Periódico do Núcleo de Estudos e Pesquisas sobre Gênero e Direito
Centro de Ciências Jurídicas - Universidade Federal da Paraíba
V. 9 - Nº 03 - Ano 2020 – Special Edition
ISSN | 2179-7137 | http://periodicos.ufpb.br/ojs2/index.php/ged/index

DEVELOPING AND APPLYING ROBOTIC TECHNOLOGIES AND ARTIFICIAL INTELLIGENCE SYSTEMS (USING AUTONOMOUS UNMANNED UNDERWATER VEHICLES)

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Abstract: The paper includes systematization of the main problems and contradictions in the development of modern national legislation and international legal order in the context of the processes of integrating robotic technologies and devices based on the artificial intelligence into the social life of society. The article discusses doctrinal, legal, ethical and socio-moral issues in the regulation of the development and application of artificial intelligence systems, robotic technologies, autonomous devices, etc. The authors substantiate the need to formulate a legal concept and the ethical standards for the regulation of these technologies and systems, propose directions, methods and forms for the development of a comprehensive program for the regulatory mediation of the development and integration of innovative processes in the social life of people. It is noted that the rapid development of robotic technologies and artificial intelligence systems creates an acute need of modernity - the legal regulation of relations associated with

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the application of RT and AI. At the same time, it is shown that a state that develops the effective legal models and legislative bases for regulation in this field will be able to win in an acute competitive struggle, to formulate the international legal standards and models for other countries.

Keywords: autonomous underwater vehicles (AUV), deontological codes, national legislation, artificial intelligence, international law, legal regulation, robotic technologies, ethical standards.

1. Introduction

Today, the leading priority in the development of the leading countries in the civil and military fields is the creation of not only air-, land-, but also sea-based robots and robotic complexes. At the same time, the development of robotics and artificial intelligence is an integral part of the development of Unmanned Underwater Vehicles (UUV), which in turn are divided into Remotely Operated Vehicles (ROV) and Autonomous Underwater Vehicles (AUV). Over the past 20 years, such countries as the USA, Britain, France, Germany, China, Japan, Norway and Israel have increased their R&D funding by 30 times to build civilian and combat robots and robotic complexes of primarily bottom infrastructure [13]. Particular attention is paid not only to the creation of the UUVs itself, but also to the software, the creation and development of a digital intelligent navigation system, etc.

In recent years, a significant number of civil and military UUVs have been created in various countries that have a leading position in the field of marine technology, hardware and software, digital developments in the field of navigation systems. During this period, the UUVs have not only demonstrated its effectiveness in the performance of reconnaissance, survey and exploration, depth survey, mine action and other works, but also opened up the fundamentally new areas of use. The latter is associated with the use of artificial intelligence systems based on the so-called strong AI system (autonomous artificial devices and robotic technologies capable of performing a whole range of intellectual functions, making operational decisions, effectively responding to emerging

factors, changing conditions, etc.). In general, the development of new technologies increases the scope of application and use of the UUVs. Over the past 5 years, the number of autonomous UUV developments has increased more than twice.

At the same time, the general concept of legal regulation of relations associated with the use of autonomous UUVs (based on both weak artificial intelligence (UUV-wAI) and strong artificial intelligence (UUV-sAI), as well as the moral and ethical coding of software development processes both at the level of current national legislation, adopted doctrinal legal acts and deontological codes, and at the international legal level, have not been formed.

Moreover, the lack of moral and ethical and doctrinal legal bases for the development of robotic technologies and related software, as well as constitutional and legal ideas and practices in this area, leads to the fundamental challenges to national and global security, to a serious lag in the legal development of social relations, to the possibilities of effective "legal coding" and governmental management of these processes.

