

Prosodic structure of Farasani Arabic: Accentual Phrase without a pitch accent

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Abstract

This study proposes a model of intonational phonology of Farasani Arabic, a dialect of Arabic spoken on the Farasan Islands, Saudi Arabia, based on the Autosegmental-Metrical framework [1], [2], [3]. Tonal patterns of utterances, produced in neutral and narrow focus contexts, were collected from seven Farasani native speakers. The findings show that Farasani Arabic, which has lexical stress, is typologically unique in that it has no pitch accent unless a word is emphasized. Instead, in neutral focus, most words form an Accentual Phrase (AP), marked by a Low tone on its left edge and a High tone (Ha) on its right edge. Additionally, there are two prosodic units above the AP: an Intermediate Phrase (ip) and an Intonational Phrase (IP). An ip is marked, on its final syllable, by a high boundary tone (H-), which is higher than the preceding Ha tone and delimits syntactic constituents such as relative clauses, adjuncts, and alternative questions. An IP is defined by a boundary tone [H%, L%, !H%, or HLH%] on its final syllable, overriding the boundary tone of the lower prosodic units. The findings on the AP and lack of pitch accents are discussed in terms of the typology of word-prominence type.

Index Terms: intonation, Arabic, prominence, Accentual Phrase, pitch accent, focus, Autosegmental-Metrical, Farasani Arabic, stress, prosodic structure, intonational phonology

1. Introduction

Farasani Arabic (hereinafter: FA) is an under-documented dialect of Arabic spoken by about 20,000 people in the Farasan Islands, which are located in the Red Sea to the southwest of Saudi Arabia [4]. FA has lexical stress, whose location is predictable based on syllable weight. Stress is on the word-final syllable if it is superheavy (CVVC, CVCC), the penultimate syllable if heavy (CVV, CVC), and the antepenultimate syllable (if available) or word-initial syllable in all other cases. Stressed syllables in FA have clear acoustic correlates; they are longer and louder than unstressed syllables.

The association between stress and pitch accent has long been known in intonation research. In languages with stress, a word becomes prominent by carrying a postlexical pitch accent on its stressed syllable (e.g., English, German, Greek, Spanish, many dialects of Arabic). Therefore, it is expected that a stressed syllable would carry a pitch accent in FA.

According to the typology of word prominence marking [5], [6], languages that mark word prominence with pitch accents on its stressed syllables belong to head-prominence languages. In languages that have no lexical prosody, i.e., no stress or tonal specification (e.g., Korean, Mongolian, W. Greenlandic), word prominence is marked with boundary tones on the edges of a Prosodic Word (PW) or an Accentual Phrase (AP). Since most APs include only one word, the AP boundary tones mark the edges of a word. Those languages belong to edge-prominence

languages. There are also head/edge-prominence languages, which have both pitch accents marking prominence on stressed syllables and PW/AP boundary tones marking the edges of a word (e.g., Bengali, Georgian, Persian). Since FA has lexical stress, it is expected that the stressed syllable of a word would carry a pitch accent, and thus FA would belong to head-prominence languages.

Below, we introduce a model of FA intonational phonology in the Autosegmental-Metrical (AM) framework [1], [2], [3], and discuss the intonation model from the view of prosodic typology, especially the typology of word prominence marking.

2. The present study

The goal of the current study is to propose a phonological model of Farasani Arabic intonation in the AM framework, focusing on the following questions: 1. How are word prominence marked in neutral and focus conditions? 2. What prosodic units are there in FA and how is each unit marked by intonation?

