

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: 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: 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: for the speaker or writer, 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

Annotation units for factivity:

- Sentence? (No)
- Proposition? (from PropBank)
- Clause?
- Event?
- Nominals? (from NomBank?) The intuition is that if you can substitute the word *event* for a noun, then it is an event in that context. For example:

- (1) a. Lunch was a tuna sandwich.
b. # The event was a tuna sandwich.
- (2) a. Lunch was a grand affair.
b. ok The event was a grand affair.

Further evidence may come from derivational morphology. Also, non-specific indefinites may need to be excluded (*John wants a baptism*).

Examples:

- (3) Losing my money made me mad (Two propositions according to PropBank)
- (4) Losing money would make me mad (Two propositions according to PropBank)
- (5) The loss of my money made me mad (*loss* might not be included in PropBank)
- (6) The hunting of deer is encouraged (*hunting* might not be included in PropBank)

DECISION: The annotation units will be the propositions identified by PropBank and NomBank.

English annotation units: Use PropBank coding manual.

ACTION ITEM (Owen and Mona): Ask Martha and Adam if they can quickly identify the annotation units in our corpus (English and Arabic). Answer: no.

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.

4 Simple Clauses

In this section, we give some details on how to annotate simple matrix clauses, such as *The cheese 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:

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

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* 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:

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

In (8) 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:

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

In (9) 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:

- (10) a. I expect John to arrive shortly
b. John will most probably arrive shortly

In (10) 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**.

- (11) a. I hope John will arrive shortly
b. # John will probably/perhaps/maybe/certainly arrive shortly

In (11) 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**

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

In (12) above, the WS 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**

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

In (13) 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**.

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

In (14) 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**.

(15) Did you regret giving up your kingdom for a horse?

In (15) 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.

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

In (16) 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:

- (17) 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:

- (18) a. The air raids killed many people.
b. The air raids didn't kill many people.

We also discussed the following example:

- (19) 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 whether *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.

- (20) If John dies, I will cry

In (20) 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**.

- (21) If John died, I would cry

In (21) 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**.

- (22) 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**.

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

In (23) 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**.

(24) 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.

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

In (25) 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**.

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.