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Modeling of Prefixal Word Formation (on the Example of the English-Language Construction-Engineering Vocabulary)

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Abstract*: The article considers prefixation as a way of word formation in the English-language construction vocabulary, performs a modeling of prefixal word formation on the example of anti- morpheme and formulates conclusions regarding the productivity and regularity of use of prefixes in the English-language construction-engineering vocabulary.

Index Terms*: prefix, prefixal word formation, modeling, machine translation.

I. INTRODUCTION

Accelerating development of the construction industry, use of the latest innovative technologies in construction, based on the use of foreign experience, has led to an increase in the need for translations of construction documentation. Accuracy and speed of translations play a special role in that context. Thus, in addition to interpretation services, machine translation systems (MTSs) are increasingly used for processing of information.

Today there are numerous commercial MTSs (PRAGMA, PROMT, PROLING, SYSTRAN, etc.), but all of them have one significant drawback – low accuracy of translation.

Uncertainty inherent in natural speech is one of unresolved problems of automatic text processing. Uncertainty means lexical units in their initial form, which do not correspond to any of the translation options provided by the translation electronic dictionary.

The analysis of texts, in particular MTS translation results, showed that the absence of translation equivalents in an electronic dictionary was due both to the cases of introduction of new words (new fragments of knowledge) and to the productivity of affixal word formation, which accounted for about half of the new words in MTSs.

Thus, formalization of the process of word formation in natural language is one of the ways to improve quality of machine translation, which will automate the process of recognizing "new" words in the system of words that are formed by productive affixal word-formative models.

II. PROPOSED METHODOLOGY AND RESULT ANALYSIS

A. Prefixation As A Way of Word Formation in The English-Language Construction Vocabulary

As is known, affixal word formation – "a way of word formation by means of affixes" – is one of the main ways of replenishing and expanding English vocabulary [1].

Prefixation as a way of word formation modifies the stem by adding a prefix to it [2].

Prefixation is presented by a standard set of prefixes, by means of which a significant number of derived words are formed. In general, 127 prefixes and semi-prefixes, among which prefixes of Latin origin are predominant ones, are involved in formation of new prefixal units.

In order to determine productivity and regularity of prefixal word formation in modern construction-engineering terminology, the authors conducted an analysis of "English-Russian Construction Dictionary" [3] and "Complete English-Russian / Russian-English Dictionary" by Muller [4].

The analysis of the modern construction-engineering terminology, determination of productivity and regularity of affixal means of the English language allowed to identify 24 prefixes and semi-prefixes (prefixoids): all- (all-aluminum); anti- (anticorrosive); counter- (counterforce); de- (degreasing); dis- (discontinuity); ex- (extension); half- (half-span); im- (impermeability); in- (incline); inter- (intersection); ir- (irreversible); micro- (microcrack); mis- (mismatch); multi- (multitiered); non- (nonconformity); out- (outline); over- (overlay); pre- (prefiltration); re- (rebuilding); self- (self-locking); semi- (semitrailer); sub- (substation); super- (superheating) and un- (undercoat) [3, 4].

As shown by the analysis, the majority of the prefixes under consideration proved their productivity and regularity in the system of affixal word formation in the English-language construction-engineering vocabulary.

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However, such highly productive prefixes as half-, self-, semi-, sub-, super- in the system of affixal construction-engineering term formation turned out to be insufficiently productive in formation of the "new" words.

As is known, simple and compound words are formed in accordance with derivational models and word-formative types. The latter determine the scheme of formation of derived words from a certain part of speech and are characterized by, firstly, a common part of speech for directly motivated words and, secondly, a common morpheme, both in the morpheme representation and in the semantic meaning.

A derivational model means a pattern of transformation of generating words into derivative ones, i.e. a combination of the forming stem of a word and word-formative morphemes with the reflection of their new meanings and the definition of morphological and morphonological features. The general meaning that distinguishes motivating words from motivated ones is called a word-formative meaning of a particular word-formative type held by a word-formative morpheme [5].

Word-formative types differ in the degree of regularity and productivity. This feature is widely used in language and largely influences formation of dictionaries for various purposes, including translation ones [6].

Productivity is defined as an ability of motivating word stems to combine with a morpheme (affixal morpheme), which has a significant word-formative potential, since it makes it possible to form words according to a certain word-formative type in a certain period of language development.

In contrast to productivity, regularity is the ability to form derivative words according to a frequently repetitive formal-semantic model.

A word-formative pair consisting of a motivating and a motivated word is a basic unit of study of word-formative models. Example: disintegrate – disintegrator.

Comparison of the word-formative pairs is considered as a tool for determining grammatical characteristics of the derivative word, the grammatical meaning of the formed word, word-formative meaning of the morphemes, word derivativeness, keyword to search in a dictionary, translation options for the derivative word, along with possible morphonological and graphic changes and lexical restrictions.

Lexical restriction refers to the units that are formed under a nontypical scheme of a certain word-formative model and cannot be recognized by MTSs during morphological processing and, therefore, must be marked in a translation dictionary.

