Taiwan Child Language Corpus: Data Collection and Annotation

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Abstract

Taiwan Child Language Corpus contains scripts transcribed from about 330 hours of recordings of fourteen young children from Southern Min Chinese speaking families in Taiwan. The format of the corpus adopts the Child Language Data Exchange System (CHILDES). The size of the corpus is about 1.6 million words. In this paper, we describe data collection, transcription, word segmentation, and part-of-speech annotation of this corpus. Applications of the corpus are also discussed.

1  Data Collection

Taiwan Child Language Corpus (TAICORP) is a corpus of text files transcribed from the child speech recorded between October 1997 through May 2000. The target language is Southern Min Chinese spoken in Taiwan.

1.1  Children

All fourteen children participated were from Taiwanese-speaking families in Min-Hsiung Village, Chiayi County, Taiwan.

There were nine boys and five girls, aged from one year two months to three years and eleven months at the beginning of the project. More than half of the children were recorded over more than two years.

1.2  Recordings

The recordings were made through regular home visits. Spontaneous speech of these children at play was recorded using Mini Disc recorders. The interval of the sessions was about two weeks. There were totally 431 recording sessions, each 40 to 60 minutes long, totaling about 330 hours.

1.3  Transcription

Each recording session was transcribed into a separate text file, using Chinese orthography. For words that do not have a conventionalized written form, the Taiwan Southern Min romanization system, i.e., Taiwan Southern Min Pinyin was used.

About half of the sessions (from children under two and a half years old) also have phonetic transcription in unicode IPA (International Phonetic Alphabet).

The three primary transcribers, who were also the investigators who did the recordings, were well-trained linguists. All recordings were first transcribed by the investigator of the specific session and then checked by the other two transcribers.

2  Text files in CHILDES format

TAICORP adopts the format of CHILDES (Child Language Data Exchange System), originally set up by Elizabeth Bates, Brian MacWhinney, and Catherine Snow, to transcribe and code the recordings of child speech into machine-readable text (MacWhinney & Snow 1985, MacWhinney 1995).

The main components of CHILDES format are headers and tiers.

2.1  Headers

Obligatory headers are necessary for every file. They mark the beginning, the end and the participants of the file.

Constant headers mark the name of the file and the background information of the children.
**Changeable headers** contain information that can change within the file, such as the recording date, duration, coders and so on. These headers begin with @, for example:

**Obligatory headers:**
- @Begin
- @End
- @Participants

**Constant headers:**
- @Age of XXX:
- @Birth of XXX:
- @Coder:
- @Educ of XXX:
- @Filename:
- @ID:
- @Language:
- @Language of XXX:
- @SES of XXX: social and economic status of a specific speaker
- @Sex of XXX:
- @Warning: the defects of the file

**Changeable headers:**
- @Activities:
- @Comment:
- @Date:
- @Location:
- @New Episode:
- @Room Layout:
- @Situation:
- @Tape Location:
- @Time Duration:
- @Time Start:

### 2.2 Tiers

The content of a file is presented in tiers, including main tiers and dependent tiers. A main tier, indicated by *, contains the utterance of the speaker.

**Main tiers**

The main tiers used in TAICORP include the following:
- * INV: the utterance of the investigator
- * CHI: the utterance of the target child
- * MOT: the utterance of mother
- * FAT: the utterance of father
- * SIS: the utterance of sister
- * BRO: the utterance of brother
- * GRM: the utterance of grandmother
- * GRF: the utterance of grandfather
- * OTH: the utterance of other people

The main tier is the most important tier because it is where the utterances are listed. The utterances in the main tier were transcribed in the romanization (pinyin) system of Taiwan Southern Min (to be explained and illustrated in Section 5).

**Dependent Tiers**

Additional information is given in dependent tiers, indicated by %, following the main tier. Dependent tiers can be changed according to the design and goals of each corpus.

The dependent tiers used in TAICORP include the following:

- %ort: transcription in standard orthography
- %cod: part-of-speech coding
- %pho: phonetic transcription in IPA
- %ton: tone value in 5-point scale

For adults' speech, only %ort and %cod tiers are used. For younger children's speech, %pho and %ton tiers are also used. The following text is an example from TAICORP. ([m…] = speech in Mandarin; SHI = 是 "be")

@Begin
@Participants: CHI Lin Target_Child, INV Rose Investigator, MOT Mother, OTH Great Grandmother
@Age of CHI: 2;1.22
@Birth of CHI: 28-AUG-1995
@Sex of CHI: Male
@Coder: Rose, Kay, Joyce
@Language: Taiwanese
@Date: 20-OCT-1997
@Tape Location: Lin D1-1-56
@Comment: Time Duration 37 minutes
@Location: Chiayi, Taiwan
@Transcriber: Rose
@Comment: Track number is D1-1

*INV: bo2lin2@s [=m], li2 tha5tu2a2 khi3 to2?
%ort: [m 柏林], 你頭挂仔 去 陀?
3 Statistics of the corpus

The corpus size is about 1.6 million words (more than 2 million morphemes/Chinese characters). The number of utterances/lines, words, mean length of utterances (MLU) are listed in Table 1.

|       | Lines   | Words    | MLU   |
|-------|---------|----------|-------|
| Children | 161,253 | 434,557  | 2.695 |
| Adults  | 336,173 | 1,211,946| 3.605 |
| Total   | 497,426 | 1,646,503| 3.150 |

Table 1 Statistics of the corpus

It might be worth mentioning that the MLU of adults in this corpus is relatively short. This could be attributed to the nature of this corpus as being child-directed speech.

