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HIERARCHY OF INTELLIGENT SYSTEMS

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ИЕРАРХИЯ ИНТЕЛЛЕКТУАЛЬНЫХ СИСТЕМ

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ІЄРАРХІЯ ІНТЕЛЕКТУАЛЬНИХ СИСТЕМ

Considered in general terms the problem of the formation of intelligent systems in the framework of searching the way of the revival of the Donetsk region and the formation of subsequent long-term programme of development based on relevant scientific and technological paradigm.
Key words: hierarchy of intelligent systems, scientific-technological paradigm, technological structure, nanotechnologies.

Рассмотрена в общих чертах проблема формирования интеллектуальных систем в рамках поиска пути возрождения Донецкого региона и формирования программы последующего долгосрочного его развития на основе соответствующей научно-технологической парадигмы.
Ключевые слова: иерархия интеллектуальных систем, научно-технологическая парадигма, технологический уклад, нанотехнологии.

Розглянута в загальних рисах проблема формування інтелектуальних систем в рамках пошуку шляху відродження Донецького регіону і формування програми подальшого довгострокового розвитку на основі відповідної науково-технологічної парадигми.
Ключові слова: ієрархія інтелектуальних систем, науково-технологічна парадигма, технологічний уклад, нанотехнології.

Introduction

In connection with the need to restore the Donetsk region and the formation of a program for its subsequent long-term development, the problem of formulating a corresponding strategy for its scientific and technological development arose. At the same time, we must bear in mind that due to our social and economic backwardness, we now have to make a rapid transition from the fourth (and sometimes even the third) to the paired fifth-sixth technological order. Such a transformation of the economy assumes a significant change in the personnel structure of production. In particular, this means that in the foreseeable future such a layer as workers will disappear - they will be replaced by operators, adjusters, programmers of robotic complexes. The corresponding transformation will occur with the engineering and technical staff of enterprises. Already today, management in its activities should be structured on the project approach. The coming changes lead to a gradual withdrawal of the Person from the sphere of production processes into the sphere of management of these processes, the formation of the "digital" economy is actively proceeding. These phenomena are largely due to progress in information and communication technologies (ICT).

These phenomena are largely due to progress in information and communication technologies (ICT).On the basis of new, mainly computer, technologies (and this is in contrast to the integration processes of the past), globalization is under way - the creation of a global financial and information space. Of course, this process is uneven in different parts of the world. Nevertheless, the direction of movement is set and it is determined by a powerful "globalizer" - ICT. The development of information infrastructure, the elimination of "digital inequality" contribute to the development of civil society in the country, public and private initiative, the emergence of an information society or knowledge society. The result of the symbiosis of advanced science and high technologies - information technology - today not only has a great impact on many aspects of life in developed countries, - ICTs become a kind of cultural tradition that coexists along with others (ethnic, religious, etc.). Information technology and telecommunications gave birth to a new, virtual world, giving the person, along with additional opportunities, new problems, exacerbating even more his responsibility for his actions in the real world. Unfortunately, often the withdrawal from actual actions into the space of illusions is simpler, and reality, thus, becomes a surrogate of wandering and fantastic feats in the world of dreams. Perhaps the free exchange of information, the formation of a favorable socio-psychological and economic and legal environment, the support of social partnership will help overcome this negative, remove some tension and become an important condition for the development of civil society.

In this paper, we briefly review the system of intelligent systems, the basic element of which is the information infrastructure.

Information infrastructure

The creation of an information infrastructure is one of the key elements in the system of social and economic development of the country. Initiation and creation of information enterprises of small business, support and organization of public and economic structures that stimulate their activities, should become one of the tasks of forming the information infrastructure of the Donetsk region. Small business enterprises of information profile can be created on the basis of a network of communications of large enterprises, in particular,

the coal industry, scientific and educational institutions. The information network will make it possible not only to activate private initiative and breathe life into the corresponding production branches, but will also enable the socially-cultured enterprises connected with them to learn new forms of activity and social activity. On the basis of these enterprises, with the use of modern information technologies, for example, electronic exchanges (goods, services, etc.) or public associations in the form of computer and information clubs can be created.

