

A Rich Annotation Scheme for Mental Events

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Abstract

We present a rich annotation scheme for the structure of mental events. Mental events are those in which the verb describes a mental state or process, usually oriented towards an external situation. While physical events have been described in detail and there are numerous studies of their semantic analysis and annotation, mental events are less thoroughly studied. The annotation scheme proposed here is based on decompositional analyses in the semantic and typological linguistic literature. The scheme was applied to the news corpus from the 2016 Events workshop, and error analysis of the test annotation provides suggestions for refinement and clarification of the annotation scheme.

1 Introduction

Many semantic annotation schemes have a very skeletal annotation of the event expressed by the verb in the clause: just the participants and the roles they play in the event. However, semantic role labels do not capture the details of the causal and other interactions between participants in events (Talmy, 1976; Talmy, 1985; Talmy, 1988), or the subevents that make up the event. For this reason, some have proposed a finer-grained annotation of events (Ikuta et al., 2014; Croft et al., 2016). These efforts have focused mainly on physical events: motion, change of (physical) state, force transmission, application/removal, creation/destruction and so on. This perhaps reflects the fact that the verbal semantics literature in theoretical linguistics has also focused mainly on physical events (Talmy, 1976; Talmy, 1988; Levin and Rappaport Hovav, 1995; Levin and Rappaport Hovav, 2005; Goldberg, 1995; Croft, 2012).

But much of what we talk about is about ourselves, including our mental states—perception, knowledge and belief and emotions—and how we interact with others. For example, in the news corpus used for the shared annotation task for the NAACL 2016 Workshop on Events, the corpus which we use for our test annotation, of the 779 main clause actual (real world, actually occurring) events, only 264 of them, or 34%, describe physical events. In the verbal semantics literature, there has been some attention to certain kinds of mental events (and hardly any attention to social events). However, there has not been a systematic attempt to analyze all types of mental events in the theoretical literature. The primary sources for the semantic analysis of mental events are therefore computational resources such as VerbNet (Kipper-Schuler, 2005; Palmer et al., 2017) and FrameNet (Baker et al., 1998; Ruppenhofer et al., 2016). While these resources are broad, the semantic analysis of FrameNet is restricted to participant roles (Frame Elements), though VerbNet has developed some predicate calculus representations to analyze event structure.

We propose an annotation scheme for different semantic types of mental events. The annotation scheme is intended to support a force dynamic decomposition of events that is at least partly attributable to the meanings of the argument structure constructions that mental verbs occur in. The force dynamic analysis is based on Talmy’s (1976; 1988) analysis of event structure. In the force dynamic model, event structure is defined in terms of the interactions between the participants in the event. An argument structure construction is the configuration of subject, object and oblique phrases (governed by various

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prepositions in English, sometimes expressed by case inflections in other languages) which a verb occurs with. Goldberg (1995; 2006) argues that an argument structure construction has a meaning which represents a highly schematic event structure.

It is this highly schematic event structure that we aim to annotate: it is schematic enough that a relatively small number of annotation categories can be used, but it provides more detailed information about the internal structure of events than semantic role labels on argument phrases. The mental event annotation scheme proposed here is compatible with the annotation scheme in the force dynamic representation proposed in Croft et al. (2016); however they analyze only physical events.

The argument for annotating the internal structure of events is twofold. First, many English verbs allow for different semantic interpretations when they occur in different argument structure constructions. The examples in (1) illustrate the ambiguity, with the standard labels for the force-dynamic type given in brackets:¹

- (1) a. She flailed with her feet to get her balance and managed to **kick** the chair. [contact]
- b. So he's going to shoot if I have to **kick** him black and blue. [change of state]
- c. **Kick** the ball into Lake Michigan... [ballistic motion]
- d. Go on, **kick** him the ball and let's see what he'll do with it. [transfer]
- e. You **kick** wildly at the plastic bottle, finally knocking it loose. [conative—action aimed towards a target entity]

Thus, a semantic annotation of the event expressed by a clause cannot rely simply on a verb's lexical semantics taken out of grammatical context.

