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Towards the Intonational Phonology of the Sophia Variety of Bulgarian

1. Introduction

At various times in the past, the intonation of Bulgarian has been the object of scientific interest. However, there has, as yet, been no description which has attempted to establish the relations between phonological tonal categories, their phonetic exponency and their information-structural function within a modern descriptive framework.

In the linguistic literature we find three different interpretations for the phonetic realization of Yes/No questions. Nikolaeva (1977) and Wąsik (1979) divide the Slavic languages into two groups. The first group includes the West-Slavic languages. In these languages Yes/No questions are realized with a final pitch rise (*anticadence*). The intonation of Yes/No questions in the languages of the second group, i.e., the East-Slavic and the South-Slavic languages, is characterised by a rising-falling nuclear pitch. The pitch maximum of the rise (anticadence) is reached within the vowel of the accented syllable, which is followed by a falling pitch movement (cadence). Lehiste and Ivić (1980) describe this intonation pattern for Yes/No questions as a *reverse pattern* and suggest that this pattern should be regarded as a phonetic Balkanism. This intonation contour has a quasi-symmetrical form and can be considered as a rising-falling pitch movement in the terms of the British School. The interval between the pitch maximum and the pitch minimum is quite large, spanning at least an octave. The peak is realized within the accentuated vowel. In words with an initial as well as a final lexical stress the pitch minimum and the pitch maximum of the reverse pattern are reached within the same syllable. The phonological description by Grice et al. (2000) relates this contour to the intonation of Yes/No questions in East-European languages. The different realisations of this contour, consisting of a low-pitched nucleus followed by a rising-falling pitch movement are considered to have the same underlying representation, namely L* H-L%. The study also demonstrates that depending on whether or not the nuclear accent is placed on the last word of the intonation phrase, the phrasal accent in different languages and in different variations of the same language can have a secondary association with other syllables:

  a) with a syllable in a fixed position from the end of the phrase (standard Hungarian and Cypriot Greek)
  b) with a lexically stressed post-nuclear syllable (standard Greek and standard Rumanian)
  c) copied to a syllable, specified according to the rules described in a) and b), and at the same time associated with the nuclear syllable (Transylvanian Hungarian and Transylvanian Rumanian)

These approaches can explain different phonetic contours if the same underlying phonological intonation structure is assumed. Andreeva et al. (2001) take the tonal sequence L*+H L-L% as a basic phonological form of the Yes/No questions with the question particle *li* as well as of syntactically and lexically unmarked confirmation-seeking Yes/No questions in the Sophia variety of Bulgarian.

The present study focuses on two issues. Firstly, what the underlying tonal representation of the 'reverse pattern' is in Bulgarian – L* H-L% (Grice et al. 2000) or L*+H L-L% (Andreeva et al. 2001). In other words: What is the status of the high pitch target, a phrase accent or a trailing tone of a bi-tonal nuclear accent? Secondly, what is the principle behind the phonological association of the phrase accent (H- and L-, respectively): Is there a secondary association in Bulgarian and, if there is, what is the tone-bearing unit?

However, it should not be ignored that, in addition to the 'reverse pattern', we can also find both a final rising and final falling pitch contour in Yes/No questions in Bulgarian. These patterns will also be briefly described (section 3.2 and 3.3) and their pragmatic function

discussed (section 3.4). Finally, a further information-structural aspect is addressed in section 4, namely the focus-associated accent patterns in *non-questions*.

2. Material

For the empirical study we used a corpus of data containing both quasi-spontaneous speech acquired in map tasks (Anderson et al., 1991) and strictly-controlled read speech data. The map task speakers included five female and three male speakers of the Sophia variety of Bulgarian, all with an academic background and aged between 21 and 42. The read material comes from four speakers (three female and one male) from Sophia, aged between 25 and 45. The following 3 test sentences were recorded several times in random order in a sound-treated studio in the Institute of Phonetics, Saarland University. These sentences are a subset of a larger data set.

1. ˈvčera   ˈmama   ni   poˈmaga po graˈmatika.
    yesterday mama   us   helped   in   grammar
    'Yesterday mum helped us in grammar.'

2. ˈvčera   ˈMareto   poˈmaga po graˈmatika.
    yesterday Mareto   helped   in   grammar
    'Yesterday Mareto helped in grammar.'

3. ˈvčera   ˈmama   ˈmaza   ˈmasata.
    yesterday mama   painted   the table
    'Yesterday mum painted the table.'

The statements in the material were embedded in dialogue sequences as replies to wh-queries uttered by the instructor and were produced three times with broad focus or with contrastive and non-contrastive narrow focus on the first, medial or last content word (*mama/Mareto*, *pomaga/maza* or *gramatika/masata*)[1]. Sentence 2 was produced three times as a reaction to a described situational context which was constructed to induce focus on the first, medial or the last content word in the sentence. The recordings were digitised at a sampling frequency of 16 kHz and with an amplitude resolution of 12 bits using the Advanced Speech Signal Processing Tool (xassp). All data were manually labelled on the basis of the synchronised microphone signal and spectrogram.

3. Phonological Analysis

All analysed intonation contours are described from the phonetic and structural perspectives. The analysis uses the methods of autosegmental-metrical phonology (Pierrehumbert 1980, Beckman and Pierrehumbert 1986 and Pierrehumbert and Beckman 1988) and of interactional conversation phonology (Selting 1995).

