

Semantic Formation of Computer Linguistics Terms: A Contrastive Study of English and Uzbek

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ABSTRACT

This study investigates the formation of computer linguistics terminology in English and Uzbek using semantic methods within a contrastive linguistic framework. The research aims to identify lexical-semantic features and analyze the role of semantic derivation, secondary nomination, and metaphorization in term formation. The study is based on the analysis of computer linguistics terminological units in both languages and their classification into thematic groups, including terms derived from natural phenomena, somatic components, anthroponyms, and metaphor-based lexical units. The results demonstrate that semantic methods are a productive source of terminology development in both English and Uzbek, contributing to vocabulary expansion and conceptual precision in scientific communication. The findings highlight differences in the productivity of semantic term formation between the two languages and confirm the importance of semantic processes in the development of modern scientific terminology. The study contributes to research in lexical semantics, terminology, and contrastive linguistics, particularly in the field of computer linguistics.

Keywords: Computer linguistics terminology, semantic methods, lexical-semantic analysis, term formation, contrastive linguistics, English-Uzbek terminology, semantic derivation, metaphorical terms.

INTRODUCTION

In the context of globalization and the rapid development of science and technology, computer linguistics has emerged as a crucial field within modern linguistics. The continuous advancement of this discipline has led to the formation of a unique and dynamic system of computer linguistics terminology. As the global community becomes increasingly interconnected, the demand for clear, standardized, and culturally adapted terminological systems has grown significantly.

In linguistics, there are concepts such as the lexical-semantic features of words or terms, word formation through semantic methods, lexical-semantic processes, and lexical-semantic variants. Given the leading role of the English language in shaping global scientific discourse, and the growing development of scientific terminology in Uzbek language, this contrastive analysis is both timely and relevant.

LITERATURE REVIEW

According to the linguist A.I. Smirnitsky, in some cases, the concept of a lexical-semantic variant and the concept of word formation through the lexical-semantic method may not be distinguished. Within the notion of a lexical-semantic variant, two aspects are taken into account: the formal (or formative) side of the lexical unit, and the semantic (content) side, which represents one of the word's polysemous meanings. In this regard, monosemous words are expressed by a single lexical-semantic variant. In addition, polysemous words are represented by a number of lexical-semantic variants (LSVs) equal to the number of their meanings. The lexical-semantic process, in turn, refers to the understanding and expression of a linguistic unit at the lexical level [11].

From the analysis of the studied sources, it becomes clear that there is a significant difference between word formation through the lexical-semantic method and the concept of a word's lexical-semantic feature. In this case, special emphasis is placed on the formal (lexical) and semantic (meaning-related) properties

of a lexical unit. Moreover, in linguistics, the term lexical semantics is also used in a somewhat different sense. In linguistics, the lexical-semantic aspect is regarded as a subfield of linguistic semantics that investigates the meanings of words. It examines the semantic structure of linguistic units, their functioning within grammar and composition, as well as the linguistic relations between a word's various meanings and its usage across different contexts.

According to Yu. S. Stepanov, the semantic development of a word is subordinated to two functional needs of language: the assimilation of reality through metaphor and the cognition of the world through scientific concepts. He identifies two distinct directions in this process: first, a shift in the denotations of a lexeme occurs, a process rooted in metaphor; second, the content of signifiates constantly deepens due to their integral connection with the system of word meanings. Continuing this thought, the scholar emphasizes that terms emerge as a result of the development of subsequent meanings based on the word's primary sense. Furthermore, he acknowledges that the content of signifiates undergoes continuous deepening due to the direct correlation between the system of meanings of lexical units and the system of concepts [12].

The emergence of terminological units through semantic derivation has also been studied by a number of Russian linguists (Yu.D. Apresyan, V. P. Danilenko, D. S. Lotte, V. N. Prokhorova, A. V. Superanskaya, N. V. Podolskaya, N. V. Vasilyeva). They acknowledged that the "semantic method" of term formation is one of the productive and significant means, emphasizing that in the enrichment and expansion of a language's vocabulary, not only grammatical (morphological and syntactic) methods play an important role, but also the semantic method - which is part of the derivation of terms and lexical units in general - holds great importance in this process [7].

