Annotating Belief in Communication: Manual

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Abstract
This is an annotation manual for communicated belief.

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1 Introduction: Goal of Annotation

We annotate whether the speaker/writer (SW) intends the hearer-reader (HR) to interpret a stated proposition as SW’s strongly held belief, as a proposition which SW does not believe strongly (but could), or as a proposition towards which SW has an entirely different cognitive attitude, such as desire or intention.

- The nature of the proposition (opinion, statement about interior state, external state) is not of interest.
- We do not annotate truth: real-world (encyclopedic) truth is not relevant.

We have three categories:

- Committed belief (CB): the speaker or writer indicates in this utterance that he or she believes the proposition. For example, I know Mark and Sandra have eloped.
  A subcase of committed belief concerns propositions about the future, such as The sun will rise again.

- Non-committed belief (NCB): the speaker or writer identifies the proposition as something which he or she could believe, but he or she happens not to have a strong belief in the proposition. For example, Mark and Sandra may have eloped.
  A subcase of non-committed belief concerns propositions about the future, such as John may return tomorrow.

- Not applicable (NA): for the SW, the proposition is not of the type in which he or she is expressing a belief, or could express a belief. Usually, this is because the proposition does not have a truth value in this world (be it in the past or in the future). For example, I wish Mark and Sandra would finally elope.

The interest of the annotation is clear: we want to be able to determine automatically from a given text what beliefs we can ascribe to the author, and with what strengths he or she holds them. Across languages, many different linguistic means are used to denote this attitude towards an uttered proposition, including syntax, lexicon, and morphology. To our knowledge, no systematic empirical study exists for English or Arabic, and this annotation is a step towards that goal.
2 Annotation Units

The annotation units are syntactic propositions, identified by their head word. We will not mark the full span of a verb and its dependents, or some of its dependents, only the verb. For example: in *He set up the table beautifully*, only *set* is annotated, not *set up*. In cases of copula constructions (where the verb is the verb *to be*), we will assign the annotation to the predicate following it, whether noun or adjective. For example, for *These are particularly exciting times at the Indianapolis museum*, *times* as the head of the following NP is the bearer of the annotation. This is also true for small clauses (copula clauses without overt copula) such as those following *consider* or *make* in English. Nominalizations are not annotated for now.

Examples (the annotation units are in boldface):

(1) **Losing** my money **made** me **mad** (Two propositions according to PropBank)

(2) **Losing** money would **make** me **mad** (Two propositions according to PropBank)

(3) The loss of my money **made** me **mad** (*loss* might not be included in PropBank)

(4) The hunting of deer is **encouraged** (*hunting* might not be included in PropBank)

DECISION:

3 Nested Sources of Propositions: Reported Speech Acts

Here we can take Sec 2.2 from UPitt TR-02-11 (Jan), but we need to modify examples, and explain what we want annotated.

However, in the initial phase, we are only annotating from the point of view of the writer/speaker. Hence all reported speech acts are NCB or NA.

4 Simple Clauses

In this section, we give some details on how to annotate simple matrix clauses, such as *The moon is made of yellow cheese*.

4.1 Basic Diagnostics

We can use the following diagnostics:
• **I am certain that...**: If the main proposition can be embedded under *I am certain that...* (from the point of view if the WS), then that proposition should be labeled **CB**. For example:

(5)  
   a. The moon is made of cheese
   b. I am certain that the moon is made of cheese

In (5) above, in some contexts (a) expresses the same as (b). If determined that this is the case in this context, label the *be* proposition as **CB**.

• **I am not sure but think that...**: If the main proposition can be embedded under *I am not sure but think that...* (from the point of view if the WS), then that proposition should be labeled **NCB**. For example:

(6)  
   a. Probably, the moon is made of cheese
   b. I am not sure but I think that the moon is made of cheese

In (6) above, in some contexts (a) expresses the same as (b). If determined that this is the case in this context, label the *be* proposition as **NCB**.

• **I have no opinion on this, but someone claims that...**: If the main proposition can be embedded under *I have no opinion on this, but someone claims that...* (from the point of view if the WS), then that proposition should be labeled **NCB**. For example:

(7)  
   a. The AP reported that Iraq was bombed
   b. I have no opinion on this, but someone (AP) claims that Iraq was bombed

In (7) above, in some contexts (a) expresses the same as (b). If determined that this is the case in this context, label the *be bombed* proposition as **NCB**.

