Rasulova Gulmira Xursanbek qizi
PhD student of Namangan State Technical University
Email: rgulmira0509@gmail.com
Nasirdinov Bakhodir Abdullajon o'g'li
Teacher of Namangan State Technical University
UO'K: 81'33:81'367

SEMANTIC ANALYSIS OF ROBOTICS TERMINOLOGY IN ENGLISH AND UZBEK

Abstract. *This study presents a semantic analysis of robotics terminology in English and Uzbek, aiming to explore the linguistic challenges and patterns involved in translating and localizing technical vocabulary across these two languages. Through a comparative qualitative approach, key robotics terms were examined in terms of their meaning, origin, structure, and usage.*
Keywords: *robotics terminology, semantic analysis, English-Uzbek translation, technical vocabulary, language standardization, localization, terminology development.*

Расулова Гульмира Хурсанбек кизи
Докторант Наманганского государственного технического университета
Насирдинов Баходир Абдуллажон угли
Преподаватель Наманганского государственного технического университета

СЕМАНТИЧЕСКИЙ АНАЛИЗ ТЕРМИНОЛОГИИ В ОБЛАСТИ РОБОТОТЕХНИКИ НА АНГЛИЙСКОМ И УЗБЕКСКОМ ЯЗЫКАХ

Аннотация. *В данном исследовании представлен семантический анализ терминологии в области робототехники на английском и узбекском языках с целью выявления языковых трудностей и закономерностей, связанных с переводом и локализацией технической лексики между этими двумя языками. С использованием сравнительного качественного подхода были изучены ключевые термины робототехники с точки зрения их значения, происхождения, структуры и употребления.*

Ключевые слова: *терминология робототехники, семантический анализ, перевод с английского на узбекский, техническая лексика, стандартизация языка, локализация, развитие терминологии.*

Rasulova Gulmira Xursanbek qizi
Namangan Davlat Texnika Universiteti tayanch doktoranti,
Nasirdinov Baxodir Abdullajon O'g'li
Namangan Davlat Texnika Universiteti o'qituvchisi

INGLIZ VA O‘ZBEK TILLARIDAGI ROBOTOTEXNIKA TERMINOLOGIYASINING SEMANTIK TAHLILI

Annotatsiya. *Ushbu tadqiqot ingliz va o‘zbek tillaridagi robototexnika terminologiyasining semantik tahlilini taqdim etadi. Tadqiqotning maqsadi texnik lug‘atlarni ushbu ikki til orasida tarjima qilish va lokalizatsiya jarayonida yuzaga keladigan lingvistik muammolar va naqshlarni o‘rganishdan iborat. Taqqoslashga asoslangan sifatli yondashuv orqali asosiy robototexnika terminlari ularning ma'nosi, kelib chiqishi, tuzilishi va qo‘llanilishi jihatidan tahlil qilindi.*

Kalit so‘zlar: *robototexnika terminologiyasi, semantik tahlil, ingliz-ozbek tarjimasi, texnik lug‘at, tilni standartlashtirish, lokalizatsiya, terminologiya rivoji*.

Introduction

In the rapidly evolving field of robotics, the development and standardization of terminology have become essential for effective communication among researchers, engineers, and educators across the globe. As robotics integrates into various sectors - including manufacturing, healthcare, and education - the need to understand and accurately translate its terminology into different languages grows increasingly important. This study aims to conduct a semantic analysis of robotics terminology in English and Uzbek, two languages with distinct linguistic structures and technological vocabularies. English, as the dominant language of science and technology, offers a vast and evolving lexicon in robotics. Uzbek, on the other hand, is still in the process of developing and adapting its technical vocabulary to match modern advancements.

Literature Review

Several studies have examined the formation and development of technical terms in English, which is widely regarded as the global lingua franca of science and technology. According to Bowker and Pearson (2002), English robotics terminology is often formed through compounding, abbreviation, and borrowing from other scientific fields such as mechanics, electronics, and computer science. [1] In the Uzbek linguistic context, the development of technical terminology has been influenced by historical, political, and educational factors. Previous studies, such as those by Sayfiddinova (2016) and Tursunov (2020), highlight that many Uzbek technical terms are either borrowed from Russian or newly coined through direct translation of English terms.[3,4] However, there remains a lack of standardization and a need for systematic semantic studies to ensure these terms are widely understood and effectively used.