According to V. Danilenko, "...in the process of the terminologization of general vocabulary, a word may differ in the types of its meanings, its content, and its ability to convey specific information. In this case, the form of the word is preserved, while its content acquires a new and different

meaning” [2]. A similar tendency can be observed in contemporary research, which suggests that terminology systems are often formed through the semantic reinterpretation of existing lexical units, where the word form remains unchanged while acquiring a specialized scientific function [6].

The linguist H. Shamsitdinov puts forward the following idea about the formation of terms in the Uzbek language through the lexical-semantic method: “The formation of terms by means of the lexical-semantic method has not yet become a separate object of research” [9]. However, earlier observations on the semantic development of professional and specialized vocabulary can be found in the works of S. Ibrohimov [5]. Later, it became known that research devoted to this topic was conducted by the terminologist R. Doniyorov, who made a significant contribution to the development of scientific and technical terminology in the Uzbek language. In particular, R. Doniyorov, while specifically highlighting that the technical terminology of the Uzbek language is enriched through the lexical-semantic method of term formation, classifies terms derived from commonly used words into four thematic groups: 1) terms formed from the names of human and animal body parts; 2) terms related to the names of household items; 3) terms derived from the names of everyday objects and items; 4) terminological units formed from terms related to non-mechanical technology [4]. Building on this, H. Dadaboyev further emphasizes that many Uzbek terms are formed from common words through lexical-semantic processes such as semantic narrowing and functional adaptation, which allow general vocabulary to acquire precise, context-specific meanings within scientific domains [1]. Similarly, A. Madvaliyev highlights that lexical-semantic meaning extension contributes to the enrichment of national terminology and the development of specialized lexicons [8]. This perspective is further confirmed by G. Djumambetova, whose study of economic terms in English and Uzbek analyzes the lexical-semantic processes by which native words acquire specialized meanings and addresses challenges in bilingual terminology and translation [3].

MATERIALS AND METHODS

The study analyzed computer linguistics terminology in English and Uzbek, focusing on terms formed through semantic processes. The dataset included one- and two- component terms collected from dictionaries, linguistic corpora, and specialized technical sources. Each term was classified according to its structural properties (monolexemic or multicomponent) and the method of formation (semantic vs non-semantic).

Semantic processes considered in this study included meaning extension, narrowing, and functional adaptation, which allow general vocabulary to acquire precise, context-specific meanings in scientific domains. Terms formed through these processes were identified as semantically derived.

Quantitative analysis was performed to determine the proportion of semantically formed terms in each language. In Uzbek, terms were formed through semantic processes, while in English, were semantically derived. The structural and semantic characteristics of selected terms are presented in Table 1. and Table 2. This methodology allowed a comparative assessment of semantic word formation in English and Uzbek, highlighting differences in structural tendencies and productivity of term formation.

RESULTS AND DISCUSSION

The analysis of computer linguistics terms in Uzbek and English shows that secondary nomination predominates, supporting the view that most new terms arise from reinterpretation of existing linguistic units. Saidkodiroya defines transterminologisation as the movement of terms between terminological systems, where existing lexical items acquire new, specialized meanings, illustrating secondary nomination in terminology formation [10]. Similarly, Yuldashev and Rakhimova describe secondary nomination as a figurative level of naming that arises through human interpretive activity, whereby existing nominative means are repurposed in new functions. This process allows nuanced and abstract meanings to be expressed without increasing the

number of vocabulary units [13]. Based on their nominative characteristics, these terms can be classified and described according to several thematic groups. For example:

1. Terms derived from the names of natural phenomena such as Cloud – *Bulut*, storm – *bo‘ron*, wave – *to‘lqin*, firewall – *olovli to‘siq*, thunderbolt – *chaqmoq*, flooding – *suv bosish*, hurricane – *dovul*, storming – *shamol yoki bo‘ron*, and cyclone – *ciklon* are used in the field of computer linguistics.

