

THE FORMAL MODEL OF THE GRAMMAR OF THE UZBEK LANGUAGE

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ABSTRACT

The speed and ability of modern computers is expanding. And this makes it possible to solve some problems of different industries under new methods. The computer's capabilities have also shown their actions in the direction of computer linguistics, that is, in those directions of linguistics, which can be solved automatically more precisely with the help of a computer. The paper provides formal models of parts of Uzbek grammar speech, which can be used to develop morphological analysis and electronic database of Uzbek words. Formal models are designed for the official business style of the Uzbek language.

Keywords: Computer linguistics, formal models, formal grammar, morphological analysis, computer, development, electron base, axiomatic theory.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Currently, in modern linguistics and modeling, more and more attention is paid to the problems of creating formal models of natural languages, i.e. writing linguistic concepts using mathematical symbols of a formal language or formal grammar. Many rules, spawning words, expressions and sentences are called formal grammar. The subject of formal grammar is primarily considered grammatical forms, their structure, grouping by parts of speech and the rules of inflection, the rules of combinations. The word-formation, the word is changeable and the inflectional model, the form of the word and the form of the phrase are the basic units of formal grammar. A formal language has much in common with a natural language, the sentences of which are also constructed in accordance with grammatical rules. Exceptions to the rules characteristic of the grammar of natural languages indicate that the system of rules fixed in the grammar of a language cannot accurately describe all the laws of language development. Formal languages are simpler than natural languages. They are created simultaneously with the system of rules for constructing words and sentences. Exceptions to the rules in a formal language can only indicate inconsistency and incorrectness of the system and grammar rules. Grammar rules can be written in various ways. The grammar of a natural language is traditionally described as grammatical rules in a natural language. The grammar of a formal language can also be described as a set of rules in a natural language. But usually they use special means of writing: formulas and schemes. [1]

Formal grammar has existed since when it became necessary to learn a foreign language. In general, when studying foreign languages, we only dealt with formal signs of words, translating each time, for example, the Uzbek form of the word into the corresponding foreign one and vice versa. Logical grammar built all its positions on the basis of the semantic side of the word, then the new one completely ignores the meaning, based solely on form. Meanwhile, formal grammar provides a surprisingly clear and concise outline. The task is to formulate a grammar - a set of rules that determine which sequences of words in a given sentence satisfy the generated sentence obtained through certain rules for constructing sentences. [2]

Formal model of parts of speech

The development of a formal language model is supposed to be carried out on the basis of the concepts of axiomatic theories of mathematical logic.

A 3-level analysis of the sentences of the Uzbek language is proposed:[3]

- 1) parts of speech (words);
- 2) members of the sentences;
- 3) constructions of the sentences.

To present a formal model of the grammar of the Uzbek language, we give a formal definition of some grammatical concepts.

The word is determined by the formula

$$\text{Word} = \begin{cases} \text{source word} \\ \text{derivative word} \end{cases}$$

The list of words is determined by the complete dictionary of words in a given language (source words) and the rules of word formation (derived words). Words formed using derivational affixes are also defined by the dictionary of a given language. Belonging to a particular part of speech is also determined by the dictionary.

Derived word = source word + formative affixes

It should be noted that proper names (geographical names, names of people and others) and words defined by word-building formulas as: word + affix, word + word, word - word, affix + word are considered to be original, as they are given in the dictionary.

So the source words are:

1. Noun - daftar(notebook);
2. Adverb – tez(quick);
3. Adjective – katta(large);
4. The preposition – bilan(with);
5. Numeral – yigirma(twenty);
6. The conjunction - va (and);
7. The verb - topmoq(to find);
8. Modal words –yo'q(no).
9. The pronoun - ular(they);

Here are ways to form words using formative affixes of the Uzbek language.

It should be noted that not all affixes given (specific examples are considered, but this does not mean that this is a categorically correct application for all words) can join all words. This paper does not provide a detailed description of this.

We introduce the following notation:

⊕ - join operation;

⇓ - operation connection or not connection

∨ - operation or;

∅ - is a zero indicator.

