

Phonological System of Standard Slovak*

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1. All linguistic schools stress the systemic character of the sound level. This systemic character is, however, more easily presented on the basis of oppositions of vowels than of consonants. The vocalic system is often represented by triangles and quadrangles. This form of representation is less common for consonants. This is probably due to the fact that consonants have a more complicated structure and mutual relationships.

That is why elements are sought with the help of which it would be possible to represent the whole phonological system. These elements should be common for both vowels and consonants. They should enable us to define all the phonemes of a language investigated at the same level. The first step to such a description was made by Jakobson (1956) who defined the phoneme as a set of distinctive features.

Nevertheless, when using Jakobson's original distinctive features spectrograms do not seem to be a reliable basis for explaining the individual distinctive phonemes in a given language. An acoustic signal does not make it possible to derive the features of phonemes.

In spite of these difficulties it would be convenient to describe the phonological system of a language with the help of distinctive features, but using only such features, indeed as many of them as are necessary for the delimitation of the known phonemes and for the identification of their place in the described phonological system.

This system can be compared to the generative system which is built on a small number of elements and operational rules. Distinctive features can function as such elements, and operational rules can be compared to the rules by which a set of phonemes can be analyzed into certain subsets with the help of distinctive features applied in a certain sequence so that each of these subsystems can be represented by a single distinctive feature.

2. So far, two descriptions of the phonological system of Slovak were proposed. Pauliny's (1961) description is based on the articulatory properties of distinctive features and on the use of phonemes in text (within neutralization). The articulatory base is evident in the case of the distinctive features defined by Pauliny as accommodated and light – dark. He considers as non-accommodated such consonants in which the sound wave does not pass through the oral cavity, and which are articulated in the front part of this cavity and do not undergo assimilation. The functional aspect is also evident in delimiting the distinctive feature 'sibilant'. The articulatory base is also evident in the distinctive features 'lateral' and 'fricative' (in the 2nd edition, Pauliny speaks of the distinctive features 'central' – 'marginal'. Importantly, in the 2nd edition Pauliny abandons the distinctive feature 'accommodated' and returns to Jakobsonian features 'compact' – 'diffuse').

A group of Russian linguists (Lekomceva et al. 1963) proposed a phonological system of standard Slovak by postulating that distinctive features are abstract entities, hence they delimit phonemes neither by their relationship to other phonemes nor on the basis of their acoustic properties. In their view, the description of the phonological system means constructing a logical model in which the elements of the sound level can be differentiated.

According to the above-mentioned Russian linguists the phonological system of Slovak includes long vowels, diphthongs and syllabic /r, l/. They consider the diphthongs /ia ie iu/ as long vowels, but differentiated from them by the distinctive feature 'palatal', and the diphthong /uo/ by

the distinctive feature ‘tense’. They do not see the distinctive feature of ‘length’ in the diphthong /uo/, although it is known that in standard Slovak this diphthong functions as a long one.

It is also interesting (but less understandable) that the consonants /t̪, d̪, ɲ, l̪/ are considered as ‘palatal’ just like diphthongs. Further on, it is not clear why the presence of the distinctive feature ‘diffuse’ is postulated only for back vowels.

The principle that distinctive features are abstract elements differentiating phonemes on the basis of binary steps seems to be correct. However, it is not correct to postulate such distinctive features within which the sound properties of phonemes are not taken into consideration at all.

That is why we try to describe the phonological system of standard Slovak by distinctive features that are sufficient for the logical differentiation of all the phonemes and are sufficiently connected with their sound properties.

3. All the Slovak phonemes can be divided into vocalic /i u e o ä q l r l̪/ and nonvocalic /j s z c ʒ t n f v p b m š ž č ʒ̣ t̪ d̪ ɲ x h k g/ on the basis of the distinctive feature ‘vocalic’ (1) reflecting the presence or absence of tone (cf. Table 1).

These two groups are differentiated at the next level by the distinctive feature ‘consonantic’ (2) based on the presence or absence of an obstacle in the oral cavity. Consequently, the group of non-vocalic phonemes is divided into non-consonantal /j/ and consonantal /s z c ʒ t n f v p b m š/; the group of vocalic phonemes is divided into non-consonantal /i e u o ä a/ and consonantal /l r l̪/.