- a. “Cloud computing” – *bulutli hisoblash*: the definition of this term in the field of computer linguistics is the provision of computer resources, data storage, and data processing services via the Internet. In this term, the English word “cloud” (Uzbek: *bulut*) symbolically represents the Internet or a network, reflecting secondary nomination, as the original meaning of “cloud” (a natural phenomenon) has been metaphorically extended to denote virtual data storage and network-based computing.
- b. “Storm” – *bo‘ron* – in computer and network security, the term “storm” is used to describe a rapid and powerful attack by malicious software or interconnected computers (botnets).
- c. “Wave” – *to‘lqin*: in the field of computer linguistics, it refers to the transmission of data through radio waves, used in technologies such as Wi-Fi and other wireless communication systems.
- d. “Millimeter wave” – *millimetr to‘lqinlar*: used in high-speed data transmission on the Internet networks.
- e. “Firewall” – *olovli to‘siq*: in computer and network security, a firewall system is used to monitor data flow and block unauthorized access.
- f. “Fire” – *olov* here is used metaphorically, and its semantics have diverged from its primary nominative meaning, demonstrating the phenomenon of divergence.
- g. Thunderbolt – *chaqmoq*: in the field of computer linguistics, this lexeme denotes the name of a high-speed interface used for data transmission in computers. This term reflects rapid and powerful transfer, similar to that of “lightning.”

h. Likewise, one of the words directly related to natural phenomena is “flooding” – *suv bosish*. In the field of computer linguistics, it refers to a method of attack in computer networks through a wave of data or packets, or metaphorically, through a kind of “flooding” of the system. For example, DDoS attacks are carried out using the “flooding” method.

i. “Hurricane” – *dovul*: in the field of computer linguistics, this term, formed through a semantic method, is used in computer security to describe rapid and destructive attacks that cause significant damage or system failures.

j. Similarly, the lexeme “storming” – *bo‘ron* in computer linguistics represents a case of secondary nomination, denoting an attack resembling a storm. It is used to describe large-scale and rapid attacks on a network or computer system.

k. “Cyclone” – *ciklon*: in the field of computer linguistics, it is used metaphorically to describe the occurrence of complex attacks or situations in computer systems and software.

The above-mentioned examples from the field of computer linguistics demonstrate how names of natural phenomena are widely and actively used in the practice of computer linguistics, and how their metaphorical meanings play an important role in expressing scientific and specialized concepts.

2. In English and Uzbek, terms formed with the names of human body parts (somatic components) such as *barmoq* – finger, *ko‘z* – eyes, *yurak* – heart, *bosh* – head, *umurtqa pog‘ona* – backbone, *miya* – brain, and others, occupy a distinct place in the vocabulary of computer linguistics.

In computer linguistics, the English phrase “fingerprint scanner” – *barmoq izlari skaneri* – refers to a device that allows access to a computer by identifying a person’s fingerprints. The phrase “eye tracking,” whose denotative meaning in Uzbek is *ko‘z harakatlarini kuzatish*, in the field of computer linguistics denotes a computer technology that performs data input or other operations by monitoring a person’s eye movements. For example, this refers to activities carried out through games or other special programs. In addition, when the English compound

word “heartbleed” is translated into Uzbek, it becomes a word combination meaning “*yurak jarohati*” (heart injury). However, in the field of computer linguistics, it denotes a “known type of cyberattack in computer security.” In this attack, damage is inflicted on the “heart of the server” (the main data transmission component), which metaphorically represents the concept of “bleeding from the heart.” Likewise, we also pay attention to how concepts related to one of the most vital human organs – the “head” (expressed by the English lexeme “head”) – are used in the field of computer linguistics. “Head” (of a file) – *fayl boshi*: The “head” refers to the top part of a file or document in a computer. Here, the word “head” metaphorically points to the human head. “Backbone” – *umurtqa pog‘onasi* – is a term used in computer linguistics to describe network architecture. In computing, “backbone” denotes the main network or the core component that supports the entire system. Similarly, another vital part of the human body, the brain – *miya*, carries a specific meaning in computer linguistics. The term “brain” is used to refer to the most essential central part of a computer system – its main processing or control unit. For example, the term “artificial brain” – *sun’iy miya* refers to artificial intelligence systems. In the field of computer linguistics, such terms formed through semantic methods demonstrate the extent to which the names of human body parts are widely used and their importance in expressing concepts through symbolic and figurative meanings.

3. In English and Uzbek computer linguistics terms formed from personal names/anthroponyms (eponyms) can be found in the following examples: “Turing Test” – *Tyuring sinovi*, “Von Neumann Architecture” – *Fon Neyman arxitekturasi*, “Moore’s Law” – *Mur qonuni*, “Huffman Coding” – *Haffman kodlash*, “Boole Algebra” – *Bul algebrasi*, “Erlang” – *Erlang*, “Pascal” – *Paskal*, “Babbage Machine” – *Babbidj mashinasi*, “Markov Chain” – *Markov zanjiri*, “Linux” – *Linuks* and others.

