FORMAL GRAMMAR FOR A FRAGMENT OF THE SERBIAN LANGUAGE

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Abstract. This paper is about the analysis and synthesis of typical sentences taken from advertisements. To be more precise, it is about the analysis and synthesis of the sentences-advertisements in which somebody looks for, rents out, lets out, buys or sells an apartment, office or land. The chosen advertisements are written in a form of complete and grammatically correct sentences. First, their detailed syntactic analysis was done, according to the groups they belong to, and after that, the formal grammar for a chosen fragment of language is defined (see [1]).

1. INTRODUCTION

A detailed syntactic analysis of a chosen fragment of the Serbian language was done, according to the groups the sentences belong to.

1.1. COMPOSITE SYNTACTIC CATEGORIES

Sentence. Sentences can be divided into five groups, according to the way they are formatted. Every sentence contains either a subject and a predicate, i. e., a noun phrase and a predicate phrase (sentences from the first, the second and the fourth group), or only a predicate phrase (sentences from the third and the fifth group), when the subject is omitted. In addition, several examples of sentences, which are characteristic in their groups, are given. At the same time, their essential features are listed. By means of tree structures, Fig. 1 shows the sentence formation.

Because of technical reasons, the following abbreviations are used for syntactic categories (lexical and composite):

S	for sentence	**Adv**	for adverb
PredP	for predicate_phrase	**CN**	for common_noun
VP	for verb_phrase	**Adj**	for adjective
AdvP	for adverbial_phrase	**Det**	for determiner
NP	for noun_phrase	**Prep**	for preposition
CNP	for common_noun_phrase	**Conj**	for conjunction and
ModP	for modifier_phrase	**Adj_p**	for adjective_passive
V	for verb		

The following abbreviations are used for cases:

nom	for the nominative case	**gen**	for the genitive case
dat	for the dative case	**acc**	for the accusative case
instr	for the instrumental case	**loc**	for the locative case

Abbreviations used for gender: **m** for masculine gender, **f** for feminine gender and **n** for neuter gender.

Finally, **num** is used for number, i. e. **sng** for singular and **pl** for plural.

First, the sentences in the form of *somebody looks for something* and *somebodies look for something* are cited:

Devojka traži apartman.
(A girl looks for an apartment.)

Devojke traže apartman.
(Girls look for an apartment.)

Zaposlena devojka hitno traži luksuzan apartman.
(An employed girl urgently looks for a luxurious apartment.)

Ozbiljne devojke traže hitno apartman sa grejanjem u centru.
(Serious girls urgently look for an apartment with central heating in the downtown.)

A common characteristic of all the sentences of the group is that their subjects are noun phrases in the nominative case (either in singular or plural). The predicate phrase and the noun phrase, which are next to each other, agree in person and number. In these sentences the agreement in gender is not necessary because they contain only the verb *tražiti*(*to look for*) in the present tense, the third person singular or plural (*on/ona traži* (*he/she looks for*); *oni traže* (*they look for*). This is shown in Fig. 1a.

The second group of sentences is in the form *two persons look for something*. For example:

Dva studenta traže nameštenu sobu u gradu.
(Two students look for a furnished room in town.)

Dve devojke hitno traže nameštenu sobu sa kuhinjom.
(Two girls urgently look for a furnished room with a kitchen.)

In these sentences number *dva* (*two*) precedes the common noun in the noun phrase. This number and the noun phrase, which are next to each other, agree in gender. Because of that, besides the case, the gender of the noun is an essential feature of the noun phrase. The predicate phrase contains the verb in plural *traže* (*look for*) because two persons look for something (Fig. 1b).

The third group contains three types of sentences. The first one are the sentences of the form *(I/We) rent out (let out, buy, sell, look for) something*:

Kupujem kuću.
(I buy a house.)

Povoljno iznajmljujemo vikendicu na moru.
(We favourably let out a weekend cottage at the seaside.)

Jevtino prodajem ogradjen gradjevinski plac.
(I cheaply sell a fenced building site.)

Kupujemo hitno prazan stan sa telefonom.
(We urgently buy an empty flat with telephone.)

The same group contains sentences of the form *I/we rent (let) out something to somebody* and *I/we rent (let) out to somebody something*:

Iznajmljujem jevtino vikendicu pored obale strancima.
(I let out cheaply a weekend cottage to foreigners.)

Hitno i povoljno izdajem stan mladom bračnom paru.
(I urgently and favourably rent out a flat to a young married couple.)

Jevtino izdajem dvema učenicama polunameštenu sobu.
(I cheaply rent out a semi - furnished room to two schoolgirls.)

Izdajem povoljno i hitno dvama studentima praznu garsonjeru.
(I rent out favourably and urgently an empty one - room apartment to two students.)

Finally, sentences of the form *I/we rent out (let out, look for) something for somebody* and *I/we rent out (let out, look for) for somebody something* are also in this group:

Hitno tražimo nameštenu sobu u centru za učenicu.
(We urgently look for a furnished room in the downtown for a schoolgirl.)

Iznajmljujem namešten jednosoban stan za samce.
(I let out a furnished single-room flat for single-men.)

It is clear that all the sentences of this group do not have the subject. The verb in the predicate phrase is in the present tense in one of two numbers - singular or plural (Fig. 1c).

The sentences that follow are in the form *somebody needs something*. For example:

Ozbiljnom bračnom paru potreban stan sa centralnim grejanjem.
(Serious married couple needs a flat with central heating.)

Dvema devojkama je potrebna soba u gradu pored obale.
(Two girls need a room in a town near the coast.)

These sentences have a logical subject. The subject is in the dative case in singular or plural, while grammatical subject is in the nominative case. The predicate phrase

contains the verb phrase and the noun phrase in the nominative case. The verb phrase contains the passive verb form *is needed*. The adjective *needed* may be used in all three genders (masculine, feminine and neuter). Besides the form *is needed*, we can find only *needed*, i. e. the form without the auxiliary verb *is* (Fig. 1d).

Finally, in the sentences of the fifth group, which are of the form *something is needed*, the subject is omitted. They have only a predicate phrase that is the same as the phrase in the sentences of the previous group (Fig. 1e). The following sentences are formed in that way:

Potreban plac u gradu pored mora.
(A building site in a town near the sea is needed.)

Potrebna nova kuća sa telefonom.
(A new house with telephone is needed.)

Hitno potrebno obradivo zemljište u selu.
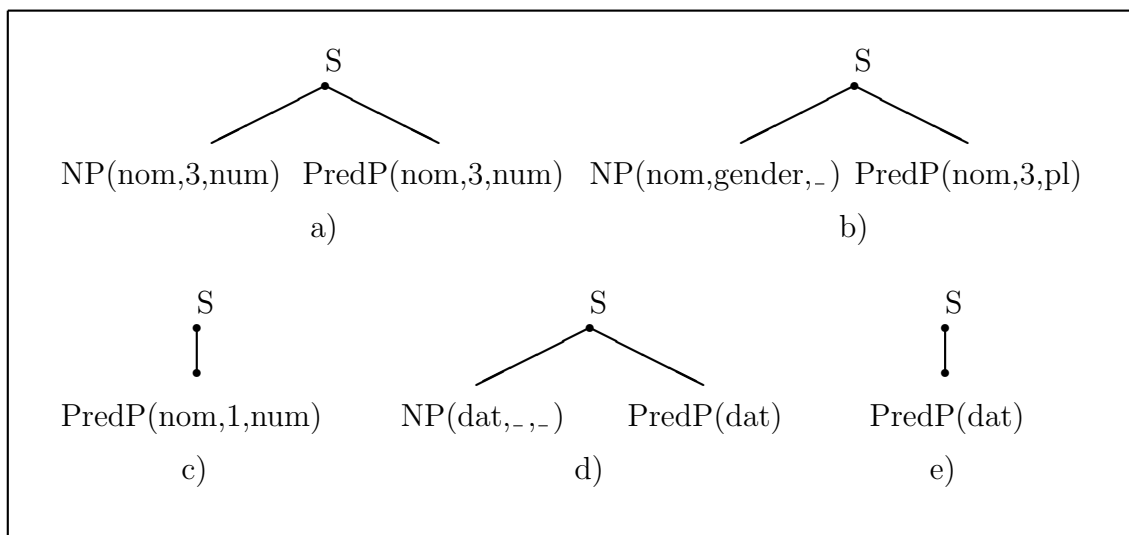(Cultivable land in the village is needed urgently.)

Fig. 1   The structure of the sentence

The predicate phrase (the predicate). A predicate phrase of a sentence can consist only of a verb or a group of words that go together with the verb. These are verbal complements (direct and indirect object) and verbal modifiers (for example: for

mood). Their role is to modify and to determine the action which the verb denotes. Fig. 2, 3 and 4 present the structure of the predicate phrases by means of a tree.

The predicate phrases which participate in the formation of the sentences from the first and the second group, have a verb phrase and a noun phrase which has the function of the direct object (Fig. 2). The verb phrase contains the verb *tražiti* (*to look for*) in the third person singular or plural (depending on the number of the subject). This verb connects the subject in the nominative case and the direct object in the accusative case. Besides the verb, the predicate phrase may contain one or two adverbs preceding or following the verb.

$$PredP(nom, 3, num)$$
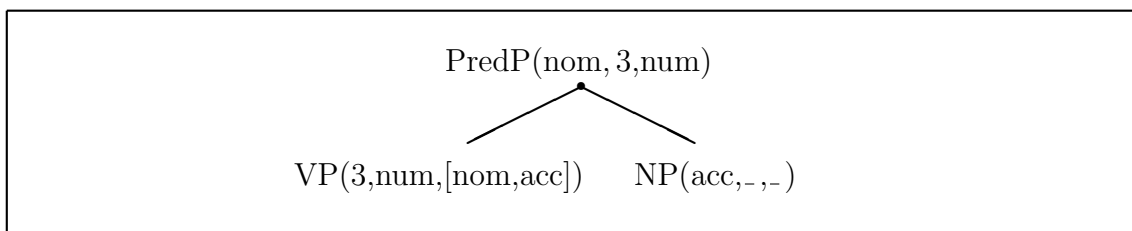$$VP(3,num,[nom,acc]) \quad NP(acc,_{-},_{-})$$

Fig. 2   The structure of the predicate phrase for the sentences from
the first two groups

The predicate phrases of the sentences from the third group contain the verb phrase and the direct object or the verb phrase, the direct and the indirect object. Taking into account the order of the objects in the sentence, the predicate phrase can be formed in five ways (Fig. 3). We can say *izdajem nešto nekome* (*I rent out something to somebody*), or *izdajem nekome nešto* (*I rent out to somebody something*), and *tražim nešto za nekoga* (*I look for something for somebody*) or *tražim za nekoga nešto* (*I look for somebody some- thing*).

