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## **New Paradigm**

### **Abstract**

This article is the continuation of article 2-2018 "Mechatronization" in the journal "Electronnyi Innovatsionnyi Vestnik" № 2. A new paradigm of the the current stage of science and technology and mankind as a whole development is proposed, which arose on the basis of a new set of concepts, mechatronization. The scientific and technical concepts that determine the specific research and development and combined by this paradigm are considered.

**Keywords: paradigm, mechatronization, myology, neurology, bionicist, sensor-soul, osteology, syndesmology, neurobionics, nanotechnologies, nanotubes**

### **Introduction**

At the end of the 20th century and at the beginning of the 21st century, a transition to the information society takes place, accompanied by the avalanche-like growth of accumulated information, and its depreciation for 4-5 years, in this connection, it is necessary to react to changes in a mobilely way.

The more information a person receives about the objects surrounding him, the more he reveals their essence, gets the opportunity to influence them purposefully. The level of development of society therefore largely depends on the volume of accumulated information, how it is stored, processed and transferred.

The new scientific and technical concept of informatization of the society based on information technologies with the use of computers in its importance can be compared only with the most outstanding technical discoveries in the history of mankind; their application allowed to increase the processing speed of information in millions of times. A personal computer made these possibilities accessible literally for every person.

The dialectics of the development of system is such that in the process of accumulating information, scientific and technical achievements are revealed that are not invested in the existing paradigm and a new one is required.

Even more the Internet moved to this, the possibility of communicating among themselves in the most remote corners of the Earth, conducting production management at a distance, the possibility of closer communication of people with psychophysical deviations with the world, with themselves, for example, deaf-mutes.

The following scientific and technical concept is important as well - satellite and mobile communication, which clearly traces the fundamental results of science, embodied in technology and become a powerful accelerator of production.

Many other concepts that will be considered in the research give us a set of concepts that can be combined under the name of a new paradigm - mechatronics.

### **Formulation of the problem**

The task of the study is to show that humanity from the cult of force (through the power of machines, the acceleration of various transitions in the production process) through human rights freely implement their ideas passes to the cult of reason (changing the constructive principles of machines, providing a new system quality, transferring the functional load from mechanical nodes to intellectual ones - electronic, computer and information components, intellectualization of movement, development of bio-drives).

### **Description of the research**

A new concept in the field of information storage - the transition from analog formats to digital formats. Especially this need has affected the satellite communications, where there is a significant removal of the receiver from the transmitter, limiting the power. Satellite communication is poorly suited for transmitting an analog signal. Therefore, the signal, for the purpose of providing noise immunity, is digitized, special transmitting antennas and error correction systems are used. It should be noted that many countries have turned from analogue television broadcasting to digital television.

A new scientific and technical concept is holography and holographic television. A method for re-recording a holographic image has been found, and thus a holographic image device is just around the corner. The screen can be vertical or

horizontal, and Old Khottabych will go for a walk right on the coffee table in the house of TV viewers. Why we recall Khottabych, because the best children's films will have to be rewritten in a holographic image, which naturally will require the research and the development of a new equipment.

The development of holographic television will allow the sky to be used as a screen and even can be as colored, will glow with all the colors of the rainbow. There will be a holographic industry, new industries, to have time to jump up, at least on the footboard of an electric vehicle.

A new scientific and technical concept is electric vehicles. Ecological, first of all, as well as economic problems caused mankind to return to electric cars at the beginning of the XXI century. By this time, the batteries have become more perfect. So in 2010, on one battery charge, the electric car Daihatsu drove 1000 kilometers, while the electric car Ventura developed a maximum speed of 515 km/h. The process of improving batteries and the mechatronic systems of electric vehicles will increase the possibility of introducing electric vehicles. The resort cities completely rebuild the maintenance service for the operation of electric vehicles. The ecological and economic effect will be significant.

A new concept is nanoscience. A nanoscale archive memory is developed that is capable of storing high-density data for a long time. The design of this memory is based on carbon nanotubes and crystalline iron nanoparticles, which under the influence of low voltage can move and the final position of the nanoparticle is fixed and read by a simple measurement of the resistance.

Nanotubes are used in radio equipment, mechanical vibrations of nanotube allow you to hear radio signals. Radio nanotubes at the expense of small sizes are used in radio-controlled devices of rather small sizes to exist in human blood.

The application of nanotechnology allows to execute the direct conversion of the light flux into motion. For example, the use of optothermal heating leads to the appearance of gradients of the surface tension of the liquid, as a result, an object made of vertically coupled nanotubes embedded in plastic effectively absorbs the light and converts it into heat. When the object is heated asymmetrically, a driving force is generated by the object over the surface of the liquid.

