

controlled by different variables than the mid/high-frequency ISPL. This suggests that a two-metric system would be valuable where the first metric describes the low-frequency performance and the second metric describes the mid/high-frequency performance. Field testing experience is presented showing that IIC does not adequately differentiate the mid/high-frequency performance of various resilient materials. Candidate mid/high-frequency metrics are evaluated to determine if any result in improved methods for evaluation and rank-ordering of floor/ceiling assemblies.

3:40

3pSA7. Flanking impact sound transmission in wood-framed multifamily construction. David Quirt and Trevor Nightingale (Acoust. Group, Inst. for Res. in Construction, Natl. Res. Council Canada, Ottawa, K1A 0R6 Canada)

This paper reports findings from a recently completed study of flanking sound transmission involving the wall/floor junction in wood-framed multifamily buildings. Flanking transmission exists in all buildings, but it can be controlled through good design. The paper examines how common construction details affect flanking paths between horizontally, vertically, and diagonally separated rooms. Variables considered include mounting conditions and orientation of the floor joists, framing of the wall assembly and any associated fire blocking, and mounting and number of layers of gypsum board. Estimates of the apparent sound insulation were obtained by summing the energy transmitted by the direct path through the wall or floor assembly separating the pair of rooms, and all the flanking paths involving the relevant wall-floor junctions. Results indicate that if there is no floor topping (i.e., the subfloor is bare) the apparent sound insulation

for both airborne and impact sources is typically limited by flanking transmission involving the floor. Since, the source room floor is an element common to all impact flanking paths, three different toppings were evaluated as treatment options, and additional layers of gypsum board and resilient mounting were considered as options for the walls. The effectiveness of each option is discussed

3:55

3pSA8. Case history building structural vibration isolation for 500 Atlantic Avenue. Gregory Tocci (Cavanaugh Tocci Assoc., Inc., 327F Boston Post Rd., Sudbury, MA 01776), George Wilson, James Phillips (Wilson Ihrig & Assoc., Inc.), Gladys Unger, and James Moore (R.H. Lyon Div. of Acentech)

Vent Building 3 of the new Central Artery Tunnel located at 500 Atlantic Avenue in Boston, Massachusetts is a heavy poured in place concrete structure with its roof situated about 3 ft. below grade. The vent building contains 23 100+-in.-diameter double-width centrifugal fans that, for a number of reasons, are not vibration isolated. The fans exhaust into a cluster of reinforced concrete shafts that rises up to about 250 ft. above grade. The tall stacks have been embedded in a luxury hotel/residential condominium complex that Extell Development Company is currently constructing. The stacks provide both vertical support and seismic support for the building. This paper summarizes the history of work on the project, and compares predicted and measured sound and vibration levels in representative building spaces. [We wish to acknowledge the support of Extell Development Company, Boston, MA for their support of this work.]

THURSDAY AFTERNOON, 30 NOVEMBER 2006

LANAI ROOM, 1:00 TO 5:15 P.M.

Session 3pSC

Speech Communication: Speech Timing and Pronunciation Training for the Japanese Language

Robert F. Port, Cochair

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Chair's Introduction—1:00

Invited Papers

1:05

3pSC1. Timing variations of frequent utterances occurring in a very large corpus of spontaneous Japanese conversational speech. Nick Campbell (ATR, Kyoto, Japan)

A corpus of spontaneous conversational Japanese speech was collected from volunteer subjects who wore high-quality head-mounted microphones and recorded their daily spoken interactions to minidisk over a period of 5 years. All recordings were transcribed and tagged according to interlocutor type, and a portion representing about 10% was further annotated for speech-act, speaker-state, emotion, and speaking style. This paper presents timing data from the corpus, showing how the same utterance can vary according to speaking style and other factors. It presents the hundred most common utterances in the corpus and relates their durations to spectral and prosodic characteristics that vary according to affect, attitude, intention, and relationship with the listener.

1:25

3pSC2. On the generation and perception characteristics of Japanese timing control. Yoshinori Sagisaka (Waseda Univ. 29-7 Bldg., 1-3-10 Nishi-Waseda, Shinjuku-ku, Tokyo 169-0051 Japan, sagisaka@giti.waseda.ac.jp), Makiko Muto (Univ. of Tokyo, Japan), Hiroaki Kato (NiCT/ATR, Japan), and Minoru Tsuzaki (Kyoto City Univ., Japan)

We have been studying temporal characteristics of Japanese for decades. Not only acoustic measurements but also perceptual studies on temporal modification have revealed the control principles lying behind manifestation of segmental duration characteristics. This talk tries to introduce familiar generation principles such as "mora-timing" and phrasal tempo reset from the viewpoint of humans temporal organization through the understanding of duration statistics. Moreover, by showing perceptual characteristics

including sentential factors, we would like to propose how linguistic units relate to temporal perception and what kind of information form can be considered in temporal cognition process. Some of our recent efforts will also be presented to investigate language-dependent temporal characteristics by observing non-native learners temporal control characteristics. We really expect that we will be able to have a better picture of generation and perception mechanism through the cross check of their characteristic differences between natives and non-natives. [Work supported by Waseda Univ. RISE research project of “Analysis and modeling of human mechanism in speech and language processing” and Grant-in-Aid for and Scientific Research A-2, No. 16200016 of JSPS.]