2 Literature Review

The first effective autonomous unmanned vehicles appeared not in the United States or Western European countries and Japan, but in the Soviet Union. In 1976-1979, a group of enthusiasts of the Underwater Robotics Laboratory of Navigation and Control Systems OF the Department of Technical Cybernetics of the Far Eastern Branch of the Siberian Branch of the USSR Academy of Sciences under the leadership of Mikhail Ageev [3], created a unique and, in fact, the world's first deep-sea autonomous survey and retrieval robotics complex, which included the AUUV L-1 with the immersion depth of 2,000 m and L-2 with the immersion depth of 6,000 meters. The last device is considered one of the most outstanding technical achievements of the xx century, along with the first artificial Earth satellite and the Vostok spacecraft. The AUUV development was based on a modular technology that stipulated the unification of all major structural elements and was subsequently developed in all subsequent Far Eastern instruments. The creation of the autonomous underwater

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ISSN | 2179-7137 | http://periodicos.ufpb.br/ojs2/index.php/ged/index

vehicles and marine underwater objects has been studied and practiced by Russian scientists since the last century. The last quarter of the last century may be called particularly productive in terms of the development of technologies for the creation of such devices. A significant contribution to the development of the technical side of the issue was made by the scientists of the Institute of Marine Technology Problems of the Far Eastern Branch of the Russian Academy of Science (FEB RAS) [1, 12, 17, 20, 25].

In the 1980s, several UUV models made repeatedly a deep-sea diving, and were also used to study the wrecks and submarines. In 1988, Mikhail Ageyev (since 1992 - the Academician of the RAS) headed the Institute of Marine Technology Problems (IMTP) of the FEB RAS created under his leadership. It continued to create the experimental samples of unique underwater robots. Naturally, during the years of perestroika and the neo-capitalist era that followed them, these works were slowed down, but they did not stop. In a sense, the market relations helped the institute, because it was allowed selling the intellectual property, which formed a long line of foreign customers. Many modern foreign AUUVs can be rightfully called the descendants of L-1 and L-2. More than a decade ago, the IMTP specialists developed an autonomous unmanned underwater vehicle of new generation "Clavesin-1R". Since then, a number of scientific centers of the Russian Federation have been engaged in the development and creation of new AUUV modifications.

In turn, the first comprehensive research and practical experience in the development and use of autonomous unmanned underwater vehicles and robotic complexes was obtained by the USA. At present, there is a fairly strong amount of literature, analytical materials, data on the implementation of military and civilian strategies for the UVV development, technical description of the current UVVs and the designed robotic technologies and complexes in this area. These theoretical and practical, technical and informational materials are available both in the English-language sources and are also presented in the languages of other countries occupying leading positions in this field. We should note that the above mentioned initial

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developments, data of strategic research programs and specific R&D have become a theoretical and practical basis for the development of UUV research and development in Russia, South Korea, France, Norway, China and other countries.

In general, the R&D experience and the application of the first UUV samples allows talking about three main conclusions that have stimulated the further development of this field in the leading countries of the world.

Firstly, the UUV development and use has shown the promise and significant potential for the development of autonomous vehicles and robotic technologies for the civilian needs (research of seabed, shelves, etc.) and the development of traditional means of the Navy Forces (changes in the strategies and nature of maritime combat, tactics of fleet use, etc.) [4, 5, 9, 10, 24, 27].

Secondly, the UUV development and production (as part of shipbuilding and instrument-making industries), because of its low material and labor intensity, does not yet have a decisive influence on the dynamics of the country's production forces, but contributes to the development and promotion of highly efficient technologies that can be used both in the traditional and in fundamentally new systems of civil and naval equipment because of its scientific complexity, because of its scientific complexity [2, 13, 22, 26].

Thirdly, the use of autonomous devices based on remote control caused a whole array of problems that could not previously be predicted. For example, the majority of operators and gunners diagnosed the signs of post-traumatic stress disorder, increased psychological excitability, rapid professional burnout, etc. after the contract expiration [11, 23]. All this stimulates the development of autonomous modes for the operation of unmanned vehicles, the creation of new forms and types of human-machine interaction, the development of possible risks and threats, as well as the insurance issues and damage compensation problems.

Based on these fundamental studies, conceptual conclusions, technologies for the development and production of the autonomous UUVs and their main systems, they were assigned to the strategic areas, and the research and development works on the problems

of their development, use, stimulation and regulation were declared priority.