First of all we analysed the utterances from our map task corpus which had been coded as checks (i.e., confirmation-seeking Yes/No questions). At this stage we considered syntactically and lexically unmarked utterances only. Experimental studies of Bulgarian intonation which have considered the contours of these questions report very different results. Tilkov (Tilkov and Bojadžiev 1977, Tilkov 1981) describes the utterance melody of questions without interrogative words and interrogative particles as finally falling and emotionally loaded. The accented syllable in these questions is uttered with a considerably higher pitch

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[1] We do not analyse the very first word *včera* but take it as a filler preceding the second lexically stressed syllable (word-initial in *mama* or *Mareto)*. The accentable syllables in the relevant material have the same segmental structure (maximally sonorant) in order to avoid micro-prosodic effects.

than the neighbouring non-accented syllables[2]. The questions in which the interrogative word, particle or verb have been left out and which are strongly context-bound are described by Penčev (Penčev 1980, Tilkov et al. 1982) as having a rising melody (his 'type 3'). According to Miševa (1991) the rising-falling nuclear pitch movement can be found only with intonationally marked interrogative utterances, in which case the pitch maximum is placed within the final part of the accented syllable. In polysyllabic structures the peak can be shifted to the right if the utterance contains enough post-accented syllables. The consideration of such contradictory conclusions gave the impetus to the present further analysis of this matter.

The checks in the quasi-spontaneous material from our corpus are realized by three different intonation contours: (a) rising-falling, (b) falling and (c) rising.

3.1 Contour 1 (Rising-Falling)

The nuclear accented syllable of Contour 1 is realized with a pitch rise towards the upcoming peak of the contour. The peak of the contour is reached either late in the nuclear accented syllable or in the next syllable. A final falling pitch movement towards the end of the intonation phrase follows the peak. In terms of the British School, this contour belongs to the rising-falling contours. The communicative-pragmatic function of the confirmation-seeking questions with Contour 1 in the map task procedure in our corpus can be identified as 'regular': The speaker verifies his understanding of the information from the previous utterance. The answer can be a positive or a negative one.

In order to determine the phonological structure of this contour in line with an autosegmental description, we have to identify the number of intonationally specified structural positions (i.e., possible phrase accents as well as pitch accents and boundary tones) in an intonation phrase and to specify the relation of this tonal structure to the units at the segmental level of the utterance. Figures 1 to 8 present sample utterances from the map task corpus with different positions of the nuclear accented syllable and with different numbers of pre- and post-accented syllables. The examples are presented with their syllable structure, their foot structure and their tonal structure. If the nuclear accented syllable is in the utterance-final position, i.e., if there is no segmental material for the realisation of the terminal falling pitch movement, then the syllable is realized with a pitch rise starting from a low pitch at the syllable onset and reaching the target peak at the end of the syllable.

(1)   [speaker MP]   'NE
                          (x)
                          LH

(2)   [speaker VP]   'nja kǎ de 'o ko lo o ke 'AN
                          (x   .   .) (x .   .) (x .) (x)
                                                          LH

If the nuclear accented syllable is followed by further syllables then a terminal falling pitch movement follows the rise (this is evidence that the functionally equivalent contours in (1) and (2) above are manifestations of a truncated rise-fall). If there is just one post-nuclear syllable then the pitch maximum is reached at the end of the accented syllable followed by a simple falling pitch movement towards the end of the intonation phrase.

(3)   [speaker AK]   'MI na
                          (x   .)
                          LH   L

(4)   [speaker NS]   na 'dva 'tri mi li 'ME tra
                          .   (x   .) (x .) (x   .)
                                                LH   L

If the nuclear syllable is followed by two unstressed syllables, different realisations of the nuclear pattern are observed with respect to peak placement. Speaker PS reaches the pitch maximum at the end of the nuclear syllable whereas speaker VP does so at the beginning of the following vowel. Speaker MP behaves in a similar manner to speaker VP, reaching the f_0-peak after the nuclear syllable, i.e., at the beginning of the following vowel.

(5)   [speaker PS]   kăm la 'LE ta ta
                               (x   .) (x   . .)
                                        LH   L

(6)   [speaker VP]   kă 'de to sa la 'LE ta ta
                               .   (x .) (x .) (x   . .)
                                              L H L

(7)   [speaker MP]   'DVO en za 'voj
                               (x   .   .) (x)
                                L   H   L

The realisation of the utterance *Ot PERpendikuljarnija?* (From the perpendicular?) provides clear evidence of the fact, that in order to determine the phonological structure of intonation contours in Bulgarian it is necessary to define four structural positions in an intonation phrase.

(8)   [speaker VP]   'PER pen di ku ˌljar ni ja
                               (x   .) (x .) (x   . .)
                                L   H   L   L

In this utterance the pitch reaches its maximum in the post-nuclear space (on the second post-nuclear syllable). The pitch minimum of the fall is reached within the syllable -*ljar*-, which is at the same time the head of the rhythmical foot and the secondary stressed syllable. After this point the contour proceeds at a level or slightly falling in the lower part of the voice-range. This fact can be treated as evidence in favour of the phonological interpretation of the H-tone as the trailing tone of a bi-tonal accent, and of the following L-tone as a phrase accent which is realized on a syllable between the nucleus and the end of the intonation phrase (yet is not placed at the intonation phrase boundary).