“Turing Test” – *Tyuring sinovi*: This term is named after the English mathematician and cryptographer Alan Turing. In the field of computer linguistics, the “Turing Test” is used to determine whether artificial intelligence can think and

communicate like a human. “Von Neumann Architecture” – *Fon Neyman arxitekturasi* a type of computer architecture model – is named after the Hungarian mathematician John von Neumann. This model serves as the foundation for all modern computers. “Moore’s Law” – *Mur qonuni* named after Gordon Moore, one of the founders of Intel Corporation – describes the observation that the number of transistors on a microchip doubles approximately every two years, leading to the continuous growth of computing power. In computer linguistics, according to Moore’s Law, the number of transistors on integrated circuit chips doubles approximately every two years. Similarly, the “Huffman Coding” – *Haffman kodlash* eponym refers to a data compression method used in computer linguistics. This term represents a case of secondary nomination and is named after the American mathematician David Huffman. The Huffman method enables efficient data compression. Another example is “Boole Algebra” – *Bul algebrasi* named after the English mathematician George Boole. Boole algebra is widely used in computer science and logic, forming the basis for conditional operations in computer systems. “Erlang” – *Erlang* is also an eponymic term, referring to a functional programming language named after the mathematician Agner Krarup Erlang. The Erlang language was specifically developed for telecommunication and embedded systems. Finally, “Pascal” – *Paskal* is a programming language in the field of computer linguistics, named after the French mathematician Blaise Pascal. The Pascal language is widely used in education and software development. Similarly, “Babbage Machine” – *Babbidj mashinasi* named after “Charles Babbage” – refers to a mechanism invented by him and used to automate calculation processes. “Markov Chain” – *Markov zanjiri* is a mathematical model named after the Russian mathematician Andrey Markov. This lexical unit is widely applied in probability theory and artificial intelligence. “Linux” – *Linuks* the name of an operating system – is associated with its creator, Linus Torvalds. The Linux operating system is open-source and is designed to operate on various platforms, which explains its popularity and versatility.

As the examples above demonstrate, computer linguistics terms derived from personal names play a significant and relevant role in the development of science and technology. These terms not only acknowledge the achievements of their founders and inventors but also introduce new concepts into the field.

4) **The following examples can be given for computer linguistics terms formed through metaphors in English and Uzbek:** “bug” – *xatolik*, “virus” – *virus*, “worm” – *qurt*, “spider” – *o’rgimchak*, “cookie” – *kuki*, “cache” – *kesh*, “Trojan Horse” – *Trojan oti*, “root” – *ildiz*, “thread” – *ipcha* and others.

“Bug” – *xatolik*: in computer terminology, the term “bug” refers to an error or flaw in a program. The original meaning of “bug” is “insect,” but it is metaphorically used to describe small and invisible errors in software. This metaphor suggests the idea of searching for hidden mistakes that “creep” into the program like insects. Similarly, the term “virus” – *virus* denotes a malicious program that damages a computer system and is metaphorically derived from the behavior of biological viruses. Because, just like biological viruses that harm the human body, a computer virus can enter the system, damage it, and make it unusable. “Worm” – *qurt* literally “worm” – refers to a type of malicious software that spreads through computer networks. In nature, a worm crawls slowly through the soil, while in computing, it metaphorically “crawls” through systems, replicating itself and infecting them. “Spider” – *o’rgimchak* – denotes a special program that collects information from websites. Here, the term “spider” metaphorically represents a program that, like a spider’s web, traverses a vast part of the Internet, gathering data from various sources. “Cookie” – *kuki*: a “cookie” is a small file used on a website to store information about the user. As a metaphor, the term “cookie” is used to represent “sweet” or “a small biscuit” implying that the website keeps certain user-related data “behind the door.” “Cache” – *kesh* is a temporary storage area on a computer used to quickly reuse information. This lexical unit comes from French and means “a well-hidden place,” metaphorically referring to a location where

data is stored so it can be accessed quickly. “Trojan Horse” – *Troyan oti*: this term refers to a virus hidden inside malicious software. Just like the “Trojan Horse” in history was brought inside the fortress through deception, this virus also enters the computer concealed within a program. Similarly, “root” – *ildiz* refers to the main or most privileged user in a computer system. Here, the word “root” is used metaphorically to represent the most fundamental, central part of the system, just like the “**root**” of a plant. “Thread” – *ipcha*: this term describes the sequence of operations within multitasking programs on a computer. The word “thread” is used metaphorically to illustrate how several processes are interconnected like threads woven together.