Methodology

This study employs a qualitative comparative semantic analysis to examine robotics terminology in English and Uzbek. A corpus of robotics terms was collected from academic texts, glossaries, and robotics manuals. Selected terms include *robot, sensor, actuator, algorithm, automation, artificial intelligence, servo motor*. Each term was analyzed in terms of etymology, semantic features, translation methods (loanword, calque, descriptive translation), and usage in Uzbek.Additionally, expert interviews with linguists and robotics professionals were conducted to gain insights into current usage and challenges in terminology development.

Results and Discussion

The analysis of robotics terminology in English and Uzbek revealed several important findings. Firstly, the classification of key robotics terms demonstrated that most Uzbek equivalents are direct loanwords or descriptive translations. For example, *robot* is adopted unchanged as a loanword, though in Uzbek it is often used more broadly to describe any automatic machine. Similarly, *sensor* exists both as the loanword *sensor* and as the descriptive translation *his qiluvchi qurilma*, creating ambiguity in usage. The term *actuator* appears as either *aktuator* or

harakatlantiruvchi mexanizm, which highlights the lack of standardization. *Artificial intelligence* has been translated as *sun'iy intellekt*, a calque that is gaining acceptance but still lacks full standardization. *Automation* exists in competing forms, *avtomatlashtirish* and *avtomatizatsiya*, largely borrowed via Russian, while terms like *algorithm* (algoritm) and *servo motor* (servomotor) are widely accepted as loanwords, particularly in technical and educational contexts.

From a semantic perspective, the study identified patterns of broadening, narrowing, and variation in meaning. For instance, *robot* in Uzbek has broadened to include a wide range of automatic devices, beyond its precise English definition. In contrast, *actuator* is sometimes narrowly interpreted as referring only to electric motors, excluding other types such as hydraulic or pneumatic devices. Furthermore, the existence of multiple Uzbek variants for *automation* (*avtomatlashtirish* vs. *avtomatizatsiya*) leads to inconsistency in terminology usage.

The analysis of translation challenges revealed three main strategies: loanwords, calques, and descriptive translations. Loanwords, such *as robot, sensor,* and *algoritm,* are widely accepted but may hinder the growth of native Uzbek terminology. Calques, such as *sun'iy intellekt*, preserve the meaning of the original but can sometimes sound artificial or less natural in Uzbek. Descriptive translations, like *his qiluvchi qurilma*, improve clarity for lay users but often lack precision and consistency in professional contexts. A significant issue lies in the absence of a unified Uzbek robotics glossary, which has led to inconsistent usage across academic and industrial fields. For example, the term *automation* is taught differently depending on the institution, resulting in confusion among learners. This highlights the need to align Uzbek technical vocabulary with international standards, such as ISO, and to integrate these terms into national terminological databases for consistency.

Localization, as the study found, requires more than direct translation. In practice, English terms such as *sensor* and *actuator* are often retained in robotics training and programming due to their familiarity and international use. However,

in educational textbooks and government documents, Uzbek equivalents are preferred. This dual usage creates challenges for both students and professionals, as it complicates the learning and application process. Finally, the study concludes that Uzbek robotics terminology is currently in transition. While most terms are still borrowed, there are ongoing efforts to create original Uzbek equivalents. The establishment of an official bilingual glossary and the creation of a digital terminological database could help unify practice and promote consistency. Such initiatives would not only strengthen communication within Uzbekistan but also enhance the international visibility of Uzbek robotics research and its integration into the global scientific community.

Conclusion

This study has explored the semantic characteristics of robotics terminology in English and Uzbek, highlighting both the linguistic challenges and opportunities in aligning technical vocabulary across the two languages. The analysis revealed that while English robotics terms are well-established and widely standardized, their Uzbek counterparts often vary in form, usage, and meaning. The reliance on loanwords, inconsistent translations, and limited standardization in Uzbek pose challenges to effective communication and technical education in the field of robotics. However, this linguistic gap also presents an opportunity for the development and enrichment of the Uzbek technical lexicon.

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