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## FOUR POINT FOUR

### Language Learners' Speech

#### (1) Construction of Speech Database for Second Language Learning of Japanese

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#### 1 PURPOSE AND BACKGROUND

Computers increasingly provide language learners with greater opportunities for ubiquitous learning through the use of large-scale databases, such as speech and text based ones. In this section, I report on the construction of a speech database for non-native Japanese speakers, with the aim of contributing to research and education on Japanese language learning systems. Nishina *et al.* have constructed a speech database for Japanese language learning and teaching under a Grant-in-Aid for Scientific Research on Priority Areas (A) research project conducted from 2000 to 2003. Contained in the database are recordings of 141 non-native speakers of Japanese. The distinctive features of these speakers can be analyzed in terms of pronunciation and prosody.

#### 2 CONTENTS

There are four different types of data files for each of the 141 non-native speakers.

##### 1. *Reading data for approximately 100 ATR sentences*

The Advanced Telecommunications Research Institute International (ATR) has developed phonetically balanced Japanese sentences for reading tasks. These consist of ten blocks, each of which contains either 50 or 53 sentences, making 503 sentences in total. All of the utterances and sentences are in Japanese. The fact that the task materials include recordings of native Japanese speakers makes it possible to compare native and non-native speakers; we decided to use these tasks precisely for that reason. However, the sentences are quite difficult to pronounce, even for adult native speakers. Accordingly, only 303 sentences out of the total set of 503 sentences were used, which were selected as being simpler sentences for non-native speakers to read with Japanese-English vocabulary lists for the tasks. The following sentence is one example of the selected sentences.

Example 1. *Unagi ya Ni WA nekki no yoona mono ga minagiru.*  
(The eel restaurant was filled with hot stuff).

TABLE 1 MINIMAL-PAIR PRONUNCIATION TASKS.

Pronunciation Type		Examples
1	Vowel / long vowel	<i>biru</i> (building) / <i>biiru</i> (beer)
2	Voiceless vowel	<i>tsu-ki</i> (moon) / <i>kishi</i> (bank)
3	Voiceless consonant/voiced consonant	<i>pin</i> (pin) / <i>bin</i> (bottle)
4	<i>Shi</i> / <i>hi</i>	<i>shikaku</i> (qualification) / <i>hikaku</i> (comparison)
5	<i>Su</i> / <i>tsu</i>	<i>tsuki</i> (moon) / <i>suki</i> (like)
6	<i>Chi</i> / <i>tsu</i>	<i>Chiru</i> (to fall) / <i>tsuru</i> (to hang)
7	<i>Da, de, do</i> / <i>ra, ri, ru, ru, re, ro</i> / <i>na, ni, nu, ne, no</i>	<i>hade</i> (flashy) / <i>hane</i> (shuttlecock) / <i>hare</i> (sunny)
8	Nasal consonant in <i>ka, ki, ku, ke, ko</i> / <i>ga, gi, gu, ge, go</i>	<i>kaikai</i> (opening a ceremony) / <i>kaigai</i> (overseas)
9	Contracted ( <i>yoo-on</i> ) / plain ( <i>choku-on</i> )	<i>kyaku</i> (guest) / <i>kaku</i> (angle)
10	Syllabic nasal <i>N</i>	<i>hon o yomu</i> (I read a book)
11	Double consonant	<i>kite</i> (to come) / <i>kitte</i> (postage stamp)
12	Nasal / double consonant sound	<i>ageru</i> (to rise) / <i>agatta</i> (to have risen)
13	<i>Za</i> / <i>ja</i>	<i>kanzashi</i> (hairpin) / <i>kanja</i> (patient)
14	<i>Tu</i> / <i>chu</i>	<i>tsuushin</i> (communication) / <i>chuushin</i> (concentrate)

## 2. Minimal pair tasks for difficult pronunciations

We have observed that non-native speakers have difficulties pronouncing certain Japanese words. The Japanese language is a pitch accent language and all syllables are pronounced with either a high or a low pitch, while English is pronounced with stress accents. Moreover, all Japanese syllables are pronounced as being approximately equal in length and stress. Among the items that might be difficult for the participants to pronounce, we selected 115 minimal-pair words for the speech recordings. These minimal pairs can be basically classified into the 14 groups shown in Table 1.