Consequently, the nuclear rising-falling pitch movement in checks can be described with an underlying tonal sequence LHLL. The analysis of the data from the map tasks enables the following phonological specification of this sequence to be made: a bi-tonal accent (L*+H), a low phrase accent (L-) and a boundary tone (L%). The bi-tonal pitch accent L*+H is realized phonetically as a pitch rise from a low target in the first part of the accented syllable to a high target within the same or within the following syllable(s). The questions still to be clarified are: Where does the high trailing tone of the bi-tonal accent occur? What causes the different positions of the f_0 maximum found in the data? With what is the phrase accent secondarily associated? In accordance with Pierrehumbert and Beckman (1988) we understand phrase accents as accents that are associated, on the one hand with a phrase boundary, like boundary tones (central association), and on the other hand with a tone-bearing unit (secondary association). However, it is problematical for this study that almost all checks from our map task corpus have the nuclear syllable in the last word of the utterance. To explain the phonological interpretation of tone-to-text association utterances with a varied rhythmic structure are required. For this reason we included the checks from the read corpus in the analysis.

Figures 1 to 7 present the realisation of the test utterance 2 from the read corpus, which was produced as a check with narrow focus on the (a) initial, (b) medial and (c) final content word of the utterance, respectively.

The rhythmic structure of this test utterance can be represented as:

        'vče ra 'Ma re to po 'ma ga po gra 'ma ti ka
        (x   .) (x   .) (x .) (x   .) (x   .) (x   . .)

2.1.1 Focus in the Initial Position of the Utterance

When the nuclear accented syllable is located in the left peripheral position of the intonation phrase (i.e., the focus is on the first content word *Mareto*) the low target point of the bi-tonal pitch accent L*+H is realized in the first half of the accented syllable by all subjects. Speakers EK and EP reach the f_0 maximum two syllables later, in the next rhythmically strong syllable (*-to* in *Mareto*), whereas speakers BA and BV place the peak in the weak syllable immediately following the accented one (*-re* von *Mareto*). All subjects realize the phrase accent L- on the rhythmically strong (non-stressed) syllable of the penultimate rhythmic foot (cf. Fig. 1 and 2).
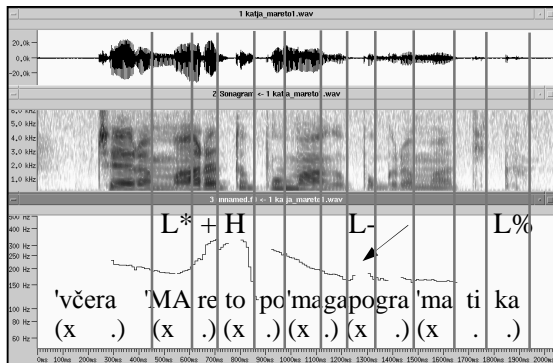
Fig. 1: Speaker EP (female)　　　　　**Fig. 2: Speaker BV (male)**
'Is it Mareto who helped you yesterday in grammar?'

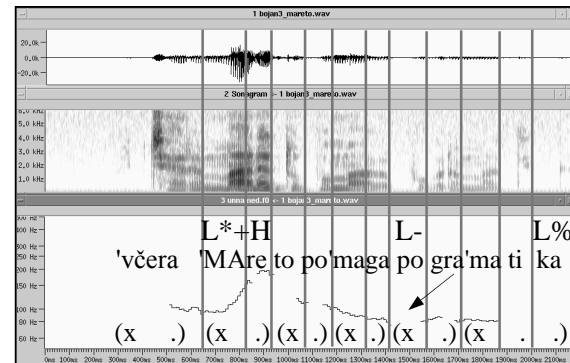### 2.1.2 Focus in the Medial Position of the Utterance

When the nuclear accented syllable is located in the middle of the intonation phrase (i.e., the focus is on the second content word *pomaga*) all speakers show the same behaviour in the realisation of the L*+H L-L% intonation contour. The low target point of the pitch accent is reached in the first half of the accented syllable, the f_0 peak is produced in the immediately following syllable and the low phrase accent is placed on the metrically (but not lexically) strong syllable (*po-*) of the penultimate foot (cf. Fig. 3 and 4).
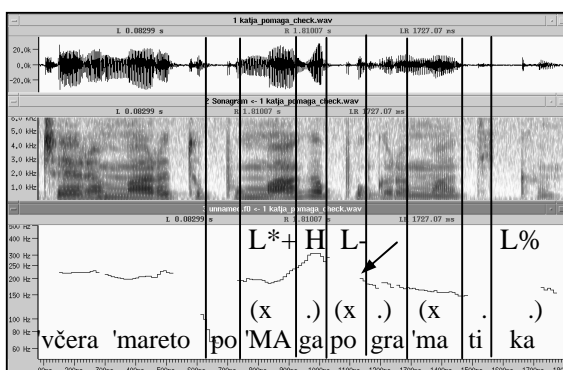