At the third level the distinctive feature ‘compact’ (3) is used. It is based on the place of articulation in the back or the front part of the oral cavity. The group of non-vocalic consonantal phonemes is divided into non-compact /s z c ʒ t d n f p b m/ and compact ones /š ž č ʒ̣ t̪ d̪ ɲ x h k g/. The group of vocalic non-consonantal phonemes is divided into non-compact /i u/, compact /ä a/ and ± compact phonemes /e o/, the group of vocalic consonantal phonemes is divided into non-compact /l r/ and compact one /l̪/.

The fourth level (4) is based on the distinctive feature ‘gravis’ which corresponds to the articulation in the front part or in the centre of the oral cavity. The group of non-consonantal vocalic non-compact phonemes is subdivided into the non-gravis /s z c ʒ t̪ d̪ ɲ/ and gravis phonemes /x h k g/. The group of vocalic non-consonantal and non-compact phonemes is divided into non-gravis /e/ and gravis /o/; and finally the group of vocalic non-consonantal compact phonemes is divided into non-gravis /ä/ and gravis /a/.

At the fifth level (5) the distinctive feature ‘occlusive’ is applied; it should be noted that occlusivity has several degrees. The phonemes /c ʒ t d n; p b m; č ʒ̣ t̪ d̪ ɲ; k g; r/ are occlusive, and the phonemes /s z; f v; š ž; x h; l/ are non-occlusive.

At the sixth level (6) the distinctive feature ‘nasal’ is used. The phonemes /n m ɲ/ are nasal, the phonemes /c ʒ t d p b č ʒ̣ t̪ d̪/ are non-nasal.

The seventh level (7) is determined by the distinctive feature ‘sibilant’. The phonemes /t d; t̪ d̪/ are sibilants, the phonemes /c ʒ; č ʒ̣/ are non-sibilants.

Finally, the eighth level (8) is based on the distinctive feature ‘voice’ which is applied to the compact non-nasal phonemes and the non-compact non-nasal phonemes.



Table 1

4. All the short phonemes are included in the phonological system of standard Slovak. They are constructed by a sequence of binary decisions (cf. Table 2).

		j	s	z	c	ʒ	t	d	n	f	v	p	b	m	š	ž	č	ʃ
1	Vocalic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Consonantal	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	Compact	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+
4	Grave	0	-	-	-	-	-	-	-	+	+	+	+	+	-	-	-	-
5	Occlusive	0	-	-	+	+	+	+	+	-	-	+	+	+	-	-	+	+
6	Nasal	0	0	0	-	-	-	-	+	0	0	-	-	+	0	0	-	-
7	Strident	0	0	0	-	-	+	+	0	0	0	0	0	0	0	0	-	-
8	Voiced	0	-	+	-	+	-	+	0	-	+	-	+	0	-	+	-	+
		ť	ď	ň	x	h	k	g	i	u	e	o	ä	a	l	r	ř	
1	Vocalic	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	
2	Consonantal	+	+	+	+	+	+	+	-	-	-	-	-	-	+	+	+	
3	Compact	+	+	+	+	+	+	+	-	-	+	+	+	+	-	-	+	
4	Grave	-	-	-	+	+	+	+	-	+	-	+	-	+	0	0	0	
5	Occlusive	+	+	+	-	-	+	+	0	0	0	0	0	0	-	+	0	
6	Nasal	-	-	+	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	Strident	+	+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	Voiced	-	+	0	-	+	-	+	0	0	0	0	0	0	0	0	0	

Table 2

Each phoneme is characterized by the lowest but sufficient number of distinctive features and acquires a firm position in the system and in certain positions in connection with other phonemes.

Long vowels, diphthongs and long syllabic /ř ě/ are not included in this system, because long vowels and /ř ě/ are distinguished from the parallel short ones by prosodic features; it is

known that this distinctive feature is not an inherent distinctive feature. Hence, it has to be considered as a feature of syllable rather than phoneme. Diphthongs can be understood as (positional) variants of the corresponding long vowels.¹

In order to depict the complete phonological system of an investigated language it is also necessary to describe syntagmatic features of particular phonemes. They can be described partly by checking the occurrence of the particular phonemes in connection with other phonemes (the so-called phonematic groups), and partly by discovering and generalizing certain rules. These rules should make it possible to identify the occurrence of phonematic classes, not the particular phonemes.

