In Proceedings of ICSLP-98

A DISCOURSE CODING SCHEME FOR CONVERSATIONAL SPANISH

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ABSTRACT

This paper describes a 3-level manual discourse coding scheme that we have devised for manual tagging of the CallHome Spanish (CHS) and CallFriend Spanish (CFS) databases used in the CLARITY project. The goal of CLARITY is to explore the use of discourse structure in understanding conversational speech. The project combines empirical methods for dialogue processing with state-of-the art LVCSR (using the JANUS recognizer). The three levels of the coding scheme are (1) a speech act level consisting of a tag set extended from DAMSL and Switchboard; (2) dialogue game level defined by initiative and intention; and (3) an activity level defined within topic units. The manually tagged dialogues are used to train automatic classifiers. We present preliminary results for automatic speech act classification and topic boundary identification and inter-coder speech act confusion matrices.

1. INTRODUCTION

The goal of the Clarity project is to explore the use of discourse structure in understanding conversational speech. The project combines empirical methods for dialogue processing [5] with state-of-the art LVCSR using the JANUS recognizer [7, 11, 16]. We are currently working with the CallHome Spanish (CHS) and CallFriend Spanish (CFS) databases of unrestricted telephone conversation.

The particular understanding task that we are currently pursuing is *functional activity identification* — classifying segments of a dialogue as representing one or more of the following: informing, instructing, inquiring, planning, convincing, negotiating, gossiping, arguing, managing the conversation, and greeting/closing. The functional activity identifier will take as input aspects of discourse structure and prosodic information. Three levels of discourse structure are thought to be relevant: speech acts [14], dialogue games [4, 3], and topic segments. We are currently training automatic classifiers for these levels. This paper describes the discourse coding scheme that we use for manual tagging of the training data for these classifiers.

Our coding scheme divides discourse structure into three levels tagged separately. The three levels of the coding scheme, from lowest to highest, are (1) a speech act level consisting of a tag set extended from DAMSL and Switchboard; (2) dialogue game level defined by initiative and intention; and (3) an activity level defined by topic boundaries. Figure 2 shows a fragment of a tagged dialogue. Each of the three levels of tagging are discussed in the following sections. To facilitate the tagging process, we have written a detailed manual [15] containing decision trees, tag descriptions, examples, and helpful hints.

2. THE SPEECH ACT CODING SCHEME

The lowest level of tagging is the speech act level. Our coding scheme is heavily based on DAMSL (from the Discourse Resource Initiative [1]) and on the Switchboard SWBD-DAMSL tags (from the Johns Hopkins LVCSR summer workshop 1997 [8]). In this paper we will be referring to two speech act codings of CHS. The preliminary coding differed from SWBD-DAMSL in only minor ways. The entire CHS corpus was tagged with the preliminary coding scheme, inter- and intra-coder consistency was checked, and a speech act classifier was trained. We then revised the coding scheme in order to improve consistency, further refine large categories, and support the task of functional activity identification. Wherever we use a SWBD-DAMSL tag, it retains its original definition from the SWBD-DAMSL manual. We have made up new tag names for speech acts whose definition differs from the definition in the SWBD-DAMSL manual. The remainder of this section describes the revised coding scheme.

Our speech act tags fall into the categories Questions, Answers, Agreement/Disagreement, Discourse Markers (including Backchannels), Forward Functions, Control Acts, Statements, and Other. The greatest changes with respect to SWBD-DAMSL involve an expansion of control acts, the addition of coarse emotional tags to backchannels, a collapse of statements and opinions, and the addition of semantic features to statements. The complete speech act tag set is shown in Tables 2 and 2. The following paragraphs comment briefly on the deviations from SWBD-DAMSL.

Discourse Markers and Backchannels: To distinguish between uses of backchannels that may be relevant at the dialog game and activity levels, we added three emotion/attitude indicators (`positive/happy`, `negative/sad`, and `surprise`). The main discourse marker speech acts are `backchannel`, `link`, `verbal pause`, and `hedge`.

Questions	
qy	Yes/No; understand-check
qw	WH-type question
qr	alternative 'or'
qo	open-ended question
qh	rhetorical question
bh	verification request
br	repetition/clarification request
qy^g	Yes/No-question with tag question
qy^c	question about communication level problem
qy^d	question with statement form
Answers	
na	descriptive affirm
nd	dispreferred
ng	descriptive negative
nn	no, hu-huh
no	don't know
ny	yes, uh-huh
Agreement/Disagreement	
aa	accept/believe
ar	reject/disbelieve
Discourse Markers	
b	plain backchannel
b+	backchannel,positive emotional value
b--	backchannel, negative emotional value
b!	backchannel with surprise value
l	link (between two intonation units or turns)
p	verbal pause, hesitation
h	hedge
Forward Functions	
fe	exclamation
fa	apology
ft	thank you
fw	"you're welcome"
ff	formulaic; congratulations, sympathy, etc.
fp	open conversation
fc	close conversation