Fig. 3: Speaker EP (female)　　　　　**Fig. 4: Speaker EK (female)**
'Did Mareto help in grammar yesterday?'
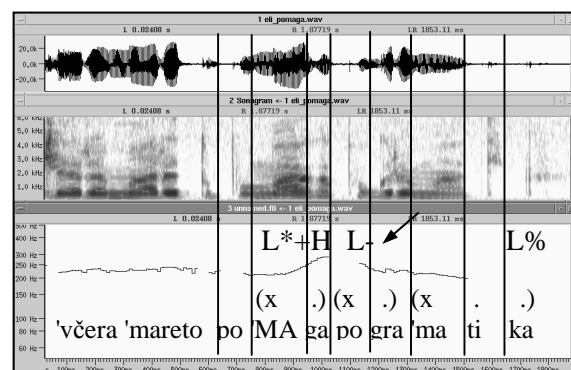
Fig. 5 illustrates an intonational 'slip of the tongue', which provides additional evidence for the fact that the phrase accent in Bulgarian is associated with the rhythmically prominent syllable of the post-nuclear foot. Speaker EP produced the L-tone at the onset of the accented syllable and continued the rise as far as the metrically strong syllable of the next (penultimate) foot, where the low phrase accent should normally be produced. The speaker then abruptly

interrupted her production of the utterance and told the experimenter that this realisation doesn't correspond to how confirmation-seeking questions should be produced.
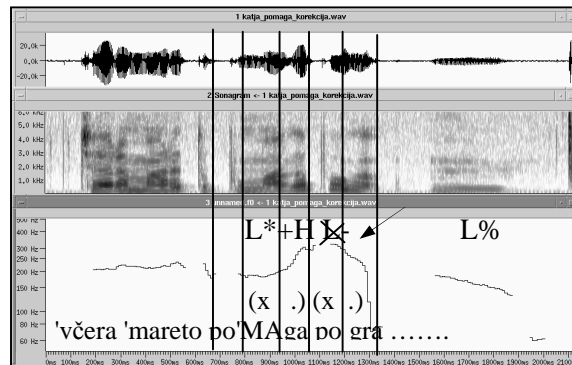
Fig. 5: Speaker EK (female)
'Did Mareto help in grammar yesterday?'

2.1.3 Focus in the Final Position of the Utterance

When the nuclear accented syllable is located in the right peripheral position of the intonation phrase (i.e., the focus is on the last content word *gramatika*) the low target point of the bitonal pitch accent L*+H is realized in the first half of the accent syllable, as before. It is immediately followed by a steep rise. The syllable in which the pitch movement takes place is the metrically and lexically strong syllable of the last ternary foot of the utterance. Different realisations by the speakers demonstrate great variability in f_0-peak placement. The peak is reached either in the final portion of the accented syllable or in the immediately following syllable. The phrase accent is realized on the final syllable of the intonation phrase (cf. Fig. 6 and 7).
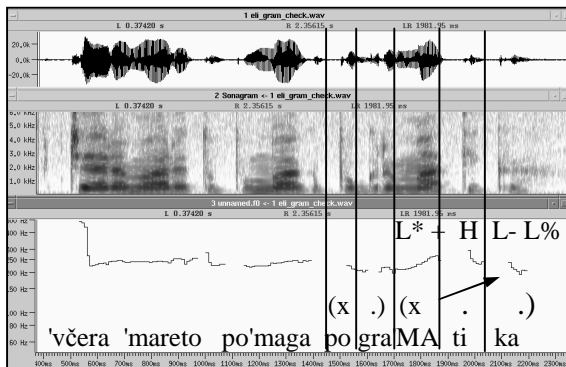
Fig. 6: Speaker EK (female)   **Fig. 7: Speaker EP (female)**
'Is it in grammar that Mareto helped you yesterday?'
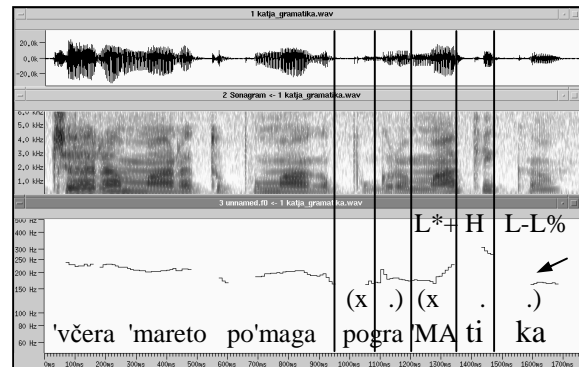
When the nuclear accent is placed on the final foot of the utterance, there is no evidence that the phrase accent is secondarily associated. This assumption is supported by figures 8 and 9. In both cases the utterance boundary is specified as L-H%. However, the pitch movement in the final portion of the contours differs considerably in its phonetic form. Fig. 8 illustrates a contradiction contour where the nuclear accent is placed on the last word *laletata* (cf. Grigorova, to appear, for more information on *the contradiction contour*). The stressed syllable (*-le-*) is followed by two metrically and lexically weak syllables (*-tata*). A slight increase in the fundamental frequency on the final syllable is noticeable, reflecting the combined peripheral association of the L- phrase accent and the H% boundary tone. Fig. 9 illustrates a *li*-question with an utterance-initial nuclear accent. The metrically strong syllable of the last (ternary) foot (*-ma-* of the word *gramatika*) is also lexically prominent, i.e., it is a

lexically stressed syllable. The phrase accent becomes a secondarily associated with this syllable, and we find a steep rise to the very end of the intonation phrase boundary.