2.1. Methods and Procedures

The data were collected from seven Farasani speakers (five females) in their 20s and 30s. Speakers were recorded in a quiet room in Farasan Island, except for one female speaker who was recorded in the US. The data included 74 sentences that varied in word length and phrase length, the location of stress, syntactic structures, and sentence types. Also included were 27 SVO sentences that varied in the location of a narrowly focused word, i.e., focus on the subject, the object, or the verb. Each focused word was 3 syllables long and varied in the location of the stressed syllable (word-initial, medial, final). Two types of narrow focus were used to elicit focused utterances: wh-question/answer and corrective focus. See examples below:

- (1) [mi:n ʕa.bi:r dʕa:ra.ban] “Who did Abeer hit?”
[ʕa.bi:r dʕa:ra.ban mu.ni:ra] “Abeer hit MONEERA”
- (2) [(muʃ le:la,) mu.ni:ra ga:lan al-go:l]
(Not Laila, but) MONEERA explained the story.

The same 27 sentences were also produced in the neutral focus condition. Recordings were segmented in *Praat*, and each utterance was labeled on four tiers: words, tones, English gloss, and sentence meaning. F0 contours were analyzed as a sequence of tonal targets by referring to the location of stress and syllable/word boundaries as well as spectrogram and waveform. The pitch targets were labeled following the conventions commonly employed in various intonational phonology models and ToBI systems [8, 9].

3. Results

3.1. Evidence of AP with no pitch accent (neutral focus)

The intonation contour of neutral declarative sentences in FA consists of a sequence of rising (L H) tones, with the L tone

consistently realized on the first syllable and the H tone on the final syllable of each word, regardless of the location of the stressed syllable (see Sec. 3.4 for the description of utterance-final L%). Figure 1 shows an example, where the stressed syllable of the first two words (3 syllables each) is circled red and the H peaks are circled in yellow. The first two words ('Lamiana', 'flattered') show a rising pattern, with a word-initial L and a word-final H (labeled as 'Ha'), regardless of the location of stress. Figure 2 shows another example where the first word (2 syllables) and the second word (4 syllables) each has a rising tone, regardless of the location of stress.

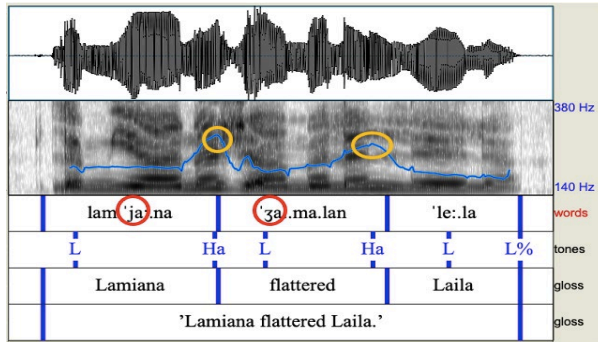


Figure 1: An f_0 track of 'Lamiana flattered Laila', where the first two words show a rising tonal pattern with L on word-initial and Ha on word-final syllable, despite their different stress locations.

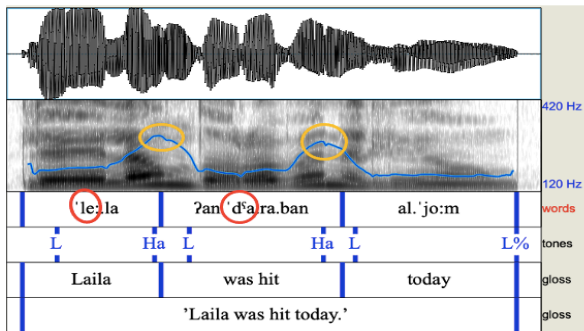


Figure 2: An f_0 track of 'Laila was hit today', where the first two words, 2 syllables and 4 syllables long respectively, show the same rising tone pattern, despite their different stress locations.

