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PHILOSOPHICAL PERSPECTIVES ON STATE LANGUAGE POLICY AND ITS IMPACT ON THE DEVELOPMENT OF RUSSIAN ROBOTICS TERMINOLOGY

PERSPECTIVAS FILOSÓFICAS SOBRE A POLÍTICA LINGUÍSTICA ESTATAL E SEU IMPACTO NO DESENVOLVIMENTO DA TERMINOLOGIA RUSSA EM ROBÓTICA

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Abstract: This article focuses on the philosophical implications of how state language policy shapes the Russian terminology in robotics. It explores the idea that language is not just a tool for communication but also a reflection of policy and educational paradigms. The study examines how various spheres, including administration, professional education, and the media environment, participate in the regulation of robotics terminology. As a rapidly evolving subset of Language for Specific Purposes, robotics terminology presents unique challenges in terms of structuring, harmonization, and codification, all of which are significantly influenced by the state's linguistic policies. This analysis opens a discourse on the philosophy of language in the context of scientific terminology, highlighting the dynamic interplay between language development and policymaking in the field of robotics.

Keywords: Language policy. Robotics terminology. Philosophy of language.

Resumo: Este artigo concentra-se nas implicações filosóficas de como a política linguística do estado molda a terminologia russa em robótica. Explora a ideia de que a linguagem não é apenas uma ferramenta de comunicação, mas também um reflexo de políticas e paradigmas educacionais. O estudo examina como várias esferas, incluindo administração, educação profissional e ambiente de mídia, participam na regulação da terminologia em robótica. Como um subconjunto rapidamente evolutivo da Linguagem para Fins Específicos, a terminologia em robótica apresenta desafios únicos em termos de estruturação, harmonização e codificação, todos significativamente influenciados pelas políticas linguísticas do estado. Esta análise abre um discurso sobre a filosofia da linguagem no contexto da terminologia científica, destacando a interação dinâmica entre o desenvolvimento da linguagem e a formulação de políticas no campo da robótica.

Palavras-chave: Política linguística. Terminologia em robótica. Filosofia da linguagem.

1. Introduction

The robotics terminology began to take shape in the 1920s. It's notable that the basic terms of robotics were borrowed from science fiction. For instance, the word "robot" first appeared in Karel Čapek's play "R.U.R." (Rossum's Universal Robots) in 1920, and the word "robotics" appeared in Isaac Asimov's short story "Runaround" in 1942. The Russian term "robototekhnika" (robototechnics/robotics) was proposed by one of the founders of applied science for the creation of automated systems, the chief designer of the Central Scientific Research and Experimental Design Institute of Robotics and Technical Cybernetics (CSRI RTC) Yurevich. The scientist justified his version of the term with the standardization requirements: "In the world, the shorter term 'robotics' is used, but I needed to release a standard, so I proposed a word analogous to 'radiotekhnika' (radiotechnics) and 'teplotekhnika' (thermotechnics)." (SpbPU, https://www.spbstu.ru/media/news/achievements/founder-national-robotics-yi-yurevich-90-years/).

The aim of the study was to explore and analyze the influence of state language policy on the evolution and structuring of robotics terminology in the Russian language, examining the interplay between language philosophy, policy-making, and terminology development in the field of robotics.

2. Materials and Theoretical framework

The emergence of the first industrial robots in the USSR dates back to the 1960s. In 1972, the tasks of machine robot production were reflected in various state planning documents. One of them was the "Resolution of the USSR State Committee on Science and Technology". Initially, the term "robot" had the following definition: "an automatic machine for performing mechanical actions similar to those performed by a human doing physical work" (Yurevich, 2021). In 1973, a comprehensive program in the field of robotics was approved, combining the efforts of industry ministries, the Academy of Sciences, and universities. The program is considered implemented: in 1975, 30 brands of industrial robots were created and launched into mass production, followed by over 100 more. At the same time, work on the standardization of robots was carried out under the USSR State Standards program (Yurevich, 2021).

According to Kazantsev, Kotenev, and Pavlov, "the first standard related to industrial robots was GOST 24836-81. Then, GOST 25685-83 established the classification of industrial robots, and GOST 25686-85 defined the terms and definitions of key concepts in the field of manipulators, auto-operators, and industrial robots" (Kazancev, Kotenev and Pavlov, 2014, p. 224).

The first terminological GOST 25686-85 "Manipulators, auto-operators, and industrial robots. Terms and definitions" codifies the standardized definition of the term "industrial robot": it is "an automatic machine, stationary or mobile, consisting of an executive device in the form of a manipulator with multiple degrees of freedom, and a reprogrammable software control device for performing motor and control functions in the manufacturing process" (GOST 25686-85, https://files.stroyinf.ru/Data/292/29241.pdf). It's worth emphasizing that this definition indicates automatic control ("automatic machine") and reprogrammability ("reprogrammable control device") - characteristics that distinguish an industrial robot from other machines consisting of a manipulator and a non-reprogrammable control device.