1) Basics of parts of speech (words)::

Δ_s - is the basis of the noun; Δ_{pr} - is the basis of the adjective;

Δ_{nb} - "is the basis of the numeral; Δ_r -is the basis of the pronoun;

Δ_a - is the basis of the adverb; Δ_{vb} - the basis of the verb;

Δ_{vb_3} - the basis of an incomplete verb;

2) E – case:

e_1 - the subjective case-∅; e_2 - possessive case -∅,-ning;

e_3 - accusative case -∅,ni; e_4 -dative case - ga;

e_5 - original case -dan; e_6 - locative case - da;

3) P - affixes of belonging: p_1 - i(si); p_2 - lari; p_3 - niki;

4) N - is the plural affix of - lar;

- 5) M - is the affix indicating the sign of the place and time of the arc -dagi;
- 6) U - is the affix specifying a limitation -gacha;
- 7) S - noun: s_1 - common noun -kitob(book); s_2 -proper noun - Toshkent(Tashkent);
 s_3 - abstract noun - tinchlik(world);
- 8) Pr-adjective: pr_1 - relative:yozgi(summer); pr_2 - quality: katta(big);
- 9) T - Adjective degrees: t_1 - positive : \emptyset ; t_2 - comparative:roq;
- 10) Nb - is the numeral:
 nb_1 - ordinal:beshinchi(fifth); nb_2 -quantitative:besh(five); nb_3 -piece: beshta(five);
 nb_4 -separation:beshtadan(five); nb_5 -fractional:beshdan ikki(two of five)
- 11) R – pronoun: r_1 - personal - men, biz, u, ular (II person and plural not used);
 r_2 - reflexive - o'z; r_3 -index - ushbu; r_4 - interrogative - kim;
 r_5 - specific- hamma; r_6 - negative - hech kim;
- 12) A - is an adverb:
 a_1 -of the mode of action- to'satdan(suddenly); a_2 - time - erta(tomorrow);
 a_3 - place - orqadan(from the back); a_4 - degrees- qisman(partually);
 a_5 - purpose - qasddan(intentionally);
- 13) Vb -verb
 Vb_1 - the main verb - keldi(come);
 Vb_2 - auxiliary verb – bo'ldi(not individually translated);
 Vb_3 - incomplete verb - edi(not individually translated);
- 14) LH – face and number affixes
LH1 - I conjugation: l_1 -man; l_2 -miz; l_3 -di; l_4 -dilar;
LH2 - II conjugation: l_1 -m; l_2 -k; l_3 -di; l_4 -dilar;
LH3 - III conjugation: l_1 -(i)m \oplus yo'q; l_2 -(s)i \oplus yo'q; l_3 -(i)miz \oplus yo'q; l_4 -
(lar)i \oplus yo'q;
LH4 - IV conjugation: l_1 -sin; l_2 -ishsin, -(sin)lar;
- 15) NK - mood affixes:
NK1 - imperative: nk_1 - sin; nk_2 - ishsin, -(sin)lar;
NK2 - conditional - sa, -sa edi;
NK3 - inclination of the target - moqchi;
NK4 - \emptyset -indicative mood;
- 16) Zg - collateral affixes:
 zg_1 - the main guarantee - \emptyset ; zg_2 -reflexive pledge of the verb- in, - il;
 zg_3 - mutual pledge of the verb - ish; zg_4 - passive pledge of the verb -il;
 zg_5 - compulsory verb -ar, -dir, -tir, -gaz, -az, -kaz, -kiz, -qaz.
- 17) Ng - negative forms: ng_1 - ma, - mas; ng_2 - LH3;
- 18) Tm - affixes of time
1. tm_1 – past tense: tm_1^1 – di; tm_1^2 – ib; tm_1^3 – ar, - ir; tm_1^4 – ar edi, ir edi;
 tm_1^5 - gan, - yotgan; tm_1^6 - gan edi, - yotgan edi;
2. tm_2 - present:
 tm_2^1 - a,y; tm_2^2 - yap; tm_2^3 - ib(status verb - turibdi);
3. tm_3 - future tense - moqchi
- 19) Fv - functional forms of the verb
 fv_1 - communion - ($\Delta_{vb} \oplus ((ganV(aVy)) \oplus digan V ((a)rV(i)rV -mas)$);
 fv_2 - the participle- ($\Delta_{vb} \oplus (- gach V - guncha V - gani)$);
 fv_3 - infinitive - ($\Delta_{vb} \oplus (- ish V uv)$);
- 20) Mv - modal verbs -shart, zarur, emas, kerak, yo'q;

Now we give models of parts of speech.

