CASIA-CASSIL: a Chinese Telephone Conversation Corpus in Real Scenarios with Multi-leveled Annotation

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Abstract

CASIA-CASSIL is a large-scale corpus base of Chinese human-human naturally-occurring telephone conversations in restricted domains. The first edition consists of 792 90-second conversations belonging to tourism domain, which are selected from 7,639 spontaneous telephone recordings in real scenarios. The corpus is now being annotated with wide range of linguistic and paralinguistic information in multi-levels. The annotations include Turns, Speaker Gender, Orthographic Transcription, Chinese Syllable, Chinese Phonetic Transcription, Prosodic Boundary, Stress of Sentence, Non-Speech Sounds, Voice Quality, Topic, Dialog-act and Adjacency Pairs, Ill-formedness, and Expressive Emotion as well, 13 levels in total. The abundant annotation will be effective especially for studying Chinese spoken language phenomena. This paper describes the whole process to build the conversation corpus, including collecting and selecting the original data, and the follow-up process such as transcribing, annotating, and so on. CASIA-CASSIL is being extended to a large scale corpus base of annotated Chinese dialogs for spoken Chinese study.

1. Introduction

In order to improve the performance of systems in spoken language processing, mining and utilizing complex discourse phenomena are of paramount importance. Currently, data driven or machine learning technology will be benefited from the large-scale conversation corpus with rich phonetic, linguistic and paralinguistic annotation. In the last few decades, several English conversation corpora have been published, such as Switchboard-DAMSL (Jurafsky et al., 1997) of telephone conversations, the ICSI Meeting Corpus (Janin et al., 2003) and the AMI Meeting Corpus (Carletta et al., 2006) of natural meetings. Annotated with abundant discourse information including dialog-acts (DAs), adjacency pairs (APs), topics, etc., these corpora greatly promote researches on English spoken discourse analysis, as well as various applications such as spoken language translation, speech recognition, spoken dialog system, and summarization as well. Meanwhile, few researches on spoken Chinese discourse have been reported, implying that such an annotated corpus of Chinese dialogs is unavailable.

CASIA-CASSIL, a large-scale corpus of Chinese spontaneous telephone conversations in tourism domain, is now being built as a fundamental corpus for study on spoken Chinese phenomena. To develop the first edition of CASIA-CASSIL, we have collected a large number of spontaneous telephone recordings up to the present. After a strict selection, only a minority of dialogs remains, which are with good voice-quality, enough turns and strictly belong to required domains. These selected dialogs are then transcribed and now being annotated with multi-leveled information, including Turns, Speaker Gender, Orthographic Transcription, Chinese Syllable, Chinese Phonetic Transcription, Prosodic Boundary, The Stress of the Sentence, Non-Speech Sounds, Voice Quality, Topic, Dialog-act and Adjacency Pairs, Ill-formedness, and Expressive Emotion.

The remainder of this paper is organized as follows. Section 2 introduces how we collect and select the original data, and gives some statistics of corpus. Section 3 describes the annotation conventions or guidelines briefly. Section 4 presents some details in annotation process, and shows an annotated example. Finally, we give concluding remarks in Section 5. In addition, Appendix A, B, and C give descriptions of annotated tags. Figure 1 gives an annotated example.

2. Data Collection and Selection

2.1 Audio Data

Restricted in tourism domain, in the first edition, we collected numbers of telephone recordings in the following four kinds of guest service centers: hotel, restaurant, airport, and travel agency. Besides, recordings are collected for taxi server when drivers have phone calls with passengers¹. The audio sampling resolution and audio sampling rate of original recordings are 8 bits and 8 kHz.

The work on data collection lasted for about 2 years and will be continued. Some statistics of the collected data in each scenario are shown in Table 1. Although we collected numbers of recording data, only about 10% of them are selected.

2.2 Data Selection

The original audio data are first roughly transcribed manually. Data selection process is based both on transcription and original audio data. There are three criterions to judge whether a dialog is eligible or not. 1) Quality of the recording: the environment in many scenarios is noisy, which leads to a low quality audio record, especially in restaurant and airport. If the noise is

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¹ We properly processed the problems on privacy and there is no problem on copyright.
so strong that it covers up speaker’s voice, it is difficult for annotators to label phonetic information. The information loss will block the following annotation process.

2) **Length of a dialog**: 10 or more turns are required. Note that our corpus is restricted to dialogs between two speakers. Once a speaker changes during the conversation, the dialog will be discarded or divided into two separated ones considering the integrality of divided dialogs. If a dialog contains less than 10 turns, it will be discarded.

