, gravity).

In this manner, the author distinguishes such concepts as: motion speed and motion, though they have the same unit of measurement — m/s. Unlike speed, motion has a direction (it is a vector quantity) and has a physical substrate. It can be transferred from a material body (particle) to the other body when they collide, while speed, as a measure of intensity of motion, is not transferred.

The question is how the amount of motion is measured if it differs from speed. Can it have different values? The answer is yes, it can differ from speed. But in that case, it is designated as momentum or amount of motion. According to the author, this is the basis of relativistic mechanics. Let us consider how the amount of motion or momentum of a moving material body is defined. According to the classical physics, it is defined according to the equation: **p = mυ,** where **m** is the mass of a material body, **υ** is the motion speed; however, for high sublight speeds, this equation is not acceptable. Instead, the equation of relativistic momentum is used that states that when the motion speed approaches the speed of light, the body momentum rapidly increases; $P = m\vec{v}\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$; having in mind that the quantity of mass (m) of any material particle is constant, it should be acknowledged that progressively increased momentum at sublight speeds is related with progressive increased amount of motion (rather than speed). The next part of the relativistic momentum equation: $\vec{v} = \frac{1}{\sqrt{1-\frac{v^2}{C^2}}}$ is the indicator of motion or amount of motion of a material body and it will differ from the quantity of motion speed.

The author thinks that the following terms must be distinguished: a) motion speed (scalar quantity) in m/s; b) MB motion (instantaneous speed) in m/s; c) motion or pure impulse in m/s that equals: c (speed of light);

It is the MB motion that defines the amount of momentum of a moving MB. Its quantity is defined by the following equation: $\vec{v}\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$; Therefore, the amount of MB momentum is defined by the product of MB mass and its motion: $p = \vec{v}\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$

Another aspect of mechanical motion is the motion path. The classical (or Newtonian) physics refers to mechanical motion as linear motion only, e.g., body motion in a one-dimensional measurement. In this case, the following terms are acceptable: motion path, linear speed (m/s), momentum (kg.m/s).

The author believes that in addition to linear motion and linear speed there is also so-called surface motion and surface speed. This is the change (increase or decrease) of a surface over a certain time interval (ΔS/ΔT), e.g., motion in two-dimensional space (dimension). The terms of motion path or linear speed are not acceptable for such form of motion. To describe it, m2/s will be used. This is the
change of surface (area) per unit of time. The amount of motion is kg.m^2/s. Isn't it the angular momentum applied for rotating motion and angular speed? Yes, angular motion is the surface motion when the circle area is changed over a certain period of time by a certain amount measured by the circle.

The author believes that surface motion is present in the STC and quantum mechanics, and, therefore, the terms of speed and motion path are not acceptable in quantum mechanics (the latter are acceptable for linear motion only).

Conclusion: mechanical motion (motion in the space) of any system (particle, body) goes as a result of the action (or transfer) of an impulse (impulse momentum) on it. The latter has physical substrate as "acceleration zone" which is a flow of gravitons-impulse (components of STC particles) in the motion direction.

Conclusion: According to the author's concept a zone (space area) is formed behind each elementary particle where chaos is disturbed and there is a preferred motion direction (PMD) of graviton-pulses since they are driven to the formed space as a result of a particle movement. The author refers to this zone, which represents a flow of graviton-pulses towards the motion direction, as the acceleration zone. This zone discerns material particles in motion (that obtained an acceleration momentum) from still particles. The magnitude of the latter is directly proportional and corresponds to the speed of motion)

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