## 3. Reading data for 108 sentences including difficult pronunciation words

We decided that utterances should be evaluated within the context of a sentence. Accordingly, we prepared 108 sentences that included the 115 minimal-pair words. In addition, the accents of the minimal pairs were made as similar as possible. Special attention was also given to ensure that the sentences were natural, with easy-to-understand meanings. One example sentence is presented below:

Example 2. *Tenki ga warui node, denki o tsuketa.*

(Because the weather was bad, I switched on the lights.)

*Tenki* (weather) and *denki* (electricity) is an example of a voiceless and a voiced word contrasted within a sentence.

#### 4. Dialogue reading data including 11 types of prosody

In order to evaluate the prosody of non-native speakers, a dialogue reading task was also included in the test. For effective evaluations, the dialogue task was divided into 11 different items, differing in terms of their syntactic structures, such as simple yes/no questions or wh-questions, right-based or left-based structures, and various types of final particles. The prosodic boundaries were defined depending on the right- or left-based structures. Some examples are provided below:

Example 3. A: *Jirou wa donna ie ni sunde imasuka?*

(What kind of house do you (*Jirou*) live in?)

B: *Aoi yane no ie desu.* (A house with a blue roof.)

Example 4. A: *Yumiko wa donna ie ni sunde imasuka?*

(What kind of house do you (*Yumiko*) live in?)

B: *Aoi / ookina ie desu.* (A big, blue house.)

Example 3 is a left-based structure while Example 4 is a right-based structure. The speaker should say *aoi yane* without a pause in Example 3, while in the case of Example 4 the speaker should say *aoi / ooki* with a pause, reflecting the meanings of the respective sentences.

### 3 PARTICIPANTS

The 141 overseas students who read the four different types of task were from eight universities that some of the project members are affiliated with: Iwate University, Kyoto University, Osaka University, Tokyo Institute of Technology, Tohoku University, Toyohashi University of Technology, the University of Tsukuba, and the University of Tokyo.

More than ten native languages were represented among the participants, including Chinese, Korean, Thai, Vietnamese, Malaysian Indonesian, Arabic, Spanish, French, and English. Their Japanese language abilities ranged from intermediate to advanced levels at the respective universities, with Japanese language learning periods ranging from six months to three years.

### 4 EVALUATION

We prepared a web interface in order to evaluate the data according to five levels. The evaluation results indicate that evaluators are rather strict with respect to phonemes, but are more lenient about prosodic issues. It seems that learners must be able to pronounce basic phonemes properly before they can make themselves understood. On the other hand, teachers tend to be more willing to accept errors in prosody. The underlying reasons for this are a topic that should be investigated in future research.



## 5 RESEARCH USES

The database is being used by researchers in various fields, such as speech recognition and linguistics. For example, Ohta and Nakagawa<sup>4,5</sup> have employed the database to develop evaluation methods, while Omata *et al.*<sup>6</sup> have utilized the data to analyze samples of Japanese speech uttered by native Korean speakers.

## 6 CONCLUSION

We constructed four types of reading tasks and recorded data from 141 participants. While we recognize that accent and intonation for a word are important aspects of speech, these have not been included in the present database. We selected items where the most important issue is for the non-native speaker to be understood. These non-native speakers, with diverse mother tongues, were observed to have distinctive features in terms of their pronunciations of the Japanese language. We have conducted evaluations and presented various special features of non-native speakers according to the mother tongue. The database has been used by numerous researchers to advance their various research projects. We believe that the construction of this speech database will serve as a useful tool for technological and pedagogical research into speech-related aspects of Japanese language teaching.

The database corpus was distributed in 2002 on five CD-ROMs, which include the reading text sentences, words and dialogues. Furthermore, in 2007, this database was stored as a speech resource by the Speech Resources Consortium supported by the National Institute of Informatics<sup>8</sup>. Accordingly, the database is now even more accessible.

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# COMPUTER PROCESSING OF ASIAN SPOKEN LANGUAGES