Speech act annotation

July 31, 2014

Contents

1 Introduction

Our goal is to develop an annotation scheme and protocol for the classification of email sentences in terms of speech acts. A further objective is to use such annotated data to produce a sample segmentation of our email corpus so that we can test the validity of the hypotheses made in our previous work.

2 Background and Related Work

In this section we introduce the concept of dialog act (DA) and provide details concerning a few works related to the field of speech act recognition and email segmentation.

2.1 Background

Speech act theory [Austin, 1975] attempts to describe utterances in terms of communicative function (e.g. question, answer, thanks...). Indeed, utterances are not limited to their semantic content, they also have a communicative function : a goal, and an effect. For Austin, they can be analyzed at three levels: locutory (the linguistic characteristics of the utterance), illocutory (the intention of the speaker) and perlocutory (the real-world effects of the utterance). When we refer to speech acts[1], we are interested in the illocutory level of utterance analysis.

Thus, in most works, it's in terms of speech acts that interactions between participants of a conversation are modeled. Austin considers utterances as actions performed by a speaker ; this is based on the idea that every enunciation is the realization of a social act. Verbs that specify these actions are called *performative verbs*, such as when someone says "I grant you the title of captain". But speech acts are not only constituted by these kinds of verbs. [Searle, 1976] offers five classes of dialog acts : assertives (assertion...), directives (order, request, advice, etc.), commissives (promise, invitation, etc.), expressives (congratulations, thanks, etc.) and declarations (war declaration, nomination, baptism, etc.).

There are a number of different speech act taxonomies [Traum, 2000]. Table 1 details two founding taxonomies: Austin's and Searle's. Table 2 presents a few recent taxonomies used in the context of online conversation analysis.

[1] Also known as dialog acts

Act	Description or examples	Reference
Verdictives	to condemn, to decree...	
Exercitives	to command, to order, to forgive...	
Commissives	to promise, to guarantee, to bet, to swear...	[Austin, 1975]
Behabitives	to apologize, to thank, to criticize...	
Expositives	to assert, to deny, to postulate...	
Assertives	asserts a state of fact	
Directives	attempt to make an interlocutor do something	
Commissives	commitment on the part of the speaker	[Searle, 1976]
Expressives	expression of a psychological state	
Declarations	statement with a direct impact	

Table 1: Foundational taxonomies for speech acts categorization

2.2 Speech act classification applied to forum posts

Here we explain the work of [Kim et al., 2010].

2.2.1 Methodology

The authors annotate both threads and posts in a corpus built from the CNET forums[2]. Two annotators use a dedicated tool[3] for the annotation task. Before starting to annotate the overall data set, a pilot annotation was performed to ensure that both annotators had the same understanding of the taxonomy.

2.2.2 Taxonomy

First, they classify threads into two groups of classes: the basic group, which is futher subdivided into *Solution Type* classes and *Problem Source* classes, as well as a miscellaneous group. The different classes are detailed in table 3. *Solution Type* and *Problem Source* classes can be used either separately or together, therefore there is an additional combined class set made of each combination of a *Solution Type* class and a *Problem Source* class (e.g. *Search-OS* or *Install-Network*). The combined class set being the superset of basic class sets, it was used to do the annotation.

[2]http://forums.cnet.com

[3]http://mandrake.csse.unimelb.edu.au/ rbp/cgi-bin/su/Classify.py

Act	Corpus or kind of corpus	Reference
Disclosure Edification Advisement Confirmation Question Acknowledgement Interpretation Reflection	multi-domain	[Lampert et al., 2006]
Direct request Question-request Open question First person commitment First person expression of feeling First person other Other statements	corporate mail	[De Felice et al., 2013]
Accept response Acknowledge and appreciate Action motivator Polite mechanism Rhetorical question Open-ended question Or/or-clause question Wh-question Yes-no question Reject response Statement Uncertain response	BC3	[Ulrich et al., 2008]

Table 2: Examples of speech act taxonomies specific to online conversation analysis

Class	Group
Support	Solution Type
Documentation	Solution Type
Install	Solution Type
Search	Solution Type
Hardware	Problem Source
Operating System	Problem Source
Software	Problem Source
Media	Problem Source
Network	Problem Source
Programming	Problem Source
Spam	Miscellaneous
Other	Miscellaneous

Table 3: Thread classes in [Kim et al., 2010]

Then, they annotate each individual post with one or several post classes. These classes are categorized into two groups, the answer group and the question group, plus three single classes. The different classes used are detailed in table 4.

2.2.3 Annotator agreement

The authors use Cohen's Kappa to compute annotator agreement:

$$\kappa = \frac{P(a) - P(e)}{1 - P(e)}$$

Where $P(a)$ refers to the relative observed agreement between two annotators, and $P(e)$ is the hypothetical probability of chance agreement between two annotators.