Second, there is a strong correlation between a construction's form and the semantics of the event. That is, particular argument structure constructions have meaning, as Fillmore et al. (1988), Goldberg (1995; 2006) and other construction grammarians have argued. The correlation is not perfect: there is some lexical idiosyncrasy in the choice of prepositions for some argument structure constructions, for example. Also, some constructions are polysemous and have metaphorical uses, which means that their meaning is not completely determined by their form. Nevertheless, the need for semantic annotation of event structure partly independent of a verb's lexical semantics is evident from the many-to-many mapping between verbs and argument structure constructions.

Both of these arguments for the annotation of internal event structure apply to mental events, although to a lesser degree.

2 The Force Dynamic Structure of Mental Events

Mental verbs describe mental events, that is, mental states or processes of a person (or certain animals to whom internal mental states are attributed). These mental states or processes generally though not always occur oriented to some external situation: an entity, a static state of affairs, or the occurrence of a dynamic event. Mental events are usually divided into three domains: perception, cognition and emotion, with some linguists such as Levin (1993) and Verhoeven (2007) distinguishing desire/intention from emotion.

Mental events differ from physical events in two major ways. First, there is no physical transmission of force between the external situation and the person's mental state. Hence there is no force dynamic relation between participants. Nevertheless, mental events are construed as having "directionality". We will describe the varying construals of mental events as *mental force dynamics* or *mental dynamics* for short.

Second, what is happening in the mind is not outwardly apparent to the observer. Hence, the actual mental event—state or process, for example—is a construal by the observer who produces a sentence describing the mental event. Alternative construals of mental events are generally inferred from the grammatical constructions that mental predicates occur in, constructions that are often but not always used also for physical events. Tense-aspect constructions indicate whether the mental event is construed

¹The examples in (1) are from Croft et al. (2016); they were taken from COCA and Google.

as a state or a process, and argument structure constructions indicate the “direction” of causation in mental events. In many cases, there is a lexical split between alternative construals of mental events.

Mental events have two primary participants, the person whose mental state/process is being described, usually called the *experiencer*, and the external situation (entity, etc.), called the *stimulus*; the stimulus of emotion predicates is also called the target/subject matter of emotion (T/SM) following Pesetsky (1995).

The semantics literature has described three common construals of the mental force dynamic relation between the experiencer and the stimulus. Viberg (1983), a cross-linguistic survey of the semantics of perception verbs, distinguishes *activity* from *experience* predicates, as illustrated in 2.²

- (2) a. Everyone was **looking** at you.
b. I **see** garbage on people’s side yards that they haven’t even picked up.

The activity construal corresponds to Levin’s *Marvel* verb class 31.3 (Levin, 1993) (emotion verbs) and *Peer* verb class 30.3 (perception verbs; Levin does not include cognition verbs, which usually take sentential complements). The experience construal corresponds to Levin’s *Admire* verb class 31.2 (emotion verbs) and *See* and *Sight* verb classes 30.1 and 30.2 (perception verbs).

In the third construal of the relationship that has been discussed in the literature, the external situation is construed as causing a mental state to occur in the experiencer (Zaenen, 1993; Pesetsky, 1995; Levin and Grafmiller, 2013; Doron, 2017).

- (3) a. But as much as they **annoyed** him, he annoyed them right back.
b. But most of the exhibits will **surprise**, perhaps **startle**, and in some cases **delight** viewers.

In languages such as Hebrew (Doron, 2017) and Korean (example 4) there is explicit causative morphology in the causative construal.

- (4) Senghankyung-i tto han-pen na-lul nolla-ke ha-ess-ta
Senghankyung-NOM again one-time I-ACC surprise-CAU CAU-PST-DECL
‘Senghankyung surprised me once again.’ (Sejong Corpus)

The causative construal corresponds to Levin’s *Amuse* verb class 31.1 (emotion verbs); there are no basic perception verbs with this construal.

Activity and experience perception events can be distinguished aspectually in English by the Progressive construction, which is sensitive to the stative-dynamic event distinction. English sometimes distinguishes activity and experience lexically (*look* vs. *see*). However, other verbs may have either construal:

- (5) a. You can **taste** the mixture to see if you want a stronger coffee flavor. [activity]
b. I could almost **taste** a dish by watching it being prepared, especially if it was something simple. [experience]

This is an example of a single verb having alternative semantic interpretations that need to be distinguished, although in this case both construals use the same argument structure construction (the transitive).

