DISCOVERY OF THE NEW LAWS OF MOVEMENT WITHIN THE MOVING SYSTEM IN THE NEW THEORY OF RELATIVITY

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Annotation

In this work, present a new theory of relativity of Galileo and discovery the new law of movement within moving system.

The more in depth analysis of the theory of relativity to move towards to explain the new special theory of relativity. The new special theory of relativity[1-7,14] explained correctly the entire fundamental phenomenon that occur in mechanical and electromagnetic processes, inside of inertial moving systems and in the systems at rest. However, some statements in this papers[1-7] did not reveal the full basic physics philosophical approach to the description of these phenomena. This paper eliminate this shortcoming[14]. It allowed objectively excluding all admitted errors in the development of the theory of relativity. In addition, it confirmed the right of new special theory of relativity [1-7].

The author demonstrate in this paper and the paeper [5,14] the new theory of relativity, in which a new law of motion of solid body inside of the moving system is discover.

INTRODUCTION.

In his special theory of relativity, A. Einstein introduced new concepts of space, and new concepts of motion in these spaces. However, the problem fulfilled only in the sense, that only one formal mathematical description of motion in these spaces given. Deep real physical justification of this mathematical scheme still not solved.

Physical and philosophical foundations of the theory of relativity, which set forth in the books, are substantially ignore. Mostly by giving the mathematical exposition of the theory of relativity, exposition that has nothing in common with the physical theory of relativity.

In addition, the false interpretation of the physical provisions in the theory of Galileo's relativity in a variety of sources and absurd applications in various sections of the mathematics transferred to the theory of relativity.

Direct experimental data that confirm the conclusions of Einstein's theory of relativity require very fine measurements. Nevertheless, they are not currently available. In this regard, it might be smarter to consider that the Einstein's theory of relativity and its mathematic are an incomplete sketch of the theory.

Therefore, a large flow of research connected with the special theory of relativity has no serious physical justification and is only a mathematical abstraction on this subject.

§ 1 Comment of the modern description of the theory of relativity in classical mechanic.

This section talks about an overview of the manner in which the mathematical apparatus applied in the theory of relativity.

The authors of the books preset us the theory of relativity and formulate the principles of relativity of Galileo introducing the concept of the system at rest K. For example one laboratory or Earth with the coordinates x, y, z in relation to which formulated the laws of physics. In addition, they represent the moving system k (e.g. One vehicle) with the coordinates x', y', z', which at the initial moment of time coincides with the coordinates x, y, z and the moving system k moving intro of the system at rest K.

If the constant velocity of the inertial system k denote by v, then after a time t the coordinates of the x', y', z' axis move relative to the fixed x, y, z coordinates by a distance vt in the direction of the x axis. If at one moment t, an event occurs at the point with the coordinates x, y, z relative to the system K than this point will have coordinates $x', y', z' \in k$ inside of moving system

$$x' = x - vt, \quad y' = y, \quad z' = z \qquad 1)$$

As well, Galileo ads that time has an absolute character. The time offset between consecutive events in two systems is always the same. That is, the time is the same in two systems. Therefore, the moment of fulfillment of the events will be the same from the point of view of both systems K, k. To formula 1), you can attach another one

$$t' = t \qquad 2)$$

However, following time the authors write a strange thing that is “illogical"

$$\frac{d^2x'}{dt'^2} = \frac{d^2x}{dt^2}, \quad \frac{d^2y'}{dt't^2} = \frac{d^2y}{dt^2}, \quad \frac{d^2z'}{dt'^2} = \frac{d^2z}{dt^2} \qquad 3)$$

When, in fact, the moving body in the system at rest has a greater speed and pass a greater distance.

This means that in the system at rest a great force apply on the body $m\frac{d^2x'}{dt'^2} < m\frac{d^2x}{dt^2}$

How did they determine that the second derivatives of the distance traveled by the object in the two systems would be equal? In essence, a purely mathematical operation, with no the physics of the process, variation of the mathematical factors. Because the coordinate x of the system at rest has a relationship with the coordinate x' of the moving system

$$x = x' + vt \qquad 4)$$

Accordingly, the first derivative would be equal to

$$\frac{dx}{dt} = \frac{dx'}{dt} + v \quad 5)$$

In this case $\frac{d^2x'}{dt'^2} = \frac{d^2x}{dt^2}$

However, in the sources of science this equation 5) is not given. Because simple math make us suspect there is something wrong. The speed of the solid body in the system at rest is not equal to the speed of the solid body in the moving system; it is greater by the value of v.

Simply they found a derivative of the speed $\frac{dx}{dt}$ in the system at rest and a derivative of the speed $\frac{dx'}{dt} + v$ in the moving system and obtained the result

$$\frac{d^2x'}{dt'^2} = \frac{d^2x}{dt^2} \quad 3)$$

That is, they obtained a derivative of the constant v equal to zero.

They were not confused that the distance x in the system at rest K is not equal to the distance x' in the moving system k, Fig.1. The distance x is not the same that the distance x', than consequently the second derivative of the distance x is not the same that the second derivative of the distance x'