The terminology of robotics developed alongside the industry itself. The production of "complex equipment required a unified and understandable terminology that underwent all stages of structuring and was codified in the form of standards" (Grinev-Grinevich, 2008, p. 304). Specialists from the Central Scientific Research Institute of Robotics and Technical Cybernetics (CSRI RTC) participated in the development of "28 standards and 8 recommendations for industrial robots and manipulators" (Kazancev, Kotenev and Pavlov, 2014, p. 224).

Yurevich (2021) regretfully notes that starting from 1991, the funding and "development of robotics at the state level ceased", and the robot park decreased more than tenfold, concurrent with the overall decline in production in the country. In the opinion of Ulanov (2021), "at the current stage, robotics is becoming an integral part of everyday life; it represents one of the rapidly developing branches of industry" (p. 3). The development of new technologies in the 21st century required the codification, standardization, and harmonization of specialized vocabulary for the new stage of industrial development.

3. Results and Discussion

The robotics terminology, being, on the one hand, a part of the language system, and on the other hand, a reflection of the development of the scientific and technical direction, is influenced by the state language policy. From the perspective of Desheriev, all "activities in the field of language policy are interdependent and indivisible, and since language policy is an integral part of national policy, it largely depends on the general principles of the latter."

Language policy in the field of robotics terminology is based on a number of regulatory legal acts of the Russian Federation: the Constitution of the Russian Federation, the Federal Law "On the State Language of the Russian Federation" (in the latest version of April 30, 2021, No. 117-FZ) and the Law of the Russian Federation of October 25, 1991, No. 1807-I "On the Languages of the Peoples of the Russian Federation", among others.

Simultaneously with the development of robotics in Russia, the corresponding regulatory and legal base is being formed as one of the forms of state language policy in the field of normalization and codification of terminology.

In 2013, a document was adopted - Government Decree No. 2036-r "On Approval of the Strategy for the Development of the Information Technology Industry in the Russian Federation for 2014-2020 and for the Future until 2025". It highlighted "new algorithms for the interaction of robotic complexes and humans" and "new human-machine interfaces, including new methods of using gestures, vision, voice interfaces for controlling computer and robotic systems" (GSPI, http://publication.pravo.gov.ru/Document/View/0001202207290014).

In 2014, the Government of the Russian Federation published the "Forecast of Scientific and Technological Development of the Russian Federation for the period until 2030". It stated that "the creation of bio-like and anthropomorphic robotic devices will entail significant shifts in the structure and forms of population employment, the application of robots in systems focused on the interaction 'human-human'" (Prognoz, https://prognoz2030.hse.ru/data/2014/12/25/1103939133/Prognoz_2030_final.pdf).

In 2020, the Decree of the Government of the Russian Federation No. 2129-r "On the Approval of the Concept for the Development of Regulation in the Field of Artificial Intelligence and Robotics Technologies until 2024" came into force. It directly emphasizes the "need to develop and clarify terms and definitions in the field of artificial intelligence and

robotics technologies", the "importance of carrying out work to build and harmonize the ontology of the subject area" (GSPI, http://publication.pravo.gov.ru/Document/View/0001202008260005).

In the Government Decree of November 5, 2020, No. 2869 "On the Strategy for the Development of the Machine-Tool Industry for the Period until 2035", it is noted that the priority directions for the development of organizational innovations in the world are the application of the Internet of Things concept in industrial production and the introduction of industrial robotics. It underscores that an industrial robot is one of the means of intellectual automation of production, which can be used depending on the degree of automation as both auxiliary and main equipment (GSPI, http://publication.pravo.gov.ru/Document/View/0001202011090029?index=0&rangeSize=1).

Grinev-Grinevich and Sorokina (2018), speaking of the need to regulate terminology, note that "special vocabulary is, perhaps, the only area of the dictionary that can consciously change and be managed" (p. 20). Analysis of the aforementioned regulatory documents shows that robotics is referred to promising high technologies; the creation of a legal, organizational, and technological infrastructure for the development of industrial robotics is envisaged; it points to the absence of a clear understanding of the terms "robot", "intelligent robot", "robotics"; it emphasizes the importance of carrying out work to build and harmonize the ontology of the subject area.

According to Edlichko (2019), language policy in the field of terminology is "a special kind of meta-language activity", "an actively developing and important direction within the framework of the state language policy" (p. 25). The author introduces the term "state terminological policy", which he understands as "a complex of measures and activities aimed at regulating the processes of term selection, unification of forming, developing, or existing terminologies (including ordering, standardization, harmonization) and lexicographic codification of terms in different languages (state, official, minority, etc.), as well as the scientific and methodological activity of international and local terminological organizations at various institutional levels" (Edlichko, 2019, p. 24).