Croft (1993) argues that there are consistent differences in argument structure across languages between the activity, causative and experience construals, and offers a “causal” analysis for the differences. The activity construal always expresses the experiencer as subject, and the stimulus as either object (as in Spanish *mirar*) or as an oblique, usually derived from a locative (as in English *look at*). The activity construal conceptualizes the mental event in terms of the experiencer directing her attention to the stimulus: the experiencer engages in a mental activity, usually volitionally, and hence is coded as subject.

The causative construal always expresses the stimulus as subject; the experiencer is expressed as object or as an oblique, typically dative. The causative construal conceptualizes the mental event in terms of the stimulus causing a mental state to occur in the experiencer, as described above; hence the stimulus as initiator of the event is subject.

²All examples in sections 2 and 3 are from the news segment of COCA unless otherwise indicated.

In contrast, the experience construal is variable: the experiencer may be subject or nonsubject, as in 6 (a nonsubject experiencer is often in a dative case, hence the term “dative experiencer”). Most English verbs have subject experiencers (Talmy, 1985). However, there are some English verbs taking the stimulus subject construction for the experience construal, namely Levin’s *Appeal* verb class 31.4 (emotion) and her Stimulus Subject Perception Verb class 30.4 (perception).

- (6) a. We can now begin to **understand** the senseless act.
 b. What **appeals** to you might not **appeal** to your neighbor.

The experience construal conceptualizes both directing of attention by the experiencer and the change of mental state by the stimulus. Hence it is stative (no direction of causation), and either experiencer or stimulus may be expressed as subject.

There may be a subtle semantic difference in the experience construal when both argument structures are possible. When the experiencer is subject, they have greater control over the mental event, and when the experiencer is object, they have less control. In Yoruba, one of the major languages of Nigeria, the subject experiencer construction indicates that the experiencer has control over their anger, but the object experiencer construction indicates that the anger has come to them involuntarily (Rowlands, 1969).

- (7) **Mo** binú vs. Inú bi **mi**
 I anger_inside inside anger **me**
 ‘I am angry’ vs. ‘I feel/felt angry’

Pesetsky (1995) argues that some transitive constructions in English are ambiguous between what we are calling causative and experience construals. He argues that sentence 8 may mean that the article in the *Times* causes Bill to be angry at something else, for example corruption described in the article (the causative construal), or it may mean the same as sentence 9, namely that Bill has a mental state of anger with respect to the article, for example because it was written in a biased manner (the experience construal). Sentence 9 has only the experience construal.

- (8) The article in the *Times* **angered** Bill. (Pesetsky, 1995)
 (9) Bill **was angry** at the article in the *Times*. (Pesetsky, 1995)

Pesetsky observes that one cannot express both the causative of the mental state and the distinct situation towards which the caused mental state is directed in a simple clause in English, although a periphrastic causative construction can express both. However, Doron (2017) observes that it is possible to do so in Hebrew.

- (10) *The article in the *Times* **angered** Bill at the government.
 (11) The article in the *Times* **caused** Bill to **be angry** at the government. (Pesetsky, 1995)
 (12) ha-martse ‘**inyen** ota be-balshanut
 the lecturer **interested** her in-linguistics
 ‘The lecturer got her interested in linguistics.’ (Doron, 2017)

A final issue is the occurrence of some emotion predicates in the progressive, such as *But she isn’t rejoicing over her place in history..* This does not seem to be the activity construal, since the activity construal requires some control over the mental state, and emotions generally cannot be controlled by the experiencer. It is possible that the progressive occurs here because the verb describes not just an emotional mental state but also outward action reflecting the mental state.

3 Towards an Annotation Scheme for Mental Events

Based on the analysis of mental events in the semantics literature summarized in section 2, we developed an annotation scheme for mental force dynamic relations. We applied this annotation scheme to the mental event verb classes in VerbNet. Specifically, we annotated each example sentence for each case frame for each verb class and subclass in VerbNet that describes mental events. The number of example

sentences, and hence the number of VerbNet (sub)class case frames for mental events, is 233. In this process, we were obliged to add four additional annotations. Two of the four new annotations, Engage and Refrain, pertain to subevents functioning as arguments of the main clause predicate event, which is uncommon in physical events but frequent in mental events. The other two new annotations, Judge and Intend, represent mental dynamic construals beyond the three construals discussed in the semantics literature.