These rules constitute an indispensable component of the description of the given phonological system. Their disadvantage, however, is that they are not mutually interrelated; hence they do not form a system in which each rule would have its place.

Nevertheless, it is not difficult to order these rules in such a way that each following rule is implied by the previous one and that a more general rule precedes a more specific one. It seems that the phonological system in which the phoneme is defined as a set of distinctive features and in which the position of the phoneme is defined by the necessary number of binary selections of distinctive features is more appropriate for such method of description than the classical descriptions because phonemes are identified by indispensable distinctive features. In addition, this method is more economical than the classical identification of phonemes.

5. This study is an attempt at describing the phonological system of standard Slovak in such a manner that distinctive features of all the phonemes are defined and a system of rules is developed with the help of which the occurrence of the phonemes is specified and the phonematic structure of the domestic root morphemes is described. In this way the conditions for the occurrence of phonemes, at first in the central part of the morpheme are defined, and then also in its front and back parts (chains X and Y).

It is well known that all the vowels and the syllabic /r l/, i.e. the vocalic distinctive feature can occur in the central part of the Slovak root morpheme. The rule can be formulated as follows:

$$(1) \quad [] \rightarrow [+ \text{voc}] / X - Y$$

Rule (1) (as well as the subsequent rules) can be read in the following way: Each phoneme must contain the distinctive feature 'vocalic' if it is preceded or followed by the chain X or Y. These chains can be composed of 1 – 4 consonants, but they cannot equal zero.

If the front or the back chain equals zero and the position denoted by the hyphen is at the beginning or at the end of the morpheme, Rule 1 has to be supplemented by Rule 2 prohibiting the occurrence of liquids.

$$(2) \quad [] \rightarrow [- \text{cons}] \left/ \begin{array}{l} \left\{ \begin{array}{l} = \left[\begin{array}{l} + \text{voc} \\ - \end{array} \right] Y \\ \left[\begin{array}{l} + \text{voc} \\ - \end{array} \right] = \\ X \end{array} \right. \end{array} \right.$$

According to Rule (2) only the phoneme characterized by the distinctive feature ‘non-consonantal’ (i.e. vowel), can occur in this position.

The occurrence of the vowel and the diphthong have to be examined separately. This phonological system does not entail the distinctive feature ‘long’ and ‘diphthong’: the distinctive feature ‘long’ has to be interpreted as a prosodic feature and the ‘diphthong’ as a biphonemic vocalic group. In our description we presuppose that diphthongs are monophonemic: from the functional point of view they are very close to long vowels. However, for the sake of clarity we understand long vowels as the doubling of the distinctive feature ‘vocalic’ and another distinctive property, and that is why they are denoted as (+voc +voc). Rule (1) has to be supplemented by Rule (3) stating that in the middle of a morpheme both long vowels and long liquids can occur.

$$(3) \quad [] \rightarrow [+ \text{voc} \quad + \text{voc}] / X - Y$$

Nevertheless, this rule does not apply to domestic morphemes in which the long vowels /é ó/ cannot occur. As the vowels /e o/ are characterized by the distinctive feature \pm compact Rule (3) must be modified in order to permit only compact and non-compact vowels in the given position.

$$(3a) \quad [] \rightarrow \left[\begin{array}{cc} + \text{voc} & + \text{voc} \\ \left\{ \begin{array}{l} [+ \text{comp} \quad + \text{comp}] \\ [- \text{comp} \quad - \text{comp}] \end{array} \right\} \end{array} \right] / X - Y$$

Eventually, we need a rule according to which long *á* (non-gravis compact) is not permitted in the middle of the morpheme; only the gravis compact vowel /a/ can occur there.

$$(4) \quad [] \rightarrow [+ \text{grave}] / X \left[\begin{array}{cc} + \text{voc} & + \text{voc} \\ + \text{comp} & + \text{comp} \\ - & - \end{array} \right] Y$$

The restrictions of the occurrence of long vowels at the beginning and at the end of the root morpheme are the same as in Rule (2) (cf. 2a).

