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Semantic Relations in English and Uzbek Computer Linguistics Terminology: A Comparative Analysis of Hyponymy, Hyperonymy, Meronymy and Holonymy

Begjanova Aysiliu¹

1. Karakalpak State University, doctoral student

*Correspondence: aysuliwmaxmudovna@gmail.com

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Abstract: This article examines semantic relations in English and Uzbek computer linguistics terminology, with particular attention to hyponymy, hyperonymy, meronymy, and holonymy. The study is based on a comparative semantic analysis of terminology used to describe computational linguistic concepts and their hierarchical or part-whole relations. The analysis demonstrates that English and Uzbek computer linguistics terminology share a considerable conceptual structure, especially in taxonomic relations such as language model → neural language model, corpus → parallel corpus, and annotation → morphological annotation. At the same time, the linguistic realization of these relations differs because of the analytical character of English and the agglutinative structure of Uzbek. The study also distinguishes hyponymic relations, based on the “kind-of” principle, from meronymic relations, based on the “part-of” principle. The results suggest that these distinctions are important for terminology standardization, bilingual terminography, semantic annotation, and the development of computational linguistic resources.

Keywords: computer linguistics, terminology, semantic relations, hyponymy, hyperonymy, meronymy, holonymy, terminology management, Uzbek, English.

1. Introduction

Computer linguistics is an interdisciplinary field located at the intersection of linguistics, computer science, artificial intelligence, natural language processing, computational modeling, and knowledge representation. Its terminology therefore contains numerous conceptual relations that cannot be adequately described by presenting individual definitions alone. A terminological unit acquires a more precise semantic status through its relationship with other units within a specialized conceptual system.

The importance of conceptual relations is also reflected in international terminology standards. ISO 704:2022 emphasizes the links between objects, concepts, definitions, and designations as a basis for terminology work, while ISO 1087:2019 establishes fundamental vocabulary for terminology work and terminology science [1].

In computer linguistics, these principles become especially important because specialized concepts are frequently organized into hierarchical structures. For example, language model may be related to statistical language model, neural language model, and large language model. Similarly, corpus may include monolingual corpus, parallel corpus, comparable corpus, and annotated corpus. These relationships demonstrate that

terminology reflects not merely lexical naming but also the conceptual architecture of a scientific field. The source material of the present study explicitly argues that computer-linguistic terms should be analyzed through the sequence “term → concept → conceptual relation → terminological system” rather than through the isolated relation between a term and its dictionary meaning [2].

The aim of this study is to compare the principal semantic relations observed in English and Uzbek computer linguistics terminology and to determine the similarities and differences in their conceptual organization and linguistic realization [3].

2. Materials and Methods

The study uses a qualitative comparative approach. The research material consists of English and Uzbek computer linguistics terms discussed in the source material, including terminology representing language models, corpora, annotation, parsing, classification, electronic dictionaries, machine translation systems, semantic search, and linguistic databases.

The analysis is based on four principal types of semantic relations: hyponymy, hyperonymy, meronymy, and holonymy. Hyponymy is examined as a hierarchical relation in which a more specific concept belongs to a more general conceptual category. Meronymy is analyzed as a part-whole relation in which one conceptual unit constitutes a component, member, or structural element of another.

The analysis also considers terminology variation. Daille demonstrates that term variation may participate in conceptual structuring rather than functioning merely as formal variation. In computational terminology, semantic relations can also be extracted from definitions and modeled for terminology resources, as demonstrated by Malaisé, Zweigenbaum, and Bachimont. Frame-based approaches similarly treat relations between concepts and terms as computationally representable knowledge structures.

For the comparative analysis, three criteria were applied: the conceptual level of the term, the type of semantic relation it enters into, and the linguistic form through which the relation is expressed.

3. Results and Discussion

3.1. Hyponymy and hyperonymy

Hyponymy represents one of the most systematic semantic relations in computer linguistics terminology. The general principle can be expressed as:

X is a kind of Y.

In this structure, X is the hyponym and Y is the hyperonym. The hyperonym denotes a broader conceptual category, whereas the hyponym identifies a more specific member of that category.

The analyzed terminology demonstrates this pattern clearly:

language model → statistical language model / neural language model / large language model;

corpus → monolingual corpus / parallel corpus / comparable corpus / annotated corpus;

annotation → morphological annotation / syntactic annotation / semantic annotation;

parsing → dependency parsing / constituency parsing / semantic parsing.

In each case, the more specific term preserves the main semantic component of the broader term while adding one or more differential features. Thus, parallel corpus retains the general conceptual content of corpus but specifies the relation between texts in two or

more languages. Likewise, neural language model adds the differential feature “neural” to the broader concept of language model [4].

This structure is also compatible with computational lexical resources. WordNet, for example, organizes lexicalized concepts through a network of semantic relations rather than treating words as isolated units. Miller’s work on WordNet similarly describes semantic relations as links between synonym sets [5].