3 Methods and Materials

The formation of a legal concept and ethical standards should take into account the following comprehensive program based on the regulatory triad:

- *firstly*, it is a universal level connected with the general principles and models of regulation of robotic technologies and robotics standards;

- *secondly*, it is the social and regulatory systems formed within a certain environment, conditioned by the socio-cultural and historical context, where any interaction or process is theoretically and ideologically loaded and conditioned by the socio-cultural factors and dominants;

- *thirdly*, on the one hand, it is the requirements of the formal legal language and legal technology, through which the regulatory and legal regulation of this interaction field is implemented; on the other hand, it is the requirements of mathematical, algebraic, program language and engineering-technical models, methods and standards (in the development of autonomous devices, their functioning, software, etc.), which should also become an integral part of regulation.

Therefore, it is needed the dialogue and joint fundamental research projects between the engineers, lawyers, programmers, etc. In this regard, this project is oriented to the post-disciplinary research strategy [8, 19]. The post-disciplinary strategy is not built on the basis of any discipline, thus setting and limiting the problem field and the theoretical and methodological arsenal. On the contrary, the team work is aimed at the formation of a comprehensive subject orientation, which is not limited to strict disciplinary frameworks, involving the achievements and positions, primarily of various social and human sciences, categories, concepts and ideological and conceptual innovations of natural and technical sciences into the communicative process [7, 21]. The following concepts and categories are an example of the latter: convergence (mixing, merger, differentiation, meeting of materials, substances, etc.), used in the political and legal system of knowledge to describe transitional, mixed political systems; or ideological and conceptual innovations

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of synergetics, organically included in the humanitarian research system. Another example is the formation of a philosophical system based on the mathematical justification and modeling of the social, legal and political specified by Alain Badiou [6].

Other important and system-forming methodological principles, which are relied on by the presented research project, include as follows:

1) the completeness principle in understanding the specifics of the behavior and interaction of people and robotic devices in the context of legal field, when, on the one hand, the legal institutions, structures and mechanisms that are taking place, largely determine human activity, set the norms and standards for the development of hardware, devices, nature and direction of their use, and on the other hand, the effectiveness and sustainability of specific practices of application and interaction are predetermined by the "subjective factor";

2) the "understanding interpretation" principle; the concept of legal regulation of robotic technologies is built by the methods of understanding and explanation, which generally corresponds to the heuristic postnonclassical (understanding) science. This approach allowed considering the field of legal everyday life in human interaction and robotic devices, the convergence of human cognitive structures and "artificial intellectual systems", the features of joint activity (social action and interaction using robotic and digital technologies);

3) the principle of social and legal conventionality means that the value-regulatory systems, operating in the society, have a specific historical and socially communicative nature, which are transferred to the structuring and ordering in the field of human interaction and robotic technologies by analogy. When forming the legal concept of regulation of the latter, it is necessary to take into account both this "transfer" and the convergence of social-normative regulators with new forms and methods of regulating specific relations between human and machine interaction (for example, personalities and robotic devices operating on the basis of "weak artificial intelligence"), human and digital, electronic personality (for example, personality and autonomous

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robotic devices functioning on the basis of "strong artificial intelligence"). At the same time, the development of a legal regulatory concept should take into account the following regulatory triad:

- firstly, it is a universal level connected with the general principles and models of regulation of robotic technologies and robotics standards;

- secondly, it is the social and regulatory systems formed within a certain environment, conditioned by the socio-cultural and historical context, where any interaction or process is theoretically and ideologically loaded and conditioned by the socio-cultural factors and dominants;

- thirdly, on the one hand, it is the requirements of the formal legal language and legal technology, through which the regulatory and legal regulation of this interaction field is implemented; on the other hand, it is the requirements of mathematical, algebraic and technical language and the algorithms, methods and standards (used in the development of autonomous devices, their functioning, software, etc.), which should also become an integral part of regulation.