3.1 Attend and Affect

The core of the annotation consists of the three construals of mental force dynamics described in section 2. The activity construal represents an Attend relation between the experiencer and the stimulus (or T/SM). The experiencer directs her attention to the stimulus; this is generally a volitional activity on the part of the experiencer.

The causative construal represents an Affect relation between the experiencer and the stimulus. The stimulus, which as noted above may be an entity, a state of affairs, or an occurrence of a dynamic event, brings about a mental state in the experiencer. This is not physical causation, let alone volitional causation, but what Talmy (1976) calls affective causation. Affect is also the force dynamic relation between an event of any kind and a Beneficiary (or “Maleficiary”) who is positively (or adversely) affected by the event, as in *A school bookkeeper baked a cake for Gurley with purple-and-gold icing, the school colors*. In this case, as in (2016), a single clause will be annotated for two segments of the causal chain, the “core” event and the participant in the Affect relation with respect to the core event.

3.2 Experience and Experience*

The experience construal represents both Attend and Affect at once (see section 2), that is, one “direction” of causation is not highlighted at the expense of the other; as a result, the relation is construed as stative. However, for annotation purposes, we represent the double construal simply as a distinct, third type of construal, an Experience relation between experiencer and stimulus. This construal is generally a stative relation holding between the two participants, as in examples 13 and 15. It can also have an inceptive aspectual construal, as in examples 14 and 16; an inceptive construal is not uncommon among normally stative predicates.

- (13) I see garbage on peoples side yards that they havent even picked up.
- (14) Stead walked out the back door and suddenly **saw** a bobcat holding in its jaws a dead rabbit
- (15) But I don’t really **remember** much about the clock.
- (16) I started to cross-examine them but suddenly **remembered** I’d left the tire iron inside the house.

We also distinguish between the experiential construal in which the experiencer is subject (Experience) and the construal in which the stimulus is subject (Experience*). The purpose of distinguishing these alternative argument linkings is to allow for the mapping of the referents of the subject and object phrases to the correct semantic participant roles. Also, in those languages that distinguish alternative construals semantically, as in the Yoruba sentences given in example 7, Experience and Experience* allows us to capture the distinct semantic interpretations of the alternative construals.

3.3 Engage and Refrain

The stimulus for a mental event need not be an entity but may be a state of affairs or the fact of an event occurring. In some cases, the state of affairs is expressed as an event nominal, as in example 17 below. In this case, the Experience relation holds between the experiencer and a stimulus that represents a state of affairs. In another case, the state of affairs is expressed as a sentential complement, particularly with cognitive verbs (propositional attitude verbs), as in example 18. These are analyzed in force dynamic terms in the same way as example 17. (For now, we are not distinguishing between propositions and events as complement types.)

- (17) I could understand [**their action**].

(18) She then discovered [**that a purse was missing**].

In yet other cases, the state of affairs is divided syntactically between the “subject” and the “predicate” of the state of affairs, as in example 19. The noun phrase *a threat* is traditionally described as a predicative complement. In order to simplify the mapping between the syntactic structure and the semantic structure, we treat the state of affairs’ “subject” and “predicate” as two separate “arguments”, and posit an Engage relation between the two (that is, the referent of *it* Engages in the property of being a threat). In fact, there are only two event participants, the experiencer and the stimulus state of affairs, namely that it is a threat.

(19) But in a June 2005 survey, by a 48% to 44% margin, more respondents judged [**it**] [**a threat**].

We have also tentatively posited the negative counterpart to Engage, Refrain, since the syntactic construction for Refrain in English differs from the construction for Engage (*Rebuilding a life in Black Forest won't completely free [her] [of the emotional turmoil that has marked the past year], she said.*); as noted above, one of the goals of this annotation scheme is to capture the semantics of the argument structure constructions that mental event verbs occur in.

3.4 Judge

In addition, we posited another distinct mental dynamic image scheme, Judge. Judge describes an active mental process mostly under the control of the experiencer, like Attend: it describes mental processes such as comparing, categorizing, inferring and measuring something. Unlike Attend, however, Judge describes the result of the mental process: the conclusion, classification or measurement arrived at. The result is often expressed as a predicative complement, as in example 19.