Table 1: Speech Act Tags

Control Acts	
ca-com	promise or commitment for action
ca-prq	requesting permission for action
ca-off	offer for action
ca-sug	give permission to act or suggest action
ca-dir	requesting or directing hearer to act
ca-not	prohibit action
ca-clm	speaker claims ownership of something
Statements	
s	plain statement of information
s^me	speaker mental state, wishes, preferences
s^hyp	hypothetic statements, "if" and "then"
s^val+	positive attitude or value judgment
s^val-	negative attitude or value judgment
s^obl	obligation or need to do something
s^fut	future action/tense
s^cert+	explicit certainty
s^cert-	doubt/uncertainty
s^jk	joking/sarcastic statement
Other	
bc	correction of Hearer
bd	downplayer; downplay an apology or praise
atd	attention directive
^t1	self-talk
^t3	talk to third party
^ins	introduction statement, start new topic
^is	indirect speech
^q	direct quote of self or other
^m	mimicing preceding speech segment
^2	completion of other speaker
^r	repetition by same speaker
^e	expansion of yes/no answer
^cor	self-correction

Table 2: Speech Act Tags, continued

Control Acts: Control acts, utterances that involve an expected action by the hearer or the speaker, include commands, requests, prohibitions, offers, promises, etc. Instead of using the SWBD-DAMSL `ad` tag (action directive), we base our expanded set of control act tags on Lampert & Ervin-Tripp [10]. The control acts are commit, permission request, offer, suggestion/permission-statement, directive/request, prohibition, and ownership claim.

Statements: Special attention was given to splitting descriptive statements and opinions (sd and sv in SWBD-DAMSL) into subcategories. Statements and opinion statements make up 48% of the speech acts and cover 71% of the words in our earlier tagged CHS database. Statements and opinions also displayed some inter-coder confusion in the preliminary tagging. For these reasons, we aimed to make statement tagging more detailed and less confusable. In our coding scheme, all statements and opinions are coded with the same tag with an added dimension of seven semantic features. A statement can be tagged with none, one or several of these semantic features. We are currently tagging the following features: (1) `mental state:` speaker expresses his/her own emotional state or psychological state; includes expressed emotion, preferences, psychological states, wants, tastes, likes, wishes, and desires; (2) `reality:` speaker expresses a claim about a hypothetical world; includes hypotheticals, conditionals, some wishes; (3) `value judgment/attitude:` speaker expresses an attitude or value judgment, positive or negative, about state, situation, or people; includes some evaluatives (name calling), and some explicit opinions; (4) `obligation:` speaker expresses an obligation involving self; (5) `tense:` speaker makes statement about something that has not yet happened; (6) `certainty:` speaker expresses certainty or uncertainty about accuracy of his/her statement; and (7) `joke/sarcasm:` speaker makes joke or sarcastic comment. For all but two of the features we tag only the marked case. For the features `attitude` and `certainty`, we distinguish two marked cases, + and –, from the unmarked case. Thus, `attitude` can be positive or negative, and `certainty` can be explicitly certain or uncertain.

```
#Topic Boundary
#Activity:Convince 0   #Activity:Inform 4
#Activity:Planning 5   #Activity:Negotiate 2
#Activity:Inquire 1    #Activity:Gossip 0
#Activity:Argue 0      #Activity:Conv-mgmt 0
#Activity:Greet-cls 0  #Activity:Instruct 1
#Game:Info
<I> s A: Llevan una lavadora,
         they bring a washing machine
<I> s A: llevan una no se' que',
         they bring I don't know what
<I> s A: llevan una cosa de cada cosa
         they bring one of each
#Game:Quest^Aband
<I> qw B: pero como,
          but how
#Game:Quest
<I> qy B: pero pagan impuestos,
          but are they taxed
<I> s^cert-
    B: pero se supone que el menaje no paga
    but household items are not supposed
    to be taxed
<R> ny A: si'
          yes
#Game:Info^Elab
<I> s^e A: no si' paga impuestos,
           no yes it is taxed
<I> s^cert+
    A: paga el quince por ciento, si' sen~or
       it's taxed fifteen per cent, yes sir
<R> b  B: ah si'
          oh yes
<R> s^m B: paga quince por ciento de impuesto
           it's taxed fifteen percent
```