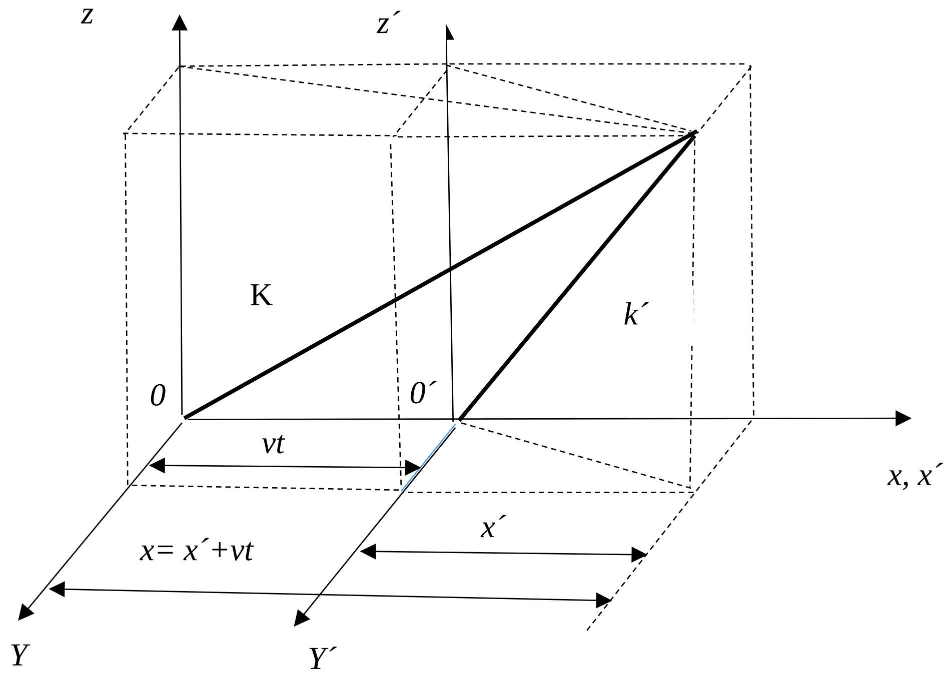


Fig. 1

It was absurd to think that in the same time the solid body would pass two different distances at the same speed with the same acceleration.

However, they did not take into account this physical process, shown in Fig.1.

At the initial time t=0, when the origin of the system at rest $K$and the motion k coincide Fig.2, they defined the distance $\bar{x}$ as $\bar{x} = x_2(t = 0)$ -$x_1(t = 0)$.

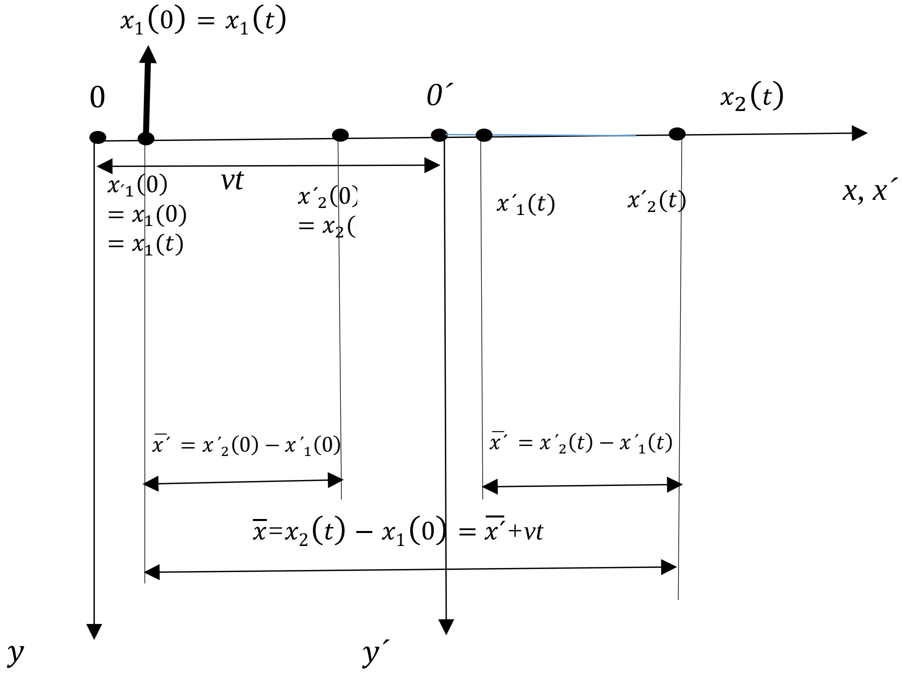


Fig. 2

In addition, at the moment t of time, Galileo's formula four determined the coordinates of this point is

$$x(t) = x' + vt \qquad 4)$$

And got the result

$x_2(t) = (x'_2 + vt)$ 6)

$x_1(t) = (x'_1 + vt)$ 7)

How they found the coordinates of two points 6), 7) of the segment of the distance x, which the solid body passed in the system at rest? They determined the length of this segment of the distance $\bar{x}$, as the difference of the coordinates of these two points $x_2(t)$ -$x_1(t)$, 6), and 7).

$\bar{x} = x_2(t)$ -$x_1(t) = (x'_2 + vt) - (x'_1 + vt) = x'_2 - x'_1 = \overline{x'}$ 8)

Using this calculation, they obtained that the length of the segment of the distance $\overline{x'}$ of the movement by the solid body in the moving system k is equal to the length of the distance $\bar{x}$ of the movement by the solid body in the system at rest K. Equation 8).

It is this delusion that did not allow revealing the fundamental property in the moving system k and the nature of the phenomena occurring inside of it.

We note that the length of the segment of the distance (x'), which apply to transform physical processes from the moving system k to the system at rest K, measure only in the moving system. Because it is hard to imagine that, we can be in an absolute system at rest.

Only knowing the relative velocity v of the moving system k with respect to the conditionally chosen the system at rest K, we can calculate the coordinates of the system at rest K, equating 4).

Real motion of objects in inertial physical systems.

Let us analyze the real processes that occur when the solid body moves along the coordinate axis x of the system at rest K from the point $x_1(0)$ to the point $x_2(t)$ Fig.2.

Let find how the length of the distance $\bar{x} = x_2(t) - x_1(0)$ of the movement of the solid body inside of the system at rest K relate to the length of the distance $\overline{x'} = x'_2(t) - x'_1(t)$ of the movement of a solid body inside of the moving system k.