On the basis of these enterprises, with the use of modern information technologies, for example, electronic exchanges (goods, services, etc.) or public associations in the form of computer and information clubs can be created. The information infrastructure will allow the subjects of social and economic activity not only to exchange information, but also to interact on a wide range of production issues, to receive and transmit operational information to state authorities and local governments regulating and supervising their activities. The information field formed in the country will become, on the one hand, a factor in the formation of a positive image of entrepreneurs and the stimulation of their activities, and on the other hand, a guarantor of the inability for officials to "trade" with information. And, finally, in the creation and functioning of the information infrastructure, the enterprises of the information business, conventional and electronic media actively participate.

And, finally, in the creation and functioning of the information infrastructure, the enterprises of the information business, conventional and electronic media actively participate. Informatization should become one of the priority activities in the Donetsk region, the locomotive of the formation of a "digital" economy in the region. Particular attention in this case requires remote areas of the region. Access via the Internet and e-mail to the outside world puts an end to their "isolation", a development in the development, which includes the formation of a civil society in the region.

Access via the Internet and e-mail to the outside world puts an end to their "isolation", a development in the development, which includes the formation of a civil society in the region. The degree of development of the information infrastructure, the increase in the speed of information exchange and the density of information flows, the inclusion in the global computer network, which allows exchanging experience and carrying out joint projects with foreign partners, is the basic condition for the integration of the People's Republic into the world socio-political and economic space. Modernization of the telecommunications industry refers to the general condition for the deployment of a variety of social and production processes. This branch is designed not only to meet the needs of the population in the means of communication, it is also an indispensable element that ensures the management of technological processes in various sectors of the economy. Therefore, the improvement of communication facilities is of paramount importance in the process of re-equipping both individual production complexes and the national economy as a whole. Ultimately, the perfection of electronic communications of the information infrastructure will facilitate the free exchange of information and the further development of the "circulatory system of democracy".

Super-task is needed

Today in the globalized world, the agenda is shaping a new social and economic phase. Its essence lies in the fact that it relies heavily on infrastructure - communications (transport, communications), energy, finance, housing and communal services. Note that the limitations in the development of this phase can not be removed in the framework of

the existing system of property relations ... Unfortunately, answers to questions concerning the identification of the subject of the ongoing social transformations are still poorly seen in philosophy and even in futurology. There are, however, models (scenarios) of development, discussions about the "performance society" (Guy Deborah [1]) or about "new nomads" (Jacques Attali [2]: the omnipotence of money is the most just order of government) they ("nomads"), basically, consumers (utilizers), but who is the subject-creator is an open question ...

By the way, about the periodization of the phases of social development ... Since then, as a person separated from the animal world, he learned to use elements of the surrounding reality (natural and artificial materials) and began to create the Technosphere. The development of human society proceeded unevenly (History is the race of nations!). From time to time new sources of energy were developed and new technologies appeared that had a significant impact on the emergence of a new civilizational way of life. So, as a result of the Neolithic revolution and the birth of regular agriculture, the first class societies, state formations, arise. The first phase of social development was formed on the basis of the agricultural-economic block of industries, the transition to the next (industrial) phase occurred as a result of the industrial revolution (in the socio-political sphere this transition was carried out through bourgeois revolutions in different countries), the block of industrial branches was the base one. The next phase should be based (as mentioned above) on the block of infrastructure industries ... This is not great news, this phase was predicted under the names: "third wave" (Alvin Toffler [3]), "postindustrial era", "information society" (Daniel Bell [4]), the "knowledge society", etc. The emergence of a new "information" state of society today is particularly acute in the unprecedented manipulation of mass consciousness through the media and the Internet ...

The "post-industrial" phase will be followed by the formation of a phase based on the socio-humanitarian block of the economy (education, science, culture, health, etc.), the "cognitive society" (Sergei Pereslegin [5]). The further process of social and economic transformation is inevitable, because at some time the issue will inevitably arise on the agenda in connection with the limitations caused by the imperfection of the very nature of man (including his physical and psychological capabilities). Perhaps in a primitive form the "presentiment" of this phase is contained in the idea of communism ...

It should be noted that the formation of each phase occurred around a certain (key) package of technologies, as a result of the corresponding scientific and technological revolution, the replacement of scientific paradigms. Of course, within the framework of any phase of social and economic development, it is possible to distinguish smaller scientific and technological and logical leaps ... the problem is to find a set of technologies that is key for social transformation.