3) **Content of a dialog**: since we restrict domain as tourism, we expect to collect conversations between a client and the service, instead of conversations between colleagues or outlying chats. Unfortunately, majority dialogs collected in travel agency and taxi are failed. Thus it can be seen that compared with text corpus, collection of spoken corpus has more difficulties. Moreover, the spoken corpus selection is of huge workload. Especially for spontaneous conversations in real scenario, the circumstance and content are really beyond our control, so strict selection is essential to get the high quality corpus.

### 2.3 Statistic of selected data

After strict selection, we get 792 dialogs of three scenarios in total. The average length of a dialog is about 90 seconds. All the selected transcriptions are further manually corrected and cut into turns by professional annotators. Table 2 gives some statistics of the corpus. In average, a dialog contains 16.5 turns, 33 sentences. The average sentence length is 10.5 Chinese characters, 6.9 Chinese words. We get word segmentation using ICTCLAS Tagger\(^2\).

| Scenarios         | Hotel       | Restaurant | Airport | Overall | Average |
|-------------------|-------------|------------|---------|---------|---------|
| **Data amount**   |             |            |         |         |         |
| Dialogs           | 206         | 263        | 323     | 792     | --      |
| Turns             | 3,676       | 4,389      | 4,993   | 13,058  | 16.5    |
| Sentences         | 7,352       | 8,778      | 9,986   | 26,116  | 33.0    |
| Characters        | 78,950      | 85,491     | 110,135 | 274,576 | 10.5    |
| Words             | 57,800      | 44,112     | 78,368  | 180,280 | 6.9     |

### Table 1: Amount of Collected Data and Selected Data

### 3. Annotation Convention

The annotation is designed as a multi-leveled framework based on previous annotation systems (Li et al., 2000; Li et al., 2001; Li, 2002; Li and Zu, 2006). Each level is time-aligned to the audio data. Concretely speaking, each level is defined as follows.

1) **Turn (turn)**: to take count of speaker changing in the conversation.

2) **Speaker Gender (spk)**: male or female.

3) **Orthographic Transcription (HZ)**: manually corrected text with word segmentation and POS information. Specially, status of speaker is represented as service (speaker A) or client (speaker B).

4) **Chinese Syllable (PY)**: the canonical syllable in Pinyin. The boundaries of syllable segments are manually divided based on audio data strictly.

5) **Chinese phonetic transcription (SY)**: including initial and final, sound change annotations, and segmentation. Especially, there are various kinds of dialects in Chinese. Most of the speakers are bilingual speakers in dialects or regional accent Mandarin. Some of regional accent and misspeaking are also represented in this level.

6) **Prosodic boundary (BI)**: prosodic structures including prosodic phrase and intonation phrase and turn boundaries.

7) **The stress of the sentence (ST)**: the stress of each intonation phrase.

8) **Voice quality (VQ)**: to describe the phonation information of the speakers, such as falsetto, whisper, creaky, etc.

9) **Non-speech sounds (MIS)**: to note nonlinguistic phenomena including non-verbal background noise such as ringing, door opening sounds, and breath, coughing, cry, laugh, and so on.

10) **Topic (TP)**: an open set includes opening, closing, inquire, advice, request, reservation, and others. The definition is described in Appendix A. It will be enriched while annotating process.

11) **DA and AP (dialogact)**: similar to DA definition in ICSI-MRDA corpus (Dhillon et al., 2004), the unit of DA is utterance. A dialog will be segmented into utterances before being labeled with DA tags. There are two levels of DA tags: general tags (9 labels) which represent the basic form of an utterance (e.g., statement, question, etc.), and appended specific tags (36 labels) which represent the function or characteristics of an utterance. Specially, considering the integrality of utterance when turn changes, a tag set called interruption is proposed, which contains 3 tags (abandoned, interrupted, and indecipherable). Each utterance needs one general tag; meanwhile, it might contain one or more specific tags. General tag and specific tag are connected by symbol ‘^’. If the utterance is not integrated, an interruption tag will be appended. Interruption tag follows general tag and specific tag with symbol ‘.’. The definition of each DA tag is described in Appendix B.

\(^2\) http://ictclas.org/
APs are paired utterances, defined as one kind of sociolinguistic facts about conversation structure, which is a reflection of dialog structure (Levinson, 1983). An AP consists of two parts produced by different speakers (Dhillon et al., 2004). In our work, AP contains the following relationships of the utterances: question-answer, greeting-greeting, offer-acceptance, and apology-downplay.

12) Ill-formedness (ill-formedness): Since the dialogs are naturally-occurred, ill-formedness utterances are unavoidable. We give three basic categories to describe part of ill-formedness phenomenon, and divide the three categories into 13 patterns in total. Details are shown in Appendix C.

13) Expressive emotion (EMOT): there are 70 kinds of expressive representations, such as happy, appreciate, scared, worry, surprise, and so on. Each expressive emotion has two grades to further measure the degree of expressiveness.