At the initial time $t = 0$, the origin of the coordinate axes of the two systems 0,0´ coincide, Fig. 2. The movement of the solid body along the coordinates x' starts from the point $x'_1(0) = x_1(0)$ at the time $t = 0$. Inside the moving system k, the object moves on the distance $\overline{x'} = x'_2(t) - x'_1(t) = x_2(0) - x_1(0)$.

However, inside of the system at rest K, there will be a completely different process.

The movement of the solid body along the coordinates x starts from the point $x_1(0)$ at the time $t = 0$. The point $x_1(0)$ does not change its position inside of the system at rest K during the time t. The motion of the point $x_2(0)$ continues to the point $x'_2(t)$.

The motion of the solid body proceed in the following way.

Inside of the system at rest K, the solid body will reach the point $x'_2(t)$. Because the point of $x'_2(t)$ is inside of the moving system k. During the time $t = t$ the point $x'_2(t)$ remove on distance vt. The length of the distance $\bar{x} = x_2(t) - x_1(0)$ cannot measure directly inside of ideal system at rest. But it can be count in conditionally chosen system at rest K.

It is obvious that these two lengths of distances $\bar{x}, \bar{x}'$ are the essence of the ratio of the lengths of the paths of motion of the solid body inside of two inertial systems and they are not equal.

From here on out all the consequences of the incorrect conclusions of the modern theory of relativity.

Let us dwell for a moment on the thoughts of those what the theory of relativity offered us for a long time.

Yes, in fact, Galileo deduced the formula

$$x' = x - vt, \quad y' = y, \quad z' = z \qquad 1)$$

Nevertheless, Galileo deduced it as a simple ratio of coordinates. That is, the value of distance x' not relates in any way to the time t, but distance x always depends on the time t.

Therefore, x, x' are the coordinates of solid body in the moving system and in the system at rest at any time t and nothing more.

The real motion of the solid body in two systems K, k in the forward direction from the point 0 = 0 ', at time t = 0 to the 2 different points $\boldsymbol{x_{t=t}} \in \boldsymbol{K}, \ \boldsymbol{x'_{t=t}} \in \boldsymbol{k}$, Fig.3.

Consider the motion of a solid body inside of the system at rest K from point 0 to point $\boldsymbol{x_{t=t}}$ during the time interval from $t = 0 \ to \ t = t \ , Fig. 3$.

At time $t = 0$, the origin of the coordinates of the two systems of the system at rest K and the moving system k coincide at the point

$0{,}0'$. The solid body for example a bullet or a thrown stone from the time $t = 0$ starts flies out from the point $0{,}0'$, Fig. 3. During the time t the point $x'_{t=0} \in k$ moves to the distance vt to the point $x'_{t=t} \in k$ and the solid body reaches this point $x'_{t=t} \in k$.

Thus, during the time t the bullet flies from the point 0 to the point $x'_{t=t}$ inside of the system at rest K, passes the distance $\bar{x} = \overline{x'} + vt$, Fig.3.

Now let us analyze the motion of the bullet in the moving system k.

In fact, during the time t the bullet flies from the point 0 to the point $x'_{t=t}$ inside of the system at rest K, passes the distance $\bar{x} = \overline{x'} + vt$, Fig.3.

However, since we are always inside the system of motion k, for example, in an aircraft, we only can measure the distance $\overline{x'}$ that the bullet flies from the point $x'_{t=0}$ to the point $x'_{t=t}$, Fig.3. This is due to the fact that we, the bullet, the points $0'$, $x'_{t=t}$, uniformly moved to a distance vt relative to the system at rest K.

Conclusion.

Inside the uniformly moving inertial system k, there is no way to fix or measure the movement of vt.

For this reason, when we determine the velocity of the solid body within the moving system k, we must define this velocity as

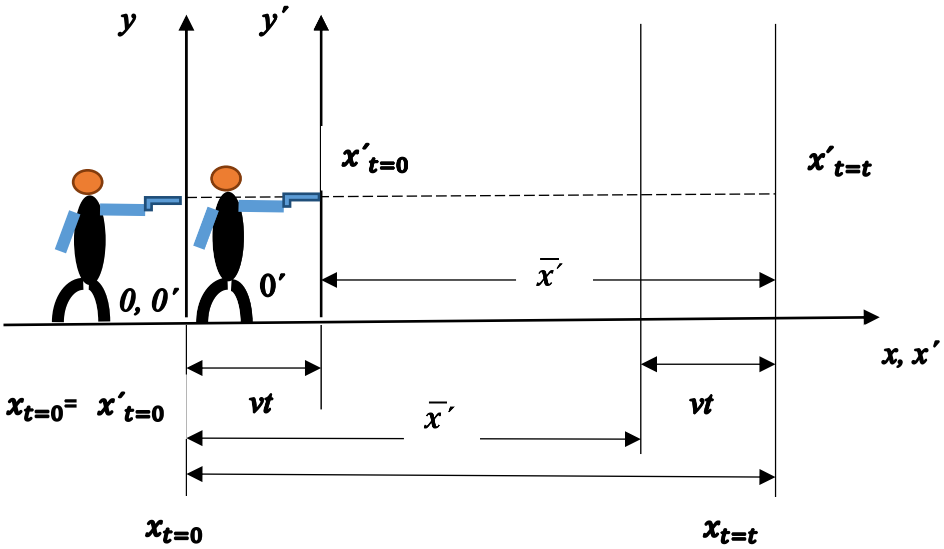
$$v_k = \frac{\bar{x'}}{t} \qquad 6)$$

In addition, when we determine the velocity of the solid body inside of the system at rest K, we must define this velocity as

$$v_K = \frac{\bar{x}}{t} = \frac{\bar{x'} + vt}{t} = v_k + v \qquad 7)$$

Moreover, as we can see, the velocities of a solid body in the two systems are different and the forces apply to body are different.

$$m\frac{d^2x'}{dt'^2} \neq m\frac{d^2x}{dt^2}, \qquad 8)$$



$$\bar{x} = \bar{x}' + vt = x_{t=t} - x_{t=0}$$

Fig.3.