$$(2a) \quad [] \rightarrow [- \text{cons} \quad - \text{cons}] / \left\{ \begin{array}{l} = \left[\begin{array}{cc} + \text{voc} & + \text{voc} \\ - & - \end{array} \right] Y \\ X \left[\begin{array}{cc} + \text{voc} & + \text{voc} \\ - & - \end{array} \right] = \end{array} \right\}$$

Diphthongs (similarly to long vowels) can be described as a combination of two distinctive features. The description of Slovak diphthongs requires the distinctive features ‘vocalic’, ‘compact’ and ‘gravis’. Then the diphthong /ia/ can be characterized as a combination

of non-compact non-gravis and compact gravis phonemes; the diphthong /ie/ as a combination of a non-compact non-gravis phoneme and a \pm compact non-gravis phoneme, and finally, the diphthong /uo/ as a combination of non-compact gravis and \pm compact gravis phonemes. (The diphthong /iu/ does not occur in the root morpheme.) The occurrence of the diphthongs /ia ie/ is described by Rule 5a, that of the diphthong /uo/ by Rule (5b).

$$(5a) \quad [] \rightarrow \left[\begin{array}{l} - \text{comp} \\ - \text{grave} \end{array} \left\{ \begin{array}{l} + \text{comp} \\ + \text{grave} \\ \pm \text{comp} \\ - \text{grave} \end{array} \right\} \right] / \quad X \left[\begin{array}{cc} + \text{voc} & + \text{voc} \\ - & - \end{array} \right] Y$$

$$5b. \quad [] \rightarrow \left[\begin{array}{cc} - \text{comp} & \pm \text{comp} \\ + \text{grave} & + \text{grave} \end{array} \right] / \quad X \left[\begin{array}{cc} + \text{voc} & + \text{voc} \\ - & - \end{array} \right] Y$$

6. The Rules for defining the occurrence of phonemes within the chains X and Y are positional and combinatory. Certain phonemes in a given position (from the point of view of the centre) are permissible or not depending on the positional rules. Combinatory rules define the occurrence of the phonemes from the point of view of the attached phonemes.

If a consonantal phoneme is only in the X chain, it cannot be / ʒ ʒ / (non-sibilant voiced).

$$(6) \quad [] \mapsto \left[\begin{array}{l} - \text{strid} \\ + \text{voic} \end{array} \right] / \quad = - \left[\begin{array}{l} + \text{voc} \\ - \text{cons} \end{array} \right]$$

In this case (and also in a number of other cases) it seems more convenient to formulate a negative, restrictive rule (denoted here by an arrow beginning in a vertical line). Such a rule says that the phoneme mentioned or the distinctive features mentioned cannot occur in the given positions.

The restriction rules cannot be used in the Y chain; permitted are all the phonemes with the exception of the phoneme /f/ at the absolute end of the word. That is why special Rule (7) has to be introduced.

$$(7) \quad [] \mapsto \left[\begin{array}{l} - \text{voc} \\ + \text{cons} \\ - \text{comp} \\ + \text{grave} \\ - \text{occl} \\ - \text{voic} \end{array} \right] / \quad \left[\begin{array}{l} + \text{voc} \\ - \text{cons} \end{array} \right] - \#$$

In front of the position denoted by the hyphen – only the distinctive feature ‘vocalic non-consonantal’ is permitted. It is evident that only vowels (not liquids) are permitted in the centre of

the morpheme. If further research reveals any other restrictions it will be necessary to introduce some new rules.

If in the X chain (in the front part of the morpheme), the basic rule applies which says that only phonemes with the distinctive features consonantal + occlusive (8) can occur in the first position.

$$(8) \quad [] \rightarrow \begin{bmatrix} + \text{ cons} \\ \alpha \text{ occl} \end{bmatrix} / \text{---} = -[+ \text{ conc}] \begin{bmatrix} + \text{ voc} \\ - \text{ cons} \end{bmatrix}$$

However, phonemes characterized by the distinctive feature compact /n ŋ t' d' ʒ ʒ' / are not permitted there. Consequently, Rule 8 must be followed by two restrictive Rules, i.e. Rule (9) for /n ŋ/ and Rule (10) for /t' ʒ ʒ' /.