• **Matrix clause to adverb**: If you can transform the matrix clause of the target proposition into an adverb which expresses some degree of certainty, then the proposition should be labeled **NCB**. For example:

(8)  
   a. I expect John to arrive shortly
   b. John will most probably arrive shortly
In (8) above, in some contexts (a) expresses the same as (b). If you determine that this is the case in this context, label the *arrive* proposition as **NCB**.

(9)  

a. I hope John will arrive shortly  
b. # John will probably/perhaps/maybe/certainly arrive shortly  

In (9) above, the meaning of (a) cannot be conveyed by (b), so you cannot assume that the *arrive* proposition is an **NCB**. Instead, use other diagnostics; in this case, because the matrix verb is *hope*, it is an **NA**.

### 4.2 Basic Auxiliary Verbs

Auxiliary verbs used for perfective tenses and for passive voice (*to be* and *to have*), as well as the *will* of future tense are not annotated, i.e., the proposition is considered simplex. To determine the annotation of the proposition, use the diagnostics in Section 4.1 and the other rules in this section. In the case of the future tense, the proposition is marked **CBF** or **NCBF**. The usual rules and diagnostics are used to distinguish **CBF** from **NCBF**.

Modal auxiliary verbs (*may*, *might*, *can*, *could*, *should*, *need to*, *ought to*, *have to*) are considered introducing a complex proposition. For modal auxiliary verbs, see Section 5.1.

### 4.3 Simple Questions

The main proposition in a question (*wh*- or yes/no) is always **NA**, since it is being queried. For example, *Is the moon made of yellow cheese*, the made-proposition is **NA**.

### 4.4 Imperatives

Imperatives are **NA**.

### 5 Complex Clauses

In this section, we discuss how to annotate complex sentences, including complement clauses (*John claims the moon is made of yellow cheese*), and adjunct clauses (*if the moon were made of yellow cheese, I would eat it up*).
5.1 Modal Auxiliary Verbs

Modal auxiliary verbs (may, might, can, could, should, need to, ought to, have to) are considered introducing a complex proposition and they are, by default, annotated as CB. If used deontically (as describing or creating an obligation or permission), their complements are annotated as NA. If used epistemically (as describing a non-certain belief), the complement is most probably annotated NCB.

Here are some examples:

- **Modal verbs of necessity**

  (10) I need/must/have to search you

  In (10) above, the SW surely believes the need, must, have to propositions. As such, need, must, have to would all be labeled CB. However, the WS is not expressing a belief about the search proposition, so it would be labeled NA.

- **Epistemic certainty**

  (11) It’s possible that the moon is made of cheese, but I don’t know

  In (11) above, the WS believes in the possibility, is not as certain about the be made of proposition (it is possible NOT certain), and believes in the know proposition. Based the definitions outlined above, the be possible proposition is labeled CB, the be made of proposition is labeled NCB, and the know proposition is labeled CB.

  (12) I doubt that the moon is made of cheese

  In (12) above, the WS believes in his or her doubt and is not as certain about the be made of proposition (it is doubtful NOT certain). Based the definitions outlined above, the doubt proposition is labeled CB, and the be made of proposition is labeled NCB.

5.2 Complex Questions

While the main proposition in a question (wh- or yes/no) is always NA (see Section 4.3), this does not mean that any embedded clauses are also automatically NA.

(13) Did you regret giving up your kingdom for a horse?
In (13) above, the regret proposition is **NA**, while the giving up proposition is **CB**, since the speaker clearly believes that the hearer did indeed give up her kingdom.

### 5.3 Classes of Matrix Verbs

Here we discuss specific classes of matrix verbs.

- **Matrix verbs of desire, hope, and longing** (DHL): Verbs which express a state that the WS wish were true (past, present, or future) are marked as **NA**. Example: The complements of the verbs *to hope* and *to wish*.

- **Matrix verbs of expectation**: The complements of the matrix verbs *expect*, *wait*, and *try* are **NCB**.

### 5.4 Multi-Word Expressions

Some things that appear to be sentences containing verbs are actually frozen or semi-frozen multi-word expressions. We have made the following decisions so far as annotation for these expressions themselves and for what is embedded below them (except of there is other evidence):

- **Tell you what**: **NA** in matrix, use usual rules in embedded.

- **Go ahead**: **NA** in matrix, **NA** in embedded if it is an imperative (which always seems the case after *go ahead*).

- **How’s that**: **NA** in matrix, use usual rules in embedded.

- **I say**: as in *I say wait*: **NA** in matrix, use usual rules in embedded.

- **As you know**: **CB** in matrix. Eric’s test: this can be modified by adverbs as in *as you probably know*. The adverbs can change it from **CB** to **NCB**. The embedded clause is almost always **CB** in these cases.