Today, the development of national standards is carried out in accordance with Article 26 of the Federal Law of June 29, 2015, No. 162-FZ "On Standardization in the Russian Federation" (FZ 162, http://www.consultant.ru/document/cons_doc_LAW_181810/) and in GOST R 1.2–2016

(GOST R 1.2–2016, https://files.stroyinf.ru/Data/622/62242.pdf). Standards in the field of robotics are developed in accordance with the aforementioned documents.

The main work on standardizing and codifying robotics terminology is performed by the technical committee for standardization TC 141 "Robotics," established by the Rosstandart order of September 1, 2016, No. 1246 (TC 141, https://tk141.rtc.ru/). TC 141 "Robotics" also performs the functions of the permanent working body of ISO/TC 299 Robotics (participates in the opening of new projects, consideration, and voting on draft and final editions of international standards, periodic review of international standards, etc.). ISO/TC 299 consists of seven working groups, among which is the working group WG1 "Vocabulary and characteristics."

Currently, there are 87 standards in the field of robotics, most of which relate to industrial robotics. They can be divided into 4 groups.

The first group – standards developed in the USSR and having the status of interstate standards. The second group includes interstate standards developed in the 1990s. This group consists of only three standards. The third group – national standards of the Russian Federation in the field of robotics developed in the 21st century. The group includes 6 standards. The fourth group – the new set of national standards "Robots and robotic devices." This is the largest group, represented by 48 GOSTs (TC 141, https://tk141.rtc.ru/). Out of the 48 standards of this complex, 4 are terminological: for example, "GOST R 60.0.0.4-2019 / ISO 8373:2012 Robots and robotic devices. Terms and definitions".

Let's analyze GOST R 60.0.0.4-2019 / ISO 8373:2012 Robots and robotic devices. Terms and definitions (GOST R 60.0.0.4-2019, https://files.stroyinf.ru/Data/707/70723.pdf). Terms are grouped into sections corresponding to the main thematic groups of robotics.

In Section 2 "General terms," basic robotics terms are codified, such as "robotic device," "industrial robot," "service robot," "personal service robot," "professional service robot," "mobile robot," etc. The standardized definition of the term "robotics" is as follows: "the science and practice of designing, manufacturing, and using robots." The term "robot" has a definition: "an executive mechanism, programmable in two or more degrees of mobility, having a certain degree of autonomy and capable of moving in the external environment to perform assigned tasks" (GOST R 60.0.0.4-2019, https://files.stroyinf.ru/Data/707/70723.pdf).

To harmonize national and international terminology, English equivalents of terms are provided in the standard. For example:

"2.26 collaborative robot: A robot designed for direct interaction with a human" (GOST R 60.0.0.4-2019, https://files.stroyinf.ru/Data/707/70723.pdf).

In the standard, abbreviations are used, and their English equivalents are given, for example: "HRI – human-robot interaction – information exchange and actions between a human and a robot intended to complete a task using a user interface" (GOST R 60.0.0.4-2019, https://files.stroyinf.ru/Data/707/70723.pdf).

The footnote to the term "robot" in the GOST indicates that earlier, in 2018, the TC ISO "Robotics" adopted a different definition of the concept "robot": "A programmable executive mechanism with a certain level of autonomy for carrying out movement, manipulation, or positioning". This fact indicates a high degree of debate around the concept "robot", the variety of its author's interpretations, and, as a result, the absence of a unified standardized definition of the term "robot" at the moment. For example, Begishev (2021) proposes "to introduce into scientific and practical use an author's version of the definitions of the concepts "robot" and "robotics", which "along with the main concepts in the field of robotics technologies, can be used when preparing the draft federal law "On the turnover of robots and their components (modules)" (p. 61).

The adoption and introduction of new generation GOSTs contribute to the harmonization of national and international robotics terminology. In 2020, the reference manual "Robots and Robotic Devices. Standardized Terms and Definitions" was released. It presents about 400 standardized terms, "harmonized with international robotics terms" (Lopota, 2020, p. 62).

An important direction in the process of harmonizing national and international terminology is the creation of specialized terminological dictionaries. Let's list the main bilingual and multilingual dictionaries on robotics.

In 1989, the "English-Russian Dictionary of Robotics" was published, containing about 12,000 terms (Petrov,1989). In 1991, a "Dictionary of Flexible Manufacturing Systems and Robotics (English-German-French-Dutch-Russian)" was released, "including about 5,600 terms on robotic complexes and flexible automated systems, design, and application of robots, etc." (Voskobojnikov, 1991, p. 392). In 1993, the "Illustrated Dictionary of Robotics (English-German-French-Russian)" was released, containing 4,844 terms and 336 illustrations (Palej. 1993). In 2019, the "English-Russian Explanatory Dictionary of Robotics

and Artificial Intelligence" was published (Projdakov and Teplickij, 2019). The publication contains about 4,000 translated terms used in robotics and works on artificial intelligence, as well as in related applied areas.