3.5 Intend

The final mental dynamic image schema that we added to our annotation is Intend, for the relationship between a volitional agent and the agent's as yet unrealized, and possibly never realized, action with respect to the other participant. The Intend relation can be used for an intended subevent of a physical action. For example, in *This is the way to cook a chicken for any kind of cold chicken salad, Asian or Western*, the agent performs a physical action on the chicken, but there is an intended subsequent subevent of preparing a cold chicken salad which is not (yet) realized in this sentence. Hence the Intend relation can be used for purpose arguments for all types of events, not unlike Affect with respect to the beneficiary of an event.

There are other verbs in which there are only two participants, the agent and the entity towards which the agent's intention is directed. These include verbs of searching, caring and longing.

(20) Police were **searching** for a man suspected in the shooting.

(21) She **cared** for her grandchild until the end.

(22) She **looked** after him for years in the orphanage after their birth mother died.

(23) They seem to **long** for the “good old days” that are forever gone.

(24) What outdoor cook doesn't **lust** after one of those giant stainless steel grills, a mini-fridge and a sink with hot and cold running water?

Searching verbs and caring verbs do involve physical actions on the part of the agent, but the action is directed towards a potentially unrealized subevent pertaining to the endpoint of the causal chain: finding what is being searched for, and continued good condition of what is being cared for. Verbs of longing, on the other hand, are more purely mental events. However, all three verb classes use the construction [Subject Verb *for/after* Oblique], with the prepositions *for/after* that are characteristic of the intention/purpose construction. For this reason, we have included all of these categories in our annotation of mental events.

Intend cannot be reduced to Attend, although both describe the directing of some sort of mental state towards an external stimulus that is not (yet) affected. Example 25 is an Attend relation, using a locative

Annotation	Brief definition (Exp = experiencer, Stm = stimulus)
Attend	Exp directs attention to Stm: dynamic, volitional, no change to Stm.
Affect	Stm causes change of mental state of Exp: dynamic, causative. Used also to describe a Beneficiary/Maleficiary subevent in other types of events.
Experience	A perceptual, cognitive or emotional relation holds between Exp and Stm: stative (or inceptive), Exp is grammatical subject.
Experience*	A perceptual, cognitive or emotional relation holds between Exp and Stm: stative (or inceptive), Stm is grammatical subject.
Judge	Exp discerns or confers a perceptual, conceptual or evaluative status on an entity or a relation between entities: dynamic, volitional, no change to Stm.
Intend	Agent intends to act on another participant in some way but action on the participant is not realized: no change (yet) to participant. Used also to describe a Purpose subevent in other types of events.
Engage	A relation between an argument denoting a participant and another argument denoting the event/subevent that the participant is involved with. The participant is a core participant in the event.
Refrain	A relation between an argument denoting a participant and another argument denoting an event/subevent that the participant ends up <i>not</i> being involved with. The participant is a core participant in the event.

Table 1: Annotation scheme for mental events

preposition for the auditory stimulus that attention is being directed to; but example 26 describes a mental activity directed towards a specific sound which may or may not ever be heard by the experiencer.

(25) I **listened to** the record again (recently) for the first time in years.

(26) I **listened for** any sound of life and screamed for help.

As noted above, some semanticists distinguish verbs of desire from other emotion verbs. Levin (1993) distinguishes two subclasses of desire verbs, *Want* verbs and *Long* verbs. Unlike *Want* verbs, *Long* verbs express their “stimulus” with *for/after* in English, like other verbs of intention. For this reason, we have analyzed verbs of longing as instances of the Intend mental dynamic relation. Since *Want* verbs are semantically very similar, one might consider whether they are also instances of Intend. However, *Long* verbs may also construe the mental event as dynamic, similar to verbs of searching or caring, whereas *Want* verbs are stative.

(27) Dorothy **needs** /***is needing** new shoes. (Levin, 1993)

(28) Dana **longs/is longing** for a sunny day. (Levin, 1993)

We therefore conclude based on both syntactic and semantic differences that *Want* verbs represent an Experience construal of the desire event, while *Long* verbs represent an Intend construal.