PredP(nom, 1,num)

VP(1,num,[nom,acc])   NP(acc,_,_)

a)

PredP(nom, 1,num)

VP(1,num,[nom,acc,dat])   NP(acc,_,_)   NP(dat,_,_)

b)

PredP(nom, 1,num)

VP(1,num,[nom,dat,acc])   NP(dat,_,_)   NP(acc,_,_)

c)

PredP(nom, 1,num)

VP(1,num,[nom,acc,p_acc]) NP(acc,_,_)   NP(p_acc,_,_)

d)

PredP(nom, 1,num)

VP(1,num,[nom,p_acc,acc]) NP(p_acc,_,_) NP(acc,_,_)

e)

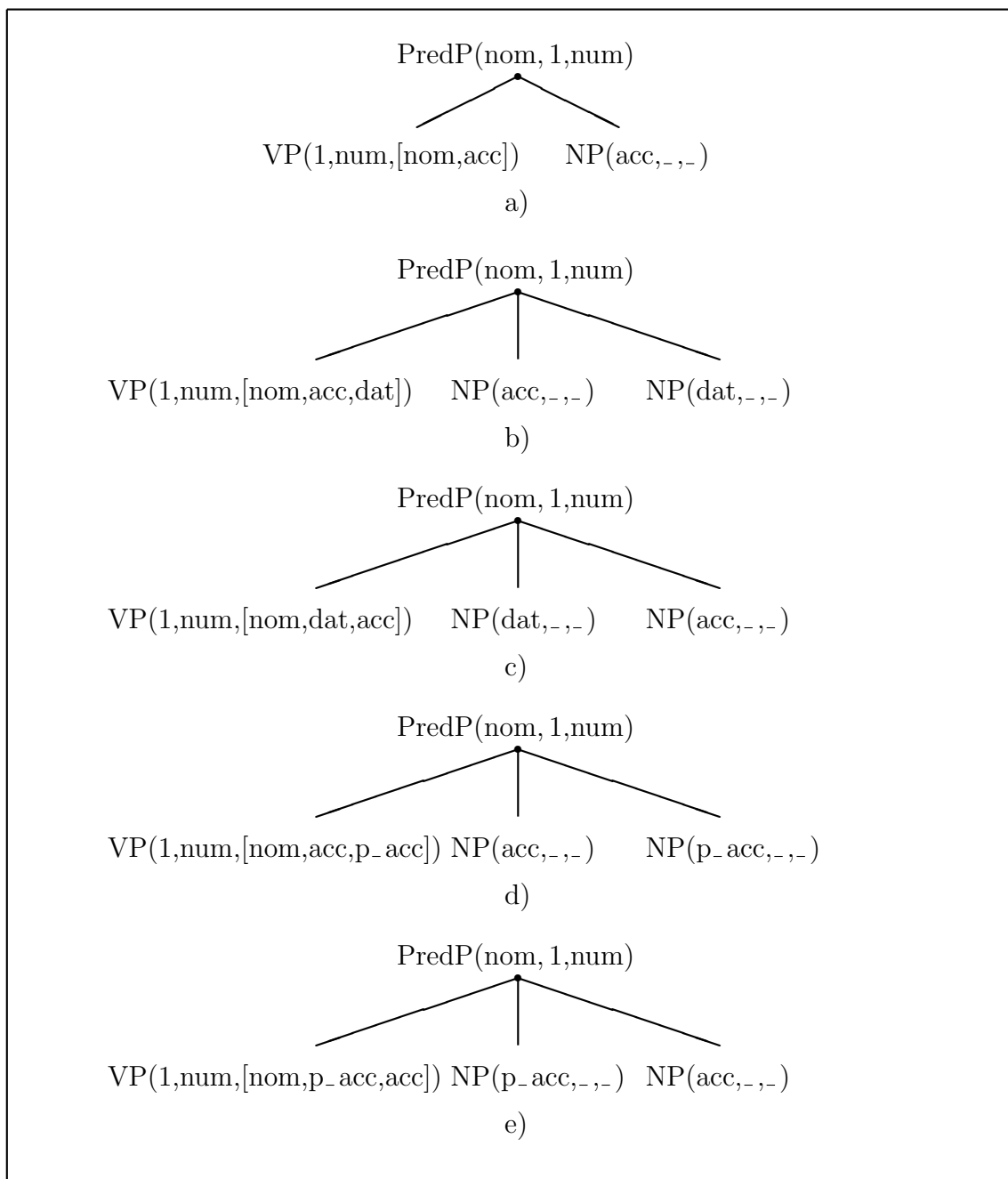Fig. 3   The structure of the predicate phrase for the sentences of
the forth and the fifth group

The first way of formation is: the verb phrase and the direct object in the accusative case. The verb phrase contains verbs: *izdavati* (*to rent out*), *iznajmljivati* (*to let out*), *kupovati* (*to buy*), *prodavati* (*to sell*) or *tražiti* (*to look for*), in the first person singular or plural, which connect the subject in the nominative case and the direct object in the accusative case (Fig. 3a).

The second way of formation of the predicate phrase is: the verb phrase, the direct object in the accusative case and the indirect object in the dative case. The verb phrase contains the verb *izdavati* (*to rent out*) or *iznajmljivati* (*to let out*), in the first person singular or plural, which connects the subject in the nominative case, the direct object in the accusative case and the indirect object in the dative case (Fig. 3b).

The third way would be: the verb phrase, the indirect object in the dative case and the direct object in the accusative case (Fig. 3c). The verb phrase contains the verb *izdavati* (*to rent out*) or *iznajmljivati* (*to let out*) in the first person singular or plural, which connects the subject in the nominative case, the indirect object in the dative case and the direct object in the accusative case.

In the forth way, the predicate phrase contains: the verb phrase, the direct object in the accusative case and the indirect object in the form *za nekoga* (*for somebody*) (the accusative case with a preposition). The verb phrase contains one of the verbs *izdavati* (*to rent out*), *iznajmljivati* (*to let out*) or *tražiti* (*to look for*) in the first person singular or plural, which connects the subject in the nominative case, the direct object in the accusative case and the indirect object in the form *za nekoga* (*for somebody*) (Fig. 3d).

Finally, the fifth way in which the predicate phrase can be formed would be: the verb phrase, the indirect object in the form *za nekoga* (*for somebody*) and the direct object in the accusative case (Fig. 3e). The verb phrase contains one of the verbs: *izdavati* (*to rent out*), *iznajmljivati* (*to let out*) or *tražiti* (*to look for*) in the first person singular or plural, which connects the subject in the nominative case, the indirect object in the form *za nekoga* (*for somebody*) and the direct object in the accusative case.

Besides the verb, each verb phrase can contain an adverbial phrase preceding or following the verb.

The nominal predicate of the sentences from last two groups has two parts (Fig. 4). The first one is a verbal part in the personal verb form. The second one is a nominal part in the nominative case. We can recognize two ways in which the predicate can be formed.

The first one is: the verbal part and the nominal part (Fig. 4a). In this case, the verb form contains the verb, which connects the logical subject in the dative case and the nominal part of the predicate in the nominative case. The noun phrase contains the noun in the nominative case in one of the three genders. The passive adjective, which is the part of the passive verb form, and the common noun from the noun phrase, agree in gender. For example: *nekome je potrebna kuća* (*somebody needs a house*), but *potreban je stan* (*a flat is needed*), i.e. *potrebno je zemljište* (*a land is needed*).

The sentences in the form *potrebno nešto* (*something is needed*) represent the second way of formation. The verb form *je* (*is*) is expected. The predicate phrases of those sentences contain a passive adjective *potrebno* (*needed*) and a noun phrase with a common noun in the nominative case. The passive adjective and the noun agree in gender (Fig. 4b).
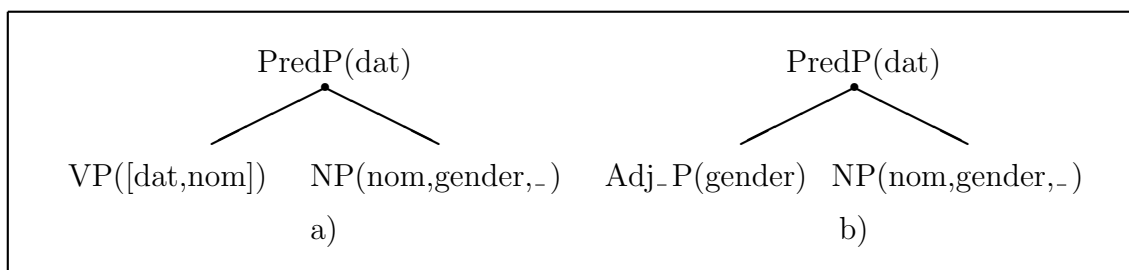

Fig. 4   The structure of the predicate phrase in the sentences of
the third and the fifth group

The verb phrase. Every verb phrase necessarily contains a verb. A verb modifier in the form of an adverbial phrase can stand before or after the verb. The trees in Fig. 5 and 6 show that fact.

The verb phrases of the sentences from the first and the second group are formed in three ways (Fig. 5). The verb phrase can have only a verb (Fig. 5a), or a verb with an adverbial phrase which precedes (Fig. 5b) or follows (Fig. 5c) it. The verb *tražiti* (*to look for*), which appears in the sentences, is in the third person singular or plural and it connects the subject in the nominative case and the direct object in the accusative case.

The verb phrases of the sentences from the third group also contain either only a verb, or a verb with an adverbial phrase preceding or following it. This verb can connect the subject in the nominative case and the direct object in the accusative case (*izdavati* – *to rent out*, *iznajmljivati* – *to let out*, *kupovati* – *to buy*, *prodavati* – *to sell*, *tražiti* – *to look for*). It can also connect the subject in the nominative case, the direct object in the accusative case and the indirect object in the dative case (*izdavati* – *to rent out*, *iznajmljivati* – *to let out*), as well as the subject in the nominative case, the direct object in the accusative case and the indirect object in the form *za nekoga* (*for somebody*), i. e. the accusative form with the preposition *za* (*for*) (*izdavati* – *to rent out*, *iznajmljivati* – *to let out*, *tražiti* – *to look for*).

The verb phrases containing the verb which connects the subject in the nominative case, the indirect object in the dative case and the direct object in the accusative case, as well as those containing the verb which connects the subject in the nominative case, the indirect object in the form *za nekoga* (*for somebody*) and the direct object in the accusative case, are formed in the same way as the corresponding verb phrases in which the arrangement of the objects (direct and indirect) is opposite.

The verb phrases in the sentences from two remaining groups, contain the passive verb form with (Fig. 6a) or without an adverbial phrase before the verb (Fig. 6b). This verb connects the logical subject in the dative case and the nominal part of the predicate in the nominative case (*nekome je potrebno nesto* – *somebody needs something*).

The passive adjective is of the same gender as the common noun from the nominal part, which follows.

