shown to closely resemble the transmission loss in the 1 dimensional case. Results for a 2 dimensional case show that the ratio is a quantity which does characterize the transmission of the structure as it is excited by the source.

4pSAc8. Fast solutions in FSI-Problems using CMS-Methods. Johannes Guggenberger (Mueller-BBM, Robert-Koch-Str. 11, 82152 Planegg, Germany, johannes.guggenberger@muellerbbm.de)

Parameter studies in FSI-problems may often become quite time consuming. In most cases the fluid parameters are well defined and only the influence of the parameters of the solid is subject to investigate. Therefore it would be desirable to investigate the fluid and solid part separately and finally combine them using CMS-Methods. This approach would also provide a good physical insight into the individual and combined behaviour of the components fluid and solid. Generally for each interface DOF one constraint mode must be added to the modal base. Since in most problems in FSI the fluid-structure interface involves many DOF the general CMS approach becomes inefficient. To reduce the number of constraint modes it is proposed to use the mode shapes of each component as a load function on the other domain. The static solution provides the modal based constraint modes. Their number corresponds to the number of total component modes which is in most cases much less then in the classic approach. The application is shown in optimization, updating, and monte-carlo-simulation problems.

THURSDAY AFTERNOON, 3 JULY 2008 ROOM 250B, 2:00 TO 3:40 P.M.

Session 4pSCa

Speech Communication: Articulatory Modeling and Control of Speech and Singing Organs

Maureen Stone, Cochair
Vocal Tract Visualization Lab, Depts of Biomedical Sciences and Orthodontics, University of Maryland Dental School, 650 W. Baltimore St., Baltimore, MD 21201, USA

Phil Hoole, Cochair
Institut für Phonetik und Sprachverarbeitung, Schellingstr. 3, München, 80799, Germany

Invited Papers

2:00

4pSCa1. Issues in the acoustic modeling of the vocal tract - a progress report on APEX. Björn Lindblom (Stockholm University, Universitetsvägen 10C, SE10691 Stockholm, Sweden, lindblom@ling.su.se), Johan Sundberg (KTH, Department of Speech, Music and Hearing, Lindstedtsvägen 24, SE-100 44 Stockholm, Sweden, jsu@csc.kth.se)

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.

2:20

4pSCa2. Articulatory comparison of spoken and sung vowels based on MRI. Pierre Badin (Département Parole & Cognition, GIPSA-lab, 46, avenue Félix Viallet, 38031 Grenoble Cedex, France, pierre.badin@gipsa-lab.inpg.fr), Nathalie Henrich (Département Parole & Cognition, GIPSA-lab, 46, avenue Félix Viallet, 38031 Grenoble Cedex, France, Nathalie.Henrich@gipsa-lab.inpg.fr), Laurent Lamalle (Plateforme régionale IRM 3Tesla, IFR n° 1, RMN Biomédicale : de la cellule à l'homme, CHU de Grenoble, BP 217, 38043 Grenoble Cedex 9, France, Laurent.Lamalle@ujf-grenoble.fr)

Understanding the differences of articulatory strategies between spoken and sung vowels is of interest to both speech and singing research. We have thus used MRI to record midsagittal images from three subjects producing sustained vowels with various characteristics. The subjects were a professional lyric soprano, a semi-professional soprano, and a semi professional bass. They were instructed to produce combinations of (1) the ten French or the five Italian oral vowels, (2) speaking, amateur singing, or professional singing modes, (3) chest or falsetto registers, (4) pitch levels varying from B2 (120 Hz) to F5 (700 Hz). Any combination that the subject would not feel comfortable with was excluded from the corpus. The midsagittal contours of the vocal organs (jaw, lips, tongue, velum, pharyngeal wall, hyoid bone, etc.) were manually traced on each image, and a number of articulatory measurements (jaw or hyoid bone height, lip aperture, tongue position, etc.) were automatically derived. Our contribution analyses the influence of the various production conditions on these articulatory characteristics, such as the jaw aperture increase related to pitch increase, or the lower position of the larynx for singing in comparison to speech. Some acoustics considerations will be discussed as well.