Speaking about technological aspects,it is necessary to remember that no transformations by themselves do not take place - a subject is needed. Therefore, at the turn of the epochs in literature and in philosophy, the problem of the formation of the New Man (through the Ultimate Goal!) Always arose. Today (for the consumer society) this issue is particularly relevant (and at the same time still not sufficiently clarified). Examples of Super missions are such great projects as the Conquest of the Arctic, Industrialization, Development of Tselina, Atomic and Space Projects, BAM ...

From the point of view of forming a new development paradigm, the robotization project "Russia-2045" is of interest [6]. Perhaps this project will be able to become one of the points of growth and the formation of a new Super Task ...

Intellegent Systems Hierarchy

Discussion of the issues of the project development of society, the controlled evolution of social systems, is now often associated with the consideration of the directions of the improvement of human consciousness - right up to transferring it to cyberorganisms (see, in particular, the Russia-2045 project, the DARPA [7]). And the first range of problems, and the second - are related to the study of trends in the development of intelligence and intellectual systems, the formulation of general principles for their description. The latter requires, at least in general outline, the pre-evolution of possible variants of the evolution of such systems, including the most complex class, with participation (not indirectly, but directly) of a person. Unfortunately, a consistent and complete theory of systems of this level has not been created to date. Nevertheless, within the framework of the general theory of systems, there is a very promising direction, which treats complex systems as hierarchical multi-level structures.

Nevertheless, within the framework of the general theory of systems, there is a very promising direction, which treats complex systems as hierarchical multi-level structures. There is a need to develop an approach that would allow from a single point of view to provide an integrated scheme for the development of complex systems, including intellectual ones, and associated high-level forms and methods of obtaining, storing, analyzing and broadcasting information (commonly called the general term "artificial intellect "(AI), see, for example, [8]). As a model and an "experimentally" implemented version of the development of complex information systems, you can choose, for example, a corporate network of business structures or even of human society as a whole. It is necessary to identify the main causes of the emergence of hierarchical structures, mechanisms for increasing complexity and levels of co-ordination in these systems, and to analyze the driving forces of their development. This approach opens the possibility to consider the features of the evolution of systems with human participation and make predictions of their development, build the appropriate models, analyze the role of the intellect in evolutionary processes.

This approach opens the possibility to consider the features of the evolution of systems with human participation and make predictions of their development, build the appropriate models, analyze the role of the intellect in evolutionary processes. The latter will make it possible to study in more detail possible types of intelligent systems and, in particular, a wide class of systems with the participation of "artificial intelligence". AI, which, by and large, is an intellectual decision-making system, is closely related to the formation of the corresponding structures and hierarchy of intellectual systems, with problems that are not directly related to management systems. And it does not matter in what form AI is implemented - "in hardware", bio or social structure ... Most likely, the optimal form of implementation is a mixed one ... something like today's distributed computations. And not necessarily one part will "know" what the other part of such a "distributed brain" is doing.

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The question is natural, is it possible, when solving particular problems within the framework of the problem related to the improvement of AI, to approach the understanding and reconstruction of human consciousness ("transferring" it to an inorganic medium)? Is that what is called "artificial intelligence" - intellect? At first glance, a paradoxical question (given that there is an appropriate scientific direction, within which numerous laboratories and institutes operate). And yet, what is "artificial intelligence"? It is clear that it is derived from the "natural", but is everything clear with natural (human) intelligence? And how to

be (in the process of artificial reproduction) with such human qualities as ethical, aesthetic, religious and, finally, individual (including genetically conditioned) and social ones (here we should recall the "Mowgli effect").

Modeling the functions of individual organs of living organisms is possible, but even the simplest organism is not reduced to the totality of its constituent members. One of the most important functions of a living system is the ability to "outstrip reflection" of changes in the external environment in which the organism is located. In other words, at some stage of the hierarchy of complexity, the living organism, being an open system, models the state of the external environment with which it is linked by the myriad of connections-the channels of information. The problem is that the "artificial" organism is also a model system in which only certain ("essential" for the creator) side of the "natural" organism are inevitably taken into account. That is, he himself is only a model and tool of man, which, like any tool, expands (qualitatively and quantitatively) the range of human sensory opportunities and abilities to react (passively or actively) to changing habitat.

That is, he himself is only a model and tool of man, which, like any tool, expands (qualitatively and quantitatively) the range of human sensory opportunities and abilities to react (passively or actively) to changing habitat. Moreover, speaking of "intellect", one can not bypass the concept of "personality" (but this is socially conditioned quality) and "goal-setting". The ability to set goals, actualize and formulate the problem, choose the appropriate methods for solving it and build models (private-scientific and mathematical) is also a purely human quality. Speaking of "goals", one can not bypass such socially conditioned concepts as "needs", "interests", "motivation", etc. Of course, social functions and connections can also be modeled. However, any model is not abstract, but specific and is aimed at solving the corresponding problem.

