VOCAL TRACT THEORY AND BOUNDARY EFFECTS

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Acoustic theory of speech production can be approached on various levels of ambition. The lowest one is to work with models for relating essentials of the formant pattern to a vocal tract model specified by a few parameters. This is the most common approach and is largely directed to the study of vowels. However, such models are less capable of handling absolute values than relational patterns. The next level of ambition is to gain a more profound insight in the actual cavity configurations within the vocal tract including details and overall constraints, consonant articulations, nasal cavity, cavity wall effects, radiation. A third level of ambition is to handle the aerodynamics of the voicing mechanism and of unvoiced sounds so as to enable a proper separation of source and filter characteristics, e.g. for the estimation of the glottis impedance and how the subglottal system affects the speech. At this level of analysis we need to consider second order effects in the analysis of rapidly changing impedance structures. Such effects could also have significance in dealing with rapidly opening or closing of the supraglottal tract. Formant bandwidths are to a considerable extent influenced by vocal tract "boundary" conditions. Of special interest is the temporal modulation of formant bandwidths by the glottal opening and closing within a voice period. The dependency of this modulation on voice register and vowel category will be discussed. Vowels with pharyngeal narrowing are especially sensitive to this damping which can be seen in the oscillogram as a truncation of the signal in the glottal open period.

Literature references appear in an expanded version of this summary.