Figure 1: A Fragement of a Tagged Dialogue

3. MANUAL TAGGING OF DIALOGUE GAMES

The middle level of tagging is based on the idea of a dialogue game [3] [4] and work on illocutionary acts by Searle [14] and others. The focus of this level of tagging is on how turns interact, i.e. how utterances from two dialog participants relate to each other. Game boundaries are determined by changes in who has the initiative and changes in speaker intention, for example changing from informing to questioning. Carletta et al. describe a conversational game as "a set of utterances starting with an initiation and encompassing all utterances up until the purpose of the game has been either fulfilled (e.g. the requested information has been transferred) or abandoned." A game will therefore consist of all turns up to the point where the tagger finds that the game has been completed or, if incomplete, includes only the initiation of a game. Games are much like modified adjacency pairs, consisting of Moves that are required, expected, or optional. Each game consists of a required Initiative Move by Speaker A, a Response Move by Speaker B that is required or optional depending on the type of game, a Feedback Move by Speaker A that is always optional, and a possible second Feedback Move by Speaker B which is also always optional. Our system contains eight main types of games plus eight modifiers. The game types are `seeking information`, `giving information`, `giving directive`, `action commit`, `giving opinion`, `expressive`, `seeking confirmation`, and `communication filler`. Taggers label turns within a game as `Initiative`, `Response`, and `Feedback`. Games may overlap, either as nested games or as interleaved games.

4. MANUAL TAGGING OF TOPIC SEGMENTS AND ACTIVITIES

The highest or most general level of tagging identifies a discourse segment and an activity focusing on the purpose and goal of the speakers within the segment. Since we are not working with task oriented dialogues, segments cannot be defined in terms of subtasks. Instead they are defined by topic boundaries. We are currently labeling ten activities: inform, inquire, plan, convince, negotiate, gossip, argue, conversation management, greet-close, and instruct. The presence of each activity is judged on a continuum. The tagger decides to what degree a certain activity is present and assigns a numerical value on a scale from 0 to 5, 0 being "not present in the segment" and 5 being "strongly present in the segment."

5. RELIABILITY OF THE CODING SCHEME

We conducted a variety of evaluations on the reliablilty of the preliminary speech act coding scheme, including intercoder agreement, intracoder agreement, confusion matrixes, and the effects of listening or not listening while tagging. The corpus was not presegmented into speech act units before manual tagging. Segmentation was therefore performed as part of the tagging process. Using one tagger as a reference, the other had a segment boundary precision of 86.1% and recall of 88.9%. Because the speech act boundaries do not necessarily agree, intercoder agreement is measured in terms of the percentage of *words* that are tagged with the same speech act by both taggers. Intercoder agreement on ten dialogues was 78.7% for two coders using the preliminary coding scheme. The most confusable speech act tags `sd` and `sv` (descriptive and opinion statements). `sd/sv` disagreements encompassed 9.2% of the word tokens. On a test of three dialogues, intracoder agreement (with a time lag between codings) was about 85%. Tagging first without listening and then later with listening resulted in revision of about 3.5% of the tags.

6. AUTOMATIC CLASSIFICATION AND SEGMENTATION

The purpose of the manually tagged data is to train automatic classifiers for identifying the three levels of discourse structure described above. We have trained a classifier for the speech act level and a segmenter for breaking dialogues into topical segments.

	Preliminary	Revised

Table 3: Results of Automatic Speech Act Classification

Language	English	Spanish
nr. of dialogues	9	15
avg. nr. of turns	345	252
uniform baseline (F1)	0.48	0.47
crossvalidation (F1)	0.58	0.53

Table 4: Topic Segmentation Results for English and Spanish CallHome

The speech act classifier is based on hidden understanding models...

We conducted two speech act classification experiments. The first was trained on a set of 80 dialogues from CHS tagged with the preliminary speech act coding scheme, and tested on 40 CHS additional dialogues that were not used for training. The second classifier experiment was trained on 30 CHS dialogues tagged with the revised speech act coding scheme and tested on 10 additional dialogues. Table 6 compares the performance of the speech act classifier in these two experiments. The results are presented in terms of how many words have correct speech act tags, not how many sentences have the correct speech act tags. This is because the classifier performs segmentation of utterances into speech act level units simultaneously with the classification, and the automatic segmentation may have different speech act boundaries from the manually tagged data that it is checked against.

To automatically determine topical segment boundaries in the CallHome dialogues, we chose to use [9]'s TextTiling algorithm. First we compute text similarity scores for all potential boundaries using blocks of text to the left and to the right of the boundary. We then move this 2-block-window over the entire dialogue and compute the similarity scores for each potential boundary. The resulting similarity graph is then smoothed, and segment boundaries are hypothesized at the minima of the similarity graph.

We ran experiments on English and Spanish CallHome data. The results of a k-fold crossvalidation are presented in Table 4. [1] [2]

ACKNOWLEDGEMENTS

We would like to thank our taggers Liza Valle, Santiago Cortes, and Susana Fuentes Arce. This work was conducted under funding from the U.S. Department of Defense.

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[1] $F1 = \frac{2PR}{P+R}$, where R=recall and P=precision.

[2] The "uniform baseline" inserts evenly spaced boundaries in all dialogues.