Spectral properties of diphthongs in two varieties of Assamese.

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Several studies have evidenced the presence of an articulatory undershoot in diphthongs [1, 2, 3, 4]. An element of the diphthong, usually the less prominent one often fails to achieve the endpoint of the vocalic element. Bladon [5] opines that one reason for this phenomenon lies in the perceptual probability that listeners pay more attention to the trajectory of the diphthong rather than the actual target. Another assumption comes from Hu [6] who opines that the distribution of the diphthongs in comparison to the corresponding monophthongs in an acoustic plane determines the presence of a spectral target. If the diphthong element has a more dispersed distribution than the monophthong, it tends not to have target and if the distribution is more comparable, the diphthong tends to have spectral target. Considering the variations in monophthongs in two varieties of Assamese, the paper examines the spectral properties of diphthongs in the two varieties.

Assamese is an Indo-Aryan language spoken by about 13 million people in the North-east Indian state of Assam and it has several varieties based on the geographic location of the speakers. Eastern Assamese (EA) and Western Assamese (WA) have distinct variations in several phonological, morphological and lexical aspects [7]. In case of monophthongs, the canonical 8 vowel system undergoes two different mergers in the varieties whereby EA becomes a seven vowel system and WA, an eight vowel system [8].

20 native speakers of Assamese, 5 males and 5 females each speaking EA and WA varieties were recorded for the study. Six Assamese falling diphthongs /ai, au, oi, ou, ei, eu/ and two level diphthongs /iu, ui/ appeared in a list of words. Diphthongs were annotated as composed of onset element, transition and offset elements. Onset of a steady state formant was considered vowel beginning and the termination of the steady state was considered vowel end. Formant frequencies F1 and F2 were extracted at midpoint of the elements in Hertz (Hz). Hz units were then converted to Mel scale using an inbuilt function on Praat 5.4. Plots of vowel group means with 1 standard deviation ellipses were generated on F1-F2 space. The mean durations of diphthong elements were calculated. In order to check the spectral dynamics of the diphthongs, the mean durations and the rate of spectral change for F1 and F2 was calculated following Tsukada [9].

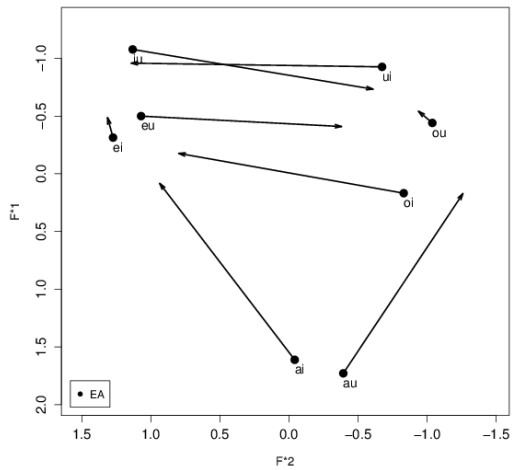

Fig 1: Diphthongs in EA variety in F1-F2 plane.

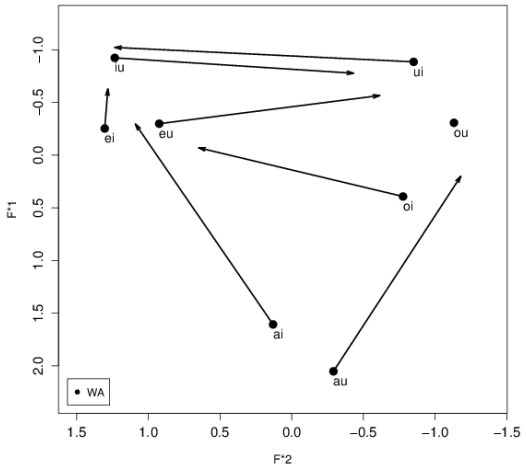

Fig 2: Diphthongs in WA variety in F1-F2 plane.

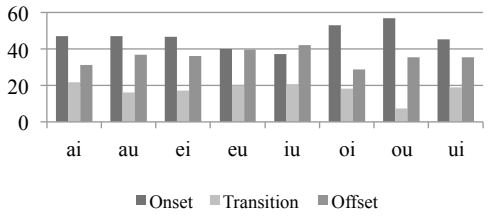

Fig. 3: Mean durations of diphthong elements in percentage for EA variety.

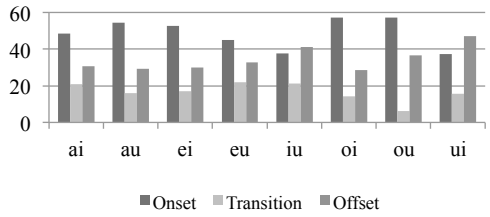

Fig. 4: Mean durations of diphthong elements in percentage for WA variety.

The diphthongs analyzed in both the varieties have shown similar patterns. In case of temporal properties, onset elements in both the varieties have been found to be longer than the offset for all the falling diphthongs. Transitions are the shortest elements of the diphthongs. Spectral results show that in both varieties falling diphthongs never reach the target, evidencing the presence of an articulatory undershoot, the offset in this case. However, the results also show that the onsets are more dispersed than the offsets. This suggests that falling diphthongs are composed of a single target in both EA and WA. The low transition duration in case of /ou/ and the high overlap of ellipses of the elements also suggest a possible monophthongization of this diphthong. The level diphthongs /iu/ and /ui/ have a clear target, however, it is the vowel /i/ rather than an element that has been seen as the target. /u/ in both the cases have larger dispersion and is more fronted than the monophthong. This suggests that in case of level diphthongs, although the targets may be different, it is the trajectory that is more important.

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