Besides one different physical process occurs when the solid body moves in the opposite direction.

The real motion of a solid body in two systems K, k in the opposite direction from the point $x'_{t=0} \in k, K$ to the point $0'_{t=t} \in K$, Fig.4.

Consider the motion of a solid body in the rest system K from point $x'_{t=0}$ to point $0'_{t=t}$ during the time interval, Fig.4.

At time $t = 0$, the origin of the coordinates of the two systems of the system at rest K and the moving system k coincide at the point 0,0´. The solid body from the time $t = 0$ starts flies out from the point $x'_{t=0}$ Fig. 4. During the time t the point $0'_{t=0} \in k$ moves to the distance vt to the point $0'_{t=t} \in k$ and the solid body reaches this point.

Thus, during the time t the bullet flies from the point $x'_{t=0}$ to the point $0'_{t=t}$, inside of the system at rest K, passes the distance $\bar{x} = \overline{x'} - vt$, Fig.4.

Now let us analyze the motion of the solid body inside of the moving system k.

In fact, during the time t the bullet flies from the point $x'_{t=0}$ to the point $0'_{t=t}$, inside of the system at rest K, passes the distance $\bar{x} = \overline{x'} - vt$, Fig.4.

However, we are inside the moving system k we only can measure the distance $\bar{x} = \overline{x'} - vt$ that the solid body flies from the point $x'_{t=0}$ to the point $0'_{t=t}$, Fig.4.

This is because the solid body flies from the point $x'_{t=0}$ to the point $x'_{t=0}$ attains the point $0'_{t=0}$ uniformly moved to a distance vt to the point $0'_{t=t}$ relative the system at rest K.

Conclusion.

Inside the uniformly moving inertial system k, there is no way to fix or measure the movement of it.

For this reason, when we determine the velocity of the solid body in the opposite direction inside of the moving system k, we must define this velocity as

$$v_k = \frac{\overline{x}'}{t} \qquad 9)$$

In addition, when we determine the velocity of the solid body in the opposite direction within the system at rest K, we must define this velocity as

$$v_K = \frac{\bar{x}}{t} = \frac{\overline{x}' - vt}{t} = v_k - v \qquad 10)$$

Moreover, as we can see, the velocities of a solid body in the two systems are different and forces apply at moving body in two system are different

$$m\frac{d^2x'}{dt'^2} \neq m\frac{d^2x}{dt^2} \qquad 11)$$

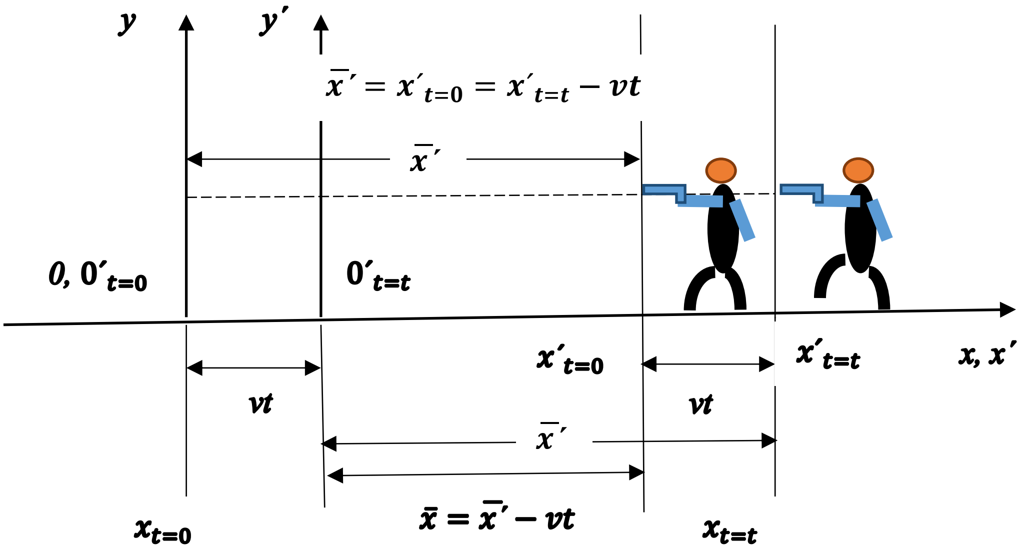


Рис.4.

General Conclusion.

The trajectory of the solid body inside of the system at rest K on the direction of motion of the moving system is greater than the trajectory of the solid body against the direction of motion of the moving system.

The distances and forces are different inside of two system K, k.

The trajectory of the solid body in the direction of motion of the moving system k is

$$x_{\text{пр}} = x' + vt \quad 12)$$

The trajectory of the solid body in the direction against the direction of motion of the moving system k is

$$x_{\text{об}} = x' - vt \quad 13)$$

These facts prove that the interpretation of the Galileo equations without taking into account the different forces acting at body inside of different inertial systems and different directions abolished the whole meaning of physical processes in inertial systems.

Since, in classical mechanics, the distance traveled by solid body are proportional to the forces that acting on body, it is safe to say that the distribution of forces acting on material points inside two inertial systems moving with different velocities is different.

These is a mistaken assertion, that the solid body inside of inertial systems pass different distance with the same force applied on solid body.

The different distribution of forces acting on the system of material points inside of moving inertial systems, which is function of velocity of moving inertial systems.

The different distribution of force, which is function of velocity of moving inertial systems, act on the system of material points inside of moving inertial systems.