VP(type)

V(type)

a)

VP(type)

AdvP   V(type)

b)

VP(type)

V(type)   AdvP

c)
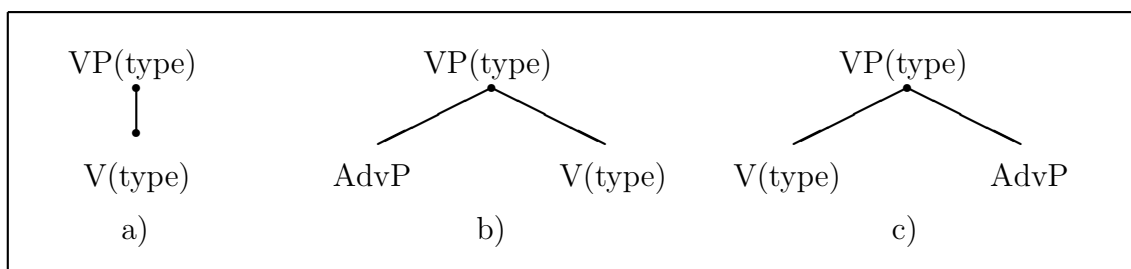
Fig. 5 The structure of the verb phrase in the sentences of
the first three groups

VP([dat,nom])

AdvP V([dat,nom])   Adj_p(gender)

a)

VP(dat,nom)

V([dat,nom])   Adj_P(gender)

b)
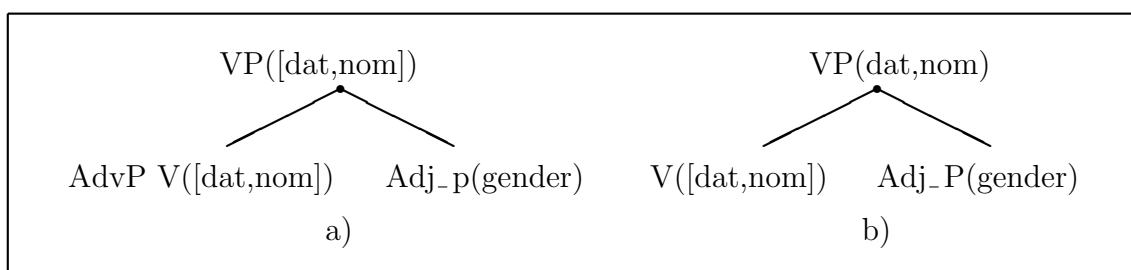
Fig. 6 The structure of the verb phrase in the sentences of
the fourth and the fifth group

The adverbial phrase. Each adverbial phrase in the sentences from the chosen fragment, contains an adverb (Fig. 7a) or two different adverbs which are connected with the conjunction i (*and*) (Fig. 7b).

The noun phrase. A noun phrase appears as a part of the sentence, which has the role of the subject, as a part of the direct or the indirect object, as the nominal part of the predicate (the predicate phrase), and as the nominal part of the modifier phrase. It is formed in several ways.

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        AdvP                              AdvP
          |                             / | \
        AdvP                        Adv  Conj  Adv

         a)                              b)
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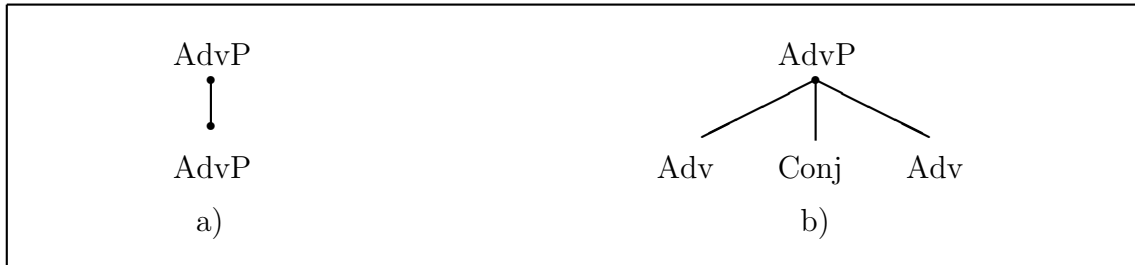
Fig. 7 The structure of the adverbial phrase

A noun phrase can be the common noun phrase. This phrase can contain either only a common noun or a common noun with one or more modifier phrases (Fig. 8). The nouns from these phrases appear without a preposition in the nominative, in the dative and in the accusative case, and with the preposition *za* (*for*) in the accusative case.

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                    NP(k,a,b)
                        |
                   CNP(k,a,b)

                       a)
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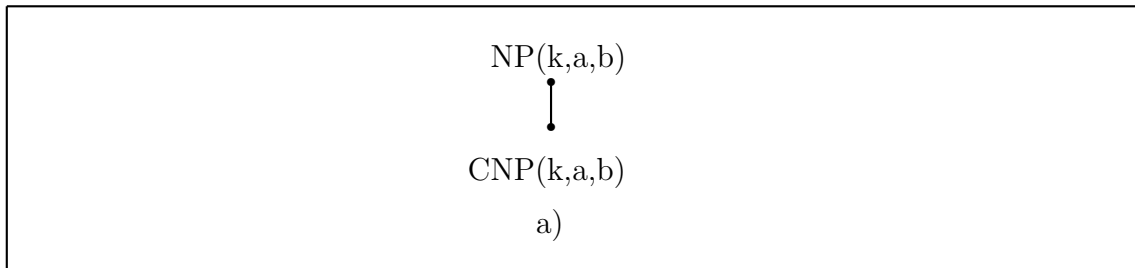
Fig. 8 The structure of the noun phrase

A noun phrase can consist of a common noun in the masculine or the feminine gender with a number preceding it (Fig. 9). Naturally, the determiner and the noun agree in gender. In the noun phrase which is in the nominative case or in the accusative case with preposition *za* (*for*) (Fig. 9a) the number is in the nominative or in the accusative case, and the common noun is in the genitive in the singular. For example: *dve devojke* (*two girls*), *dva samca* (*two single men*), *za dva studenta*

(*for two students*), *za dve učenice* (*for two schoolgirls*). In the noun phrase which is in the dative case (Fig. 9b), the number is in the dative case and the common noun is also in the dative case, but in plural (*dvema učenicama* – *to two school girls*, *dvama samcima* – *to two single men*).

NP(k,gender,-)
Det(k,gender)   CN(gen,gender)
a)

NP(dat,gender,-)
Det(dat,gender)   CN(dat,gender)
b)
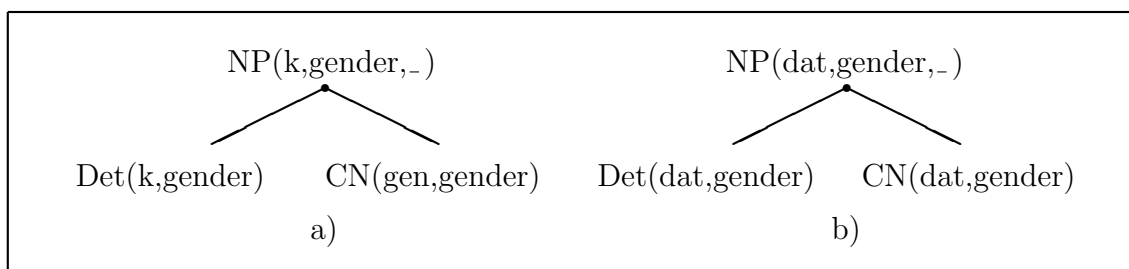
Fig. 9 The structure of the noun phrase that contains the number

The noun phrase can also consist of a common noun with a preposition (Fig. 10). The common noun can appear in the genitive case, with the preposition *pored* (*near to*), in the instrumental case with the preposition *sa* (*with*) and in the locative case with the prepositions *u* (*in*) and *na* (*on* or *at*) (Fig. 10a).

NP(l)
Prep(l)   CN(l,- -)
a)

NP(za_acc)
Prep(acc)   NP(za_acc,-,-)
b)
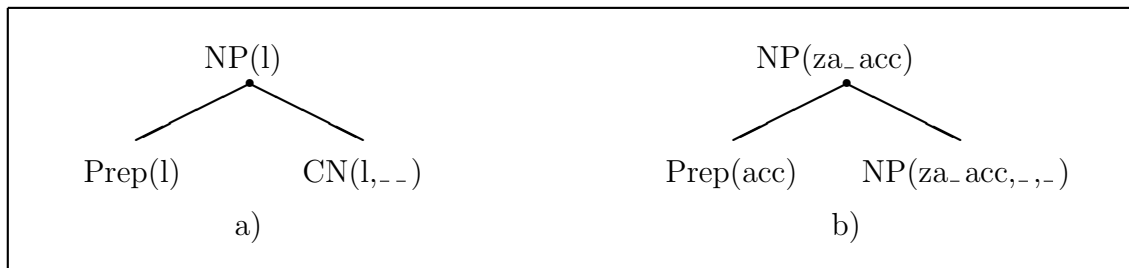
Fig. 10 The structure of the noun phrase which contains
the preposition

The preposition *za* (*for*) appears before the new noun phrase in which the common noun is in the accusative case (Fig. 10b). In that way, the modifier phrase can stand

before the nouns with this preposition. In the case of the common noun with some other preposition, this is not possible.

CNP(k,a,b)   CNP(k,a,b)   CNP(k,a,b)

CN(k,a,b)   ModP(k,a,b)   CN(k,a,b)   CN(k,a,b)   ModP(k,a,b)

a)   b)   c)
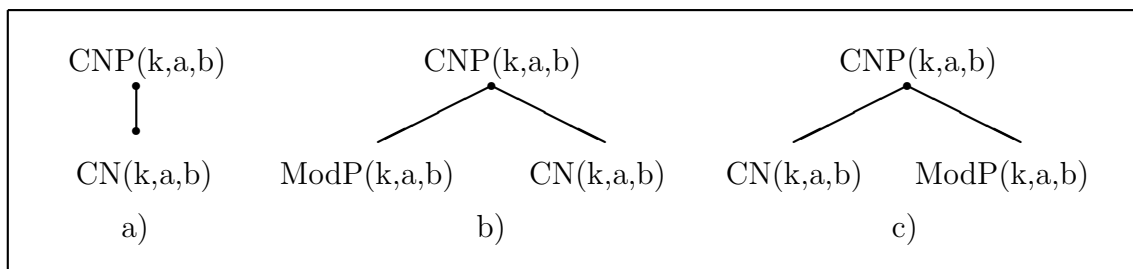
Fig 11 The structure of the common noun phrase with or without a modifier phrase

The common noun phrase. As we have already mentioned, the common noun phrase contains either a common noun, or a common noun with one or more modifier phrases, which are differently arranged around this common noun. For further analysis we can consider the following cases: a common noun without a modifier phrase (Fig. 11a), a common noun with a modifier phrase (Fig. 11b and 11c) and a common noun with two modifier phrases (Fig. 12). The analysis of the sentences that have more than two modifier phrases is very complicated (semantic part of analysis).

In these common noun phrases, common nouns appear in the nominative and dative case, in the accusative case and in the accusative case with the preposition *za* (*for*). The modifier phrases must agree with the common nouns they stand with, because their role is to determine them.