1:45

3pSC3. Temporal control in Japanese dialects. Haruo Kubozono (Kobe Univ., Nada-ku, Kobe 657-8501 Japan, kubozono@lit.kobe-u.ac.jp)

This paper discusses the extent to which temporal control varies among Japanese dialects. Most dialects of Japanese including Tokyo Japanese are so-called “mora dialects” in which the mora serves as the basic unit of timing. In the periphery of Japan, however, we find a couple of dialects called “syllable dialects” whose basic phonological unit is the syllable rather than the mora. Kagoshima Japanese (KJ) is one such dialect, but little is known about its temporal organization. The main purpose of this paper is to report on the results of an acoustic experiment on this syllable-based dialect and to compare them with those of the experiments about Tokyo Japanese (TJ). This comparison reveals the following four points: (i) geminate consonants are considerably longer than single consonants in both TJ and KJ, (ii) however, the phonetic duration of words in KJ is not determined by the number of moras involved but by the number of syllables, (iii) in KJ, vowels are consistently shorter when they follow geminate consonants than when following single consonants, and (iv) unlike English, Korean, and other languages, neither TJ nor KJ shows an effect of vowel shortening in closed syllables.

2:05

3pSC4. Japanese mora-timing and processing: The case of devoiced vowels. Natasha Warner and Naomi Ogasawara (Dept. of Linguist., Univ. of Arizona, P.O. Box 210028, Tucson, AZ 85721-0028, nwarner@u.arizona.edu)

An extensive literature has argued that Japanese speakers compensate for inherent durational differences to keep moras to approximately equal lengths (e.g., Han, 1962; Port *et al.*, 1980; Minagawa-Kawai, 1999; reviewed in Warner and Arai, 2001a). However, near-regularity of moras may not be because of intentional compensation (Warner and Arai, 2001b). This paper examines Japanese listeners processing, rather than production, of one case of irregularly timed moras: vowel devoicing. When Japanese vowels are devoiced, the mora tends to be shorter than usual. If speakers aim for regular timing, one might predict that listeners would also expect moras to be regularly timed and would thus have difficulty processing sequences that deviate from regular mora timing. However, one could predict that listeners are aware of what deviations from regular timing to expect, and thus have no difficulty processing timing deviations. The results, from phoneme monitoring and lexical decision tasks, show that listeners only have difficulty processing devoiced vowels in environments where devoicing would not be expected. In fact, where devoicing would be typical, listeners find devoiced vowels easier to process. This suggests that in processing, knowledge of patterns in the language outweighs any bias toward regularly timed moras.

2:25

3pSC5. Perception and production of long and short vowels in Japanese by children. Takayuki Arai (Dept. of Elec. and Electron. Eng., Sophia Univ., 7-1 Kioi-cho, Chiyoda-ku, Tokyo, 102-8554 Japan), Kyoko Iitaka, and Eriko Ohki (Sophia Univ., Chiyoda-ku, Tokyo, 102-8554 Japan)

Studies have shown that acquisition of reading depends on such phonological processes as verbal short-term memory and temporal processing of speech. An inability to encode phonological representations orthographically may cause reading disabilities, such as dyslexia. Categorical perception is known to be closely associated with phonological encoding. Thus, studies examining the temporal processing of speech sound categorization may be useful in differential diagnoses of reading development and disabilities. The first study examines the perception of long and short Japanese vowels by a group of seven normal six-year-old children and two with delayed phonological development. Subjects were asked to identify vowel length in sets of words. The first vowel in each stimulus word was made to vary with respect to length. Perception by normal and delayed children differed in ways similar to what had been reported in previous English studies. In the second study, the relation between perception and reading of long/short vowels was examined by a group of 125 children ages 4 to 8. Similar settings were used for the second experiment. The results showed that (1) a large developmental change of perception was observed in ages 6–8 and (2) a positive correlation was obtained between perception and reading tasks.

2:45

3pSC6. Effects of speaking style on the regularity of mora timing in Japanese. Michael Connolly Brady, Robert F. Port, and Kyoko Nagao (Dept. of Linguist., Indiana Univ., Bloomington, IN 47405)

The regularity of mora timing in Japanese has remained controversial over the years [Warner and Arai, *Phonetica* 58, 1–25 (2001)]. It is possible that the degree of regularity varies with speaking style. Four Japanese subjects spoke six-mora proper names with varying syllable structures where the second name had either three simple syllables (e.g., *Tomiko*) or two syllables with a long vowel (e.g., *Tooko*) or a long consonant (e.g., *Tokko*). These were read either in formal sentences, read in conversational style sentences, or used in spontaneous description of pictures of characters having these names. Moras were measured as the intervals between vowel onsets using an automatic vowel-onset detection algorithm. Although all styles suggested regular mora timing, the results show that the styles differ in the degree of temporal compensation for the moras constituted by long vowels and long consonants which are shorter than consonant-vowel syllables. The compensation was clearest in the most formal style of speech.