Pierrehumbert and Beckman (1988) postulated the following principles concerning secondarily association:

(a) to be fully realized, the peripherally associated tones must be also secondarily associated;

(b) the property of the secondarily associated tone depends on the primary association with a higher node (The mono-tonal accent tone H*< in the utterance in Fig. 8 primarily associates with the lexically prominent syllable of the metrically strong foot. This fact prevents the secondary association of the phrase accent.)

(c) as a consequence of the absence of a secondary association, there is only insignificant influence of the utterance tones on the f_0 contour (Fig. 8 presents the phrase tone L-).
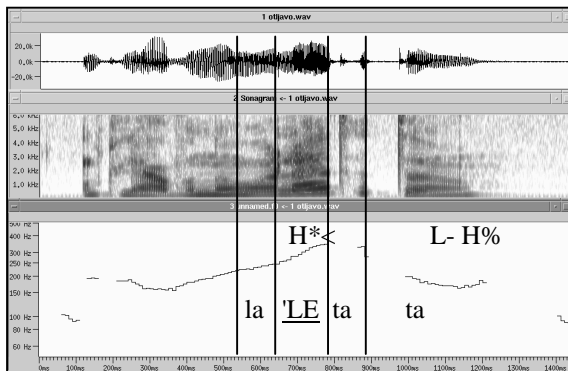
Fig. 8: map task corpus,
    speaker VP (female)
    laLEtata
    'the tulips'
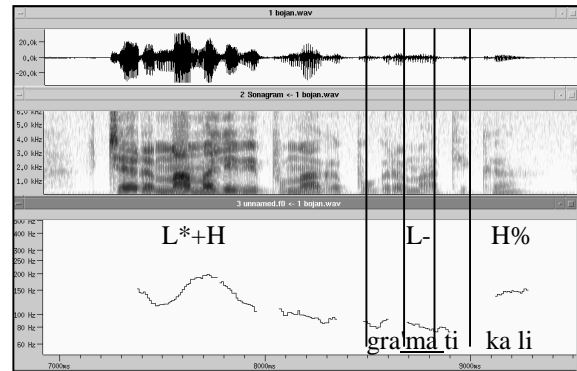
Fig. 9: read corpus,
    speaker BV (male)
    graMAtika
    'grammar'

	'vče	ra	'ma	re	to	po	'ma	ga	po	gra	'ma	ti	ka
	(x	.)	(x	.)	(x	.)	(x	.)	(x	.)	(x	.	.)
EP			L*		H				L-				L%
KP			L*		H				L-				L%
BV			L*	H					L-				L%
BA			L*	H					L-				L%
EP							L*	H	L-				L%
KP							L*	H	L-				L%
BV							L*	H	L-				L%
BA							L*	H	L-				L%
EP											L*H		L-L%
KP											L*	H	L-L%
BV											L*	H	L-L%
BA											L*H		L-L%

Fig. 10: Realisation of the L- and H- target points and of the phrase accent in checks with focus in the utterance-initial, utterance-medial and utterance-final positions.

Fig. 10 brings together the production patterns of all four subjects in three different focus positions (utterance-initially, medially and utterance-finally):

(1) The nuclear accent syllable is pronounced with a pitch rise towards the upcoming contour peak. The peak is realized either late in the accent syllable or on the post-nuclear syllable(s). The peak is immediately followed by a terminal falling pitch movement (in British School terms, this contour is classified as a rising-falling pitch contour).

(2) In line with the autosegmental phonological description, this contour is represented as a sequence of a bi-tonal accents (L*+H), a low phrase accent (L-) and a low final boundary tone (L%).

(3) The realization of the trailing tone (H) is influenced by speaker-specific production strategies as well as by the position of the accented syllable within the intonation phrase[3].

2.1.4 The Prosodic Tree for Bulgarian (Exemplified by a *Check*)

Figure 11 illustrates an interrogative utterance (test utterance 2 from the read corpus) consisting of one intonation phrase.

(1) Association of accent tones

In agreement with the original model by Pierrehumbert (1980) for English, the tone-bearing unit in Bulgarian is a syllable. The representation of the Bulgarian accent tones, in the same way as the model for English and Japanese (Beckman and Pierrehumbert 1986), requires an n-branching tree structure, containing either strong or weak terminal elements. The strong terminal elements of the tonal node are the starred tones, whereas the weak ones are the leading or trailing tones. The tree representing mono-tonal accents does not have a branching structure.

The tonal accent (TA) L*+H primarily associates with the metrically strong rhythmic foot (Σs). This connection runs upwards through the prosodic tree to the head of the foot σ_s, i .e. to the metrically strong syllable.

The black dashed lines in the Fig. 11 represent the phoneme-to-syllable associations between the vocalic segments on the segmental tier and the terminal elements (syllables) of the prosodic tree. The primary association between the syllable and the T-node of the tonal tier is marked by a solid line.

(2) Association on higher tiers

In the model by Beckman and Pierrehumbert (1986) and Pierrehumbert and Beckman (1988), modified for American English, the boundary tones and the phrase accents are regarded as products of the peripheral association with the constituent nodes higher in the prosodic hierarchy.