The modifier phrase. In the sentences which are analyzed, the modifier phrases are adjectives (Fig. 13a), modifiers for location and common nouns in the instrumental case with the preposition *sa* (*with*) – Fig. 13b. The adjectives are in the same case as the common noun they stand with. The modifiers for location are formed of the noun phrases in which there is a preposition before the common noun.

CNP(k,a,b)

ModP(k,a,b)   ModP(k,a,b)   CN(k,a,b)

a)

CNP(k,a,b)

ModP(k,a,b)   CN(k,a,b)   ModP(k,a,b)

b)

CNP(k,a,b)

CN(k,a,b)   ModP(k,a,b)   ModP(k,a,b)

c)
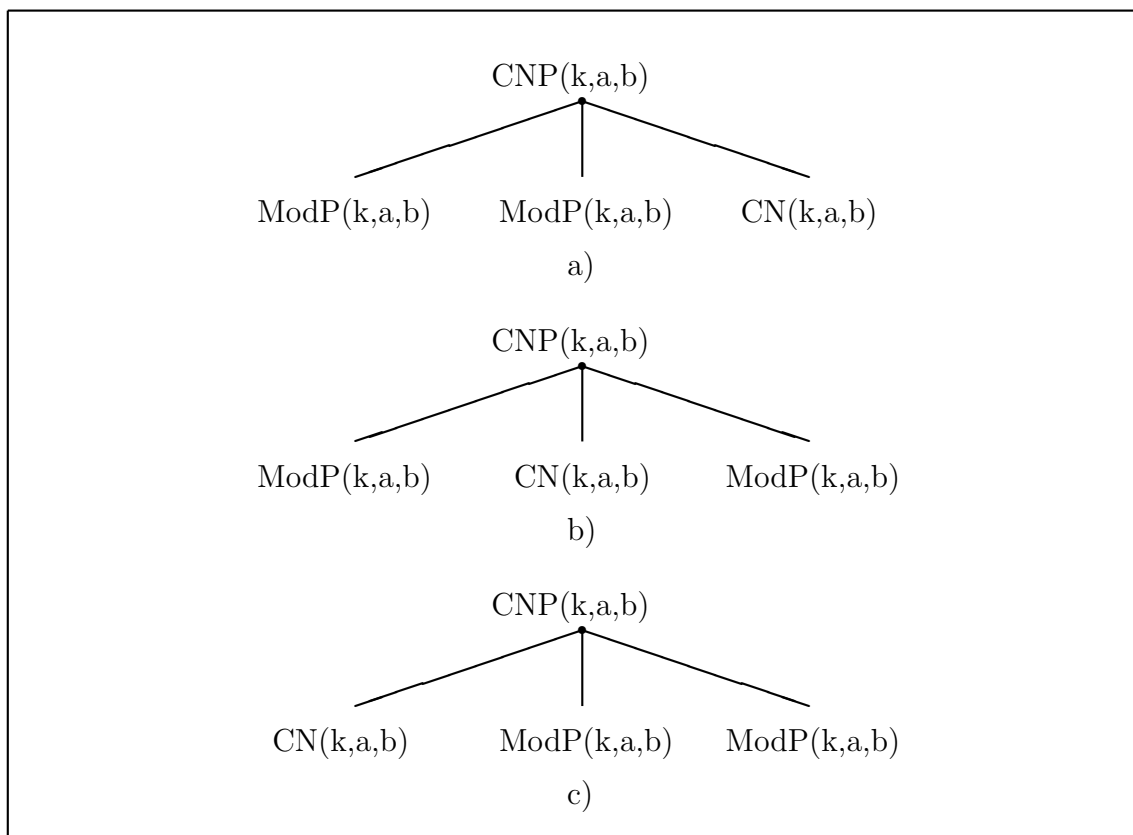
Fig. 12 The structure of the common noun phrase which contains two
modifier phrases

The modifier phrase stands before the common noun in the nominative, dative
case and accusative case. Common nouns, which appear within the modifier phrase
(when it is an adjective) are in the genitive case with the preposition *pored* (*by*), in
the instrumental case with the preposition *sa* (*with*) and in the locative case with
prepositions *u*(*in*) and *na* (*on* or *at*).

$$\text{ModP(k,a,b)} \qquad\qquad\qquad \text{ModP(k,}_-,_-)$$

$$\text{Adj(k,a,b)} \qquad\qquad\qquad \text{NP(l)}$$

a)   b)

Fig. 13 The structure of the modifier phrase

In the following text the lexical categories that appear in the chosen fragments of language will be discussed.

1.2 LEXICAL SYNTACTIC CATEGORIES

Verbs. The verbs which appear in the advertisements are transitive and in the present tense, in the first or the third person, singular or plural. Some of these verbs have a direct object, some of them have an indirect object and some of them are in the passive voice. The important feature of all of them is that the common nouns, connected by the verb, can be in different cases.

The verb *tražiti* (*to look for*) appears in the sentences from the first group in the third person singular or plural (the forms *traži* – *looks* and *traže* – *look*). This verb connects the subject in the nominative case, singular or plural, and the direct object in the accusative case.

The same verb appears in the sentences from the second group, but this time it is in the third person plural (*dve osobe nesto traže* – *two persons look for something*). It connects the subject in the nominative case in plural and the direct object in the accusative case.

In the sentences of the third group, the verbs are in the first person singular or plural. They connect the subject in the nominative case, in singular or plural, and the

direct object in the accusative case (*izdajem/o – I/we rent out*, *kupujem/o – I/we buy*, *iznajmljujem/o – I/we let out*, *prodajem/o – I/we sell*, *tražim/o – I/we look for*). Besides that, they connect the subject in the nominative case in singular or plural, the direct object in the accusative case and the indirect object in the dative case (*izdajem/o – I/we rent out*, *iznajmljujem/o – I/we let out*). Finally, they also connect the subject in the nominative case in singular or plural, the direct object in the accusative case and the indirect object in the form *za nekoga – for somebody* (*izdajem/o – I/we rent out*, *iznajmljujem/o – I/we let out*, *tražim/o – I/we look for*).

At the end, the sentences of the fourth group contain the verb in passive (*je potreban/a/o – is needed*). It connects logical subject in the dative case and the nominal part of the predicate in the nominative case.

In the sentences of the fifth group, the passive verb form also appears, but the verb form *je* (*is*) is excepted and only the passive adjective exists in the corresponding gender.

Common nouns. In the following sentences common nouns appear with or without prepositions. They are in any of the three possible genders, in both numbers and in several cases.

In the sentences from the first group, common nouns in the nominative case in the singular (*devojka – girl*, *samac – single man*, *samica – single woman*, *stranac – foreigner*, *student – student (male)*, *studentkinja – student (female)*, *učenik – school--boy*, *učenica – school-girl*, *par – couple*, *porodica – family* i *nepušač – non-smoker*) and plural (*devojke – girls*, *samci – single men*, *samice – single women*, *stranci – foreigners*, *studenti – students (male)*, *studentkinje – students (female)*, *učenici – school-boys*, *učenice – school-girls* and *nepušači – non-smokers*) appear in the role of the subject. The common nouns in the accusative case in singular (*apartman – suite*, *lokal – office*, *plac – building site*, *stan – flat*,*kiosk – stand*, *kafić – café*, *restoran – restaurant*,*garsonjeru – studio*, *kuću – house*, *sobu – room*, *njivu – cultivated field*, *vikendicu – weekend cottage*, *prodavnicu – store*, *radionicu – workshop* and *zemljište – land)* are in the role of the direct object. They also appear as the direct objects in the sentences of the second and the third group.

In the sentences of the second group, common nouns in the genitive case in the masculine (s̑amca – *single man*, *studenta* – *student (male)* and *ucenika* – *student*) or in the feminine (*devojke* – *girls*, *samice* – *single women*, *studentkinje* – *students (female)* and *ucenice* – *school–girls*) have the function of the subject which stands next to the number two in the corresponding form (case and gender).

Common nouns in the dative case (*devojci* – *to a girl*, *devojkama* – *to girls*, *samcu* – *to a single man*, *samcima* – *to single men*, *samici* – *to a single woman*, *samicama* – *to single women*, *strancu* – *to a foreigner*, *strancima* – *to foreigners*, *studentu* – *to a student (male)*, *studentima* – *to students (male)*, *studentkinji* – *to a student (fe--male)*, *studentkinjama* – *to students (female)*, *učeniku* – *to a school-boy*, *učenici* – *to a school-girl*, *učenicima* – *to school-boys*, *učenicama* – *to school-girls*, *paru* – *to a couple*, *porodici* – *to a family*, *nepušaču* – *to a non-smoker* and *nepušačima* – *to non-smokers*) have the function of the indirect object in the sentences from the third group. These nouns appear in the sentences from the fourth group too, they are in the same case but have the role of the logical subject. Common nouns in the dative case in the masculine (*samcima* – *to single men*, *studentima* – *to students (male)* and *učenicima* – *to school-boys*) and in the feminine (*devojkama* – *to girls*, *samicama* – *to single women*, *studentkinjama* – *to students (female)* and *učenicama* – *to school-girls*) which have the number two before of them in the corresponding gender and in the same case (*dvama* – *to two*, for the masculine, and *dvema* – *to two*, for the feminine) appear in the same role.

Common nouns in the accusative case with the preposition *za* (*for*) (*devojku* – *a girl*, *devojke* – *girls*, *samca* – *a single man*, *samce* – *single men*, *samicu* – *a single woman*, *samice* – *single women*, *stranca* – *a foreigner*, *strance* – *foreigners*, *studenta* – *a student (male)*, *studente* – *students (male)*, *studentkinju* – *a student (female)*, *studentkinje* – *students (female)*, *učenika* – *a school-boy*, *učenicu* – *a school-girl*, *učenike* – *school-boys*, *učenice* – *school-girls*, *par* – *a couple*, *porodicu* – *a family*, *nepušača* – *a non-smoker* and *nepušače* – *non-smokers*) perform the function of the indirect object in the form *za nekoga* (*for somebody*) in sentences of the third group.

Common nouns in the nominative case are the nominal part of the predicate in the sentences of the fourth and the fifth group. The nouns of the masculine gender are: *apartman* – <u>*a suite*</u>, *lokal* – <u>*an office*</u>, *plac* – <u>*a building site*</u>, *stan* – <u>*a flat*</u>, *kiosk* – <u>*a stand*</u>, *kafić* – <u>*a café*</u> and *restoran* – <u>*a restaurant*</u>, of the feminine gender: *garsonjera* – <u>*a studio*</u>, *kuća* – <u>*a house*</u>, *soba* – <u>*a room*</u>, *njiva* – <u>*a cultivated field*</u>, *vikendica* – <u>*a weekend cottage*</u>, *prodavnica* – <u>*a store*</u> and *radionica* – <u>*a workshop*</u>. One noun is of the neuter gender. It is the common noun *zemljište* – <u>*land*</u>.