The examples given above demonstrate how important metaphors are in computer linguistics and how they help express domain-specific concepts in a simple and accurate way.

We found it appropriate to present the Uzbek and English terms formed through semantic processes in the field of computer linguistics and widely used in professional practice in the following table.

Table 1. *Examples of the semantic formation of computer linguistics terms in the Uzbek and their interpretations*

S. No.	Uzbek term	Meaning in general usage	Meaning in the field of computer linguistics
1.	<i>Tarjima</i> (Translation)	<i>Matn tarjimasi, bir tildan boshqa tilga matn yoki nutqni tarjima qilish jarayoni</i> (Text translation is the process of translating written or spoken content from one language into another)	<i>Mashina tarjimasi, kompyuter yoki dastur orqali avtomatik tarjima qilish jarayoni</i> (Machine translation is the process of performing automatic translation using a computer or software)
2.	<i>Ekranga chiqarish</i>	<i>Tasvirni ekranga chiqarish, kinolar yoki videolarni ekranga chiqarish jarayoni</i> (Displaying an image on the screen refers to the process of projecting	<i>Kompyuter ekraniga chiqarish, matnni yoki ma'lumotlarni ekranda ko'rsatish jarayoni</i> (Displaying on the computer screen refers to the process of showing

		movies or videos onto a screen)	text or information on the screen)
3.	<i>Ovozli buyruq</i>	<i>So'z buyrug'i, har qanday boshqa turdagi buyruqni so'z yoki ovoz orqali berish</i> (Word command refers to giving any type of command using words or voice)	<i>Kompyuter buyrug'i, kompyuterni ovoz yordamida boshqarish jarayoni</i> (Computer command refers to the process of controlling a computer using voice)
4.	<i>Tuzilma</i>	<i>Har qanday boshqa tuzilma, qurilish yoki turli mexanik sistemalarning tuzilmasi</i> (Any other structure refers to the construction of a building, device, or various mechanical systems)	<i>Kompyuter tuzilmasi, kompyuterdagi ma'lumotlarning yoki kodlarning tuzilmasi</i> (Computer structure refers to the organization of data or code within a computer)
5.	<i>Tarmoq</i>	<i>Televizion tarmoq: televizion kanallar yoki xabar tarqatuvchi tuzilma</i> (Television network: a system that broadcasts television channels or transmits news)	<i>Kompyuter tarmog'i, kompyuterlar o'rtasidagi aloqa tizimi</i> (Computer network (a system that enables communication and data exchange between multiple computers)

From the examples presented in the table above, it can be observed that in Uzbek, one-and two-component terms in the field of computer linguistics are represented with translations and explanatory interpretations often composed of multi-component lexical units. In contrast, in the table below (Table 2), the English terms are predominantly monolexemic, while their Uzbek translations often consist of multi-component lexical units. The explanations, however, are formed from multi-component lexical units. It is also evident that the number of terms formed in Uzbek through semantic methods is relatively smaller compared to English.

Table 2. *Examples of semantically formed computer linguistics terms in English*

S. No.	English term	General usage		Usage in the field of computer linguistics	
		translation	meaning	translation	meaning
1.	Bug	insect	waste or small insect	Data error	Software or system error
2.	Server	Service staff	A person who provides service in a café or restaurant	Computer or software system	Computer or software used to store and manage data
3.	Mouse	Creature, animal	Mouse, mammal	Computer device	Device used to control a computer
4.	Port	Military or commercial port	Parking area for ships or vehicles	Computer port	Port or connector used to connect devices
5.	Boot	Shoes	long and thin footwear designed for the feet	To start the system	To start the computer system

CONCLUSION

This study examined the role of semantic processes in the formation of computer linguistics terminology in English and Uzbek. The findings show that semantic word formation functions as an important mechanism in both languages, although its realization differs structurally. English tends to form monolexemic terms through semantic extension, whereas Uzbek more frequently employs multi-component and descriptive constructions. This distinction is reflected in the quantitative data, where English demonstrates a slightly higher proportion of semantically derived terms compared to Uzbek.

Overall, semantic word formation proves to be a productive strategy that supports the development and expansion of modern scientific terminology, particularly in rapidly evolving fields such as computer linguistics.

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