Modern studies have not paid attention to the fact that the theory of Galileo, speaking about the inertial moving system and the system at rest, did not take into account the dynamic process of motion and its nature inside of moving system. Modern studies considers process as a mathematical transformation of one coordinate system into another.

$$x' = x - vt, \quad y' = y, \quad z' = z. \qquad 1)$$

Treating this transformation 1) as a transformation of the rest system with coordinates x, y, z into the moving system with coordinates x', y', z', they did not take into account the dynamics of motion. The physical meaning of this phenomenon did not disclose. As was shown above, these transformations 1) do not say anything about the actual physical, dynamic process occurring in the moving system.

Since at any time t, the fixed point $x'_{t=t}$ on the coordinate system of the moving system k does not change its value in time, but the coordinate value $x_{t=t}$ of system at rest K is a function of time that is equal to

$$x_{t=t} = x'_{t=0} \pm vt \qquad 14)$$

$$x'_{t=t} \neq f(t) = const \qquad 15)$$

thus equations 14), 15), describe a simple relationship of the coordinate values of the two systems at a specific time.

Consequently equations 14), 15), describe a simple relationship of the coordinate values of the two systems at a specific time and nothing more.

Since the difference of the coordinates of any two corresponding points inside of the system at rest $x_2 - x_1, y_2 - y_1, z_2 - z_1 \in K$ and the moving system $x'_2 - x'_1, y'_2 - y'_1, z'_2 - z'_1 \in k$ was equal for a given t

$$\bar{x} = x_2 - x_1 = (x'_2 + vt) - (x'_1 + vt) = x'_2 - x'_1 = \overline{x'}.$$

This equal allowed use a simple mathematical technique to change the coordinates of the system at rest K into the moving system k to translate the mathematical description of the physical laws of classical mechanics from the system at rest into the moving system and vice versa.

However, surprisingly they concluded that the forces inside the systems at rest K are equal to the forces inside the moving system k. Despite this, the velocities of solid body inside of the system at rest K they determined as the sum of the velocity $\overrightarrow{V'}$ of movement of solid body inside of the moving system k plus the velocity $\vec{v}$ of the motion of moving system k.

$$\vec{\boldsymbol{V}} = \overline{\boldsymbol{V}}' \pm v \quad 18),$$

However, what really happened.

They got a simple mathematical description. Nevertheless, the essence of the phenomenon of motion of solid body inside inertial systems they missed.

From equation 15) we do not get the value of the transformation of the coordinate x in the coordinate x', but we get the stationary position of the point $x' \in k$ at the initial instant of time $x'_{t=0}$ within the system at rest K, Fig. 2-4.

$$x'_{t=0} = x_{t=t} \pm vt \quad 15)$$

That is, they replace the coordinates of the system at rest $\boldsymbol{x_{t=t}}$ in the coordinates of the moving system $\boldsymbol{x'_{t=0}}$ at the initial instant $t = 0$,(Fig .4).

Moreover, since in all inertial systems the laws of physics described the same mathematical equations, these actions 14),15) simply replaced the transformation of coordinates by changing the values of the coordinates.

The mathematical artificial descriptions of process based in equations 14), 15) for the inertial systems were admit but physical states of the moving inertial systems has not been investigated. The mathematical description had nothing common with the physical process in the two systems. It did not take into account the actual physical factors that lead the moving system k in a special object of investigation, in which the peculiarity of motion is not as in the system at rest K.

This simplification distracted scientists ' attention from the essence of physical phenomena inside of the moving system k.

Thus, the main factor missed.

That inside of moving system, the force acting on a point, not only depend on the force applied to that point, but also on the force applied to the moving system k.

As defined above in this work, in fact, inside of inertial moving system k, which move with velocity v , there are different forces than the forces acting inside of the system at rest K .

$$\vec{\boldsymbol{f}}_k = m\frac{d^2x'}{dt'^2} \neq m\frac{d^2x}{dt^2} \qquad 16)$$

The energy state of the moving system k is different from the energy state of the system at rest K.

The physical processes of motion occurring inside the moving systems k depend on the energy state of the moving systems.

The energy state of the moving systems k depends on the velocity v of the moving system k [5].

All these arguments convincingly confirm that the mechanical motion inside of moving inertial systems k not been fully investigated.

Conclusion

Modern studies have not paid attention to the fact that the theory of Galileo, speaking about the inertial moving system and the system at rest, did not take into account the dynamic process of motion and its nature inside of moving system k.

The motion of solid body inside of moving inertial systems k not been fully investigated.

The physical processes of motion occurring inside the moving systems k depend on the energy state of the moving systems.

In reality inside of moving system, the force acting on a point, not only depend on the force applied to that point inside of moving system, but also on the force applied to the moving system k to move it.

§2 NEW THEORY OF RELATIVITY.

A NEW THEORETICAL DESCRIPTION OF THE THEORY OF RELATIVITY FOR MECHANICS

Let us investigate the actual mechanical physical processes occurring in the real inertial moving systems. The precise physical experiments had carried inside of them. These inertial moving systems include earth, sea and air means of travel. This includes also rockets, supersonic rockets. Supersonic airplanes and spaceships. In addition, this includes the systems of parallel mirrors, the spectrometer of Michelson and all the experiments with the spectrometers.

In fact, the mechanical processes in moving systems has the following form, Fig.1.