Common nouns with prepositions, which are the parts of modifier phrases, could be found in sentences from all the groups. In the sentences from the first three groups, the direct objects are in the accusative case. In the sentences from the last two groups, the nominal parts of the predicate are in the nominative case. These are the common nouns in the genitive case with the preposition *pored* – <u>*next to*</u>: *grada* – <u>*town*</u>, *mora* – <u>*sea*</u>, *puta* – <u>*road*</u>, *jezera* – <u>*lake*</u>, *reke* – <u>*river*</u> and *obale* – <u>*coast*</u>. Furthermore, these are the common nouns in the instrumental case with the preposition *sa* – <u>*with*</u>: *grejanjem* – <u>*central heating*</u>, *telefonom* – <u>*telephone*</u>, *kupatilom* – <u>*bathroom*</u>, *kuhinjom* – <u>*kitchen*</u>, *inventarom* – <u>*equipment*</u>, *garažom* – <u>*garage*</u>, *strujom* – <u>*electricity*</u>, *vodom* – <u>*water*</u>, *placem* – <u>*building site*</u>, *zgradom* – <u>*building*</u>, *kućom* – <u>*house*</u>, *voćem* – <u>*trees*</u>, *dozvolom* – <u>*permission*</u> and *potkrovljem* – <u>*loft*</u>. Finally, these are the common nouns in the locative case with prepositions *u* – <u>*in*</u>: *kući* – <u>*house*</u>, *gradu* – <u>*town*</u>, *selu* – <u>*village*</u>, *ulici* – <u>*street*</u>, *centru* – <u>*centre*</u> and *okolini* – <u>*neighborhood*</u> and *na* – <u>*at(by, on, in)*</u>: *brdu* – <u>*hill*</u>, *moru* – <u>*sea*</u>, *periferiji* – <u>*suburb*</u>, *planini* – <u>*mountain*</u>, *jezeru* – <u>*lake*</u> and *obali* – <u>*coast*</u>.

Adjectives. The adjectives that appear in the chosen sentences are used with the common nouns, and they agree with them in gender, number and case.

Because of that, when the noun is in the nominative case then the corresponding adjectives are in the same case and number. *Devojka* (<u>*a girl*</u>) can be *ozbiljna* (<u>*serious*</u>), *zaposlena* (<u>*employed*</u>) or *uredna* (<u>*neat*</u>), *samac* (<u>*a single man*</u>) can be *zaposlen* (<u>*employed*</u>), *samica* (<u>*the single woman*</u>) can be *zaposlena* (<u>*employed*</u>), *student* (<u>*a student*</u>) can be *strani* (<u>*foreign*</u>), *studentkinja* (<u>*a student-girl*</u>) can be *ozbiljna* (<u>*serious*</u>), *strana* (<u>*foreign*</u>), *par* (<u>*a couple*</u>) can be *bračni* (<u>*married*</u>), *mladi* (<u>*young*</u>), *ozbiljan*

(*serious*), *strani* (*foreign*), *zaposleni* (*employed*), *porodica* (*a family*) can be *ozbiljna* (*serious*), *tročlana* (*trinomial*).

In the same way (when nouns are in the nominative case in plural), *devojke* (*the girls*) could be *ozbiljne* (*serious*), *zaposlene* (*employed*), *uredne* (*neat*), *samci* (*single men*) could be *zaposleni* (*employed*), *samice* (*single women*) could be *zaposlene* (*employed*), *studenti* (*students- male*) could be *strani* (*foreign*), *studentkinje* (*students-female*) could be *ozbiljne* (*serious*) or *strane* (*foreign*).

Nouns in the dative case can also be preceded by the adjectives of the same case. Something is necessary *devojci* (*to a girl*) – *ozbiljnoj* (*serious*), *zaposlenoj* (*employed*), *urednoj* (*neat*), *devojkama* (*to girls*) – *ozbiljnim* (*serious*), *zaposlenim* (*employed*), *urednim* (*neat*), *samcu* (*to a single man*) – *zaposlenom* (*employed*), *samici* (*to a single woman*) – *zaposlenoj* (*employed*), *samcima* (*to single men*) – *zaposlenim* (*employed*), *studentu* (*to a student-male*) – *stranom* (*foreign*), *studentima* (*to students-male*) – *stranim* (*foreign*), *studentkinji* (*to a student-female*) – *ozbiljnoj* (*serious*), *stranoj* (*fo--reign*), *studentkinjama* (*to students-female*) – *ozbiljnim* (*serious*), *stranim* (*foreign*), *paru* (*to a couple*) – *bračnom* (*married*), *mladom* (*young*), *ozbiljnom* (*serious*), *stranom* (*foreign*), *zaposlenom* (*employed*), *porodici* (*to a family*) – *ozbiljnoj* (*serious*), *tročlanoj* (*trinomial*).

Adjectives in the accusative case are used together with the corresponding nouns in the accusative case with the preposition *za* (*for*). Something is *za devojku* (*for a girl*) – *ozbiljnu* (*serious*), *zaposlenu* (*employed*), *urednu* (*neat*), *za devojke* (*for girls*) – *ozbiljne* (*serious*), *zaposlene* (*employed*), *uredne* (*neat*), *za samca* (*for a single man*) – *zaposlenog* (*employed*), *za samce* (*for single men*) – *zaposlene* (*employed*), *za samicu* (*for a single woman*) – *zaposlenu* (*employed*), *za samice* (*for single women*) – *zaposlene* (*employed*), *za studenta* (*for a student-male*) – *stranog* (*foreign*), *za studentkinje* (*for students-female*) – *ozbiljne* (*serious*), *strane* (*foreign*), *za par* (*for a couple*) – *bračni* (*married*), *mladi* (*young*), *ozbiljan* (*serious*), *strani* (*foreign*), *zaposleni* (*employ--ed*), *za porodicu* (*for a family*) – *ozbiljnu* (*serious*), *tročlanu* (*trinomial*).

Corresponding adjectives are used together with the nouns of the masculine and neuter gender, in the nominative or in the accusative case. *Apartman* (*a suite*) can

be *luksuzan* (*luxurious*), *lokal* (*an office*) can be *nov* (*new*), *plac* (*a building site*) can be *gradjevinski* (*construction site*), *ogradjen* (*fenced*), *stan* (*a flat*) can be *jednosoban* (*one room*), *jednoiposoban* (*one and half room*), *dvosoban* (*two room*), *dvoiposoban* (*two and half room*), *trosoban* (*three room*), *komforan* (*comfortable*), *manji* (*little*), *namešten* (*furnished*), *nenamešten* (*unfurnished*), *nov* (*new*), *prazan* (*empty*), *renoviran* (*renovated*), *useljiv* (*instantly available*), *vojni* (*military*), *luksuzan* (*luxurious*), *polunamešten* (*semi-furnished*), *funkcionalan* (*functional*). *Kiosk* (*the stand*) can be *montažni* (*prefabricated*) or *metalni* (*metallic*), *kafić* (*a café*) can be *nov* (*new*), *restoran* (*a restaurant*) can be *sredjen* (*arranged*), *zemljište* (*a land*) can be *obradivo* (*cultivable*) or *gradjevinsko* (*construction site*).

Nouns of the feminine gender in the nominative case singular appear with or without adjectives of the corresponding gender and case. *Garsonjera* (*a studio*) can be *prazna* (*empty*), *nameštena* (*furnished*), *polunameštena* (*semi-furnished*), *kuća* (*a house*) can be *komforna* (*comfortable*), *luksuzna* (*luxurious*), *nedovršena* (*unfinished*), *nova* (*new*), *porodična* (*family*), *privatna* (*private*), *prizemna* (*ground-floor*), *stara* (*old*), *trošna* (*ruined*), *ukrovljena* (*with roof*), *useljiva* (*instantly available*), *započeta* (*started*), *veća* (*big*), *završena* (*finished*), *vikend* (*weekend*). *Soba* (*a room*) can be *dvokrevetna* (*double bedded*), *komforna* (*comfortable*), *zasebna* (*separate*), *nameštena* (*furnished*), *nenameštena* (*unfurnished*), *polunameštena* (*semi-furnished*), *devojačka* (*maid's*), *superkomforna* (*super-comfortable*), *prazna* (*empty*), *njiva* (*a cultivated field*) can be *plodna* (*fertile*), *vikendica* (*a week- end cottage*) can be *seoska* (*country*), *nedovršena* (*unfinished*), *prodavnica* (*a store*) can be *novootvorena* (*newly opened*), *opremljena* (*equipped*) and *radionica* (*a workshop*) can be *opremljena* (*equipped*).

The same nouns appear in the accusative case and the adjectives that appear together with them are in the same case. List of nouns could be longer.

Besides for these adjectives, which appear together with the common nouns, the passive adjective *necessary* appears in all of the three genders (*je potreban/a/o*).

Adverbs. Adverbs are the next lexical category that appears in the chosen sentences (*hitno* – *urgently, povoljno* – *favorably* and *jevtino* – *cheaply*). They appear

either independently or connected with the conjunction i (*and*) but in that case,two different adverbs must be used.

Numbers. Numbers appear as more precise modifiers of some common nouns. Namely, that is number *dva* (*two*) in the masculine and feminine gender, in the nominative, dative and accusative case with the preposition *za* (*for*).

Conjunctions. Only one conjunction appears in the analyzed sentences. It is the conjunction i (*and*).

Prepositions. Common nouns appear with or without prepositions. Each preposition occupies the position next to the common noun in certain case. The preposition *za* (*for*) goes together with the common nouns in the accusative case, the preposition *pored* (*next to*) is next to the common nouns in the genitive case, the preposition *sa* (*with*) is next to the common nouns in the instrumental case and the prepositions u (*in*) and *na* (*at, by, on, in*) are next to the common nouns in the locative case.

2. MAIN RESULTS

Formalization of grammar for the natural language brings about many problems. This is because it is very complex to control the varieties and ambiguities of the natural languages. For many years , attempts have been made to describe the natural language by means of mathematics, i.e. - to create its mathematical formalization. But, in spite of the great achievements of Chomsky and Montegue, the problem is not completely solved. The only exception is the analysis of a sub-language which was done in this work. We present a set of simple grammatical rules for the chosen fragment of the Serbian language.