To clean the walls of blood vessels from cholesterol deposits, absolutely microscopic engines (the size of a molecule) are needed. The ZETTTL group was able to create a nanoengine - mechatronic module, using multiple layers of carbon

nanotubes. The nanoengine is a rotating metal plate on which a carbon nanotube is fixed.

Low external stresses with high accuracy control the speed of work and the position of the rotor–plate. This is a high level of mechatronization.

Now we are starting to consider the next scientific and technical concept, the main for a new paradigm is artificial intelligence (AI).

The most common approach assumes that AI will be able to exhibit behavior that is not different from human behavior, and in normal situations. This idea is a generalization of the approach of the Turing test, which asserts that the machine will become reasonable when it is able to maintain a conversation with an ordinary person, and he will not be able to understand that he is talking to the machine (the conversation is by correspondence).

The science of AI has evolved from the origin of the foundations of mathematical theory of computation - the theory of algorithms, when the first computers were created, a prehybrid approach that assumes that only the synergistic combination of neural and symbolic models achieves a full range of cognitive and computational possibilities.

For example, the expert rules of inference can be generated by neural networks, and generating rules are obtained through statistical training. Supporters of this approach believe that hybrid information systems will be much stronger than the sum of different concepts separately.

It was proposed the creation of artificial intelligence systems based on the modeling of reasoning, where the theoretical basis is logic, through an agent-oriented approach, developed since the early 1990s, based on the use of intelligent (rational) agents.

According to this approach, the intellect is a computational part (roughly speaking, planning) of the ability to achieve the goals, set for the intellectual machine. The machine itself will be an intelligent agent, perceiving the surrounding world with the help of sensors, and capable of influencing objects in the environment with the help of actuators.

This approach focuses on those methods and algorithms which will help the intellectual agent survive in the environment in the performance of its task. So, here algorithms of path search and decision making are studied much more carefully.

A logical approach can be illustrated by the use for this purpose of the language and the logical programming system Prolog. Programs written in the Prolog language represent sets of facts and rules of logical inference without rigidly setting of the algorithm as a sequence of actions leading to the desired result.

Artificial intelligence is developing. The problem of machine learning deals with the process of independent acquisition of knowledge by an intelligent system in the process of its work. This direction was central from the very beginning of the development of AI.

In the middle of the 20<sup>th</sup> century Ray Solomonoff outlined a report on a probabilistic machine that is taught without a teacher. Supporters of this approach believe that the phenomena of human behavior, its ability to learn and adapt is the consequence of the biological structure and the peculiarities of its functioning. This approach differs from the understanding of artificial intelligence by John McCarthy when they proceed from the premise that artificial systems are not required to repeat in their structure and functioning the structure and processes occurring in it inherent in biological systems.

The next scientific and technical concept is robotics. In 1962, the first industrial robots "Versatran" and "Unimate" were launched in the USA, some of which still function, having overcome the threshold of 100,000 hours of work resource.

If in these early systems the ratio of costs for electronics and mechanics was 75% to 25%, then at present it has changed. The final cost of electronics continues to decline steadily. The appearance of inexpensive microprocessor control systems in the 1970s, which replaced specialized robot control blocks for programmable controllers, contributed to a reduction in the cost of robots by about three times. This served as an incentive for their mass distribution in all branches of industrial production. The most important classes of robots of wide use are **manipulation** and **mobile** robots.

**Robotic manipulator**-automatic machine (stationary or mobile) consisting of an actuator in a manipulator having several degrees of mobility, and a program control device that serves to perform motor and control functions in the production process.

**A mobile robot** is an automatic machine in which there is a moving chassis with automatically controlled drives. Such robots can be wheeled, stepping crawlers. There are also crawling, floating and flying mobile robotic systems.

The control of robotic systems is being improved. The complex of tasks connected with the adaptation of robot to the circle of problems solved by it, programming of movements, synthesis of the control system and its software is being solved.

The next scientific and technical concept is military technology. A bright representative of mechatronic systems is the plane Su-47 "Berkut" with a forward-swept wing which gives the impression of a futuristic machine that flies in defiance of the laws of physics. Of course, all this seems only at first glance. An unconventional wing model warms up interest in the aircraft. Specialists and pilots admire for its maneuverability.