However, as they write: "*The standard Cohen's Kappa cannot be used in multi-class annotation tasks. By the time the annotation process started, no standard methodology for calculating Cohen's Kappa for multi-class tasks was found. Therefore, an extended method for calculating κ value was proposed to address this problem.*"

They propose an improved Cohen's Kappa for a multi-class situation, but the methodology is not applicable to our case because it takes into account the link information for each class (a concept we do not consider at all).

Class	Group
Answer-Answer	Answer
Answer-Add	Answer
Answer-Correction	Answer
Answer-Confirmation	Answer
Answer-Objection	Answer
Question-Question	Question
Question-Add	Question
Question-Correction	Question
Question-Confirmation	Question
Resolution	-
Reproduction	-
Other	-

Table 4: Post classes in [Kim et al., 2010]

2.2.4 Classification

The authors use four different models for thread classification: 1 Nearest Neighbor, Naïve Bayes and Support Vector Machine. A majority class model (ZeroR) and a random model (RAND) are used as baselines. Features are weighed using four different schemes: Information Gain (IG), Term Frequency-Inverse Document Frequency (TF-IDF), raw count and simple binary. For post classification, the authors use a conventional Maximum Entropy learner[4] as well as two structural learners : SVM-HMMs and CRFs (using *CRF++*[5])

Features for threads are built by using the initial post or concatenating all posts in the thread to form the "text" of the thread. They then construct different bag-of-words feature sets by tuning different parameters such as input text, pre-processing, tokenization method, and n-gram length. For posts, features used include lexical, structural, contextual, and semantic features..

2.2.5 Evaluation

Results for both thread classification and post classification are evaluated using micro-average precision (P_μ), recall (R_μ), F-score (F_μ) and macro-

[4]http://maxent.sourceforge.net/
[5]http://crfpp.sourceforge.net/

averaged precision (P_M), recall (R_M) and F1-score (F_M) on a stratified[6] 10-fold cross-validation

2.3 Email segmentation

[Lampert et al., 2009] attempts to segment emails into several prototypical areas, such as the contribution of the author, quotes of the original message, the signature, opening and closing formulas, etc. To do this, he uses a system based on SVM (Support Vector Machines) and reaches a precision of 87% for a segmentation into nine distinct zones.

3 Proposal

Here we describe our finding and proposal.

3.1 Observed raw speech acts

The following categories have been empirically extracted from our corpus. This was done by two researchers through the analysis of individual messages, on a sentence by sentence basis. We postulate that a sentence can carry more than one of these labels.

- opinion ("what a nightmare", "this is bullshit")
- action report ("I did try apt-cache search geotiff but it didn't work")
- observation ("It doesn't happen every time I move the cursor, it is completely random")
- code, log, or command ("usermod - G admin 2ndroot")
- meta discourse...
  - introduction...
    - question ("the question for this mail is...")
    - problem description ("here's my problem")
    - procedure ("do this:")
  - qualifier for previous utterance ("just a thought")

[6] The authors make sure that *"if a given post is contained in the test data for a given iteration, all other posts in that same thread are also in the test data (or more pertinently, not in the training data)"*

  - non-verbal separator ("–")
  - channel change ("maybe I'll file a wishlist bug for this")
  - automated quote introduction ("On 20/02/07, Larry wrote:")
  - formal mark of formatting ("[snip]")
- question ("Should I just change them by hand?")
- greetings...
  - general ("Hi all")
  - targeted ("Hey Steve")
- signoff ("see you")
- signature...
  - automatic ("Brian Lunergan Nepean, Ontario Canada")
  - manual ("Sean")
- call for help ("please help!", "can anyone help me???")
- thanks...
  - by anticipation ("Thanks for any help,")
  - by reaction ("Thanks I'll try that!")
- advertisement ("Novo Yahoo!")
- reference...
  - to a post
  - to a previously introduced item ("what does that command do exactly?")
  - to a channel ("Check the forums, we just discussed this subject and proceedures for both dd and rsync")
- goal statement ("I would like to be able to send the whole package via email to acquaintances in ISO form and let them make their own DVDs")
- description...
  - of a system ("My ubuntu 1 bandwidth settings are set to -1")

    - of an environment ("I am using ubuntu 12.04")
- assertion ("DD will work over the network")
- solution research report ("I couldn't find anything on the forums")
- constraint on the solution ("I don't want to have to do a fresh install")
- preference on the solution
- contact information ("mns:renato4010591@hotmail.com")
- feedback on service or product
- suggestion to improve a service or product
- untested possible solution
- rhetorical question
- related comment or anecdote
- personal interrogation ("I wonder how it works")
- quote
- answer acknowledgment...
    - and confirmation
    - and rejection...
        * because inapplicable
        * because unsatisfactory
    - without feedback
- answer...
    - from self...
        * with explicit solution
        * with implicit solution
        * without solution
    - from identified third party...
        * with explicit solution
        * with implicit solution

        * without solution
    - from unidentified third party...
        * with explicit solution
        * with implicit solution
        * without solution

- instruction ("Open a terminal")
- thread closure
- hypothesized solution
- problem assimilation to another ("I had a similar problem")
- question complement
- question correction

3.2 Annotation protocol

This is a proposed protocol for a future annotation task (work in progress).