Grammatical rules

$$
\begin{array}{lll}
\textbf{S} & \rightarrow & \text{NP(nom,3,num)} \quad\quad \text{PredP(nom,3,num)} \quad (\text{ num} = \text{sng,pl}) \\
\textbf{S} & \rightarrow & \text{NP(nom,gender,}_{-}\text{)} \quad \text{PredP(nom,3,pl)} \quad\quad (\text{ gender} = \text{m,f,n}) \\
\textbf{S} & \rightarrow & \text{PredP(nom,1,num)} \\
\textbf{S} & \rightarrow & \text{NP(dat,}_{-}\text{,}_{-}\text{)} \quad\quad\quad \text{PredP(dat)} \\
\textbf{S} & \rightarrow & \text{PredP(dat)}
\end{array}
$$

$$
\begin{array}{lll}
\text{PredP(nom,3,num)} & \rightarrow & \text{VP(3,num,[nom,acc])} \quad\quad\quad \text{NP(acc,}_{-}\text{,}_{-}\text{)} \\
\text{PredP(nom,1,num)} & \rightarrow & \text{VP(1,num,[nom,acc])} \quad\quad\quad \text{NP(acc,}_{-}\text{,}_{-}\text{)} \\
\text{PredP(nom,1,num)} & \rightarrow & \text{VP(1,num,[nom,acc,dat])} \quad\quad \text{NP(acc,}_{-}\text{,}_{-}\text{)} \quad \text{NP(dat,}_{-}\text{,}_{-}\text{)} \\
\text{PredP(nom,1,num)} & \rightarrow & \text{VP(1,num,[nom,dat,acc])} \quad\quad \text{NP(dat,}_{-}\text{,}_{-}\text{)} \quad \text{NP(acc,}_{-}\text{,}_{-}\text{)} \\
\text{PredP(nom,1,num)} & \rightarrow & \text{VP(1,num,[nom,acc,p}_{-}\text{acc])} \quad \text{NP(acc,}_{-}\text{,}_{-}\text{)} \quad \text{NP(za}_{-}\text{acc)} \\
\text{PredP(nom,1,num)} & \rightarrow & \text{VP(1,num,[nom,p}_{-}\text{acc,acc])} \quad \text{NP(za}_{-}\text{acc)} \quad\; \text{NP(acc,}_{-}\text{,}_{-}\text{)}
\end{array}
$$

$$
\begin{array}{lll}
\text{PredP(dat)} & \rightarrow & \text{VP([dat,nom])} \quad \text{NP(nom,m,}_{-}\text{)} \quad (\text{Adj}_{-}\text{p=potreban}) \\
\text{PredP(dat)} & \rightarrow & \text{VP([dat,nom])} \quad \text{NP(nom,f,}_{-}\text{)} \quad\; (\text{Adj}_{-}\text{p=potrebna}) \\
\text{PredP(dat)} & \rightarrow & \text{VP([dat,nom])} \quad \text{NP(nom,n,}_{-}\text{)} \quad (\text{Adj}_{-}\text{p=potrebno})
\end{array}
$$

$$
\text{PredP(dat)} \quad \rightarrow \text{Adj}_{-}\text{p(gender)} \quad \text{NP(nom,gender,}_{-}\text{)}
$$

$$
\begin{array}{lll}
\text{VP(3,num,[nom,acc])} & \rightarrow & \text{V(3,num,[nom,acc])} \\
\text{VP(3,num,[nom,acc])} & \rightarrow & \text{AdvP V(3,num,[nom,acc])} \\
\text{VP(3,num,[nom,acc])} & \rightarrow & \text{V(3,num,[nom,acc]) AdvP} \\
\text{VP(1,num,[nom,acc])} & \rightarrow & \text{V(1,num,[nom,acc])} \\
\text{VP(1,num,[nom,acc])} & \rightarrow & \text{AdvP V(1,num,[nom,acc])} \\
\text{VP(1,num,[nom,acc])} & \rightarrow & \text{V(1,num,[nom,acc]) AdvP}
\end{array}
$$

$$
\begin{array}{lll}
\text{VP(1,num,[nom,acc,dat])} & \rightarrow & \text{V(1,num,[nom,acc,dat])} \\
\text{VP(1,num,[nom,acc,dat])} & \rightarrow & \text{AdvP V(1,num,[nom,acc,dat])} \\
\text{VP(1,num,[nom,acc,dat])} & \rightarrow & \text{V(1,num,[nom,acc,dat]) AdvP}
\end{array}
$$

$$
\begin{array}{lll}
\text{VP(1,num,[nom,acc,p}_{-}\text{acc])} & \rightarrow & \text{V(1,num,[nom,acc,p}_{-}\text{acc])} \\
\text{VP(1,num,[nom,acc,p}_{-}\text{acc])} & \rightarrow & \text{AdvP V(1,num,[nom,acc,p}_{-}\text{acc])} \\
\text{VP(1,num,[nom,acc,p}_{-}\text{acc])} & \rightarrow & \text{V(1,num,[nom,acc,p}_{-}\text{acc]) AdvP}
\end{array}
$$

$$
\begin{array}{lll}
\text{VP(1,num,[nom,dat,acc])} & \rightarrow & \text{VP(1,num,[nom,acc,dat])} \\
\text{VP(1,num,[nom,p}_{-}\text{acc,acc])} & \rightarrow & \text{VP(1,num,[nom,acc,p}_{-}\text{acc])} \quad (\text{transformacije})
\end{array}
$$

VP([dat,nom]) → AdvP V([dat,nom]) Adj_p(gender)
VP([dat,nom]) → V([dat,nom]) Adj_p(gender)

AdvP → Adv
AdvP → Adv Conj Adv

NP(k,a,b)   → CNP(k,a,b) (k = nom, dat, acc, za_acc)
NP(k,gender,_)   → Det(k,gender) CN(gen,gender)
                              (k = nom, za_acc; gender = m, f)
NP(dat,gender,_) → Det(dat,gender) CN(dat,gender)(gender = m, f)
NP(l)   → Prep(l) CN(l,_,_) (l = pored_gen, sa_ins, u_loc, na_loc)
NP(za_acc)   → Prep(acc) NP(za_acc,_,_)

CNP(k,a,b) → CN(k,a,b)   (k=nom,dat,acc,za_acc)
CNP(k,a,b) → ModP(k,a,b) CN(k,a,b)
CNP(k,a,b) → CN(k,a,b)   ModP(k,a,b)

CNP(k,a,b) → ModP(k,a,b) ModP(k,a,b) CN(k,a,b)
CNP(k,a,b) → ModP(k,a,b) CN(k,a,b)   ModP(k,a,b)
CNP(k,a,b) → CN(k,a,b)   ModP(k,a,b) ModP(k,a,b)

ModP(k,a,b) → Adj(k,a,b)
ModP(k,_,_) → NP(l)   (k = nom, acc; l = pored_gen, sa_ins, u_loc, na_loc)

Dictionary

V(3,sng,[nom,acc]) → [traži]
V(3,pl,[nom,acc])   → [traže]

V(1,sng,[nom,acc])   → [izdajem, iznajmljujem, kupujem, prodajem, tražim]
V(1,pl, [nom,acc])   → [izdajemo, iznajmljujemo, kupujemo, prodajemo,
                                         tražimo]
V(1,sng,[nom,acc,dat]) → [izdajem, iznajmljujem]
V(1,pl,[nom,acc,dat])   → [izdajemo, iznajmljujemo]

V(1,sng,[nom,acc,p_acc]) → [izdajem, iznajmljujem, tražim]
V(1,pl,[nom,acc,p_acc])   → [izdajemo, iznajmljujemo, tražimo]

V([dat,nom]) → [je]
V([dat,nom]) → [ ]

Adv → [hitno, povoljno, jevtino]

CN(nom,3,sng) → [devojka, samac, samica, stranac, student, studentkinja, učenik,
                    učenica, par, porodica, nepušač]
CN(nom,3,pl)   → [devojke, samci, samice, stranci, studenti, studentkinje, učenici,
                    učenice, nepušači]
CN(acc,_,_)   → [apartman, lokal, plac, stan, kiosk, kafić, restoran, garsonjeru,
                    kuću, sobu, njivu, vikendicu,prodavnicu, radionicu,zemljište]

CN(gen,m)   → [samca, studenta, učenika]
CN(gen,f)   → [devojke, samice, studentkinje, učenice]
CN(dat,m)   → [samcima, studentima, učenicima]
CN(dat,f)   → [devojkama, samicama, studentkinjama, učenicama]
CN(dat,_,_)   → [devojci, devojkama, samcu, samcima, samici, samicama,
                    strancu, strancima, studentu, studentima, studentkinji,
                    studentkinjama, učeniku, učenici, učenicima, učenicama,
                    paru, porodici, nepušaču, nepušačima]
CN(za_acc,_,_) → [devojku, devojke, samca, samce, samicu, samice, stranca,
                    strance, studenta, studente, studentkinju, studentkinje,
                    učenika, učenicu, učenike, učenice, par, porodicu,
                    nepušača, nepušače]
CN(nom,m,_)   → [apartman, lokal, plac, stan, kiosk, kafić, restoran]
CN(nom,f,_)   → [garsonjera, kuča, soba, njiva, vikendica, prodavnica, radionica]
CN(nom,n,_)   → [zemljište]

CN(pored_gen,_,_) → [grada, mora, puta, jezera, reke, obale]
CN(sa_ins,_,_)   → [grejanjem, telefonom, kupatilom, kuhinjom, inventarom,
                       garažom, strujom, vodom, placem, zgradom, kućom, voćem,
                       dozvolom, potkrovljem]
CN(u_loc,_,_)   → [kući, gradu, selu, ulici, centru, okolini]
CN(na_loc,_,_)   → [brdu, moru, periferiji, planini, jezeru, obali]

Adj(nom,3,sng) → [zaposlena, ozbiljna, uredna, zaposleni, strani, strana, tročlana,
                     bračni, ozbiljan, mladi]
Adj(nom,3,pl)   → [ozbiljne, strane, uredne, zaposleni, strani]

Adj(dat,_,_) → [zaposlenoj, ozbiljnoj, urednoj, zaposlenom, stranom, stranim, tročlanoj, bračnom, mladom, ozbiljnom, stranoj, ozbiljnim, urednim, zaposlenim]

Adj(acc,_,_) → [luksuzan, nov, gradjevinski, ogradjen, jednosoban, jednoiposoban, dvosoban, dvoiposoban, trosoban, komforan, manji, namešten, nenamešten, prazan, renoviran, useljiv, vojni, polunamešten, funkcionalan, montažni, metalni, sredjen, praznu, nameštenu, polunameštenu, komfornu, luksuznu, nedovršenu, novu, porodičnu, privatnu, prizemnu, staru, trošnu, ukrovljenu, useljivu, započetu, veću, završenu, vikend, dvokrevetnu, zasebnu, nenameštenu, devojačku, superkomfornu, plodnu, seosku, novootvorenu, opremljenu, stolarsku, obradivo, gradjevinsko]

Adj(za_acc,_,_) → [zaposlenu, ozbiljnu, urednu, zaposlenog, uredne, stranog, stranu, tročlanu, bračni, mladi, ozbiljni, strani, zaposlene, zaposleni, strane, ozbiljne]

Adj(nom,m,_) → [luksuzan, nov, gradjevinski, ogradjen, jednosoban, dvosoban, jednoiposoban, dvoiposoban, trosoban, komforan, manji, namešten, nenamešten, prazan, renoviran, useljiv, vojni, polunamešten, funkcionalan, montažni, metalni, sredjen]
Adj(nom,f,_) → [prazna, nameštena, polunameštena, nova, komforna, luksuzna, nedovršena, porodična, privatna, stara, prizemna, trošna, ukrovljena, useljiva, započeta, veća, završena, vikend, dvokrevetna, zasebna, nenameštena, devojačka, superkomforna, plodna, seoska, novootvorena, opremljena, stolarska]
Adj(nom,n,_) → [obradivo, gradjevinsko]
Det(k,m) → [dva]
Det(k,f) → [dve] (k = nom, za_acc)
Det(dat,m) → [dvama]
Det(dat,f) → [dvema]

Prep(acc) → [za]
Prep(pored_gen) → [pored]
Prep(sa_ins) → [sa]
Prep(u_loc) → [u]
Prep(na_loc) → [na]
Conj → [i]

$$\begin{aligned}
\text{Adj}_-\text{p(m)} &\rightarrow [\,\text{potreban}\,] \\
\text{Adj}_-\text{p(f)} &\rightarrow [\,\text{potrebna}\,] \\
\text{Adj}_-\text{p(n)} &\rightarrow [\,\text{potrebno}\,]
\end{aligned}$$

The arrow in the above rules indicates that the item on the left side of the arrow can generate the items on the right side of the arrow. The objects corresponding to syntactic categories, from which strings of words could be derived, are called non-terminals or variables. The objects which play the role of words are called terminals. The terminal symbols that appear in the fragment were defined by dictionary. The form of a list is used, because of better note observation. Every element from the list is the terminal's symbol.