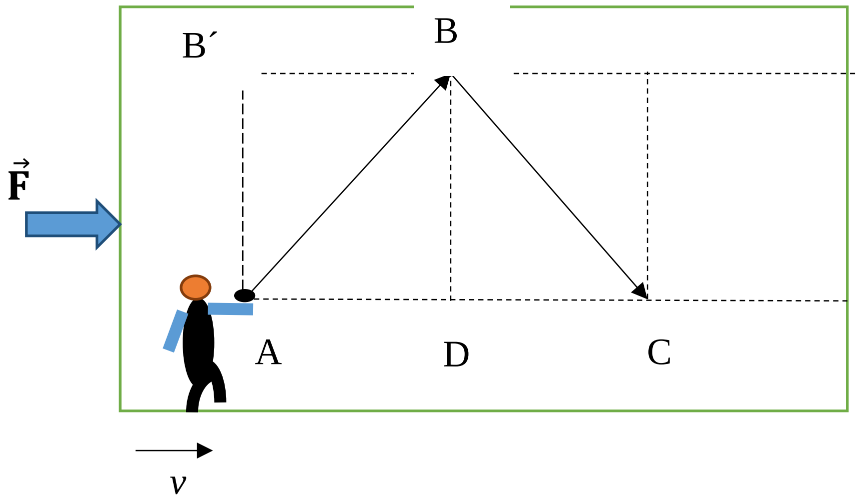


Fig. 1

For example, the moving system is a train. It moves rectilinearly and uniformly with velocity v under the influence of the force $\vec{\mathbf{F}}$ which apply to the train. In the future, we will use the word moving system instead of trains.

For the analysis of the theoretical experiment in which we are interested in the physical process, rather than calculations, we will choose individual values arbitrarily.

Suppose the weight of the moving system is $m = 1000\ kg$. Speed $v\ (m, km, \dots)$. Imagine the trajectory of the stone is not as curved, but as straight.

Suppose that the man throws the stone vertically upwards and fixes where this stone will fall $Fig. 1$.

Suppose that throughout the trajectory of the stone the module of forces applied to the stone will be constant.

However, such a simplification will not affect the meaning of the physical process that interests us. This approximation Figure 1 is more similar to the movement of an electromagnetic wave, which reflected from the ceiling. Since in these conditions the electromagnetic wave has an infinitely small mass and gravity acts not will existed.

Admit an infinitesimal acceleration to calculate the force $\vec{\mathbf{F}}$, which apply to the moving system k. During the time of the experiment, the acceleration vary by an infinitely small magnitude. Its arithmetic mean deviation is 0. Select the velocity of the moving system equal to $= 100\, m/sec$, and the limit of the acceleration variation within the limits equal to $\vec{\boldsymbol{a}} = \pm 0{,}5\text{м./сек.}$.

We can calculate the force acting on the moving system.

$$\vec{\mathbf{F}} = m \cdot \vec{\boldsymbol{a}} = (1000 \times 1)\,\frac{\text{кг.м.}}{\text{сек}^2} \qquad 5)$$

Suppose that the person's weight is $60\,kg$ and the weight of the stone $m_{к} = 1$ кг. These masses are part of the total mass of the moving system k. A simple analogue is the train and inside it is a man with a stone. The man throws the stone vertically upwards and fixes where this stone will fall $Fig. 1$.

For the person who observe this trajectory inside the moving system, the stone describe a straight vertical trajectory AB' inside of the moving system k, Fig.1.

It is clear that a man's force $\vec{\boldsymbol{f}}_m$ act to the stone as well as the force of gravity of the earth act on the stone. Let us not dwell on the analysis of the action of these forces on the stone. Because it is not essential.

Let us analyze the trajectory of the stone Fig.1.

For the observer who is in the system at rest K on the ground, the stone describe the trajectory $ABC\ Fig. 1$. The forces applied to the stone are vertical. However, the observer in the system at rest K observes a completely different trajectory of the stone, $Fig. 1$. The trajectory by length and by direction does not coincide with the trajectory observed inside a moving system.

The observing trajectory of the stone from the system at rest K is the real trajectory of the stone inside of the moving system k.

Ask ourselves. What happens inside the moving system? Why flying stone in the moving system have the completely different trajectory that the observer observe from the system at rest?

This fact can explain only by one theoretical logical argument. In any moving system, the force $\vec{\mathbf{F}}$ apply on the stone.

Let us conduct more thorough theoretical studies of the process.

The moving system k moves in the direction x and we observe it from the system at rest and see the trajectory ABC, Fig. 2. The travel time of the stone can measure inside of the movement system and can measure inside of the system at rest. Because time is constant in two systems, it is universal. However, we do not have the opportunity to accurately measuring the distances $AB, BC,$ ABC inside the system at rest. Nevertheless, we can calculate them by knowing the velocity of the moving system v and measuring the distance AB' inside of the moving system $Fig. 2$.

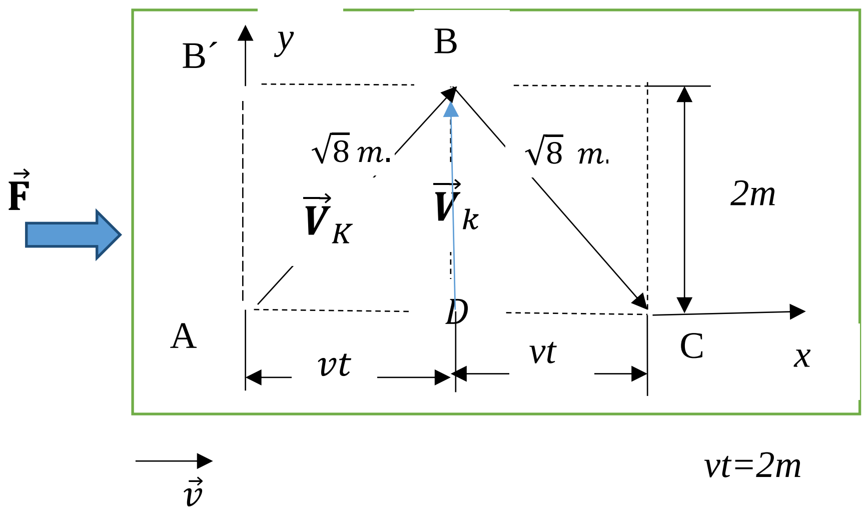


Fig.2

Suppose we made these measurements and obtained the following conditional results.

$$v = \frac{1m}{sec}\ , AB' = 2m.\ , vt = 2m.\ , AB = BC = \sqrt{AB^2 + BD^2} = \sqrt{8}\, m.$$

6)

Inside the moving system k are the force $\vec{f}_m$ applied by man to the stone and the force of gravity. Their directions and values, describe the trajectory in the system at rest $AB' + B'A = 4m.$ But in fact, the same forces inside the moving system k, describe a very different trajectory ABC in direction and in length.