### 5.5 Correlatives

Another construction we discussed is the correlative as in *The more we know, the better*. The speaker has a committed belief about the correlation between *more* and *better*, but does not have a committed belief about *know*. Since there is no single word or contiguous string of words that express the correlation, we decided to annotate *more* and *better* as **CB**, but maybe with some shading instead of a solid color. *Know* will be annotated as **NA**.
5.6 Purpose Adjunct Clauses

Verbs in purpose clauses are marked as NA. To determine if a clause is a purpose clause, replace to with in order to. If the utterance as a whole is still grammatical, the clause is a purpose clause.

(14) a. I am writing to ask you for money
    b. I am writing in order to ask you for money

In (14) above, to ask for is a purpose clause, as it could successfully be replaced by in order to ask for. Since this is the case, the ask for is labeled NA.

5.7 Relative Clauses

There is no distinction between restrictive and descriptive relative clauses. NNED MORE TEXT.

5.8 A Note on Presuppositions in Complex Clauses

Presuppositions (which are explicitly stated) should be annotated as CB. The test for presupposition is that it is still asserted when the matrix clause of the sentence is negated. The in the classic example below, beating your wife is presupposed when the sentence is positive and when it is negative:

(15) a. You stopped beating your wife.
    b. You didn’t stop beating your wife.

Definite event nominals are usually presupposed. In the examples below, the speaker presupposes the existence of the air raids even when the sentence is negative:

(16) a. The air raids killed many people.
    b. The air raids didn’t kill many people.

We also discussed the following example:

(17) a. Wait until you get July and August done.
    b. Don’t wait until you get July and August done.

We did not agree on weather you get July and August done is a presupposition. That is, we don’t agree on whether the negative still presupposes that you will get July and August done.
5.9 *If*-Clauses: the Hypothetical & Conditional

Clauses with *if* are particularly complex.

(18) If John dies, I will cry

In (18) above, the WS has no belief in the *die* or *cry* propositions because they are purely hypothetical. So, both *die* and *cry* would be labeled NA. However, there is a causal connection between *die* and *cry*, and this causal connection could be labeled CB.

(19) If John died, I would cry

In (19) above, the WS has no belief in the *die* or *cry* propositions because they are purely hypothetical. So, both *die* and *cry* would be labeled NA. However, there is a causal connection between *die* and *cry*, and this causal connection could be labeled CB. We are not explicitly annotating the causal connection here however at this phase.

(20) John was safe, but if he had died, I would have cried

This example is slightly different. The WS knows that John did not die and now has a certain belief in both the *die* and *cry* propositions - both of which would be labeled CB. The *die* and *cry* propositions are labeled CB due to negative polarity (the fact that John did not die). The causal connection still holds between *die* and *cry*, so this too would be labeled CB.

(21) I don’t know if John died, but if he were to die, I would cry

In (21) above, the WS has no belief in the *die* or *cry* propositions because he or she does not know if John did die. So, both *die* and *cry* would be labeled NA. However, there is a causal connection between *die* and *cry*, and this causal connection could be labeled CB.

(22) If John would have died, I would (have) crie(d)

Here, the *die* proposition would be labeled CB because the WS clearly has a strong belief about John dying (he did not die, so this is negative polarity). On the other hand, the WS has no belief in the *cry* proposition, so this proposition would be labeled NA. The causal connection still holds, and this connection would be labeled CB, as dying clearly entails crying.

(23) If I doubted the meeting were in Pittsburgh, I wouldn’t have flown to Pittsburgh

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In (23) above, the WS has strong belief in all three propositions. He or she does not doubt there was a meeting in Pittsburgh because he or she flew to Pittsburgh (a case of negative polarity). Thus, the doubt proposition would be labeled CB. The WS also clearly believes that the meeting is in Pittsburgh. Hence, the be in Pittsburgh proposition is also CB. Finally, the WS did in fact fly to Pittsburgh, so he or she must believe that there was an event taking place in Pittsburgh. As such, the fly proposition is also CB.

NOTE: we want to add a NEG suffix for counterfactuals, whose negation is CB.

NOTE: Negation does not change the rules for ‘I hope not’, ‘I don’t call for’.
NOTE: No annotations of interjections such as ‘please’.

6 Annotation Tool

Annotation Tools that could be used:

- GATE (Sheffield)
- PropBank
- Emacs
- Teruko’s tool
- ACE (University of Pennsylvania)

For the pilot project, we use Microsoft Word.