Defined formal grammar is called type 2 or context free in Chomsky hierarchy. This grammar has one production which is called ε-rule. At one of the non-terminals V([dat, nom]), the empty list shows that this non-terminal may be omitted in some sentences.

Grammar does not have productions of the form $A \rightarrow Aa$ for any variable A and it is not left recursive. The defined grammar is both LL and LR grammar, since both top-down parsing and bottom-up parsing can be applied on it [5].

3. EXAMPLES

Syntactic structures can be represented by graphs stemming from a root and made up of nodes and branches, referred to as rooted trees (see [3]). When featuring structures, the nodes of the rooted trees represent the constituents and the branches their interrelations.

For the sentence *Zaposlenoj devojci potreban manji jednosoban stan* (*An employed girl needs a small one room flat*), the rooted tree, according to the rules of the grammar, is represented in Fig. 14.
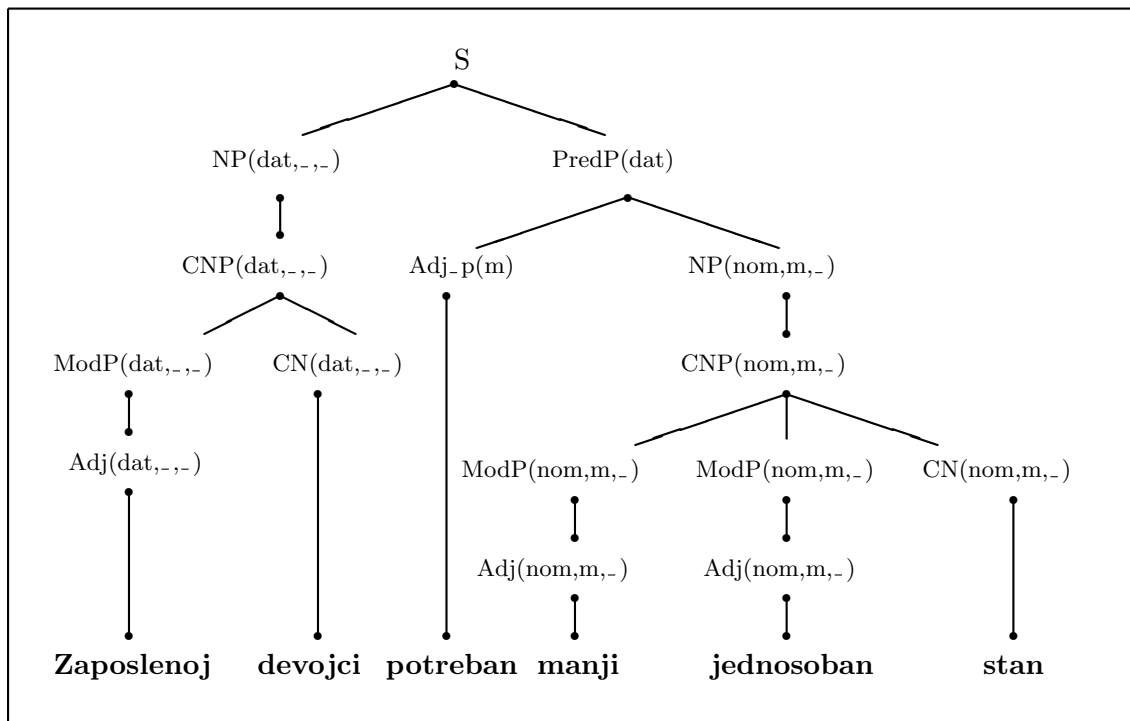
Fig. 14 Rooted tree (I variant)

The derivation for the given sentence, i.e., a set of strings, each of which differs from the string that immediately precedes it, through the replacement of only one of its symbols by one or more symbols, in accordance with the rules of the grammar, would be:

S
NP(dat,-,-)+PredP(dat)
CNP(dat,-,-)+PredP(dat)
CNP(dat,-,-)+Adj-p(m)+NP(nom,m,-)
ModP(dat,-,-)+CN(dat,-,-)+Adj-p(m)+ NP(nom,m,-)
ModP(dat,-,-)+CN(dat,-,-)+Adj-p(m)+CNP(nom,m,-)
ModP(dat,-,-)+CN(dat,-,-)+Adj-p(m)+ModP(nom,m,-)+ ModP(nom,m,-)+ CN(nom,m,-)
Adj(dat,-,-)+CN(dat,-,-)+Adj-p(m)+ModP(nom,m,-) +ModP(nom,m,-)+ CN(nom,m,-)
Adj(dat,-,-)+CN(dat,-,-)+Adj-p(m)+Adj(nom,m,-) +ModP(nom,m,-)+ CN(nom,m,-)
Adj(dat,-,-)+CN(dat,-,-)+Adj-p(m)+Adj(nom,m,-) +Adj(nom,m,-)+CN(nom,m,-)
zaposlenoj+CN(dat,-,-)+Adj-p(m)+Adj(nom,m,-) +Adj(nom,m,-)+CN(nom,m,-)
zaposlenoj+**devojci**+Adj-p(m)+Adj(nom,m,-) +Adj(nom,m,-)+CN(nom,m,-)
zaposlenoj+**devojci**+**potreban**+Adj(nom,m,-) +Adj(nom,m,-)+CN(nom,m,-)
zaposlenoj+**devojci**+**potreban**+**manji** +Adj(nom,m,-)+CN(nom,m,-)
zaposlenoj+**devojci**+**potreban**+**manji**+**jednosoban**+CN(nom,m,-)
zaposlenoj+**devojci**+**potreban**+**manji**+**jednosoban**+**stan**
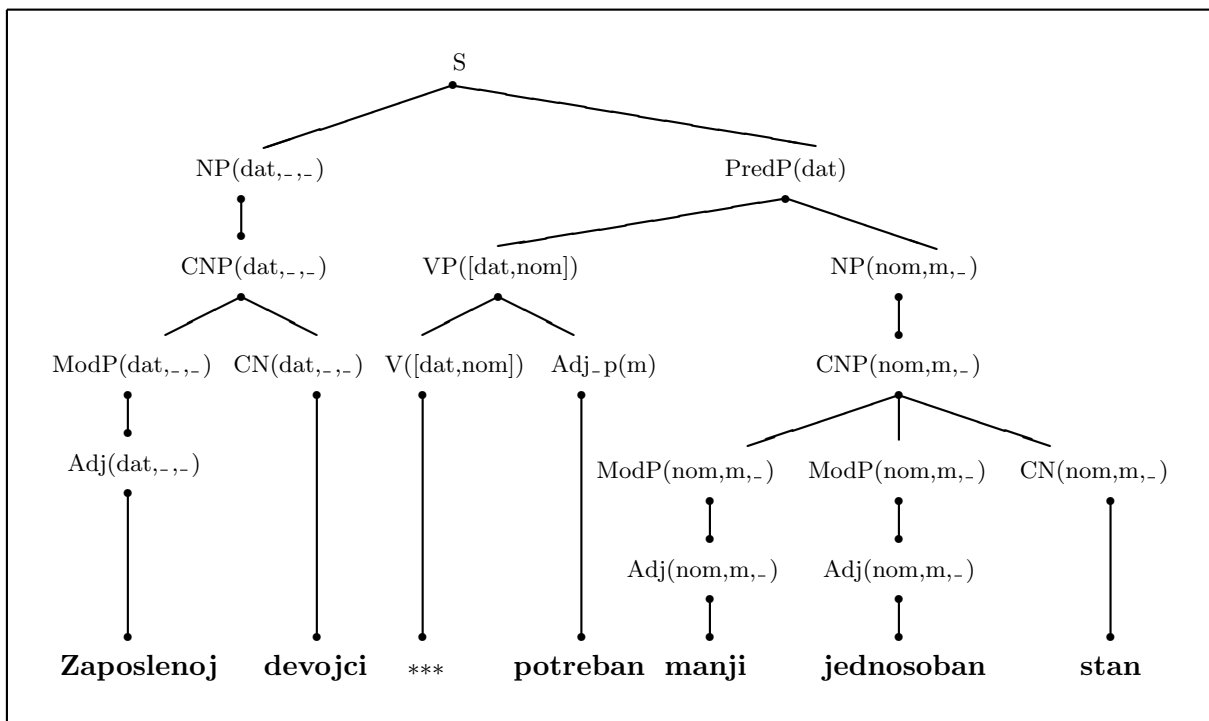(An employed+girl+needs+a small+one-room+flat).