This trajectory ABC is possible to observe only from the system at rest. And this is the actual trajectory ABC of the solid body that body passed inside of the moving system k with speed $\vec{\boldsymbol{V}}_K = \vec{\boldsymbol{V}}_k + v, \quad \vec{\boldsymbol{V}}_k \in k$.

As a result the distance ABC in the system at rest K increases or decreases depending on the sum of the vectors of the speed $\vec{\boldsymbol{V}}_k \in k$ and the speed v of the moving system k, Fig. 2. Then there is no doubt that inside the moving system k on the solid body in addition to the forces of gravity and the applied force of man $\vec{\boldsymbol{f}}_m$, added part of the force $\vec{\mathbf{F}}$ applied to the moving system k. We will indicate it as $\vec{\boldsymbol{f}}_{\boldsymbol{mx}}$. This means that for each mass not depending on where it is located in a moving system one additional force $\vec{\boldsymbol{f}}_{\boldsymbol{mx}}$ is applied. The force $\vec{\boldsymbol{f}}_{\boldsymbol{mx}}$ is distributed depending on the mass. This force $\vec{\boldsymbol{f}}_{\boldsymbol{mx}}$ has a direction of force $\vec{\mathbf{F}}$ and changes the form and length of the trajectory of motion of solid body inside of the rest system.

This force is similar to the pressure in the liquid on any point. Since the physical processes of aerostatics converge with the processes of hydrodynamics. The pressure on the point and the pressure forces inside the liquid retain the same nature as for aerostatics. The laws of Pascal and Archimedes same for aerostatics.

The force acting inside of the moving system k we will express as

$$\vec{\boldsymbol{f}}'_k = \vec{\boldsymbol{f}}_m + \vec{\boldsymbol{f}}_{\boldsymbol{k}}. \quad 10)$$

Where $\vec{\boldsymbol{f}}_{\boldsymbol{mx}} = \vec{\boldsymbol{f}}_k$.

This is the new law of mechanics for the moving inertial system.

The force acts on a point of space inside of moving inertial system is the vector sum of the internal force $\vec{\boldsymbol{f}}_m$ that acts on this point and one part $\vec{\boldsymbol{f}}_{\boldsymbol{mx}} = \vec{\boldsymbol{f}}_k$ of the force $\vec{\mathbf{F}}$ that acts on the moving system k. Consequently, the velocity $\vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}}$ of any moving object inside the moving system k determined by the vector sum of the velocity measured inside the moving system k and the velocity of the whole system of motion $\vec{v}$.

And only on the basis of this new law it is possible to explain what physical processes take place inside of moving inertial systems.

The direction and value of the force applied to the moving object in the moving system is the vector of the sum of forces 10) applied to this object.

Consequently, the velocity $\vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}}$ of any moving object inside the moving system k determined by the vector sum of the velocity measured inside the moving system k and the velocity of the whole system of motion $\vec{v}$. But the observer cannot measure this velocity $\vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}}$ inside the moving system when the observer is inside of the moving system. The observer can measure only the speed $\vec{\boldsymbol{V}}_k$. Because the observer and the moving object move with same velocity $\vec{\boldsymbol{v}} - constant$.

And trajectory $(\vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}})t$ of moving body inside the system at rest which we see from the system at rest will be determined by the sum of the velocity $\vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}}$ (Fig.2). It is not possible to measure the trajectory of movement in the system at rest, when the observer is inside of the system at rest. But we can calculate it by measuring the speed $\vec{\boldsymbol{V}}_k$ and the speed $\vec{\boldsymbol{v}}$.

So we know the force $\vec{\mathbf{F}}$ applied to the motion system k wich is sourse of $\vec{\boldsymbol{v}}$.

We know the velocity $\vec{\boldsymbol{V}}_k$ of any object inside the system of motion k.

Thus, the actual velocity $\vec{\boldsymbol{V}}_K$ of a moving object inside the system at rest, the trajectory of which can be observed only from the system at rest K will be equal

$$\vec{\boldsymbol{V}}_K = \vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}} \qquad 11)$$

Let us create a correct bijective transformation of solid body movement in inertial systems.

We can measure only the speed $\vec{\boldsymbol{V}}_k$ of the solid body travels inside of the moving system. The distance that the solid body pass inside of the moving system with velocity $\vec{\boldsymbol{V}}_k$ can transform inside of the system at rest K as follows

$$\vec{\boldsymbol{V}}_K \cdot t = \left(\vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}}\right)t \qquad 12)$$

Finding the vector $\vec{\boldsymbol{V}}_k t = \vec{\boldsymbol{x}}'$ of the distance between two points $A'B'$, we obtain the vector $\vec{\boldsymbol{V}}_K \cdot t = \vec{\boldsymbol{x}}$ between these two points AB in the system at rest K (Fig.2).

