

Interaction between Breathiness and Nasality: An Acoustic Analysis

Authors : Pamir Gogoi, Ratree Wayland

Abstract : This study investigates the acoustic measures of breathiness when coarticulated with nasality. The acoustic correlates of breathiness and nasality that has already been well established after years of empirical research. Some of these acoustic parameters - like low frequency peaks and wider bandwidths- are common for both nasal and breathy voice. Therefore, it is likely that these parameters interact when a sound is coarticulated with breathiness and nasality. This leads to the hypothesis that the acoustic parameters, which usually act as robust cues in differentiating between breathy and modal voice, might not be reliable cues for differentiating between breathy and modal voice when breathiness is coarticulated with nasality. The effect of nasality on the perception of breathiness has been explored in earlier studies using synthesized speech. The results showed that perceptually, nasality and breathiness do interact. The current study investigates if a similar pattern is observed in natural speech. The study is conducted on Marathi, an Indo-Aryan language which has a three-way contrast between nasality and breathiness. That is, there is a phonemic distinction between nasals, breathy voice and breathy-nasals. Voice quality parameters like - H1-H2 (Difference between the amplitude of first and second harmonic), H1-A3 (Difference between the amplitude of first harmonic and third formant, CPP (Cepstral Peak Prominence), HNR (Harmonics to Noise ratio) and B1 (Bandwidth of first formant) were extracted. Statistical models like linear mixed effects regression and Random Forest classifiers show that measures that capture the noise component in the signal- like CPP and HNR- can classify breathy voice from modal voice better than spectral measures when breathy voice is coarticulated with nasality.

Keywords : breathiness, marathi, nasality, voice quality

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