$$(9) \quad [] \mapsto \begin{bmatrix} + \text{ nas} \\ - \text{ grave} \end{bmatrix} / \text{---} = \begin{bmatrix} + \text{ cons} \\ \alpha \text{ occl} \\ - \end{bmatrix} [+ \text{ cons}] \begin{bmatrix} + \text{ voc} \\ - \text{ cons} \end{bmatrix}$$

$$(10) \quad [] \mapsto \begin{bmatrix} - \text{ nas} \\ + \text{ strid} \\ + \text{ comp} \\ - \text{ strid} \\ - \text{ comp} \end{bmatrix} / \text{---} = \begin{bmatrix} + \text{ cons} \\ \alpha \text{ occl} \\ - \end{bmatrix} [+ \text{ cons}] \begin{bmatrix} + \text{ voc} \\ - \text{ cons} \end{bmatrix}$$

In the second position within the two-member X chain all the phonemes with the exception of /j ʒ ʒ' / are permitted. This situation is expressed by Rule (11).

$$(11) \quad [] \mapsto \begin{bmatrix} + \text{ cons} \\ \alpha \text{ occl} \\ + \text{ strid} \end{bmatrix} / \text{---} = [+ \text{ cons}] - \begin{bmatrix} + \text{ voc} \\ - \text{ cons} \end{bmatrix}$$

The phoneme /f/ cannot occur at this place either (12).

$$(12) \quad [] \mapsto \begin{bmatrix} - \text{ comp} \\ + \text{ grave} \\ - \text{ occl} \end{bmatrix} / \text{---} = [+ \text{ cons}] \begin{bmatrix} + \text{ cons} \\ - \end{bmatrix} \begin{bmatrix} + \text{ voc} \\ - \text{ cons} \end{bmatrix}$$

A combination of phonemes within the X chain is controlled by a general rule saying that phonemes characterized only by the distinctive feature 'occlusive' are not permitted in the same sequence (13).

$$(13) \quad [] \mapsto \begin{bmatrix} X \\ \alpha \text{ voic} \end{bmatrix} / - \begin{bmatrix} X \\ -\alpha \text{ voic} \end{bmatrix}$$

Further on, Rule (14) applies which states that there phonemes characterized by the distinctive feature compact /s š p k/ are not permitted here.

$$(14) \quad [] \mapsto \begin{bmatrix} X \\ \alpha \text{ comp} \end{bmatrix} / - \begin{bmatrix} X \\ -\alpha \text{ comp} \end{bmatrix}$$

According to the general Rule (15) all consonantal phonemes can occur before /r l l'/ with the exception of those which are not allowed according to the positional Rule (6).

$$(15) \quad [] \rightarrow \begin{bmatrix} - \text{voc} \\ + \text{cons} \end{bmatrix} / - \begin{bmatrix} + \text{voc} \\ + \text{cons} \end{bmatrix}$$

The situation in front of the phoneme /v/ is similar (16):

$$(16) \quad [] \rightarrow \begin{bmatrix} - \text{voc} \\ + \text{cons} \end{bmatrix} / - \begin{bmatrix} - \text{comp} \\ + \text{grave} \\ - \text{occl} \\ + \text{voic} \end{bmatrix}$$

Any consonant can occur in front of nasals (17):

$$(17) \quad [] \rightarrow \begin{bmatrix} - \text{voc} \\ + \text{cons} \end{bmatrix} / - [+ \text{nas}]$$

The cluster /pm/ is not allowed, hence a new rule (18) has to be formulated.

$$(18) \quad [] \mapsto \begin{bmatrix} - \text{comp} \\ + \text{grave} \\ + \text{occl} \\ - \text{nas} \end{bmatrix} / - \begin{bmatrix} + \text{nas} \\ + \text{grave} \end{bmatrix}$$

Rule (19) says that only the phonemes /s š/ can occur in front of the phonemes /p t t'/.

$$(19) \quad [] \rightarrow \begin{bmatrix} - \text{grave} \\ - \text{occl} \end{bmatrix} / - \begin{bmatrix} + \text{occl} \\ (+ \text{strid}) \\ (+ \text{grave}) \end{bmatrix}$$

Finally, Rule (20) has to be introduced according to which only the phonemes /č š/ can follow the phoneme /f/.

$$(20) \quad [] \rightarrow \left[\begin{array}{l} + \text{comp} \\ - \text{grave} \\ (+ \text{occl}) \\ - \text{nas} \\ (- \text{strid}) \\ (- \text{occl}) \\ (- \text{voic}) \end{array} \right] / \left[\begin{array}{l} - \text{comp} \\ + \text{grave} \\ - \text{occl} \\ - \text{voic} \end{array} \right] -$$

As to the consonantal clusters in words like *psa*, *chviet'*, *čpiet'*, *ctit'*, *tchor*, *pchat'*, *tkať*, *bdiet'* no rule is necessary because in these words there are the consonantal root morphemes *ps-*, *chv-*, *čp-*, *ct'-*, *tch-*, *pch-*, *tk-*, *bd'-*.