4. Software and Annotation Consistency
Our annotation software is Praat\(^3\), a well-known, well-maintained and widely used tool for speech annotating, analyzing, synthesizing, and manipulating. Figure 1 shows the annotation interface using Praat.

In praat, prosodic boundary (BI) is a TextTier object, which contains a series of time points. The other levels are IntervalTier objects, which contain a series of contiguous intervals in time. The textual annotations are saved in TextGrid format. We give a simplified example in Appendix D.

There are three professional annotators in charge of transcription and annotation. First, the recorded spontaneous dialogues are selected manually, only the qualified episodes were transcribed into orthographic texts (Chinese characters) manually and then automatically chopped into short utterances. Chinese characters were transcribed automatically into orthographic Pinyin as well. After this, multi-layer’s annotations including segmental, prosodic, linguistic, and paralinguistic and pragmatic information were done in praat according to the conventions as described above.

To keep the consistency degree of annotation, the three annotators discussed a lot during the first stage with the authors and checked the annotations of the first 100 dialogs among each other. Through the checking, the

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\(^3\) http://www.praat.org
annotation guidelines were consummated, meanwhile, the consistency was improved. During the whole procedure, the annotated results were selected randomly and checked by the first author. After annotation work finished, all the labels will be checked throughout.

5. Conclusion

In this paper, we introduce a Chinese conversational corpus CASIA-CASSIL which is developed based on huge amount of telephone recordings occurred in natural scenarios. After strict selection, 792 dialogs restricted in tourism domain constitute the first edition of CASIA-CASSIL. Although the corpus is still under construction, it is expected to be the first large-scale Chinese spontaneous conversation corpus. The corpus will be annotated with multi-leveled labels in a wide range of linguistic and phonetic information. The corpus contains not only phonetic annotation, but also semantic, emotion and discourse information. We believe it will be widely used in spontaneous speech and discourse analysis and applied in spoken language translation system, speech recognition, spoken dialog system, dialog summarization and any other application systems.

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Appendix A. Topic Description.

| Topic | Description |
|-------|-------------|
| Opening | Say hello, welcome. |
| Closing | Thanks and goodbye. |
| Inquire | Inquire specific information, such as name, telephone number, address, time, and so on. |
| Advice | Opinion and advice. |
| Request | Request for room service, membership discount, etc. |
| Reservation | For hotel reservation, restaurant reservation, ticket booking, etc. |
| Others | Will be enriched while annotating process. |

Appendix B. Dialog-Act Definition.

I. General Tags

| Tag | Description |
|-----|-------------|
| s   | Statement   |
| qy  | Y/N Question|
| qw  | Wh-Question |
| qr  | Or Question |
| qrr | Or Clause After Y/N Question |
| qo  | Open-end Question |
| qh  | Rhetorical Question |
| is  | Imperative Sentence |
| es  | Exclamatory Sentence |

II. Interruptions

| Tag | Description |
|-----|-------------|
| %-  | Interrupted |
| %-- | Abandoned |
| %   | Indecipherable |

III. Specific Tags

| Group | Tag | Description |
|-------|-----|-------------|
| 1. Responses | Positive | aa Accept |
|       |       | aap Partial Accept |
|       |       | na Affirmative Answer |
|       | Negative | ar Reject |
Appendix C. Ill-formedness Patterns.

| Pattern | Description | Tag |
|---------|-------------|-----|
| 1. Parenthesis | Floor Grabber | prt^fg |
| | Floor Holder | prt^fh |
| | Hold |prt^h |
| | Third Party Talk |prt^t3 |
| 2. Overlapping | Entire Overlapped | rpt^cf |
| | Partly Overlapped | rpt^xd |
| | Different Expression but with the Same Meaning | rpt^yz |
| | Misspeaking Correction | rpt^fd |
| | Complex | rpt^fz |
| 3. Disorder | Subject Disordered | ovt^zh |
| | Object Disordered | ovt^bq |
| | Modifier Disordered | ovt^xf |
| | Complex | ovt^qt |