So far, we have shown that each word has a rising tone pattern. However, the domain of a rising tone in FA is not a word because it can include more than one word, as shown in Figure 3. Here, the first two words ('sons', 'neighbors') show a single rising tone pattern (L Ha), with L at the beginning of the first word and H at the end of the second word. This suggests that the domain of the rising tone in FA is an Accentual Phrase (AP). Based on these results, we argue that FA has an AP, defined by a L boundary tone on its left edge and a H boundary tone (i.e., Ha) on its right edge. In sum, we can conclude that, in neutral focus contexts, FA has an AP, but the AP does not have a pitch accent. That is, FA does not mark word prominence with a pitch accent even though it has stress. Instead, word prominence is marked by the boundary tones of an AP, at least for utterances produced in neutral focus contexts.

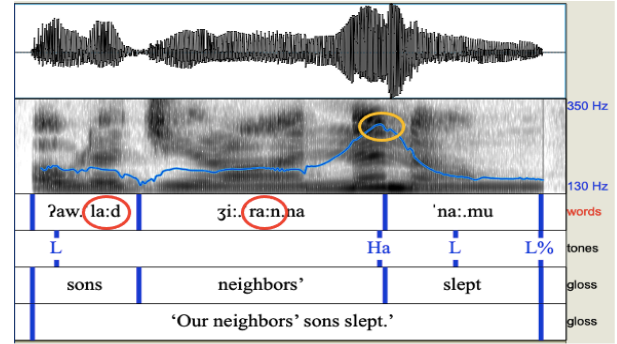


Figure 3: An f_0 track of 'Our neighbors' sons slept', where the first two words (sons, neighbors') together form a rising tonal pattern, suggesting the domain of a rising tone is an AP.

3.2. Evidence of Pitch accent in focus marking

We showed that FA does not have a pitch accent in the neutral focus condition. However, when a word is narrowly focused (in both types of narrow focus), its stressed syllable is lengthened and carries a sharp rising tone, which is analyzed as a LH* pitch accent. Figure 4 shows the same sentence as that in Figure 1, but with corrective narrow focus on the second word 'flattered'. Here, the f_0 peak is aligned with the word-initial stressed syllable, not the final syllable, of the word as in the neutral focus condition. This peak is also realized with a larger f_0 excursion than the same word in the neutral focus condition.

In Figure 4, we also see that the final syllable of both the pre-focus word and the focused word do not have a High tone (Ha) as in the neutral focus condition. First, to see if dephrasing occurred (i.e., no AP boundary) after focus, we compared the same sentences in the narrow focus condition and the neutral focus condition (where each word forms an AP). We measured the duration of the final syllable of the focused word and the initial syllable of the post-focus word and found that there was no significant difference in duration between the two focus conditions. Next, to see if dephrasing occurred before focus, we compared the duration of the pre-focus word's final syllable in the neutral condition with that of the narrow focus condition. We found that the duration of the syllable right before the focused word was significantly shorter ($p < .05$) in the narrow focus condition than in the neutral focus condition, suggesting that the boundary before focus is weaker than the AP boundary, i.e., dephrasing before focus. That is, a focused word forms one AP with the preceding word, forming the tonal pattern of [L LH* La].

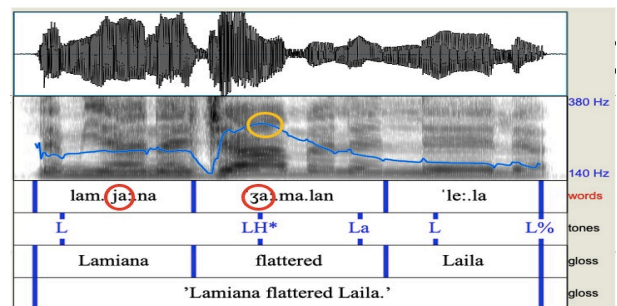


Figure 4: The same sentence as in Figure 1, but the 2nd word is narrowly focused, showing a LH* pitch accent on its stressed syllable. The AP boundary is deleted before the focused AP but not after.

