ELEMENTARY DIALECTICAL KINEMATICS AND DYNAMICS OF EXCHANGE

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1. Introductory Remarks and Concepts

1.1. *Frames of reference (first approximation)*

The fundamental dialectical law expressed in the Yes-No contradiction requires that the form and contents, absolute and relative aspects of motion, their active and reactive facets, etc. be described with the help of frames of reference and without them.

To a first approximation, all frames of reference can be divided into two types, namely, sets of empty and nonempty frames of reference.

An empty frame of reference that is a physical analog of an empty set is a primordial notion and does not need any definition. This notion is absent in modern physics, which, however, uses it in a latent form.

An empty frame of reference is an imaginary reference system, such as the Cartesian coordinates, existing only in our consciousness. The physical space is not associated with it because it exists in the ideal space of our thought. No physical processes occur in it except for imaginary mental ones.

A nonempty frame of reference is a material system with a definite physical space and we depict it just like the ideal empty frame of reference.

1.2. *Dialectics of absolutely-relative and relativism*

Dialectics of the absolutely-relative considers both absolute and relative positions, displacement, rest, and motion of objects in space and time.

Relativity does not recognize this contradiction of nature, however, for its justification it uses absolute motion in the form of the principle of the constant velocity of light in all inertial frames of reference. In particular cases relativistic effects coincide formally with nonlinear effects of motion and exchange at high velocities and this will be discussed in the subsequent chapters. Then, the principle of constancy of the velocity of light expresses the following in terms of dialectic: everything in the world is relative except for absolute motion of an electromagnetic signal. A question arise here: why is an electromagnetic wave alone permitted to have an absolute facet of motion, whereas the other objects of nature are not?

With a simplified approach, thinking proceeds in terms of extremes: only Yes (e.g., the absolute) or only No (e.g., the relative). Such method of justification of the extremes is relatively simple. It consists of proving existence of No (or Yes) with latent operation with Yes (or No). When it is impossible to avoid the contradiction, Yes and No are formally combined into a Yes-No common entire. However, in this dualistic formula Yes and No are most often considered separately.

The human mind is unable to cognize notions that do not have its opposites. This way of cognition generated by history of Reason influenced by Cosmos deserves attention as it is a peculiar law of conservation of spiritual energy. Those who try to hide an existence of that or other oppositi would inevitably bring science to a blind alley, sooner or later. The notion of absolute temperature is a simple example of it. Physics states that absolute zero cannot be attained and it is impossible to pass through it to the region of negative absolute temperatures. This is generally recognized. But it is not true, as any physical thermodynamic system occurs simultaneously in the state of positive and negative absolute temperatures. In particular, negative temperatures, high in their absolute value, are prevailed in the cores of stars, while in the upper layers of stellar atmospheres positive absolute temperatures are dominated.

From the standpoint of classical thermodynamics, this statement is unnatural. However, for dialectics, it is quite natural and this will be proved in the following.

1.3. *An absolute frame of reference*

The Universe is characterized by its proper form. Its natural form is unconditional. The Universe embraces everything and its center of mass should be considered to be at rest. We do not know this center but this does not have any practical importance.

An infinite empty ideal frame of reference with the origin at the center of mass of the Universe will be named a main empty absolute frame of reference, or simply, a main absolute frame of reference. The number of main frames of reference is infinite.

Any other ideal frame of reference with the origin at an arbitrary point of space, immovable relatively to the main one, will be termed an empty absolute frame of reference. It is natural that at present these systems can be indicated as material but they expand feasibilities of description of the absolute and relative.

1.4. *Absolute and relative motion*

Absolute motion of any state and phenomenon of nature or briefly, an object of thought, is proper motion of the object relatively to itself, i.e. to its past, present, and future and it is unconditional.

Absolute motion is inseparable from relative motion. Dialectics treats relative induced motion as mutual motion of absolute motions of objects. In particular, if a frame of reference O is associated with a certain object and absolute motion of other objects is considered relatively to it, their motion will be relative mutual motion in result. Relative motion is contradictory: being relative, it is simultaneously absolute, since mutual motion in dialectics is unconditional and as an objective fact, it is independent on any measurements. Relative motion is a form of manifestation and existence of absolute motion.

Any scalars and vectors of rest, motion, and rest-motion of objects of nature will be called also parameters-oppositi or, simply, parameters of corresponding states and objects of nature. According to this notion, the parameter is a generalized name of any physical value. Elementary state parameters are displacement, velocity, etc.

