The frequency scale of intonation

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N6. Separation of total transfer function phase into propagation and reverberant components. Lan Liu and Richard H. Lyon (Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139)

Previously reported theory of phase decomposition used the complex cepstrum to extract the all-pass phase from the total phase of acoustical space transfer functions. The all-pass phase is associated with the reverberant properties of two- and three-dimensional spaces. The dereverberation of acoustical signals in such spaces can be accomplished by this separation. This paper describes the results of some recent experimental studies of sound propagation in one-, two-, and three-dimensional spaces. A comparison of the expected and observed components of reverberant and propagation phase, with the results from these experiments, is presented.

TUESDAY AFTERNOON, 28 NOVEMBER 1989  ST. LOUIS BALLROOM A, 3:00 TO 5:12 P.M.

Session O. Speech Communication III: Fundamental Frequency and Intonation

George D. Allen, Chairman
Department of Audiology and Speech Science, Purdue University, West Lafayette, Indiana 47907

Contributed Papers

O1. Individual differences in voice quality perception. Jody Kreiman, Bruce R. Gerratt, and Kristin Precoda (West Los Angeles VA Medical Center, Audiology and Speech Pathology (126), Wilshire and Sawtelle Boulevards, Los Angeles, CA 90073, and UCLA School of Medicine, CHS 62-132, UCLA, Los Angeles, CA 90024)

Sixteen listeners judged the similarity of all possible pairs of 18 pathological voices and, in a separate session, 18 normal voices. Individual differences, multidimensional scaling was used to derive a separate perceptual space for each listener/voice set combination. These scaling solutions accounted for an average of 83% of the variance in similarity ratings for pathological voices, and 77% for normal voices. Listeners varied substantially in the acoustic characteristics they attended to when judging vocal similarity. Although all perceptual spaces included an F0 dimension, no other parameter was used by more than half the listeners, for either voice set. Listeners who shared common perceptual dimensions often differed in the way they used the same acoustic information. For example, F0 was used as a continuous dimension by some listeners, and to sort voices into groups (high- and low-pitched groups, pathological and normal groups, etc.) by others; combinations of these strategies also occurred. Implications of these results for models of voice quality perception will be discussed.

O2. The perception of the low-high (LH) tonal sequence. Kazue Hata (Speech Technology Laboratory, 3888 State Street, Santa Barbara, CA 93105) and Yoko Hasegawa (Department of Linguistics, University of California, Berkeley, CA 94720)

It has been reported that the primary cue for the HL tonal perception in Japanese is not the actual F0 peak location but rather a falling F0 contour. The F0 fall may be significantly delayed, resulting in the F0 peak within the L-toned syllable. Furthermore, it was found earlier that (1) the later the F0 fall in the L-toned syllable, the steeper the fall rate required and (2) the fall must begin within the first two-thirds of the duration of the vowel in the L-toned syllable. The present experiment investigates whether a lack of synchronization between F0 change and syllable boundary can be found in the perception of the LH as well. Synthesized nonsense words /mamama/ were prepared in such a way that both the onset of F0 rise and the F0 peak occur at various locations, while maintaining the overall F0 contour (level-rise-peak-slight fall). The stimuli were presented to native speakers of Japanese to determine the boundary between the categorical perception of LHH and LLH. The results show that the LH sequence is more constrained than the HL in terms of temporal alignment of F0 change and the syllable boundary.

O3. The frequency scale of intonation. Dik J. Hermes and Joost C. van Gestel (Institute for Perception Research/IPO, P. O. Box 513, NL 5600 MB Eindhoven, The Netherlands)

Results will be presented showing that accent-lending pitch movements are perceived on a critical-band scale. A sentence was resynthesized in two versions differing in pitch and in formant frequencies. The lower-pitched version sounded like a male voice, the higher one like a female voice. One syllable was rendered prominent by means of a pitch movement. The pitch contours of the two versions ran parallel on any of three frequency scales: a logarithmic frequency scale (semitones), a critical-band scale, or a linear frequency scale (Hz). In 2AFC experiments, subjects indicated which version the accented syllable was more prominent. Only when the excursions of the pitch movements were equal on a critical-band scale, the choice was random. In case of equality in semitones, subjects perceived the accent in the lower version as more prominent. In case of equality in Hz, the accent in the lower version was perceived as more prominent. These results allow a perceptually more realistic measuring of the prominence of accented syllables. [Work supported by Instituut voor Doven, St-Michielsgestel, The Netherlands.]

O4. Fundamental frequency and perceived prominence of accented syllables. J. Terken and R. Collier (Institute for Perception Research, P. O. Box 513, 5600MB Eindhoven, The Netherlands)

3:00

3:12

3:24

3:36