Figure 5 shows the average f0 values measured in the middle of each syllable of a 3-syllable verb when the verb has initial stress (blue), medial stress (orange), or final stress (grey) in the neutral (left panel) vs. narrow (right panel) focus conditions. In the neutral focus condition (left), the highest f0 was always on the last syllable of the verb regardless of the stress location. On the other hand, in the narrow focus condition (right), the highest f0 was always on the stressed syllable of the verb regardless of the stress location. The f0 peak, measured in the *middle* of the stressed syllable, did not always correspond to the actual f0 peak of the syllable. This is because the highest f0 was often realized at the *end* of the syllable except for the final syllable. When stress was on the first or second syllable, the f0 reached its peak near the end of the stressed syllable and started falling slowly until the end of the word. However, when stress was on the final syllable, the f0 reached its peak in the *middle* of the syllable and fell sharply at the end of the syllable (for the AP-final Low tone target (La) at the end of the focused word). That's why the f0 value is the highest when stress is on the 3rd syllable (grey line) on the right panel of Figure 5.

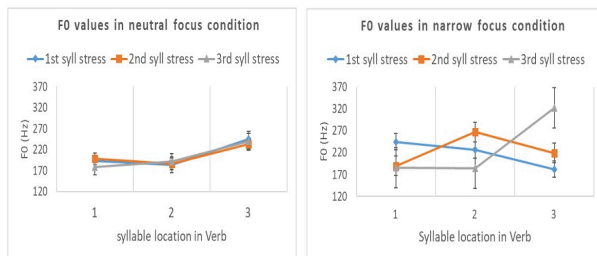


Figure 5: Left (neutral focus): the highest f0 is on the final (3rd) syllable regardless of stress location. Right (narrow focus): the highest f0 is on the stressed syllable of each verb.

Figures 6 and 7 show pitch tracks of sentences when focus is on the subject and the object, respectively. In both figures, the f0 peak is always on the stressed syllable of the focused word. When the subject was focused (Fig. 6), there was no AP boundary between the verb and object. The duration of the object's initial syllable was significantly shorter ($p < .05$) in the narrow focus than in the neutral focus condition, suggesting that all the post-focus words form a single AP. We also found that the words within the pre-focus string were dephrased, forming one AP together with the focused word (Fig. 7). That is, the focused word was located at the end of the focused AP, and the tonal pattern of the focused AP was always [L LH* La].

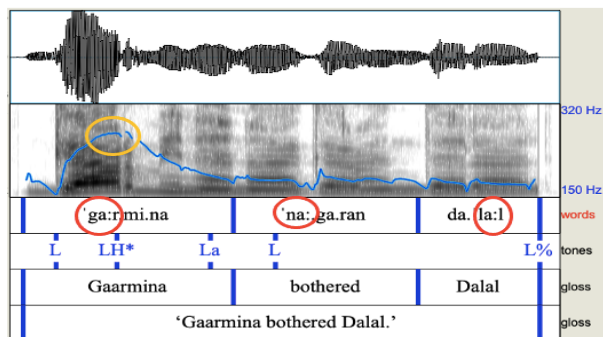


Figure 6: An f0 track of a sentence, where the 1st word (subject) is narrowly focused, forming one AP with a La boundary tone. Its stressed syllable carries a LH* pitch accent.

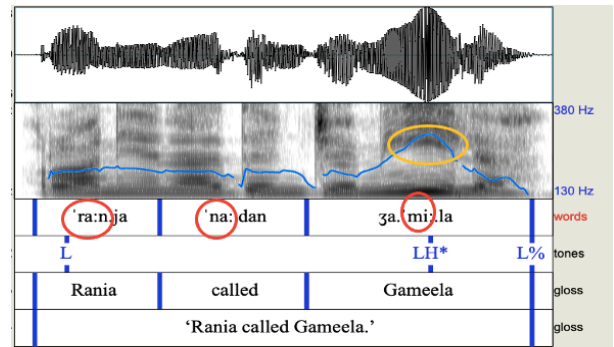


Figure 7: An f0 track of a sentence, where the last word (object) is narrowly focused. Its stressed syllable carries a LH* pitch accent.