1.5. *An absolute and relative velocity of motion*

Every object on the Earth moves in a gaseous medium and this motion is the first component of absolute motion. The second component of absolute motion is associated with natural diurnal rotation of the Earth. The third component is connected with its revolution around the Sun, etc. Eventually, the absolute velocity of motion is

$$U = \hat{u} + \sum \hat{u}_i , \tag{2.1}$$

where $\hat{u}$ is the first component of the absolute velocity. Of course, exact values of all components of this series as well as their number are unknown. Now, if a frame or reference is assigned to an object and absolute motion of other objects relatively to this frame is considered, it will result in relative mutual motion with the velocity

$$V = \hat{\upsilon} + \sum \hat{\upsilon}_i . \tag{2.2}$$

In this formula all the velocities are differences between absolute components of the velocities of the object of study and the reference object.

1.6. *Vectors of con figuration*

Both kinds of velocities (2.1) and (2.2) are derivatives of the absolute and relative vectors of position or configuration:

$$\hat{\Psi} = \hat{\psi} + \sum \hat{\psi}_i , \qquad \hat{X} = \hat{x} + \sum \hat{x}_i . \tag{2.3}$$

The description of a system of material points will be mainly restricted by the first terms of the vectors of position. The vector $\hat{\Psi}$ of the space of matter cannot be considered to be a complete vector of configuration. The space of matter, as material space, is inseparable from the ideal space of matter or time.

1.7. *A vector of space-time configuration of the first sublevel*

Material and ideal space is contradictory material-ideal space of matter that will be described by a vector of space-time configuration $\hat{\Phi}$, defining it by the integral:

$$\hat{\Phi} = \int_0^t \hat{\Psi} dt + \hat{\Phi}_0 . \tag{2.4}$$

It follows from the vector of space-time configuration that

$$\hat{\Psi} = \frac{d\hat{\Phi}}{dt} . \tag{2.5}$$

The derivative of the vector of space-time configuration $\hat{\Phi}$ is material-ideal space of matter which is a field of velocity of the $\hat{\Phi}$-configuration space.

1.8. *Vectors of space-time configuration of other sublevels*

It seems reasonable to introduce still deeper space-time configuration:

$$\hat{O} = \int_0^t \hat{\Phi} dt + \hat{O}_0 \tag{2.6}$$

for which the vector of space-time configuration $\hat{\Phi}$ is the field of its motion:

$$\hat{\Phi} = \frac{d\hat{O}}{dt} . \tag{2.7}$$

Evidently that the space-time $\hat{O}$-field is not the last one.

1.9. *Mass as a rich in content facet of an object and as a measure of exchange*

All physical objects and processes are contradictory systems of contents and form. In physics, a fundamental aspect of the contents is matter. For every level of matter, it measure is defined by a scalar parameter *m* which call mass.

Mass is closely related to exchange, therefore, as we will convince further, it simultaneously is a generalized measure of matter-space and rest-motion exchange (interexchange).

1.10. ***Nonseparability, multiplicativity of contents and form; state vectors***

The contents and shape are inseparable, therefore they can be naturally related by a multiplicative relation. In the case of a material point this relation is expressed by vectors of absolute and relative states of a material point:

$$\hat{S} = m\hat{\Psi} = m\left(\hat{\psi} + \sum\hat{\psi}_i\right), \quad \hat{S} = m\hat{X} = m\left(\hat{x} + \sum\hat{x}_i\right), \quad \text{where } \hat{\Psi} \in (\hat{\Psi}, \hat{\Phi}, \hat{O}). \tag{2.8}$$

If $\hat{\Psi} = \hat{\Psi}$ the vector $\hat{S}$ will be called a state vector of the first level or, simply, a state vector.

If $\hat{\Psi} \in (\hat{\Phi}, \hat{O})$, the vector $\hat{S}$ will be referred to as a vector of space-time state of the first or second sublevel, respectively.

Configuration $\hat{\Psi}$ and state $\hat{S}$ vectors have to reflect the most important contradiction of a moving object in space, i.e. they have to describe occurrence and non-occurrence of the object at any point of the space at the same time. Aristotle's classical logic failed to solve this logical, philosophical, and mathematical problem and in modern physics there is no description of this contradiction.