An important result of the present analysis is that a term can function simultaneously at different hierarchical levels. Morphological analyzer, for example, can function as a hyponym of a broader term such as language processing tool, while simultaneously functioning as a hyperonym for rule-based morphological analyzer, dictionary-based morphological analyzer, statistical morphological analyzer, and neural morphological analyzer [6].

This demonstrates that terminological hierarchy is dynamic and relational. The semantic status of a term cannot always be determined independently of the conceptual level under consideration.

3.2. Hyponymy in English and Uzbek

The conceptual structures identified in English and Uzbek are largely similar. Both languages organize computer linguistics terminology according to general-to-specific relations. For example:

language model — neural language model;

till modeli — neyron til modeli;

corpus — parallel corpus;

korpus — parallel korpus.

This correspondence indicates a considerable degree of conceptual isomorphism between the two terminological systems. The difference is more visible in nominal representation [7].

English normally places a modifying element before the head noun, as in neural language model, annotated corpus, and dependency parser. Uzbek also allows the modifier-head pattern, as in neyron til modeli and annotatsiyalangan korpus, but terminological expressions can become structurally longer through explanatory components and agglutinative morphology. The source study consequently identifies the conceptual relation as largely isomorphic while considering its nominational realization partially allomorphic [8].

3.3. Meronymy and holonymy

Meronymy must be distinguished from hyponymy. The fundamental relation is:

X is part of Y.

Here X is the meronym and Y is the holonym.

The distinction is particularly important in computer linguistics because many terms refer to components of larger structures. The sequence corpus → document → sentence → token should not automatically be interpreted as a hyponymic hierarchy. A sentence is not a type of corpus, and a token is not a type of sentence. Instead, these units may form a compositional or part-whole relationship.

The same principle can be observed in other examples:

word — sentence;

sentence — paragraph;

dictionary entry — electronic dictionary;

frame element — semantic frame;

tag — tagset;

lemmatizer module – NLP pipeline.

The source analysis shows that meronymy in computer linguistics is not restricted to physical parts. It can describe member-collection, structure-component, module-system, and conceptual element-structure relations.

This observation is consistent with Winston, Chaffin, and Herrmann's taxonomy of part-whole relations, which distinguishes several meronymic types, including component-integral object and member-collection relations [9].

3.4. Conceptual importance for computational terminology

The distinction between hyponymy and meronymy has direct implications for semantic annotation and terminology databases. If the relation is incorrectly represented as taxonomic when it is actually compositional, a terminological database may generate an incorrect conceptual hierarchy.

For example:

parallel corpus is a type of corpus.

However:

token is part of a textual processing structure.

This distinction is not merely theoretical. It affects terminology management, ontology construction, information retrieval, and automated semantic processing. Cabré emphasizes that terminology is an interdisciplinary area connecting linguistic, cognitive, communicative, documentary, and computational perspectives [10].

The computational representation of semantic relations therefore requires a conceptual model in which hyperonymic, hyponymic, meronymic, and holonymic relations are explicitly differentiated. Knowledge-representation approaches similarly emphasize structured conceptual relations as the basis for machine-processable knowledge [11].

Discussion

The findings demonstrate that the English and Uzbek computer linguistics terminologies share a common conceptual architecture. This commonality is mainly visible in taxonomic relations. Concepts such as language model, corpus, annotation, and machine translation system are organized according to similar general-to-specific structures in both languages [12].

The major difference lies in linguistic realization. English, as an analytical language, often expresses specialization through compact noun-noun or adjective-noun combinations. Uzbek employs similar nominal structures but may additionally use derivational and inflectional morphology as well as explanatory components. Consequently, an equivalent semantic hierarchy may be structurally compact in English but more explicit in Uzbek [13].

The analysis also shows that terminology variation should not automatically be treated as a defect. Several expressions can represent closely related conceptual units while reflecting different degrees of specialization. Daille's work similarly emphasizes the role of term variation in revealing conceptual structure. Frame-based computational terminology research further indicates that semantic relations can be connected to domain concepts and computationally represented in terminographic systems [14].

A major practical implication concerns bilingual terminology resources. A future English-Uzbek computer linguistics dictionary should ideally provide not only a term and its equivalent but also its hyperonym, hyponyms, meronyms, holonyms, definition, and contextual usage. The source study proposes a model of the form:

term – definition – hyperonym – hyponym – meronym – holonym – equivalent – context.

Such a structure would make the dictionary more useful for both human users and computational processing [15].

4. Conclusion

The comparative analysis shows that semantic relations constitute a fundamental structural property of English and Uzbek computer linguistics terminology. Hyponymy and hyperonymy organize concepts vertically according to general-to-specific relations, whereas meronymy and holonymy represent part-whole and component-system structures.

The two languages demonstrate substantial conceptual similarity, although the linguistic realization of these relations differs. English generally uses compact analytical combinations, while Uzbek can express the same conceptual relations through combinations that involve additional explanatory or morphological elements.

The distinction between “X is a kind of Y” and “X is part of Y” provides a practical diagnostic principle for terminology analysis. Applying this distinction systematically can improve bilingual terminography, semantic annotation, terminology databases, ontology construction, and computational processing of specialized language.

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