Russia is one of a few countries brought the idea of reverse sweep of the wing to a logical conclusion. This work was laborious, costly for the budget, but all the proceedings made sense. Perhaps, for this reason, the Su-47 "Berkut" is a source of pride for designers and military men, and repeatedly performs as an adornment for aviation shows. The plane received advanced avionics. The Su-47 "Berkut" is close to the characteristics of the project "Stels". The technology of the Russian fighter also allows you to remain unnoticed by radar.

Another interesting mechatronic system is the armored car "Karatel"(The Punisher). The machine is designed to transport soldiers of special forces, and fighters are placed back to back in the landing compartment, which provides them with all-around view and the ability to fire through loopholes.

In addition, the machine is equipped with a system of six video cameras, which allow you to assess the environment in difficult weather conditions and at night. Armor " Karatel" corresponds to the sixth class. The suspension and bottom of the machine are protected from mine threat.

The design of doors is original enough: each of them consists of the top and bottom doors. In this case, the lower leaf performs the functions of the footboard during the landing. Certain issues are caused by the design of the front part of the armored car with large windows located at an extremely acute angle, it is convenient for the driver to look at the road with a good viewing angle.

The next scientific and technical concept is microelectromechanical systems (MEMS). They are characterized by two signs. The first is the size, the second is the presence of moving parts and the destination for mechanical actions. In the world they are known under the abbreviation MEMS - MicroElectroMechanicalSystems.

They connect the technological breakthrough with microsystems that humanity will make in the 21<sup>st</sup> century, they are predicted to make the same revolution that microelectronics performed in the 20th century.

Microtechnologies develop on the basis of scientific and technological reserve of microelectronics. At the same time, microelectromechanical systems are called upon to actively interact with the environment. In addition, the design of systems have a distinct three-dimensionality.

From classical mechanical systems, they are distinguished by their size - materials on this scale behave somewhat differently than in bulk, although microsystems still obey the laws of classical physics, in contrast to nanosystems. Nevertheless, classical physics predicts special properties for micro-devices. All this requires a number of completely new approaches to the design, fabrication and materials of MEMS.

New tasks in design are associated with the need to calculate and simulate not only the problems of circuit engineering and logic, but also a set of problems of solid mechanics, thermoelasticity, gas and hydrodynamics - separately or simultaneously appearing in the product. As for materials, despite the fact that monocrystalline silicon - the traditional material of microelectronics - has a number of unique properties, other materials are needed with new combinations of electro-physical-mechanical properties.

New tasks of technology are associated with the most characteristic differences of microsystems from microelectronics products: if the latter are essentially two-dimensional and mechanically static, then microsystems are real three-dimensional structures whose elements must have the possibility of relative mechanical movement. These new properties require the development of new technological operations for 3-D shaping.

As MEMS develop at the junction of a multitude of branches of science and technology, it requires the participation in the work of specialists from the most diverse areas of knowledge that could effectively interact.

During the transition to the second stage of independence from the environment - dependence on the Earth, a person will be interested in the person himself, his device in terms of creating an industrial analogue.

Bionisation as a new concept of mechatronization will allow creating mechatronic systems based on bio-drives (these are not only muscular drives) - drives using the

achievements of osteology, syndesmology, myology and neurology (neurobiology), that is, creating bionics.

Bionicist - industrial analogue of man. Think - not a robot, not a slave, but an industrial analogue of a person with artificial intelligence based on neurobionics. Its difference from a person will be in the absence of a genotype, and the most undesirable - it will not have a natural (and for someone - divine) sensor - the soul, but you can say that life can procreate itself.

**The basic law of mechatronization is the most effective movement with minimal energy expenditure.**

The simplest example is if an architect has developed paths for the movement of people to an object, and people follow a different path to an object, which means that the architect does not know the basic law of mechatronization. People save their energy. To do this, the architect must calculate the movement of the flow of people and make the right logistic decision, ensuring the efficiency of the movement.

Many modern systems are mechatronic or use elements of mechatronics; therefore, mechatronics gradually becomes a “science of everything”, and the process of the society’s coverage of this science, industry, production, its penetration into other sciences is called mechatronization. Mechatronization encompasses everything and everyone.

## **Conclusion**

As a result of studies of the totality of new scientific and technical concepts, defining concrete research and development, it can be concluded that they should be united under a new paradigm, namely under the common name – mechatronization, it is necessary to dare to recognize the new paradigm.

The old paradigm - automation, fulfilled its purpose at certain stage in the development of society, but there is one important factor in it - automation of inefficiency - inefficient, mechatronicization eliminates this factor.

**The basic law of mechatronization is set forth - the most efficient movement with minimum energy expenditure.**

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