7. Within the two-element chain Y (the back part of the morpheme) only the following positional Rules apply:

In the final position, before the morpheme boundary there can stand all the consonantal phonemes with the exception of /j/, i.e. all the phonemes with the distinctive feature consonantal (21).

$$(21) \quad [] \rightarrow [+ \text{cons}] / \left[\begin{array}{l} + \text{voc} \\ - \text{cons} \end{array} \right] \left[\begin{array}{l} - \text{voc} \\ + \text{cons} \end{array} \right] - =$$

In the penultimate position there are not possible the phonemes /z ž/ with the distinctive features non-sibilant voiced (22), the phoneme /l/ with the distinctive features non-compact non-occlusive (23) and the phonemes /t' d' ň/ with the distinctive features compact nasal or non-nasal sibilant (24).

$$(22) \quad [] \mapsto \left[\begin{array}{l} - \text{strid} \\ + \text{voic} \end{array} \right] / \left[\begin{array}{l} + \text{voc} \\ - \text{cons} \end{array} \right] - \left[\begin{array}{l} - \text{voc} \\ + \text{cons} \end{array} \right] - =$$

$$(23) \quad [] \mapsto \left[\begin{array}{l} + \text{voc} \\ + \text{cons} \\ - \text{comp} \\ - \text{occl} \end{array} \right] / \left[\begin{array}{l} + \text{voc} \\ - \text{cons} \end{array} \right] - \left[\begin{array}{l} - \text{voc} \\ + \text{cons} \end{array} \right] =$$

$$(24) \quad [] \mapsto \begin{bmatrix} + \text{comp} \\ (+ \text{nas}) \\ (- \text{nas}) \\ (+ \text{strid}) \end{bmatrix} / \begin{bmatrix} + \text{voc} \\ - \text{cons} \end{bmatrix} - \begin{bmatrix} - \text{voc} \\ + \text{cons} \end{bmatrix} =$$

As combinatory rules within the two-element chain Y at first there have to be introduced several general Rules.

Consonantal phonemes differing in the distinctive feature occlusive cannot occur in this group (25).

$$(25) \quad [] \mapsto \begin{bmatrix} X \\ \alpha \text{ occl} \end{bmatrix} / \begin{bmatrix} + \text{voc} \\ - \text{cons} \end{bmatrix} \begin{bmatrix} X \\ - \alpha \text{ occl} \end{bmatrix} - =$$

After consonantal phonemes characterized by the distinctive feature sibilant there cannot occur phonemes with the distinctive feature non-sibilant /tc, tč/ (26).

$$(26) \quad [] \mapsto \begin{bmatrix} X \\ - \text{strid} \end{bmatrix} / \begin{bmatrix} + \text{voc} \\ - \text{cons} \end{bmatrix} \begin{bmatrix} X \\ + \text{strid} \end{bmatrix} - =$$

On the contrary, after consonantal phonemes characterized by the distinctive feature non-sibilant there are admissible the phonemes with the distinctive feature sibilant /ct, cť/ (27).

$$(27) \quad [] \mapsto \begin{bmatrix} X \\ + \text{strid} \end{bmatrix} / \begin{bmatrix} + \text{voc} \\ - \text{cons} \end{bmatrix} \begin{bmatrix} X \\ - \text{strid} \end{bmatrix} - =$$

$$(28) \quad [] \mapsto \begin{bmatrix} X \\ \alpha \text{ strid} \end{bmatrix} / \begin{bmatrix} + \text{voc} \\ - \text{cons} \end{bmatrix} \begin{bmatrix} X \\ 0 \text{ nas} \end{bmatrix} - =$$

$$(28a) \quad [] \mapsto \begin{bmatrix} X \\ \alpha \text{ nas} \end{bmatrix} / \begin{bmatrix} + \text{voc} \\ - \text{cons} \end{bmatrix} - \begin{bmatrix} X \\ 0 \text{ nas} \end{bmatrix} =$$