4) the integrity principle is the methodological principle of systematic and organic unity, interaction and interdependence of all elements of the social and legal and digital life of society, the integrated accounting of value-regulatory, ethical and legal elements, digital and technological standards;

5) the objectivity principle, as the methodological principle of this study, assumes an orientation toward the reconstruction of existing representations and features of the legal and engineering-technological worldview, the influence of the latter on the processes of modeling the robotics development and rationing the development of the latter;

6) the reliability principle is focused on harmonizing the findings and provisions with the available theoretical and methodological achievements of social and humanitarian and technical sciences, analytical and empirical data, expert positions and technological developments;

7) the instrumental-legal realism means the cognition of factors and dominants that affect the development of autonomous robotic

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technologies, which are necessary not only for the formation of the legal concept of advanced legal modeling, but also for the management of real socio-technological phenomena and processes.

8) the methodological principle, substantiated by Anne-Marie Maul and John Lo [28], according to which people, things, and machines form together the special, specific relations, within the framework of which each of them is formed, mediated, defined, is significant for the present study. This principle is called the "assembly method" by the researchers, it focuses on studying the issue of how these specific relationships are created and how they unfold, and most importantly, the technologies and machines are considered as integral "agents" [16], shaping and influencing the practical activity and its nature, in these relations. Moreover, within the framework of these mobile and constantly changing relationships, there are always general organizational conditions and forms ("assembly forms") necessary for their existence and development; being multiple, they preserve and are transformed as a definite whole [15]. It is these ideological and conceptual orientations that will allow implementing social and legal modeling of the general conditions, forms and models of possible general and specific development of relations in the new digital reality.

4 Main Part

It should be noted that legal and dentologic regulation of the processes of introduction and use of underwater robotic technologies, development and application of artificial intelligence systems in the UUV, differs with the fragmentation and unsystematic nature today. The solution of the above-mentioned problems is connected with the stage-by-stage and comprehensive study of general conceptual, doctrinal and theoretical-practical issues in many respects. The resolution of the latter can be provisionally presented in four key and interrelated directions.

1. Formation, adaptation and substantive adjustment of key concepts and categories fixing the essence, social purpose, experience, nature and typical models of using the autonomous UVVs. To date, the problem lies in the fact that all the main parameters, the nature and specificity of functioning of the robotic technologies (RT), the development of

artificial intelligence (AI) in the autonomous devices, are described in the framework of the natural and technical field of knowledge.

The basic concepts that are used in this context are not substantiated and are used as the scientific metaphors (for example, the notions "artificial intellect", "robot", etc. are the essentially contested concepts) that are difficult to translate into a "legal envelope", formalize them into legal definition and propose a typical regulatory model for their regulation. At the same time, the basic processes of forecasting the development of RT and AI are described in a completely different discourse, as a rule, using the mathematical modeling apparatus. In this aspect, the advanced legal modeling (the key direction of development of legal framework in the XXI century according to the Academician [14], of the transformation of social relations associated with the use of RT and AI is hampered.

The main problem here is that the artificial models of regulation and ethical standards are largely artificially transferred to the fundamentally new relationships (human interaction and robotic technologies, digital relations, etc.) in the proposed projects of legal regulation and moral and ethical coding of RT and AI. For example, the draft Federal Law "On Amendments to the Civil Code of the Russian Federation Regarding the Improvement of Legal Regulation of Relations in the Robotics Field" (a draft is developed by Grishin Robotics) uses typical regulatory models for regulating the private-legal relations, which are almost mirrored in the human-robot relations (robot-agent).

Of course, the social value of the legal norm is that it expresses the experience of human interaction in a concentrated form, as it reflects not just single cases, but covers the most typical, often repeated forms and patterns of behavior. For many, the effectiveness of a legal norm is due to the fact that the latter fixes the patterns of behavior that have already settled and have positive implications for the preservation and development of the individual, society, state. Such norms allow ensuring the stability and long-term relations. This ensures the predictability of behavior of all the community subjects, thereby crystallizing a certain order of their relationships in different fields (social order, legal order, political, economic

and other types of order). However, the formation of order and interaction models in the field of RT and AI development in such a format does not allow ensuring the effectiveness of regulation of innovative and robotic processes in the society, since the latter are rapidly evolving, and the typical models of the relationships between person, RT and AI are not formed.