Appendix D. A TextGrid file of an Annotated Dialog

File type = "ooTextFile"
Object class = "TextGrid"
xmin = 0 /*starting time*/
xmax = 86.53 /*end time*/
tiers? <exists>
size = 13 /*13 levels*/
item []:
  /*level 1: Turn*/
  class = "IntervalTier"/contiguous intervals in time/
  name = "spk"
  xmin = 0
  xmax = 86.53
  intervals: size = 39 /*total number of labels in level 1*/
  intervals [1]: /*an annotation*/
    xmin = 0 /*starting time*/
    xmax = 2.8990665757540235 /*end time*/
    text = "01" /*label*/
    intervals [2]:
      xmin = 2.8990665757540235
      xmax = 5.246733925149825
      text = "02"
    intervals [3]:
      xmin = 5.246733925149825
      xmax = 6.643020539909597
      text = "03"

item [2]: /*level 2: Speaker Gender*/
  class = "IntervalTier"
  name = "spk"
  xmin = 0
  xmax = 86.53
  intervals: size = 41
  intervals [1]:
    xmin = 0
    xmax = 2.8990665757540235
    text = "F"
  intervals [2]:
    xmin = 2.8990665757540235
    xmax = 5.246733925149825
    text = "M"
  intervals [3]:
    xmin = 5.246733925149825
    xmax = 6.643020539909597
    text = "F"

item [3]: /*level 3: Orthographic Transcription*/
  class = "IntervalTier"
  name = "HZ"
  xmin = 0
  xmax = 86.53
  intervals: size = 61
  intervals [1]:
    xmin = 0
    xmax = 2.8990665757540235
    text = "A：新年好!如家前台。"
  intervals [2]:
    xmin = 2.8990665757540235
    xmax = 5.246733925149825
    text = "B: 嗨，你好！"
  intervals [3]:
    xmin = 5.246733925149825
    xmax = 6.643020539909597
    text = "B: 我想订一个那个商务大床房。"
item [4]:                   /*level 4: Chinese Syllable*/
class = "IntervalTier"
name = "PY"
xmin = 0
xmax = 86.53
intervals: size = 563
intervals [1]:
  xmin = 0
  xmax = 1.6863598483498574
  text = "sil"
intervals [2]:
  xmin = 1.6863598483498574
  xmax = 1.882377605361048
  text = "xin1"
intervals [3]:
  xmin = 1.882377605361048
  xmax = 2.024093145902922
  text = "nian2"
intervals [4]:
  ...

item [5]:                   /*level 5: Chinese Phonetic Transcription*/
class = "IntervalTier"
name = "SY"
xmin = 0
xmax = 86.53
intervals: size = 897
intervals [1]:
  xmin = 0
  xmax = 1.6863598483498574
  text = "sil"
intervals [2]:
  xmin = 1.6863598483498574
  xmax = 1.798937614200879
  text = "x"
intervals [3]:
  xmin = 1.798937614200879
  xmax = 1.882377605361048
  text = "in1"
intervals [4]:
  ...

item [6]:                   /*level 6: Prosodic Boundary*/
class = "TextTier"   /* time points */
name = "BI"
xmin = 0
xmax = 86.53
points: size = 190
points [1]:
  time = 2.1803775737902225
  mark = "2"
points [2]:
  time = 2.398910883971617
  mark = "1"
points [3]:
  time = 2.899065757540235
  mark = "4"
points [4]:
  ...

item [7]:                   /*level 7: the Stress of the Sentence*/
class = "IntervalTier"
name = "ST"
xmin = 0
xmax = 86.53
intervals: size = 114
intervals [1]:
  xmin = 0
  xmax = 1.6863598483498574
  text = ""
intervals [2]:
  xmin = 1.6863598483498574
  xmax = 1.882377605361048
  text = "3"
intervals [3]:
  xmin = 1.882377605361048
  xmax = 2.3758858924157503
  text = ""
intervals [4]:
  ...

item [8]:                   /*level 8: Voice Quality*/
class = "IntervalTier"
name = "VQ"
xmin = 0
xmax = 86.53
intervals: size = 39
intervals [1]:
  xmin = 0
  xmax = 7.163546520853924
  text = ""
intervals [2]:
  xmin = 7.163546520853924
  xmax = 7.301584146835802
  text = "CR"
intervals [3]:
  xmin = 7.301584146835802
  xmax = 11.469061958630712
  text = ""
intervals [4]:
  ...

item [9]:                   /*level 9: Non-Speech Sounds*/
class = "IntervalTier"
name = "MIS"
xmin = 0
xmax = 86.53
intervals: size = 32
intervals [1]:
  xmin = 0
  xmax = 1.100538923590631
  text = ""
intervals [2]:
  xmin = 1.100538923590631
  xmax = 1.58286317575326725
  text = "[BP]"
intervals [3]:
  xmin = 1.58286317575326725
  xmax = 6.5094716073007766
  text = ""
intervals [4]:
  ...

item [10]:                  /*level 10: Topic*/
class = "IntervalTier"
name = "TP"
xmin = 0
xmax = 86.53
intervals: size = 3
intervals [1]:
  xmin = 0
  xmax = 3.422236544782725
  text = "<Opening>
intervals [2]:
  xmin = 3.422236544782725
  xmax = 7.94247962537013
  text = "<Request>
intervals [3]:
  xmin = 7.94247962537013
  xmax = 86.53
  text = "Closing"