4 Part-of-speech annotation

Southern Min and Mandarin are both Sinitic languages. They are very similar in their morphology and syntactic structures. Therefore, we adopted the part-of-speech coding system of the Sinica Corpus, Academia Sinica, Taiwan (see various CKIP technical reports). However, among the 115 categories used in the Sinica Corpus (CKIP 1993), only 46 codes were used in TAICORP. In other words, categorization in TAICORP is broader. These codes are listed in Table 2.

Table 2 Part-of-Speech Tagset in TAICORP

| Coding | Part-of-speech                   |
|--------|---------------------------------|
| A      | non-predicative adjective       |
| Caa    | coordinate conjunction          |
| Cab    | listing conjunction             |
| Cba    | conjunction occurring at the end of a sentence |
| Cbb    | following a subject             |
| Da     | possibly preceding a noun       |
| Dfa    | preceding VH through VL         |
| Dfb    | following adverb                |
| Di     | post-verbal                     |
| Dk     | sentence initial                |
| D     | adverbial                       |
| Na     | common noun                     |
| Nb     | proper noun                     |
| Ne     | location noun                   |
| Ned    | localizer                       |
| Nd     | time noun                       |
| Neu    | numeral determiner              |
| Nes    | specific determiner             |
| Nep    | anaphoric determiner            |
| Neqa   | classifier determiner           |
| Neqb   | postposed classifier determiner |
| Nf     | classifier                      |
| Ng     | postposition                    |
| Nh     | pronoun                         |
| I      | interjection                    |
| P      | preposition                     |
| T      | particle                         |
| VA     | active intransitive verb        |
| VAC    |                                  |
| VB     | active pseudo-transitive verb    |
| VC     | active transitive verb           |
| VCL    | transitive verb taking a locative argument |
| VD     | ditransitive verb               |
| VE     | active transitive verb with sentential object |
| VF     | active transitive verb with VP object |
| VG     | classificatory verb             |
| VH     | stative intransitive verb       |
| VHC    | stative causitive verb           |
| VI     | stative pseudo-transitive verb   |
| VK     | stative transitive verb          |
| VK     | stative transitive verb with sentential object |

58
5 Orthography-related issues for a speech-based corpus of Southern Min

5.1 Romanization system

As mentioned in Section 2, utterances in the main tier are transcribed in romanization (Southern Min pinyin). The romanization system used in TAICORP is the Taiwan Southern Min Phonetic Alphabetic (also known as Taiwan Language Phonetic Alphabet, TLPA, originally proposed by the Taiwan Language Society in 1991) announced officially by the Ministry of Education of Taiwan in 1998.

5.2 Standard orthography: Chinese characters

Chinese characters are used in the dependent tier as the standard orthography. This is a reasonable way because most of the Southern Min words are cognates of Mandarin words. However, because Southern Min does not have as conventionalized orthography as Mandarin, quite a few words in Southern Min do not have a consistent way of writing them. Some of them don't even have very obvious corresponding Characters.

In order to ensure consistency in the corpus, Southern Min dictionaries were used. These dictionaries are listed after the References.

This issue is particularly important for a corpus based on spontaneous speech, rather than written text. For example, the following common words in Southern Min have to be checked in the dictionary about their written forms because they do not occur in Mandarin:

- 奇巧 /ki5kha2/ "unusual"

If a written form cannot be found in one of the major Southern Min dictionaries, romanization is used.

Romanization is also used if the written form of a word is found in the dictionary but has so low frequency that it can't be found in the computer coding system.

For homonyms, a number is added after the character to indicate different lemmas. For example:

- 答 1 /kah4/ "to cover with a blanket"
- 答 2 /kham3/ "to cover"
- 答 3 /kua3/ "a cover"

6 The Auto-segmentation program and the Spell-checker

In order to speed up the building of the corpus, a word auto-segmentation program is necessary. Yet, when the program is segmenting words from the text, it can also deal with some related problems at the same time, such as the consistency of the transcription, adding romanization, and expanding the lexicon.

The Lexicon Bank

As the basis of the auto-segmentation program and the spell-checker, a corpus-based lexicon has been constructed which includes the lemma (both in romanization and in Chinese characters), alternative forms, synonyms, and part-of-speech. (See the Appendix for a sample of the lexicon.)