3.3. Evidence of an Intermediate Phrase (ip)

We found that FA has an Intermediate Phrase (ip), a prosodic unit higher than an AP and smaller than an Intonational Phrase. An ip is defined by a high boundary tone, H-, which is higher than the preceding Ha tone. An ip boundary tone marks the edge of a syntactic constituents such as relative clauses (RC), adjuncts, and alternative questions. An example of an ip is shown in Figure 8, where the last syllable of the object ['ra:n.ja] 'Rania (name)' carries a H- tone, which is higher than the preceding Ha, and this H- boundary tone marks the boundary between the object 'Rania' and the object RC ('who explained the story'). Similarly, in Figure 9, the f0 peak on the last syllable of the object [ar.'ro:b] 'the dress' carries a H- tone, which is higher than the preceding Ha. This ip-final H- boundary tone marks the boundary before a prepositional phrase.

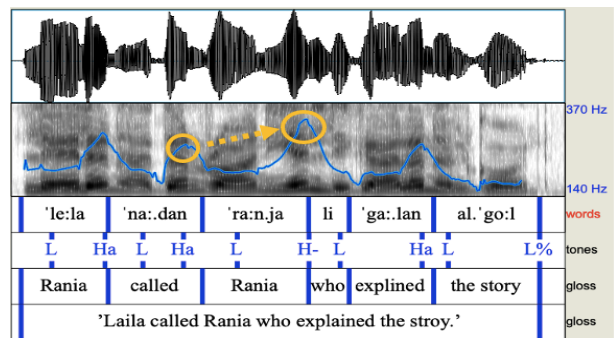


Figure 8: The ip-final H- boundary tone is higher than the preceding Ha and marks the boundary between the object and the object RC "who explained the story".

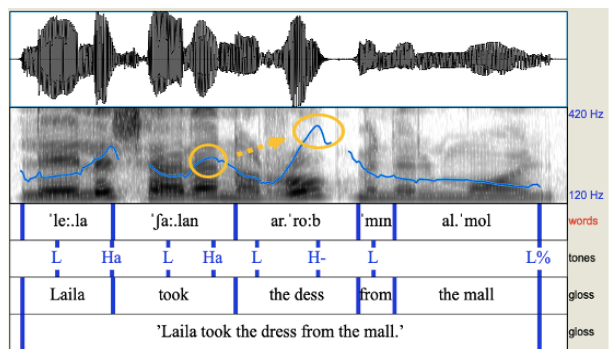


Figure 9: The ip-final H- boundary tone marks the boundary before a prepositional phrase, "from the mall".

3.4. Evidence of an Intonational Phrase (IP)

An Intonational Phrase (IP), the highest prosodic unit in FA, is defined by phrase-final lengthening and a boundary tone on the IP-final syllable, which delivers information about sentence types and various pragmatic meanings. So far, four boundary tones have been observed in our data: L% in declaratives and wh-questions (shown in all pitch track figures above); H% in yes/no-questions, continuation rises, and surprise statements (see Figure 10); !H% in alternative questions (see Figure 11); and LH% in shocking statements. Like Bengali [10] and Korean [11], the IP-final boundary tone in FA overrides the boundary tone of the lower prosodic units. This is shown when an IP ends with L%, i.e., in all the declarative sentences above (see Figures 1-9). An IP-final syllable is also an ip-final and an AP-final syllable, but when an IP-final syllable carries a L%, it does not show an AP-final Ha or an ip-final H- tone. This differs from English where both an ip-final boundary tone and an IP-final boundary tone are realized next to each other [1], [3].