An important aspect of language policy in the field of robotics terminology is related to the modern educational environment. Today, over 70 universities in the Russian Federation offer training in the specialty 15.03.06 "Mechatronics and Robotics".

For instance, the Bauman Moscow State Technical University offers students the following training profiles: "Control in Mechatronic Systems," "Industrial and Service Robots and Robotic Systems," "Autonomous and Remote Mobile Robots and Space Manipulators," and "Underwater Robotic Complexes and Devices." The Saint Petersburg National Research University of Information Technologies, Mechanics, and Optics offers a specialization in "Robotics and Artificial Intelligence." The National Research Tomsk Polytechnic University has profiles like "Mobile Robotic Complexes and Systems" and "Control Systems for Autonomous Robots." Peter the Great St. Petersburg Polytechnic University offers "Design and Construction of Mechatronic Modules and Robot Mechanisms" and "Autonomous Robots."

Several Russian universities have established scientific and educational centers in the field of robotics. For example, at the Moscow Aviation Institute (National Research University), on the basis of Institute No. 7 "Robotic and Intelligent Systems" there is a scientific and educational center "Mechatronics, Robotics, and Intelligent Systems" (MAI, https://en.mai.ru/).

In the Russian Federation, the Federal State Educational Standard of Higher Education - Bachelor's degree in the direction of training 15.03.06 "Mechatronics and Robotics" has been adopted. It was approved by the Order of the Ministry of Education and Science of the Russian Federation on August 17, 2020, No. 1046 (FGOS, https://fgos.ru/fgos/fgos-15-03-06-mehatronika-i-robototehnika-206/).

In accordance with the requirements of the Federal State Educational Standard (FGOS) and training programs for the specialty 15.03.06 "Mechatronics and Robotics," a series of study manuals has been developed. Alongside study manuals focused on providing students with basic knowledge, such as the study manual "Fundamentals of Robotics" by Yurevich, guidance manuals dedicated to specific advanced areas of robotics have been developed. For example, in 2022, the guidance manual "Intelligent Cognitive Robotics. Part 1. Quantum Cognitive Computing Technologies" was released (Korenkov et al., 2022). It

addresses the modeling of intelligent control systems and quantum self-organization of knowledge bases in robots interacting with human operators. Examples of "brain – computer – actuator" systems related to the intelligent control of cognitive service robots are provided (Korenkov et al., 2022).

An important part of implementing language policy in the field of robotics terminology is linked to the media sphere. Media inquiries for information can be directed to organizations with relevant departments. One such organization, established in 2015, is the Russian Association of Robotics (RAR) - the primary source of analytical and statistical data on the Russian robotics market. RAR's media center actively collaborates with the media in providing expert comments and interviews, selecting speakers, preparing analytical reviews, creating informational materials about robotics, and responding to inquiries sent to the association via electronic communication (email: info@robotunion.ru).

4. Conclusions

In concluding this research, it has become apparent that the state regards robotics as a high-potential, advanced technological field. At the governmental level, key priorities for the development of robotics have been clearly outlined, highlighting the sector's strategic importance. One critical aspect of this developmental focus is the emphasis on constructing and harmonizing the ontology of robotics, a task that underscores the necessity of a well-structured and unified technical language within this field.

The study has demonstrated that the terminology used in robotics doesn't evolve in isolation but is significantly shaped by state language policies. These policies manifest their influence through three primary domains: administration, professional education, and the media environment. In the administrative realm, the state's language policy shapes the official lexicon of robotics, thereby standardizing terms across various government-led initiatives and documentation. In the realm of professional education, this policy influences how robotics is taught and communicated, ensuring that there is a common understanding and usage of terms among future professionals in the field. Finally, in the media environment, the state's language policy impacts public discourse about robotics, shaping public perception and knowledge.

This comprehensive approach to language policy in robotics not only aids in creating a unified terminological base but also facilitates clearer communication among professionals,

educators, students, and the general public. Such clarity and consistency are essential for the advancement and widespread understanding of robotics as a field, ensuring that it remains accessible and comprehensible to all stakeholders.

In essence, the research has highlighted the interconnectedness of language policy and technological advancement. The state's active role in guiding the language of robotics is a testament to the importance of linguistic precision and standardization in the rapidly evolving world of high technology. As robotics continues to grow and integrate into various aspects of society, the role of language policy in its development will undoubtedly remain a crucial area of focus.

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