It is obvious that the state, as an expression of public interests, not only establishes the specific rules of behavior that guarantee a certain type and measure of interaction between the subjects, their mutual rights and obligations, but also establishes the basic norms fixing the principles and priorities for the development of social relations, that is, state, defines the legal framework for the subsequent development of society. Such activity is considered in two directions in the legal theory: This is a real reflection and consolidation of the existing patterns of social interaction, and a faster reflection of regulated social relations, that is, a legislative process, where the experience of the past and the present is projected onto the future.

In this regard, this project is oriented to a fundamentally different approach. The research team is convinced that the adaptation of existing regulatory models and the legal and technical "adjustment" of the available regulatory samples to a fundamentally new field of social relations will be mildly ineffective. In general, these relations are fundamentally different. In this aspect, we can talk about the convergence of social, digital, virtual, robotic, which requires a completely different approach to the rationing of their development.

The solution to this problem should be started with the formation of the concept of advanced legal modeling, the creation of a common doctrine, methodology and standardization of the processes of developing autonomous devices, software, predicting the relationship between human and machine, etc. And only then it is possible to implement a comprehensive program of legislative changes, the development of appropriate sub-sectors and individual branches of law.

This way is followed by the research teams of the European Union, the USA, the South Korea and other leading countries. For example, during the EU summit held in October 2017, it

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was decided to form a European concept of legal and ethical regulation of RT and AI in 2018. The official documents of the summit talk about forming the doctrine of advanced development and the development of key trends and directions for regulating this field. Based on them, it is further proposed to develop the relevant legal acts and ethical standards.

2. The specificity, complexity and integrity of relations in the development of autonomous robotic devices, software to them, requires the fundamentally different research strategies. There is a need for dialogue and joint fundamental research projects between the engineers, lawyers, programmers, etc. Of course, the interdisciplinary research is currently being implemented by analyzing the problems stated in a comprehensive manner, involving the achievement of a number of natural and human sciences in the cognitive process in this area. However, in the overwhelming majority, a "weak research position" is laid in the basis of the interdisciplinary approach. Here the adjustment of the "research optics", the thematization of the problems, the formulation of the hypotheses, categories, and concepts is mainly implemented and controlled by the disciplinary style of thinking.

Thus, the researches quite often "involve" the materials from various natural-technical and socio-humanitarian knowledge systems, with an aim of forming a different approach to the understanding and significance of the individual phenomena and processes. However, the latter is structured on the basis of "disciplinary dominants", which does not allow going beyond the established boundaries, to form another program and the "truth procedure". When involving new forms of cognition and thought registers in the new forms of cognition, the researchers place them in an "established theoretical and conceptual path", which ultimately leads to the eternal return of the same ideological and semantic (disciplinary) basis, which does not allow thinking the phenomenon differently.

Another aspect is based on the fact that the uncertainty of such notions as "artificial intelligence", "robot", "robotic technologies" etc., creates not only the theoretical gaps in the jurisprudence, but (which is more significant) does not allow legislatively regulating a significant part of the

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governmental-legal process management mechanism associated with the proliferation and use of autonomous devices, artificial intelligence, robots. In this regard, this research project is focused on the development of a theoretical and methodological understanding and definition of key categories and concepts, which will create the opportunity to bring the actual legal regimes of functioning of the state apparatus in line with the new realities of development of social relations, technologies and innovation processes in various fields of society.

3. Another important development direction, in addition to the conceptual and legal design of the categorical conceptual apparatus and the formation of a theoretical and methodological concept for the development of legal regulation of innovation processes, is the improvement of legal equipment. The development of this direction in legal science and the process of improving legal technology will allow starting to develop and adopt a whole set of the regulatory legal acts that would form the general legal framework for the development of RT and AI in modern society. According to the aspect discussed, it is necessary to create a new theoretical and legal concept of a legal subject, the so-called electronic subject of law, and the possibility of forming a concept of legal and moral-ethical responsibility of the software developers and the artificial intelligence.