Fig. 15 Rooted tree (II variant)

For the same sentence the rooted tree may have somewhat different form (Fig. 15), because of the grammar, i. e., it is possible that V([dat, nom]) can be an empty set. The derivation for the same sentence, according to the grammar rules used in this case, would be:

S
NP(dat,_,_)+PredP(dat)
CNP(dat,_,_)+PredP(dat)
CNP(dat,_,_)+VP([dat,nom])+ NP(nom,m,_)
ModP(dat,_,_)+CN(dat,_,_)+VP([dat,nom])+NP(nom,m,_)
ModP(dat,_,_)+CN(dat,_,_)+V([dat,nom])+Adj_p(m)+NP(nom,m,_)
ModP(dat,_,_)+CN(dat,_,_)+V([dat,nom])+Adj_p(m)+CNP(nom,m,_)
ModP(dat,_,_)+CN(dat,_,_)+V([dat,nom])+Adj_p(m)+ModP(nom,m,_)+ModP(nom,m,_)+
                                +CN(nom,m,_)
Adj(dat,_,_)+CN(dat,_,_)+V([dat,nom])+Adj_p(m)+ModP(nom,m,_)+ModP(nom,m,_)+
                                +CN(nom,m,_)
Adj(dat,_,_)+CN(dat,_,_)+V([dat,nom])+Adj_p(m)+Adj(nom,m,_)+ModP(nom,m,_)+
                                +CN(nom,m,_)
Adj(dat,_,_)+CN(dat,_,_)+V([dat,nom])+Adj_p(m)+Adj(nom,m,_)+Adj(nom,m,_)+
                                +CN(nom,m,_)
zaposlenoj+CN(dat,_,_)+V([dat,nom])+Adj_p(m)+Adj(nom,m,_)+Adj(nom,m,_)+
                                +CN(nom,m,_)
zaposlenoj+**devojci**+V([dat,nom])+Adj_p(m)+Adj(nom,m,_)+Adj(nom,m,_)+
                                +CN(nom,m,_)
zaposlenoj+**devojci**+***+Adj_p(m)+Adj(nom,m,_)+Adj(nom,m,_)+CN(nom,m,_)
zaposlenoj+**devojci**+***+**potreban**+Adj(nom,m,_)+Adj(nom,m,_)+CN(nom,m,_)
zaposlenoj+**devojci**+***+**potreban**+**manji**+Adj(nom,m,_)+CN(nom,m,_)
zaposlenoj+**devojci**+***+**potreban**+**manji**+**jednosoban**+CN(nom,m,_)
zaposlenoj+**devojci**+***+**potreban**+**manji**+**jednosoban**+**stan**
(An employed+girl+needs+a small+one-room+flat).

Some of the example sentences, the chosen fragment of the Serbian language contains, are the following:

Jevtino prodajem useljivu kuću pored obale (*Fig. 16*).
(*I cheaply sell instantly available house at the coast*).

Dva studenta hitno traže sobu sa grejanjem (*Fig. 17*).
(*Urgently two students look for a room with central heating*).

Izdajem luksuzan apartman stranom bračnom paru (*Fig. 18*).
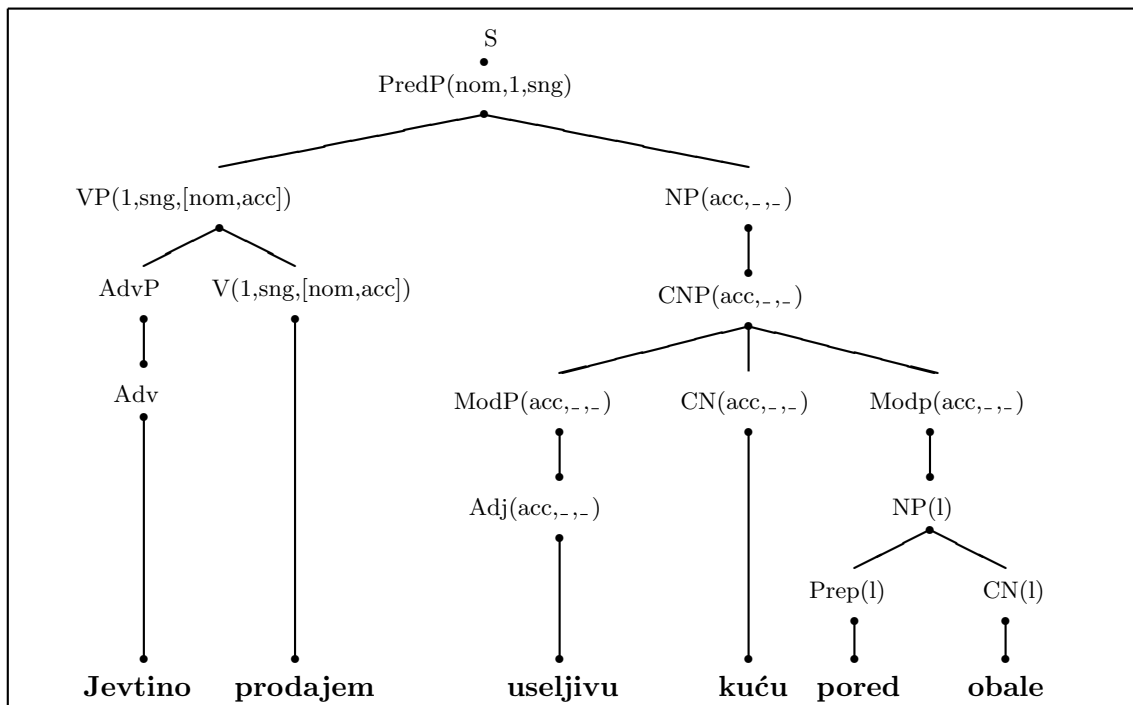(*I rent out a luxurious apartment to a foreign married couple*).

Fig. 16 Rooted tree (1)

S

PredP(nom,1,sng)

VP(1,sng,[nom,acc]) NP(acc,‗,‗)

AdvP V(1,sng,[nom,acc]) CNP(acc,‗,‗)

Adv ModP(acc,‗,‗) CN(acc,‗,‗) Modp(acc,‗,‗)

Adj(acc,‗,‗) NP(l)

Prep(l) CN(l)

Jevtino **prodajem** **useljivu** **kuću** **pored** **obale**

Fig. 16 Rooted tree (1)

S

NP(nom,m,‗) PredP(nom,3,pl)

Det(nom,m,‗) CN(gen,m) VP(3,pl,[nom,acc]) NP(acc,‗,‗)

AdvP V(3,pl,[nom,acc]) CNP(acc,‗,‗)

Adv CN(acc,‗,‗) ModP(acc,‗,‗)

NP(l)

Prep(l) CN(l)

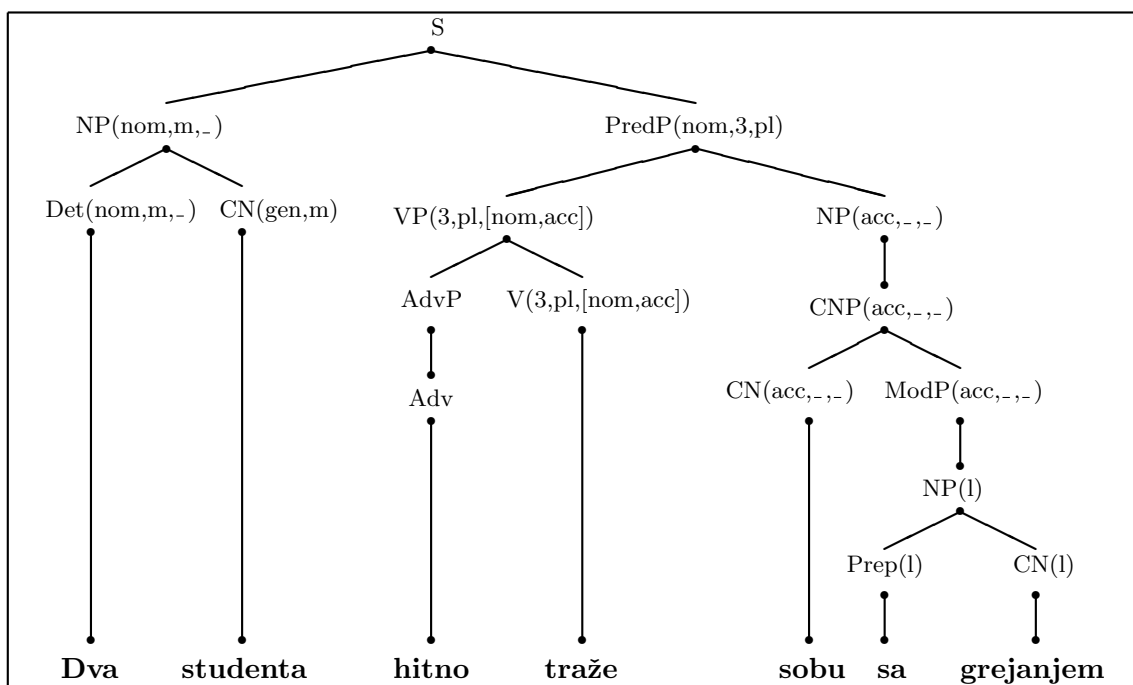**Dva** **studenta** **hitno** **traže** **sobu** **sa** **grejanjem**

Fig. 17 Rooted tree (2)
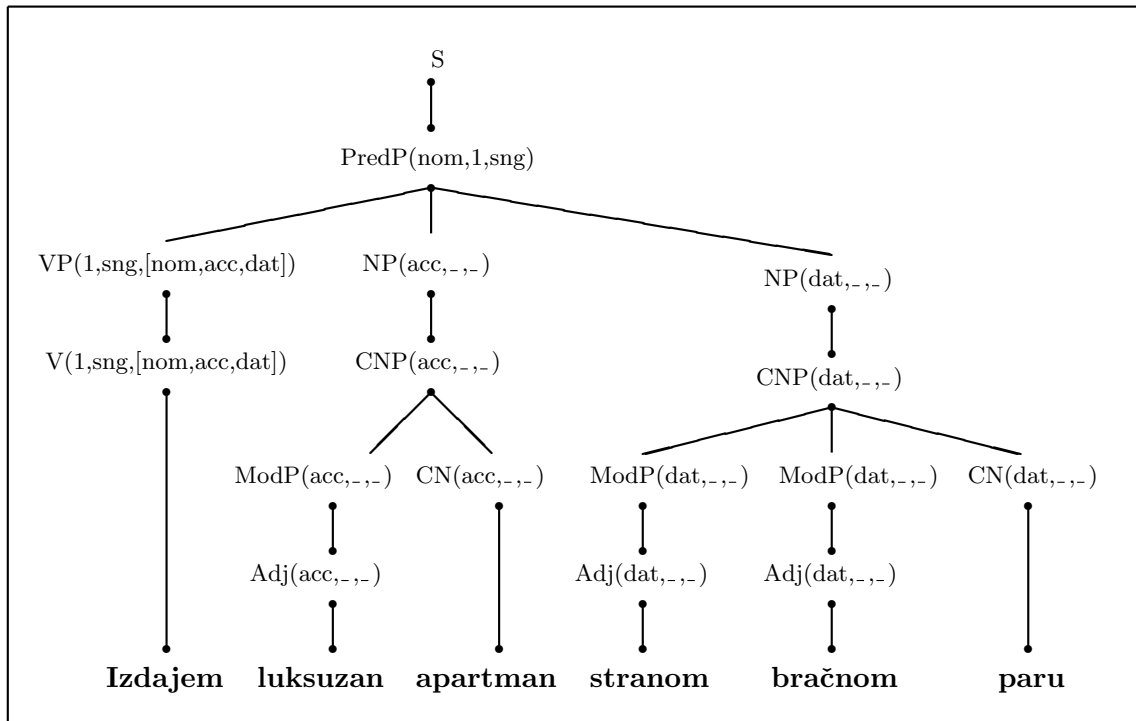
Fig. 18 Rooted tree (3)

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[4] T. Winograd, *Language as a Cognitive Process,* Vol. 1, Syntax, Addison-Wesley Publishing Company, 1983.

[5] *Dictionary of Computing,* Oxford University Press, Oxford, Market House Books Ltd., 1986.