3. Modeling of prefixal word formation on the example of anti-morpheme

Thus, let us consider the procedure for selecting a word-formative prefix and determining a productive word-formative model and a word-formative type on example of the English morpheme anti-.

Word formation can be both affixal and prefixal. The general word-formative meaning is "directed against what is indicated by the stem".

This way of word formation defines three types of models.

1. A word-formative model of a noun anti-+NO → -NO.

This model combines word-formative pairs, the forming stem of which is a noun (Table 1).

Table 1. Word-formative model of a noun ANTI-+N → -N

№	Prefix	Word-formative model	Semantic meanings of the prefix	Semantic feature of the formed word	Dictionary	Examples
1	anti-	anti-+NO → -NO	Imparting a property that neutralizes harmful effects of what is indicated by the stem	substance	SPD	antifoam (*penogasitel*)
2	anti-	anti-+NO → -NO	A remedy against what is indicated by the stem	substance	GUD	antifreeze (*antifriz*)
3	anti-	anti-+NO → -NO	Counteraction, neutralization of harmful effects	feature of procedurality	GUD	antisepsis (*antiseptika*)

Legend: GUD – "general-use dictionary"; SPD – "special purpose dictionary"

The word-formative morpheme anti- is translated into Russian:

by means of prefixes anti-, protivo- (antifreeze – antifriz);

by compound nouns (antifoam – penogasitel);

by descriptive turns (antitransformation – obratnoye preobrazovaniye).

2. The word-formative model of an adjective anti-+ ADJ → -ADJ.

This model combines word-formative pairs, which forming stem is an adjective (Table 2).

Table 2. Word-formative model of an adjective ANTI-+ ADJ → -ADJ

№	Prefix	Word-formative model	Semantic meanings of the prefix	Semantic feature of the formed word	Dictionary	Examples
1	anti-	anti-+ ADJ → -ADJ	A remedy against what is indicated by the stem	Relative adjective	SPD	Anticorrosive (*antikorroziynyy, protivokorroziynyy*)
2	anti-	anti-+ ADJ → -ADJ	Protection from what is indicated by the stem	Relative adjective	GUD	Antibacterial (*antibakterialnyy*)
3	anti-	anti-+ ADJ → -ADJ	Contrary feature, counteraction, neutralization of harmful effects	Qualitative adjective	GUD	Antidazzle (*neosleplyayushchiy, samozatemnyayushchiysya*)

Legend: GUD – "general-use dictionary"; SPD – "special purpose dictionary"

The word-formative morpheme anti- is translated into Russian:
by means of prefixes anti- and protivo-,
by compound adjectives (participles) (antidazzle – samozatemnyayushchiysya)

3. Word-formative model of an adjective anti-+ NO → -ADJ. This model combines word-formative, which forming stem is a noun (Table 3).

Table 3. Word-formative model of an adjective ANTI-+ NO → -ADJ

№	Prefix	Word-formative model	Semantic meanings of the prefix	Semantic feature of the formed word	Dictionary	Examples
1	anti-	anti-+ NO → -ADJ	A remedy against what is indicated by the stem	Relative adjective	SPD	Antirot (*protivognilostnyy*)
2	anti-	anti-+ NO → -ADJ	Counteraction, prevention of harmful effects	Relative adjective	SPD	Antipollutant (*preduprezhdayushchiy zagryazneniye, protivodeystvuyushchiy zagryazneniyu*)
3	anti-	anti-+ NO → -ADJ	Protection from what is indicated by the stem	Relative adjective	SPD	antinoise (*shumozashchitnyy, shumoizoliruyushchiy, protivoshumovoy*)

Legend: GUD – "general-use dictionary"; SPD – "special purpose dictionary"

The resulting adjectives of the fourth word-formative model can have an -ing ending.
A word-formative morpheme anti- is translated into Russian:
by means of the prefix anti-, protivo- (antiriot – protivognilostnyy);
by compound adjectives (participles) (antinoise – shumozashchitnyy, shumoizoliruyushchiy);
by descriptive turns for protection purpose (antipollutant – preduprezhdayushchiy zagryazneniye, protivodeystvuyushchiy zagryazneniyu, zashchishchayushchiy ot zagryazneniya).

III. CONCLUSION

The analysis of word-formative pairs of the English language combined into word-formative types by the criterion of commonality of a word-formative morpheme (prefix) in construction-engineering texts has led to the following conclusions.
1. The majority of considered prefixes confirmed their productivity and regularity in the system of affixal word formation in the English-language construction-engineering vocabulary. However, such highly productive prefixes as half-, self-, semi-, sub-, super- in the system of affixal construction-engineering term formation turned out to be insufficiently productive in formation of the "new" words.
In this regard, there is a need for further analysis of word-formative types in construction-engineering terms for comprehensive and detailed study of affixal means of new words' formation.
2. Models with the following prefixal morphemes (anti-; de-; dis-; non-; out-; pre-; re-; un-) are the most productive and regular models of engineering-construction terms.
3. The formed register of productive and regular English prefixes can be used to form a word-formative model in MTS as a component of morphological analysis. This will allow recognizing "new" words that are formed due to productive prefixes even in case of their

absence in a translation electronic dictionary.

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