ACOUSTICS2008/2319
Issues in the acoustic modeling of the vocal tract - a progress report on APEX

Björn Lindblom[a] and Johan Sundberg[b]
[a]Stockholm University, Universitetsvägen 10C, SE10691 Stockholm, Sweden
[b]KTH, Department of Speech, Music and Hearing, Lindstedtsvägen 24, SE-100 44 Stockholm, Sweden

Faced with an acoustic record of the human voice an investigator is often led to wonder: How was this sample produced? Direct articulatory measurements lacking, the researcher may nonetheless find information of value by resorting to numerical models that relate cavity shapes to acoustic parameters. The classical 'three-parameter models' exemplify this type of tool. The APEX model is another example, developed to help answering questions about the acoustic consequences of articulatory movements. Based on X-ray measurements from a single speaker, APEX converts input specifications for articulatory parameters such as jaw, lips, larynx, tongue tip and tongue body into formant frequencies. The introduction of independent control of the jaw and the tongue and the fact that possible tongue shapes are specified relative to a neutral reference tongue have made significant insights into various topics possible (e.g., coordination jaw/tongue in singing, compensatory articulations). Recently we have been able to increase the physiological realism of APEX representations using MRI and X-ray data. We have also investigated physical models to improve the treatment of certain 3-D front cavity configurations such as raised tongue blade and spread lips. The goal of our paper is to present an overview of the most recent version of APEX.