In Figure 11 the peripheral associations are marked with dotted lines. The right boundary of the intonation phrase is specified by a low phrase accent (PhA) L- and a low boundary tone (BT) L%. The phrase accent and the boundary tone are peripherally associated at the right edge of the intonation phrase. The phonetic manifestation of this association is a gradual fall-off in pitch at towards the end of the intonation phrase.

The peripherally associated tones in Bulgarian are secondarily associated with the terminal elements of the prosodic tree. The secondary association of the phrase accent takes place according to the following rules:

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[3] This finding supports the observation by Miševa (1991) that the contour peak in questions can be shifted to the right when the nucleus is followed by several unaccented syllables.

(1) If there is enough segmental material after the nuclear syllable the phrase accent is secondarily associated with the metrically strong syllable of the penultimate post-nuclear foot.

(2) If the penultimate foot of the intonation phrase contains the nuclear syllable the phrase accent is secondarily associated with the metrically strong syllable of the last foot.

(3) If the ultimate foot of the intonation phrase contains the nuclear syllable no secondary association of the phrase accent takes place, i.e., the secondary association is blocked, because the appropriate structural position is already occupied by an accent tone.
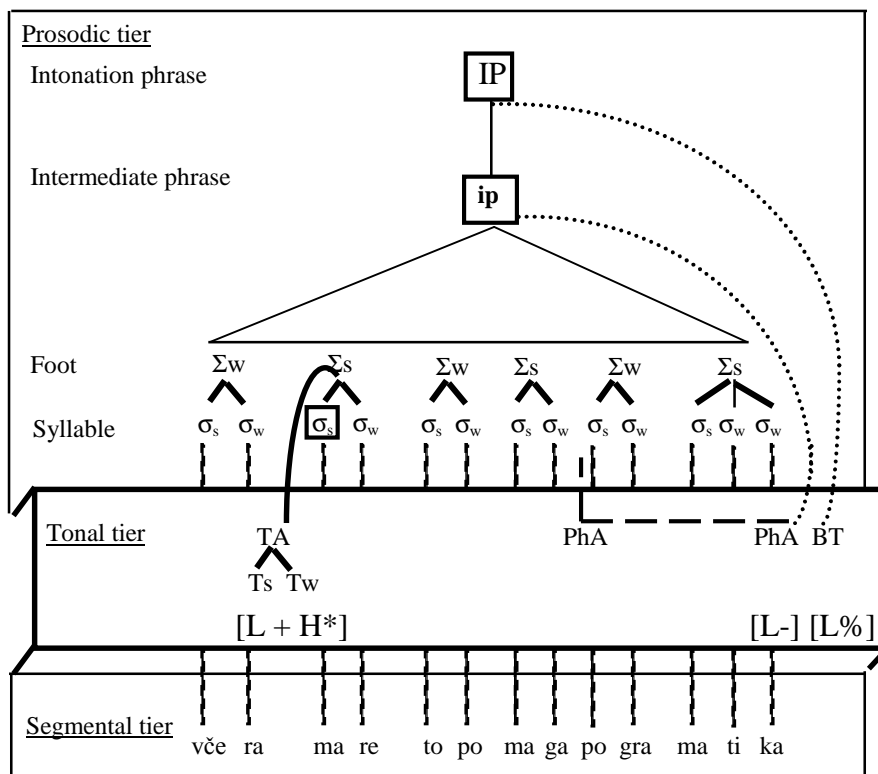

Fig. 11: The prosodic tree in Bulgarian following Grice (1995)

3.2 Contour 2 (Rising)

Contour 2 is characterized by the low pitch of the nuclear syllable followed by a gradual rise up to a high point towards the end of the phrase (a rising contour in terms of the British School). The autosegmental representation of this contour is L* H-H%. The communicative-pragmatic function of a check intonationally realized with contour 2 is an anticipation about how the route will run. However the speaker is unsure that the anticipated route is the correct one. A negative rather than a positive answer is expected[4].

In cases with no or only one post-nuclear syllable, i.e., when the tonal accent is placed on the final or the penultimate syllable of the intonation phrase, the pitch rises rapidly up to the very high register of the voice range. In other cases a steady pitch rise can take a convex form after the nuclear syllable[5] (cf. Fig. 12).

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[4] This contour corresponds to the contour of type 3 in Penčev (1980). It is used with elliptical as well as with complete sentences in a guessing situation. According to Tilkov (1981) this contour is used in elliptical additional questions, introduced by the conjunction *a* or by an indefinite pronoun.