1. A noun model with formative affixes:

$$S((\Delta_{s_1} \oplus \downarrow N \oplus \downarrow p_1 \oplus \downarrow M \oplus \downarrow e_i) V(\Delta_{s_2} \oplus \downarrow N \oplus \downarrow (UVM) \oplus \downarrow e_i) V(\Delta_{s_3} \oplus p_1 \oplus U) V(\Delta_{s_3} \oplus \downarrow p_1 \oplus M \oplus e_i))$$

Examples: kitob-im-ning(my book's),

2. Adjective Model with Formative Affixes:

$$Pr_i(\Delta_{pr} \oplus \downarrow T_i \oplus \downarrow N \oplus \downarrow p_i \oplus \downarrow e_i \oplus \downarrow LH1)$$

Examples: Katta-lar-ni(large)

3. Numeral model with formative affixes:

$$Nb((\Delta_{nb_{1,2}} \oplus \downarrow M \oplus e_i) V(\Delta_{nb_{1,2}} \oplus \downarrow N \oplus \downarrow U) V(\Delta_{nb_3} \oplus \downarrow N \oplus \downarrow p_i \oplus e_i)) V(\Delta_{nb_{4,5}} \oplus \downarrow p_i)$$

Examples: Beshinchi-da (fifth)

4. A pronoun model with formative affixes:

$$R((\Delta_{r_i} \oplus \downarrow N \oplus \downarrow p_i \oplus e_i) V(\Delta_{r_i} \oplus \downarrow (MVU) \oplus \downarrow e_i) V(\Delta_{r_{1,2}} \oplus \downarrow p_i \oplus \downarrow LH1))$$

Examples: Ular-niki-ga (to them)

5. Adverb model with formative affixes:

$$A(\Delta_{a_i} \oplus \downarrow (MVU) \oplus \downarrow e_i)$$

Examples: Erta-dan(from tomorrow)

6. The model of functional forms of the verb with formative affixes:

$$Fv((\Delta_{r_{1,3}} \oplus \downarrow N \oplus \downarrow p_i \oplus \downarrow e_i) V(\Delta_{r_{1,2}} \oplus \downarrow LH1) V(\Delta_{r_1} \oplus \downarrow N \oplus \downarrow (MVU) \oplus \downarrow e_i))$$

Examples: Ket-gan(gone)

7. Verb model with formative affixes:

$$1) Vb_1^1((\Delta_{vb} \oplus \downarrow ng_1 \oplus (tm_1^5 Vtm_1^2)) V(\downarrow ng_1 \oplus (tm_2^1 Vtm_2^2)) V(NK3) V((zg_2 \oplus tm_2) V(zg_3 \oplus tm_2) V(zg_5 \oplus tm_2) \oplus LH1) V(\downarrow ng_1 \oplus NK1))$$

Examples: Kel-ma-gan-dim(didn't come)

$$2) Vb_1^2((\Delta_{vb} \oplus \downarrow ng_1 \oplus (tm_1^1 Vtm_1^3 Vtm_1^4 Vtm_1^5 Vtm_1^6) \oplus LH2) V(zg_2 \oplus \downarrow ng_1 \oplus tm_1^1) V(zg_3 \oplus \downarrow ng_1 \oplus tm_1^1) V(zg_4 \oplus \downarrow ng_1 \oplus tm_1^1) V(zg_5 \oplus \downarrow ng_1 \oplus tm_1^1))$$

Examples: Kel-ib ket-gan-dim(came)

$$3) Vb_1^3((\Delta_{vb} \oplus \downarrow (zg_2 Vzg_3 Vzg_4 Vzg_5) \oplus tm_1^5) \oplus LH3))$$

Examples: Kel-gan edi-k(came)

$$4) Vb_1^4(((zg_{2,4} \oplus \downarrow ng_1) V(\downarrow ng_1 \oplus tm_1^1) V(zg_5 \oplus \downarrow ng_1)) \oplus LH4))$$

Examples: Bajar-il-sin(must by done)

This paper offers only formal models of parts of speech, i.e. the first level of analysis. According to this scheme, you can develop formal models of sentence members and sentence structures in the Uzbek language.

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