In the Cartesian coordinates for three-dimensional space direct transformation is

$V_x \cdot t = (V_{x'} + v)t$ 13)

$V_y \cdot t = \left(V_{y'} + v\right)t$ 14)

$V_z \cdot t = (V_{z'} + v)t$ 15)

So how

$\frac{x'}{V_{x'}} = \frac{x}{V_x} = t$ 16)

we get

$x = \frac{V_{x'}+v}{V_{x'}} x'$ 17)

$y = y'$ 18)

$z = z'$ 19)

Let us analyze graphically the physical process of motion of the solid body in the moving system$\boldsymbol{Fig}$ 3.

It should be taken into account that the velocity of the solid body inside of the moving inertial system is the sum of $\vec{\boldsymbol{V}} + \vec{v}$. Since it is, the force acting on solid body inside a moving inertial system is the vector sum of the internal force $\vec{\boldsymbol{f}}_m$ acting on this body and one part $\vec{\boldsymbol{f}}_{\boldsymbol{mx}} = \vec{\boldsymbol{f}}_k = f(m)$ of the force $\vec{\mathbf{F}}$ acting on the moving system k.

Of course, here we must take into account that when it comes to the force $\vec{\boldsymbol{f}}_k$ applied to the object of motion, here we mean the sum of the forces $\vec{\boldsymbol{f}}_k$ applied to the unit mass of the object.

Of course, here we must take into account that when we talk about the force $\vec{\boldsymbol{f}}_k$ which apply on the object of motion, here we mean the sum of the forces $\vec{\boldsymbol{f}}_k$ that apply on the unit of the mass of the object.

Figure 3 shows the motion of a solid body thrown vertically upwards inside of moving system. The velocity of motion of the solid body is the sum of vectors $\vec{\boldsymbol{V}}_k + \vec{\boldsymbol{v}}$ and the module of the sum is equal to $\sqrt{|\vec{\mathbf{v}}|^2 + \left|\vec{\boldsymbol{V}}_{\boldsymbol{k}}\right|^2}$.

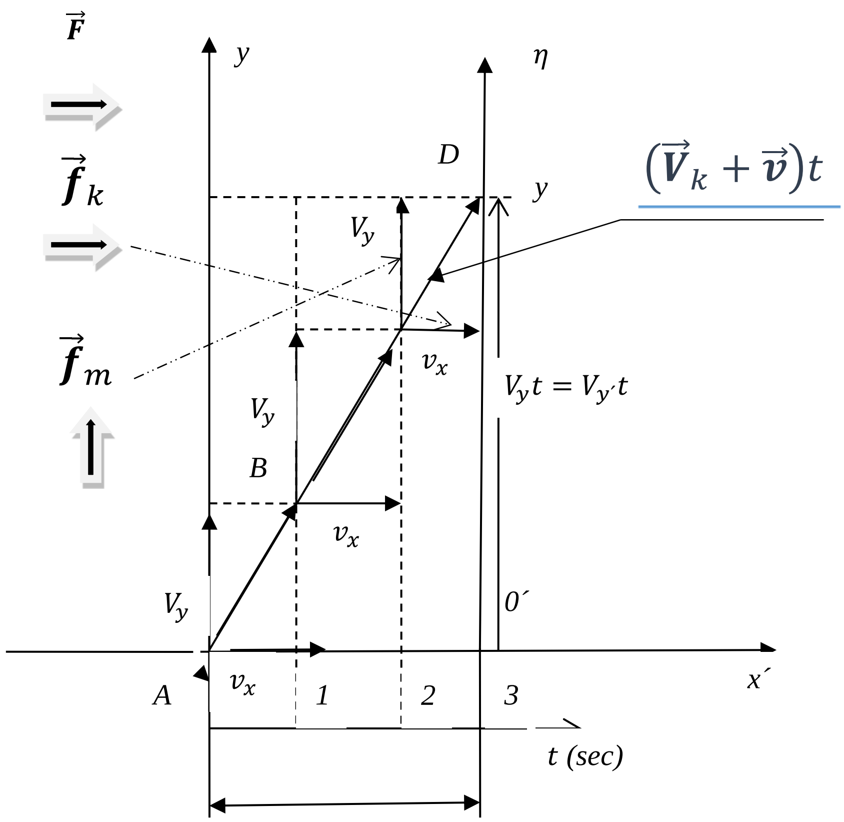


Fig. 3

This experience is easy to repeat in the train when it moves uniformly.

Conclusion.

Contemporary interpretation of the equation of Galileo excludes the analysis of physical process from the position of application of the force $\vec{\boldsymbol{F}}$ on objects inside the moving system. Perhaps for this reason, the force applied to the moving system not considered inside of moving system. The postulate of mechanic said that the system moving uniformly and rectilinearly in the emptiness moves without the application of force. Nevertheless, experiments show that there is this amazing force applied to every point inside of the moving system.

Furthermore, when we more investigate this phenomenon, then we more convince that other known physical circumstances no can explain this phenomenon.

This is not a fantastic tale about the existence of fantastic time in moving system. These is real forces appear inside of moving system.

Moreover, various physical phenomena can cause the moving system to move. Such as gravitational field and electromagnetic field of mechanical forces.

Thus, the constant force $\vec{\boldsymbol{F}}$ applied to the moving system gives it a velocity v and creates forces inside the moving system applied to its points. The physical-mathematical theory of this process through the analysis of the conservation of energy described in articles[3,4,5,7]

Perhaps this is the most amazing phenomenon of physical nature, which has always existed near us. We had no idea about the miraculous properties such as the internal motion inside of the inertial moving system

Apart, the external force $\vec{\boldsymbol{F}}$ applied to the moving system determine the movement of solid body inside of each point of the moving system.

Note. If you place the body inside this moving system of any shape, but with the mass m such that the moment of motion mv will be more the moment of motion of the initial applied force $f(\vec{\boldsymbol{F}})$ then the moving system will stop

$$mv \geq f(\vec{\boldsymbol{F}})$$

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