This problem has not yet been properly developed in modern jurisprudence. As first attempts, it is possible to name only separate articles, which pose the issues of legal regulation in the field of robotics and artificial intelligence, and using the unmanned vehicles (for example, certain legislative innovations in the Air Code of the Russian Federation). At the same time, there is no legal regulation at the current national legislation level or in model acts of the international legal level as regards the use of autonomous UUVs and the responsibility for their use. Thus, at the international level, the legal status of traditional underwater vehicles is determined by the Convention on the Sea Law dated 1982 (Art. 87 of the Convention provides freedom of navigation and freedom of scientific research, including unmanned deep-sea vehicles on the high seas). Some rights

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are granted in the exclusive economic area, if they do not damage the coastal state, and if it is received the consent of the coastal state in accordance with Art. 246 of the Convention.

The complexity of forming legal bases for the UUV use, as well as legal modes for the operation of unmanned underwater vehicles is associated with the practice of numerous bilateral agreements concluded between the states. For example, Russia ratified the "Agreement between the Government of the Russian Federation and the Government of the Republic of Finland on Cooperation and Support in Providing Services for the Icebreaking Assistance for Vessels in the Baltic Sea" on November 28, 2015. At the same time, there is no special legal regulation of the mode of autonomous UVVs at the international level.

In this regard, it is necessary to develop epy model doctrinal and legal bases and deontological standards that could be applied both at the level of the current legislation and in the context of the international legal policy of the Russian state. The rapid development of robotic technologies and the autonomous devices forms the key need of modernity - the issues of legal regulation of relations related to the application of RT and AI. At the same time, the state that develops the effective legal models and legislative bases for regulation in this field will be able to win in an acute competitive struggle, to formulate the international legal standards and models for other countries.

Another important and logical stage of the research team's work is connected with the solution of theoretical and practical problems. It is aimed at justifying and developing the necessary changes in the sectoral legislation required to create a legal regulation of using the autonomous UUVs, which are widely applied in various fields of society.

At the same time, the theoretical and practical developments should be differentiated into four conditional blocks:

- firsty, the conceptual and legal formulation of the key concepts and relations, the formation of doctrinal and legal foundations and priority directions of the state's legal policy in the field of RT and AI development, the delineation and formation of appropriate legal modes for the operation of autonomous

devices on the basis of "weak AIs" (autonomously functioning device that performs certain tasks, laid and controlled by the software and (or) the operator) and "strong AIs" (autonomously functioning device, perceiving the external environment, making the decisions, choosing or correcting the interaction model, the operation mode, etc. by its own);

- secondly, the legislative innovations related to the promotion of the development of robotic and digital technologies, software, artificial intelligence, their implementation in the social processes in order to improve the quality of life of the citizens;

- thirdly, the regulatory and legal regulation of RT and AI in the context of ensuring national security, rights, freedoms and legitimate interests of citizens;

- fourthly, the development and implementation of ethical standards, metric certificates etc. in the development of robotics and artificial intelligence, which should be complied with by the developers, manufacturers and users of innovative technologies.

In addition, the formation of a theoretical and legal system of argumentation and the elaboration of the issue of creating a new sub-sector in the sea law regulating the relations related to the development and use of the autonomous UUVs, as well as the subsequent formation of a separate complex branch of law - robot law, possessing an independent subject and a legal regulation method, - is relevant and requested in the near future. A set of legal norms governing public relations in the development and production of software, the use of robotic technologies and autonomous devices based on AI should come out as the subject of this branch of law. This complex branch of law should include: firstly, the norms of public law - constitutional, criminal, administrative, land, sea, water, air, etc., which are based on the imperative legal regulation and ensure the protection of the rights, freedoms and legitimate interests of all participants in legal relations, and provide national security of the Russian state and sustainable national development; secondly, the legal norms of private law branches forming the specific legal interaction modes between the subject that are formed from an equal legal status and

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autonomy of the participants in these relations.

4. The next group of problems associated with the description and specification of subjects of law, as well as the formation of a concept of social (moral, ethical and legal) responsibility arising in the context of using the autonomous UUV (based on the weak artificial intelligence (UUV-wAI) and strong artificial intelligence (UUV-sAI). Obviously, the latter is caused by a constant increase in the number of potentially dangerous systems and technologies operating autonomously.

There are also four groups of problem questions.