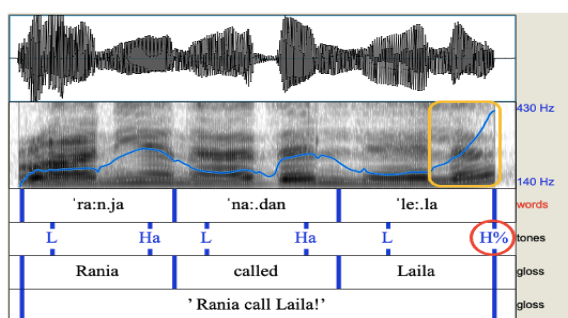


Figure 10: An example f_0 track of a statement expressing surprise, 'Rania called Laila!' The sentence ends in a H% boundary tone on the final syllable, which is marked by a yellow rectangle.

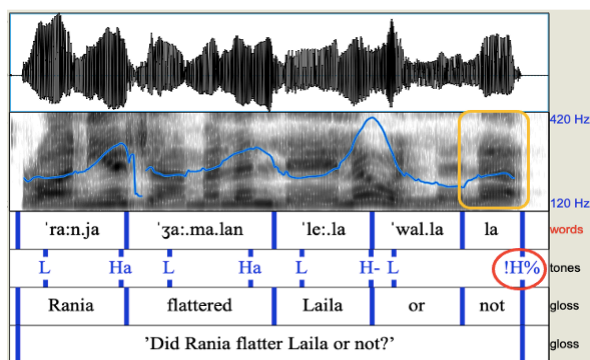


Figure 11: An example f_0 track of an alternative question, 'Did Rania flatter Laila or not?' The question ends in a !H% boundary tone on the final syllable (a yellow rectangle).

4. Discussion and Conclusions

Our study shows that Farasani Arabic has three prosodic units higher than a word: IP > ip > AP. An AP is defined by a [L Ha] tonal pattern in the neutral focus condition. It does not include a pitch accent even though FA has stress. In the narrow focus condition, the focused word does carry a LH* pitch accent and forms one AP together with the preceding words. In that case, the right edge of a focused AP is marked by La boundary tone. Thus, a focused AP has a tonal pattern of [L LH* La].

Figure 12 illustrates a proposed model of FA intonational phonology. This shows the prosodic hierarchy of FA defined by intonation for utterances produced in the neutral/broad focus condition (left) and in the narrow focus condition (right). Both trees show that an IP can have more than one ip and is marked by a boundary tone (T%) on its right edge, and an ip can have more than one AP and is marked by a H- boundary tone on its right edge. An AP can have more than one word (w) and its left edge is marked by a L boundary tone. Here, 's' refers to a syllable and 'S' refers to a stressed syllable. The two diagrams have been the same up until this point. However, the main difference between them is in the tonal pattern of the AP. When an AP includes no focused word, the AP-final syllable carries a H boundary tone (Ha), and the stressed syllable(s) is not involved in forming the tonal shape of the phrase. When an AP includes a focused word, however, the focused word comes at the end of the AP and the stressed syllable of the focused word carries a LH* pitch accent and the right edge of an AP is marked by a Low tone (La). Since a focused AP can include multiple pre-focus words, there can be a low plateau before the LH* pitch accented syllable in an AP.

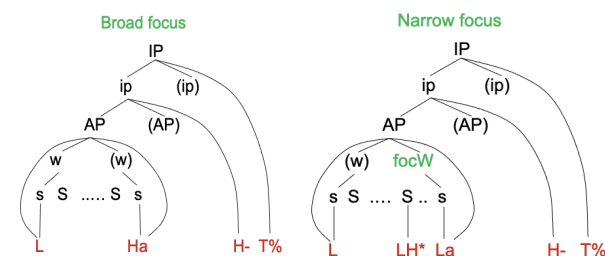


Figure 12: Intonation-based Prosodic Structure and tonal markings of Farasani Arabic in two focus conditions.