Consistency in the transcription

 Taiwanese speech recognition is still developing, so there is no way to transcribe the data with machine. Hence, transcription can only be done manually. The transcribers might be inconsistent in choosing the written form. For example, 按 怎 (an3cuann2) "how" can be transcribed as 怎樣, 怎麼樣, 按 怎, 怎麼, 什麼 and so on. Therefore, it is very important to design a program can identify the inconsistency.

When the program is segmenting the text, it tries to match a string which matches the
word in the column of "Chinese character" in
the lexicon bank. It then segments the word and
codes its pinyin. Figure 1 shows the input text
in the frame, and Figure 2 shows the output of
after segmentation. Word segmentation standard
follows mostly that of the Sinica Corpus (Chen
et al. 1996).

If the transcription happens to be one of
the "other forms," it will be replaced with the
standard form listed under the "Chinese
character."

Adding new words to the Lexicon

If a word does not exist in the lexicon, it will be
added to the lexicon after the file manager
confirms its status.

In short, the word auto-segmentation program is
able to do four things at the same time:
1 segment words in the text
2 code the pinyin for the characters
3 correct the inconsistent written forms
4 expand the lexicon bank

7 Applications of the corpus

This corpus has been used for studies on various
aspects of child language acquisition, including
tone acquisition (Tsay and Huang, 1998; Tsay,
Myers, and Chen, 2000; Tsay, 2001), consonant
acquisition (Liu and Tsay, 2000), classifier
acquisition (Myers and Tsay, 2000), final
particle acquisition (Hung, Li, and Tsay, 2004),
verb acquisition (Lee and Tsay, 2001; Lin and
Tsay, 2005), vocabulary acquisition (Tsay and
Cheng, in progress). More studies are on the
way.

Because this corpus is based on
spontaneous speech, it also has its applications
in addition to linguistic research. For example,
this corpus can be used in extracting important
speech features.

This corpus will be released by the
Association for Computational Linguistics and
Chinese Language Processing, Taiwan, in fall of
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Southern Min Spell Checker

Figure 1  Input text

Figure 2  Output text
## Appendix  Sample of the Lexicon

| Chinese character | Southern Min Pinyin | Part-of-speech | Meaning (or Mandarin synonyms) | Example |
|-------------------|----------------------|----------------|---------------------------------|---------|
| 未記e0           | be7ki3e0             | VK             |                                 |         |
| 未見笑           | be7kian3siau3/bue7kian3siau | VH             | 不要臉                         |         |
| 賣了             | be7liau2/bue7liau2   | VB             | 賣完                           |         |
| 賣了了            | be7liau2/bue7liau2   | VB             | 賣光光                         |         |
| 賣了了去          | be7liau2/bue7liau2khi3/bue7liau2/bue7liau2khi3 | VB             | 賣光光去                       |         |
| 未使             | be7sai2/bue7sai2     | D              | 不行、不能、不可以、未saih6     | 你未使去（修飾動詞） |
| 未使              | be7sai2/bue7sai2     | VH             | 不行、不能、不可以、未saih6     | 伊知道這樣未使 |
| 未使得            | be7sai2cit4/bue7sai2cit4 | D              | 不能                           |         |
| 未輸              | be7sul/bue7sul1      | D              | 未sul1、好像                   | 好像    |
| 未當              | be7tang3/bue7tang3   | D              | 不能、不可以、不行、未tang3     |         |
| 未當得            | be7tang3cit4/bue7tang3cit4 | D              | 不能、不可以                   |         |
| 賣掉              | be7tiau7/bue7tiau7   | VC             | 唱                           |         |
| 賣掉去            | be7tiau7/bue7tiau7   | VB             | 唱                           |         |
| 未振未動          | be7tin2be7tang7      | VA             | 一動也不動                     |         |
| 賣著              | be7tioh8/bue7tioh8   | VC             | 唱                           |         |
| 賣場              | be7tiunn5/bue7tiunn5 | Nc             | 唱                           |         |
| 未拝好            | be7tu2ho2/bue7tu2ho2 | VH             | 配合得不好                    |         |
| 賣完              | be7uan5/bue7uan5     | VC             | 唱                           |         |
| 欲                | beh4/bueh4           | D              | 會、愛、要、要1 (+動詞)        | 我要去市 |
| 欲                | beh4/bueh4           | D              | 快要                          | 仔買菜  |
| 欲                | beh4/bueh4           | VC             | 會、愛、要、要1 (+名詞組)       | 我要這 |
| 欲愛              | beh4ai3/bueh4ai3     | D              | 欲愛、想要、要、要愛           | 欲愛 要[m 玩具] |
| 欲愛              | beh4ai3/bueh4ai3     | VC             | 欲愛、想要、要、要愛           |         |
| 欲無              | beh4bo5              | Cbb            | bue4無、bue2bo5                 | （連接詞）本來...   |