The first one is connected with the definition of a new group of objects of legal relations and subjects of law (digital personality, autonomous robotic device). In this regard, it is necessary to formulate a legal concept that models the functioning of autonomous systems as intellectual vehicles, implementing not only a certain activity in the social field, but also a number of cognitive functions.

The second group of problematic issues is connected with the ethical standards and requirements that regulate the processes of software development and the introduction of autonomous systems in the life of society. At the same time, it is important to take into account a number of aspects: firstly, it is necessary to formalize the ethical standards as adequate for regulating the specific relations and innovative processes, and the latter's connection with the existing value-regulatory systems in the society (national and international legal levels); secondly, the forecasting and modeling of the impact of such norms on the development of RT and AI, the individual autonomous systems and robotic technologies. At present, the projects of such ethical coding for the development of RT and AI are just emerging. For example, the version of the Ethical Aligned Design ethical standard for the creation of robots and artificial intelligence of the Institute of Electrical and Electronics Engineers (IEEE), which justifies that the autonomous devices and the intelligent systems should function on the basis of a system of human value-regulatory and ethical regulators, in accordance with a universal standard of human rights and freedoms. A number of leading states offer to form the Universal Declaration

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of Robotics and Ethical Standards for the Development of Software Based on the Artificial Intelligence Systems.

The third group is associated with the insurance of liability for causing harm to health, rights and freedoms, the legitimate interests of subjects of law in the process of using RT and AI. The speed of developing the independence of robotics and the autonomy level makes the problem of establishing the guilty subject responsible for the damage caused a very complicated procedure. In this regard, it is necessary to develop a system of compulsory insurance of risks, potential threats associated with the functioning of robotics and AI.

Finally, the fourth group of problems is related to the harmonization of various regulatory and legal systems regulating the life of society and the functioning of robotic technologies. The key problem that should be posed in the development of any projects for regulatory mediation of relations. All the various social regulators of all levels, including the normative one, should be coordinated and act as consistently as possible. According to the Academician G.V. Maltsev, such an approach may serve as a guarantee for the formation of a harmonious system of developing the social system and its stability [18].

5 Conclusions

Thus, at present the main directions of doctrinal legal and ethical regulation of the processes of development and application of robotic technologies and artificial intelligence systems should be as follows:

- *firstly*, the solution of theoretical and conceptual problems in the description of RT and AI, that is, the problem of forming, adapting and substantively correcting the key concepts and categories fixing the essence, social purpose, experience, nature and typical models of using the artificial intelligence systems and the robotic technologies, is acute;

- *secondly*, the most important priorities for the development of legal science and practice are the development of a theoretical and methodological concept for the development of legal regulation of the innovation processes, as well as the improvement of legal techniques ensuring the transfer of specific relations into a "legal envelope" (rule of law, legal sets and etc.) in the discussed innovation field;

- *thirdly*, the key task of the next decade will be the development and adoption of a set of regulatory legal acts that would form the general legal framework for the development of RT and AI in modern society, as well as the legal concept of the subject of law (electronic subject of law, digital person, etc.) and the concepts of legal and moral and ethical responsibility ofthe software developers and the artificial intelligence. In addition, the model doctrinal and legal bases and deontological standards should appear in the coming years, which, will form the key forms, principles, priorities and directions for the development of RT and AI at the level of the current legislation, and in the context of the international law;

- *fourthly*, the issues of working out and forming new sub-sectors in the sea, air, civil and other branches of law regulating the relations related to the development and use of RT and AI, as well as the subsequent formation of a separate complex branch of law - robot law, possessing an independent subject and method of legal regulation, will be actualized in the near future;

- *fifthly*, in the very near future there will be sharp competition in the development and implementation of ethical standards, metric certificates etc. in the development of robotics and artificial intelligence, which should be complied with by the developers, manufacturers and users of innovative technologies;

- *sixthly*, the liability insurance for causing harm to health, rights and freedoms, the legitimate interests of subjects of law in the process of using RT and AI, is an important direction. The speed of developing the independence of robotics and the autonomy level makes the problem of establishing the guilty subject responsible for the damage caused a very complicated procedure. In this regard, it is necessary to develop a system of compulsory insurance of risks, potential threats associated with the functioning of robotics and AI.

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