Consonantal phonemes characterized by the distinctive feature non-gravis cannot occur in the cluster of phonemes if they are occlusive and non-occlusive /ts, cs/ (29).

$$(29) \quad [] \mapsto \begin{bmatrix} - \text{grave} \\ - \text{occl} \end{bmatrix} / \begin{bmatrix} + \text{voc} \\ - \text{cons} \end{bmatrix} \begin{bmatrix} \pm \text{grave} \\ + \text{occl} \end{bmatrix} - =$$

Before the phoneme /r/ there cannot occur the phonemes /c ʒ č ʒ / with the distinctive feature non-occlusive (30).

$$(30) \quad [] \mapsto \left[\begin{array}{l} (-\text{occl}) \\ -\text{strid} \end{array} \right] \left[\begin{array}{l} +\text{voc} \\ -\text{cons} \end{array} \right] - \left[\begin{array}{l} +\text{voc} \\ +\text{cons} \\ +\text{occl} \end{array} \right] =$$

Similarly before the phoneme /l/ there cannot occur the phonemes /c ʒ č ʒ/ characterized by the distinctive feature non-sibilant, the phonemes /š ž/ characterized by the distinctive feature compact non-occlusive, and the phoneme /f/ characterized by the distinctive feature gravis non-occlusive voiceless.

$$(31) \quad [] \mapsto \left[\begin{array}{l} (-\text{strid}) \\ (+\text{comp}) \\ (-\text{occl}) \\ (+\text{grave}) \\ -\text{occl} \\ (-\text{voic}) \end{array} \right] / \left[\begin{array}{l} +\text{voc} \\ -\text{cons} \end{array} \right] - \left[\begin{array}{l} +\text{voc} \\ +\text{cons} \\ -\text{occl} \end{array} \right] =$$

8. Within the three-member chain X (before the vocalic centre of the morpheme) relatively simple Rules apply.

At the beginning of the morpheme there cannot be phonemes with the distinctive feature non-occlusive (32) with the exception of the phonemes /x h/ characterized by the distinctive feature compact gravis (33).

$$(32) \quad [] \rightarrow [-\text{occl}] / = - \left[\begin{array}{l} -\text{voc} \\ +\text{cons} \end{array} \right] \left[\begin{array}{l} +\text{cons} \\ -\text{cons} \end{array} \right] \left[\begin{array}{l} +\text{voc} \\ -\text{cons} \end{array} \right]$$

$$(33) \quad [] \mapsto \left[\begin{array}{l} +\text{comp} \\ +\text{grave} \end{array} \right] / = \left[\begin{array}{l} -\text{occl} \\ - \end{array} \right] \left[\begin{array}{l} -\text{voc} \\ +\text{cons} \end{array} \right] \left[\begin{array}{l} -\text{voc} \\ +\text{cons} \end{array} \right] \left[\begin{array}{l} +\text{voc} \\ -\text{cons} \end{array} \right]$$

In the second position in these groups there can only be phonemes with the distinctive features 'gravis' or 'non-gravis' sibilant (34).

$$(34) \quad [] \rightarrow \left\{ \begin{array}{l} [+ \text{grave}] \\ [- \text{grave}] \\ [+ \text{strid}] \end{array} \right\} / = \left[\begin{array}{l} -\text{voc} \\ +\text{cons} \end{array} \right] - \left[\begin{array}{l} +\text{voc} \\ +\text{cons} \end{array} \right] + [+ \text{voc}]$$

In the third position there can only occur the phonemes /r l/ characterized by the distinctive features 'vocalic' 'consonantal' and the phoneme /v/ (35).

$$35. \quad [] \rightarrow \left\{ \begin{array}{l} [+ \text{voc}] \\ [+ \text{cons}] \\ [- \text{comp}] \\ [+ \text{grave}] \\ - \text{occl} \\ [+ \text{voic}] \end{array} \right\} / = \begin{array}{l} [- \text{voc}] \\ [+ \text{cons}] \end{array} \left[\begin{array}{l} [- \text{voc}] \\ [+ \text{cons}] \end{array} \right] - \begin{array}{l} [+ \text{voc}] \\ [- \text{cons}] \end{array}$$

Here no combinatory rules have been found with the exception of Rules (13), (14), (23) – (25) formulated for two-member clusters.