The prosodic system of Farasani Arabic is typologically unusual by having a stressed syllable but no pitch accent unless a word is emphasized. So far only a few languages have been claimed to be an exception to the association between stress and intonational pitch accent, e.g., Wolof [12], Kuot [13], and Uyghur [14]. However, whereas stressed syllables in these languages are not aligned with intonational events in all conditions, FA is unique because stressed syllables are aligned with intonational events only when a word is focused. That is, stress is partially involved in FA intonation. (We also observed that a word produced in isolation shows a H* pitch accent even though the word is not narrowly focused. This suggests that the stressed syllable carries a pitch accent when the word is not only focused but also forming one IP or pragmatically highlighted.)

FA intonation is an exception to the prosodic typology model proposed in Jun [6] not only because FA marks word prominence by edge tones even though it has a "head", i.e., lexical stress, but also because FA has a different prominence marking mechanism depending on the information structural considerations. That is, in neutral focus condition, FA belongs to an edge-prominence language, but in narrow focus condition, it belongs to a head/edge-prominence language (e.g., word prominence is marked by both a pitch accent and an AP boundary tone). We need to examine intonation of typologically more diverse languages to improve the model of prosodic typology. For FA, more research is needed to examine the intonation patterns of sentences having more complex syntactic structures and diverse pragmatic/discourse meanings. The intonation of FA should be also compared with the intonation of other Arabic varieties.

5. References

- [1] M. Beckman & J. Pierrehumbert, "Intonational structure in Japanese and English", *Phonology Yearbook* 3, 255-309, 1986.
- [2] R. D. Ladd, *Intonational Phonology*. Cambridge University Press, 1996/2008.
- [3] J. Pierrehumbert, *The Phonology and Phonetics of English Intonation*. PhD dissertation. MIT. 1980.
- [4] I. Muftah, *The Farasan people, sea, and history. Jazan, Saudi Arabia*. Jazan Literary Club. 2005.
- [5] S.-A. Jun, "Prosodic Typology", In Jun, S.-A. (ed.) *Prosodic Typology: The Phonology of Intonation and Phrasing*. Oxford University Press. Pp. 430-458, 2005.
- [6] S.-A. Jun, "Prosodic Typology: By prominence type, word prosody, and macro-rhythm", In Jun, S.-A. (ed.) *Prosodic Typology II: The Phonology of Intonation and Phrasing*. Oxford University Press. pp. 520-539, 2014.
- [7] P. Boersma & D. Weenink, Praat: doing phonetics by computer [Computer program]. Version 6.1.10. <http://www.praat.org/>, 2020
- [8] M. Beckman, J. Hirschberg, S. Shattuck-Hufnagel, "Original ToBI system and the evolution of the ToBI framework", in S.-A. Jun (ed.) *Prosodic Typology: The Phonology of Intonation and Phrasing*. Oxford University Press. pp. 9-54, 2005.
- [9] S.-A. Jun, J. Fletcher, "Methodology of Studying Intonation: From Data Collection to Data Analysis", in S.-A. Jun (ed.) *Prosodic Typology II: The Phonology of Intonation and Phrasing*. Oxford University Press. pp. 493-519, 2014.
- [10] S. Khan, *Intonational phonology and focus prosody of Bengali*. PhD dissertation. UCLA. 2008.
- [11] S.-A. Jun, "Korean Intonational Phonology and Prosodic Transcription", in S.-A. Jun (ed.) *Prosodic Typology: The Phonology of Intonation and Phrasing*. Oxford Univ. Press, pp. 201-229, 2005.
- [12] A. Rialland & S. Robert, "The Intonational system of Wolof", *Linguistics*, 39(5), 893-939, 2001.
- [13] E. Lindstrom & B. Remijsen, "Aspects of the prosody of Kuot, a language where intonation ignores stress", *Linguistics* 43(4). 839-870, 2005.
- [14] T. Major & C. Mayer, "Toward a phonological model of Uyghur intonation", in *Proceedings of the 9th International Conference on Speech Prosody*, Poznan, Poland, June 2018, pp. 744-748.