1. Sentences are identified (can be automated)
2. (a) Sentences are classified into speech acts (see 3.3)
   (b) Speech acts dependencies are found
3. (a) Sentences that do not bear the same speech act as the previous one are marked as boundaries
   (b) Further boundaries are inserted when, for two consecutive sentences bearing the same speech act:
      i. their speech acts are either Q-Q or OTHER
      ii. their speech acts are not both linked to the same sentence

3.3 Taxonomy

This taxonomy is a work in progress.

Question subclasses:
Question-Question: the sentence contains a new question.
Question-Add: the sentence supplements a question by providing additional information, or asking a follow-up question.

Question-Problem: the sentence introduces a question by stating a problem or one's motivations.
Question-Confirmation: the sentence confirms details of the question or confirms that the same problem is being experienced by a non-initiator.
Question-Correction: the sentence corrects errors in a question.
Question-Resolution: the sentence confirms the question has been answered or rendered moot.

Answer subclasses:
Answer-Answer: the sentence proposes an answer to a question.
Answer-Add: the sentence supplements an answer by providing additional information.
Answer-Confirmation: the sentence confirms details of the answer and/or that it should work.
Answer-Correction: the sentence points out error(s) in an answer and/or corrects them.
Answer-Objection: the sentence objects to an answer.
Answer-Acknowledgment: the sentence acknowledges an answer without confirming or hindering it (by the question initiator only).

Orphan classes:
Ungrammatical: the sentence is not grammatical (noise, punctuation, code, link, markup, ASCII art...).
Signature: the sentence is part of the sender's signature block.
Civility: the sentence is a polite mechanism that no other purpose.
Quote: the sentence is quoted from a previous message **Other**: the sentence does not belong to any of the above classes.

Class	Abbreviation	Dependency
Question-Question	Q-Q	A-A (optional)
Question-Add	Q-ADD	Q-Q
Question-Problem	Q-PRO	Q-Q
Question-Confirmation	Q-CON	Q-Q
Question-Correction	Q-COR	Q-Q
Question-Resolution	Q-RES	Q-Q, A-A (optional)
Answer-Answer	A-A	Q-Q
Answer-Add	A-ADD	A-A
Answer-Confirmation	A-CON	A-A
Answer-Correction	A-COR	A-A
Answer-Objection	A-OBJ	A-A
Answer-Acknowledgment	A-ACK	A-A
Ungrammatical	U	-
Civility	C	-
Signature	S	-
Quote	QUO	-
Other	O	-

Table 5: Speech act taxonomy.

References

[Austin, 1975] Austin, J. L. (1975). *How to do things with words*, volume 1955. Oxford university press.

[De Felice et al., 2013] De Felice, R., Darby, J., Fisher, A., and Peplow, D. (2013). A classification scheme for annotating speech acts in a business email corpus. *ICAME Journal*, 37:71–105.

[Kim et al., 2010] Kim, S. N., Wang, L., and Baldwin, T. (2010). Tagging and linking web forum posts. In *Proceedings of the Fourteenth Conference on Computational Natural Language Learning*, CoNLL '10, pages 192–202, Stroudsburg, PA, USA. Association for Computational Linguistics.

[Lampert et al., 2006] Lampert, A., Dale, R., and Paris, C. (2006). Classifying speech acts using verbal response modes.

[Lampert et al., 2009] Lampert, A., Dale, R., and Paris, C. (2009). Segmenting email message text into zones. In *Proceedings of the 2009 Conference*

on Empirical Methods in Natural Language Processing: Volume 2-Volume 2, pages 919–928. Association for Computational Linguistics.

[Searle, 1976] Searle, J. R. (1976). *A taxonomy of illocutionary acts*. Linguistic Agency University of Trier.

[Traum, 2000] Traum, D. R. (2000). 20 questions on dialogue act taxonomies. *Journal of semantics*, 17(1):7–30.

[Ulrich et al., 2008] Ulrich, J., Murray, G., and Carenini, G. (2008). A publicly available annotated corpus for supervised email summarization. In *AAAI08 EMAIL Workshop*, Chicago, USA. AAAI.