In the chain Y (of domestic root morphemes) no three-member clusters can occur. This is expressed by Rule (36).

$$(36) \quad [] \rightarrow \left[\begin{array}{l} + \text{voc} \\ - \text{cons} \end{array} \right] / - \left[\begin{array}{l} - \text{voc} \\ + \text{cons} \end{array} \right] \left[\begin{array}{l} - \text{voc} \\ + \text{cons} \end{array} \right] =$$

The intervocalic position in disyllabic root morphemes of standard Slovak has not been examined yet. Nevertheless, it seems that the rules concerning this position will not modify the structure described by the set of the above-introduced Rules.

9. Although all allomorphs must be expressed by the formation Rules, in many cases it is more convenient to introduce several additional Rules on alternations at the morpheme boundaries. These are in fact transformation rules.

The Rule of the merging of two neighbouring morphemes (in the type *karpat-ski*) is of great importance. The rule can be formulated in the following way:

$$(37) \quad \dots \left[\begin{array}{l} + \text{occl} \\ + \text{strid} \end{array} \right] = \left[\begin{array}{l} - \text{occl} \\ - \text{strid} \end{array} \right] \dots > \dots \left[\begin{array}{l} + \text{occl} \\ - \text{strid} \end{array} \right] \dots$$

The phonemes t s, d z, f š merge into /c z č/:

$$(38) \quad \dots \left[\begin{array}{l} + \text{comp} \\ - \text{grave} \\ - \text{occl} \end{array} \right] = \left[\begin{array}{l} - \text{comp} \\ - \text{grave} \\ - \text{occl} \end{array} \right] \dots > \dots \left[\begin{array}{l} - \text{comp} \\ - \text{grave} \\ - \text{occl} \end{array} \right] \dots$$

A special rule expresses the merging of phonemes in the *náš-ski* – *naskí* type as given in (38).

Finally, it is necessary to formulate several Rules for inserting vowels in Nom. sg. masc. (39) and in Gen. pl. fem. and neutre (40).

$$(39) \left[\begin{array}{c} - \text{voc} \\ + \text{cons} \end{array} \right] \left\{ \left[\begin{array}{c} + \text{voc} \\ + \text{cons} \\ + \text{nas} \end{array} \right] \right\} \Rightarrow \left[\begin{array}{c} - \text{voc} \\ + \text{cons} \end{array} \right] \left[\begin{array}{c} + \text{voc} \\ - \text{cons} \\ \pm \text{comp} \end{array} \right] \left\{ \left[\begin{array}{c} + \text{voc} \\ + \text{cons} \\ + \text{nas} \end{array} \right] \right\} / \left\{ \left[\begin{array}{c} + \text{voc} \\ - \text{cons} \end{array} \right] \right\} \#$$

$$(40) \left[\begin{array}{c} - \text{voc} \\ + \text{cons} \end{array} \right] \left[\begin{array}{c} - \text{voc} \\ + \text{cons} \end{array} \right] \Rightarrow \left[\begin{array}{c} - \text{voc} \\ + \text{cons} \end{array} \right] \left[\begin{array}{c} + \text{voc} \\ - \text{cons} \end{array} \right] \left[\begin{array}{c} - \text{voc} \\ + \text{cons} \end{array} \right] / \left\{ \begin{array}{c} \# + \text{voc} \\ - \text{cons} \end{array} \right\}$$

The inserted vocalic phoneme can be /o ie á/ based on various conditions which have not yet been successfully formulated.

Note:

* First published as “Fonologický systém spisovnej slovenčiny.” *Slovenská reč*, 33, 1968, pp. 265 – 271 and In *Recueil linguistique de Bratislava*. 3. Red. Ján Horecký. Bratislava, Vydavateľstvo Slovenskej akadémie vied 1972, pp. 37 – 49.

¹ In his later phonological studies the author changed his attitude and he works with the distinctive features of length and diphthongicity as with equal members of the system of distinctive features.

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