[5] In our map task corpus there were no cases of lexically and syntactically unmarked checks pronounced with the contour L*H-H% and with more than one post-nuclear syllable. Although this check question is lexically marked through the interrogative particle *li*, we used it to exemplify the realization of a contour with more than one post-
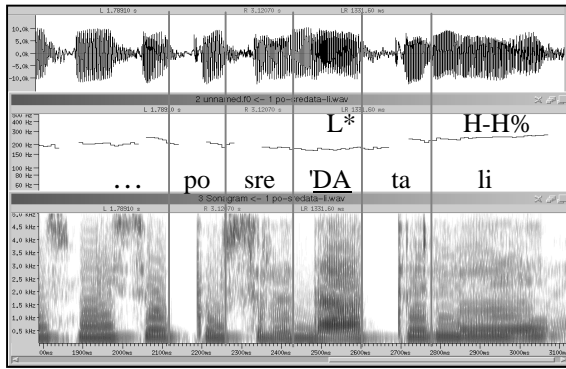
Fig. 12: map task corpus,
Speaker PS (female)
(V smisăl) po sredata li?
'(Well) in the middle?'
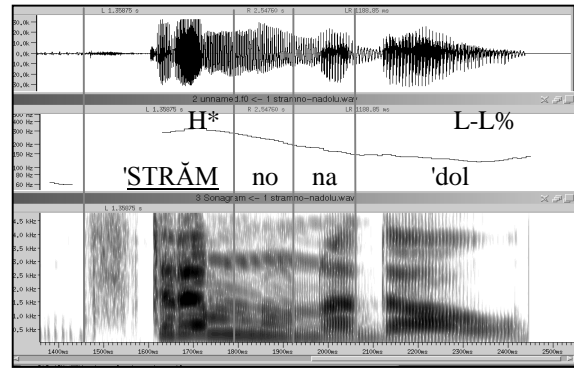
Fig. 13: map task corpus,
Speaker PS (female)
Strămno nadolu?
'Steep down?'

3.3 Contour 3 (Falling)

The fall is characterised by a peak in the first part of the nuclear syllable followed by a decrease in the fundamental frequency down to the baseline. This contour is analysed as a sequence of a mono-tonal (downstepped) accent H* tones, a low phrase accent (L-) and a low boundary tone (L%). The communicative-pragmatic function of such checks is an assumption with a relatively high degree of confidence about how the route is going to run. A positive answer is expected rather than a negative one[6].

The peak is reached either within the accented vowel or alternatively, in case of the downstepped accent tone, within the previous syllable. In the sample utterance in Fig. 13 it must be assumed (according to section 2.1.4) that there is a secondary association of the (L-) phrase accent with the head of the rhythmic foot and lexically strong syllable *do-* .

3.4 Concluding Remarks about the Functional-pragmatic Properties of *Checks*

The checks are strongly context-bound and demonstrate an expectation of a positive or of a negative answer. In the map task corpus they were mostly produced by the party that followed the route according to the instructions given by the other party (i.e., the instruction-follower). They helped him/her to fulfil the task successfully. The check refers to some element from the previous utterance or from the previous stretch of talk which was assumed by the other speaker to be 'familiar'. The check explicitly localises at least one component of the source-utterance which requires clarification.

Grice at al. (1995: 649) differentiate between three types of checks. The differentiation is based on the degree of confidence in the information provided by the interlocutor:

C_0 – with little or no confidence in the received information on the part of the speaker; incredulity;

C_1 – with some degree of confidence in the received information on the part of the speaker; no definite expectation whether the reply to the check will be positive or negative;

C_2 – with a high degree of confidence and a strong expectation of a positive reply.

This classification can be seen as an extension of Cruttendens' (1981) interpretation of f_0 contours, where the rise signals an 'open meaning' and the fall a 'closed' one. Within this

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nuclear syllable.

[6] Studies of the intonation of Bulgarian do not mention this contour in connection with lexically and syntactically marked questions.

'open-closed' continuum, the different contours of the checks in the map task material are classified as follows:

    Contour 1 (L*+H L-L%) – open (some degree of confidence)
    Contour 2 (L* H-H%) – extra open (little or no confidence)
    Contour 3 ((!)H* L-L%) – closed (high degree of confidence).

The different degrees of speaker confidence are expressed through the tonal accent in combination with the peripheral tones (a phrase accent and a boundary tone). In Contour 1 and Contour 3 with the same boundary tones (L-L%), it is the tonal accent that specifies the question as open (L*+H) or closed ((!)H*). The meaning 'extra open' in Contour 2 is signalled by the tone accent L* as well as by the boundary tones H-H%.

4. Focus-associated Accent Pattern in Non-questions

In the data from the read corpus we found the following four different accent types: L+H* with a late peak, H* with an early peak, !H* with an early peak and H+!H*/L*. The boundary tones of the test utterances were all realized as L-L%, giving three different falling contours.

4.1 Non-contrastive Narrow Focus

The underlying form of the utterances with a non-contrastive narrow focus is the sequence of the high mono-tonal tone accent (H*), a low phrase accent (L-) and a low boundary tone (L%)[7]. The focus associated accent H* has the form of a slight rise within the onset of the accent syllable starting from the mid register of the voice range. The pitch reaches its maximum point at the beginning of the syllable rhyme. The realization of H* can differ depending on whether the focus takes the final position in the utterance or a non-final one, the peak being earlier in the former. The realization of H* also depends on the distance between the tone accent and the boundary tone. The tonal movement from the high target to the low boundary target is not phonologically specified. It is realized as a linear interpolation, i.e., a transition between tonal targets and depends on how long the stretch is between the pitch accent and the boundary tone. In non-final position the fall to the low phrase accent (L-), associated with the metrically strong syllable in one of the feet following the accented syllable (for the secondary association see section 2.1.4) is usually more gradual (i.e., as long as there is sufficient segmental material), while in the final position it is steeper, since L- must be realized within the same foot as the pitch accent.
    When the last content word is focused, the H* accent can lead to ambiguity, since such an utterance can be also interpreted as having a wide focus. The speakers can resolve this ambiguity in the frequency domain by using a wider voice range or avoid it in the time domain by realizing a late peak (L+H*), but see section 4.2 below.