However, any model is not abstract, but specific and is aimed at solving the corresponding problem. Thus, for today, "artificial intelligence" is also a model related primarily to control systems, built to solve a certain range of problems, closely related to problems of computability and algorithmization (see, for example, the work of R. Penrose [9]), which so far have a very remote relation to the issues of transferring consciousness to "artificial organism-we". Nevertheless, the development of modern society is closely connected with the development of ICT, the basic components of the information infrastructure and the formation of a hierarchy of intellectual systems

Nanotechnologies

A huge field of experimental and theoretical research at the junction of various scientific fields: laser physics, condensed matter physics, chemistry, and information sciences is now occupied by the development and use of new materials, both as sources of coherent radiation, and as a signal propagation medium. One of the important elements of the package of modern technologies are in this case nanotechnology. These are technologies used in production processes that allow us to create materials, devices and technical systems, the functioning of which is determined by the nanostructure (see, for example, [10], [11]). Nanotechnology opens the possibility of controlled manipulation of individual atoms and molecules with the goal of creating nanometer objects and nanostructured materials of interest for technological applications and their diagnostics. It should be noted that nanotechnologies are qualitatively different from traditional technologies, since the usual macroscopic technologies of handling matter are often inapplicable on nanoscale, and microscopic phenomena (the interaction of individual atoms, molecules and their aggregates), negligibly weak in habitual macro staffs, become

much more significant. Unlike traditional technologies, nanotechnologies are characterized by increased knowledge intensity and cost, as well as interdisciplinarity of scientific foundations-the most obvious connection is with physics, chemistry, and biology. In particular, in modern medicine a direction was born based on the use of unique properties of nano-materials and nanoobjects for tracking, designing and changing human biological systems at the molecular level. The use of advanced scientific achievements in nano-technology allows to attribute them to high technologies. Obtaining objects of a nano-scopic scale takes place within the framework of a unique production - nanoproduction, in which one of the strategies is implemented:

– top-down (top-down) strategy – nanosystems are created on the basis of or in bulk material (for example, in electronics – in the classical technologies of in-circuit schemes based on silicon);

– bottom-up (bottom-up) strategy – nanosystems are created from elemental atomic-molecular blocks by assembling (or self-assembling) them into complex structures (realized, for example, in biological structures).

Over the past two decades, nanotechnology has evolved from a symbol of the scientific perspective into an industrial strategic direction [12], which in the near future will determine the leaders of economic growth. The promise of this direction is confirmed by the billions of dollars allocated in the world for nanotechnology today.

Conclusion

We only casually touched on the problems connected with the formulation of the hierarchy of intellectual systems and the corresponding scientific and technological paradigm of the development of the Donetsk region. It is clear that the issues discussed do not presuppose an immediate response, but when solving current tasks of reconstructing the socio-economic infrastructure of the DNR, they can serve as a guide in the formation of a strategy for its scientific and technological development. It should be borne in mind that this goal lies in the sphere of high information and computer, bio- and nanotechnologies, which are closely connected with the creation of the Donetsk innovative science-intensive cluster, the formation of the territory of advanced development with the developed information infrastructure. In parallel with the organization of a modern production structure, a large (and in many ways absolutely new) complex of social and humanitarian tasks will have to be solved.

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RESUME

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hierarchy of intelligent systems

Background: in connection with the need for the restoration of the Donetsk region and the formation of subsequent long-term programmes of its development faced the problem of formulating an appropriate strategy for scientific and technological development. Development of information infrastructure, elimination of "digital inequality" contribute to the development of civil society in the country, public and private initiatives, emergence of information society or knowledge society

Materials and methods: an analysis of the social economic situation and of information systems development are used in the article.

Results: a simulated dynamic model of cognitive systems with active elements is proposed.

Conclusion: the proposed approximate way to solve the current problems of restoring socio-economic infrastructure of the DPR. The considered problems can serve as a guide in developing strategies for scientific and technological development of the region. This lies in the field of information and computer, bio- and nanotechnologies, are closely related to the creation of Donetsk, innovative cluster, the formation of priority development areas with an advanced information infrastructure.

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