4.2 Contrastive Narrow Focus

The subjects usually choose another tone accent in utterances with a contrastive narrow focus. In the corpus they demonstrated a clear preference towards a L+H* realization, the tone accent with a phonologically specified delayed peak. The phonetic manifestation of the bi-tonal L+H* is a gradual pitch rise from the low register, which takes place on the accented syllable. The low tone is produced at the beginning or shortly before the onset of the accented syllable and the high tone is realized at the end of the accented syllable or in the following syllable.

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[7] This contour corresponds to the contour of the type 1 in Penčev (1980).

Because of the acoustic properties of H* and L+H*, intonation researchers differ in their opinion as to whether these tonal accents are categorically different or whether they represent extreme realizations of one and the same accent type. Contrary to the statement by Pierrehumbert (1980) and Pierrehumbert and Hirschberg (1990) that only L+H* can be preceded by a low target point, the statistically-based evidence from Ladd and Schepman (2003) proves that it is also true for H*. It is in this connection that we put the question whether these two accent types express different meanings. Based on the analysis of the data from our read corpus, we come to the conclusion that the interpretation domains of H* and L+H* overlap. Both accent types can signal new information as well as contrast.

4.3 Broad Focus

In the broad focus condition the speaker EK uses a tone accent that can be analyzed either as H+H!* (a high downstepped target point preceded by a high tone) or H+L* (a low target point preceded by a high tone)[8]. Because the tone accent is placed in the utterance-final position and is followed by the low boundary tones L-L%[9] it is impossible to decide which accent can be regarded as the underlying pattern for this speaker.

The other subjects always produce the broad focus with an early (mostly downstepped) peak immediately preceding or within the accented syllable of the last content word of the utterance ((!)H*). The difference between the early downstepped !H* and H* consists in (a) the scaling and (b) temporal alignment of the peak. The distinctively lower peak in !H* is aligned at the beginning or immediately preceding the syllable onset. The tone accent signals a complex focus domain that expands by means of the focus projection to the maximum focus, comprising the whole utterance, and functions as a focus exponent on the phonological level.

5. Discussion

Tonal placement can be defined as the temporal synchronization of tones with specific segments or prosodic locations and can be described in terms of phonological and/or phonetic factors. The phonological factors are qualitative and categorical (e.g., *associate* the tonal target with syllable X rather than syllable Y) and imply different accent patterns (monotonal or bi-tonal). The phonetic factors are gradient and can often be modeled by means of interacting quantitative parameters (e.g., *align* the tonal target earlier if it is close to a following tonal target). These factors fine-tune the alignment of tonal targets, determining the differing phonetic realizations of the same phonological tone. A number of intonational studies (Silverman and Pierrehumbert 1990, Arvaniti et al. 1998, Ladd et al. 2000, Andreeva and Oliva 2005, Oliva and Andreeva 2007 among many others) have suggested that the specification for the phonetic alignment of tonal targets is a function of speech tempo, phonological vowel length, syllabic structure and segmental effects (intrinsic vowel duration, consonant voicing etc.), adjacency to word and intonational boundaries, as well as proximity to other tones. The data analyzed in this study have shown unambiguously that the pitch accent used in the 'open' Sophia Bulgarian check is L*+H followed by a low phrase accent (L-) and a low boundary tone (L%). The H target has to be interpreted as a trailing tone (rather then a high phrase accent) for two reasons. Firstly, the temporal relationship between the high tone and the preceding L* is quite stable (although, of course, the exact phonetic alignment is affected by the above-mentioned factors). Secondly, and more importantly, in the data where the focus occurs early enough in the sentence, the subjects always produce a

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[8] The sequence H+!H*/L* L-L% corresponds to the intonation contour of type 2 according to Penčev (1980). The function of this intonation contour is to neutralize the main rhema in utterances with a narrow focus. Consequently the whole utterance is perceived as 'emphasized'.

[9] The following two syllables are devoiced.

following low tonal target – the phrase accent (L-). This can be seen as clear evidence for the secondary association of the phrase accent in Bulgarian.

The rules for the secondary association of the phrase tone are as follows: (a) if the nuclear syllable is early enough in the intonation phrase the phrase accent is secondarily associated with the metrically strong syllable of the penultimate post-nuclear foot; (b) if the nuclear syllable coincides with the penultimate foot of the intonation phrase the phrase accent is secondarily associated with the metrically strong syllable of the last foot; (c) if the nuclear syllable coincides with the metrically strong syllable of the final foot of the intonation phrase, no secondary association of the phrase accent occurs.

This finding suggests that the *East European Question Tune* (Grice et al. 2000), which has an L* pitch accent followed by an H- phrase accent and an L% boundary tone, does not apply to Bulgarian. Meyer and Mleinek (2006) show that Russian also does not follow that pattern. It would seem therefore that the 'East European Question Tune' (described for varieties of Greek, Rumanian and Hungarian) does not apply to Slavic languages (at least not to Russian and Sophia Bulgarian) and this therefore relativises the *reverse pattern* (Lehiste and Ivić 1980) as a manifestation of 'intonational Balkanism'. The global rise-fall intonation pattern for Yes/No questions is clearly common to many languages of the 'Balkan Sprachbund', but the discrepancy between the findings of Grice et al. (2000) and the results of this study suggest that the underlying phonological structure is different.

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