4 Applying the Annotation Scheme to Mental Events

The annotation scheme for mental events is summarized in Table 1. The scheme was tested by having two annotators involved in our project annotate the mental events in the news corpus used for the 2016 Events Workshop shared task. This news corpus contains a total of 3749 events annotated in Richer Event Description (RED) annotation, which does not annotate for force dynamics. We restricted our annotation to actual real-world events: we excluded nonfinite forms, including nominals, adjectives and prepositions, examining only primary predications. We also excluded coreferring events, some of which overlap with the previous categories. This filtering was done to avoid issues with annotating aspect and unrealized events, also part of this project although not the topic of this paper.

The filtering process left 779 events. We have no reason to believe that the distribution and type of events in the excluded categories are different from the distribution and type of events (physical, mental, social) included in our analysis. In other words, we believe that the force dynamic classification of events in the sample of 779 events is representative of the 3749 events in the total corpus. We used the VerbNet verb classification for an initial filter for mental events, and then hand-filtered the result. This left 156 mental events, of which a further 43 were deemed not to be mental events in the course of the annotation

exercise. In other words, mental events make up around 15% of the 779 events in the news corpus. This is a relatively small number, but we expect that some of the mental dynamic analysis will carry over to the social events—which make up 51% of the 779 events—since social interaction involves persons using their mental faculties in the interaction. It is also possible that conversational data, where people frequently talk about other people including their beliefs and attitudes, will have a greater proportion of mental events compared to news stories.

A trial annotation of 25 sentences was performed by the two annotators and discussed by the annotators, the adjudicator and two other participants in the project. This led to clarification of the informal guidelines for the application of the annotation scheme, and the exclusion of 4 examples which were determined not to be mental events. The test annotation was then done on 92 remaining sentences; a further 39 sentences were excluded before the text annotation as not mental events (see section 5). The test annotation consisted of 92 tokens; there was 81% agreement in annotation (75 out of 92), with a Cohen's kappa of .85. As usual, it is difficult to compare the scoring of our semantic annotation to other semantic annotation tasks. Our force dynamic analysis annotates the combination of verb semantic class and the argument structure construction and the meaning it contributes, so that task itself is also not easily comparable to other verbal semantic annotation tasks.

5 Error Analysis

The analysis of inter-annotator disagreements in the test annotation indicated a number of areas in which the annotation scheme can be improved.³

A content issue that arose in the test annotation is distinguishing cognition from communication events with an unexpressed addressee. Cognition and communication share much conceptual structure: both describe propositional attitudes, both can alternatively construe the propositional content as a topic (Boas, 2010), and both have a cognizer of the content/topic.

Communication events of course also have a second cognizer, the addressee. But it is sometimes rather subtle to decide whether the verb without an addressee entails that the propositional content must be expressed verbally and hence must describe a communication event. For example, support of a political position, as in *Skelton was a social conservative who **supported** gun rights*, is frequently verbalized, since politicians are expected to express their political views; but it was concluded that a person can support (believe in) a particular policy without necessarily expressing it to anyone, and hence *support* can describe a mental event.

On the other hand, the negative evaluation of *condemn* in *Michaloliakos **condemned** the murder last month of a 34-year-old hip-hop artist and anti-fascist, Pavlos Fyssas, by a self-professed supporter of Golden Dawn* is necessarily a speech act and hence is a communication event. 22 examples were reclassified as communication events, and the guidelines have been clarified to specify whether or not verbal expression of the mental state is inherently part of the verb meaning.

Some emotional states can emerge without there being a clear external situation that brings it about, as in *But I **feel so good**...* We concluded that we had to posit a distinct annotation category, State, to represent an autonomous mental state that is not presented as part of a mental force dynamic relation to an external situation. The State mental event type is not found in VerbNet, possibly due to the fact that syntactically *good* is an adjective, not a verb.

A second issue is the fact that the same verb may have different mental force dynamic construals. This is of course the primary reason for positing such construals as part of constructional meaning. In some cases, the difference is indicated by a difference in the tense-aspect construction rather than the argument structure construction.

- (29) [The British Foreign Office] **was considering** his request for a meeting with Hague.
- (30) According to the Arizona Republic, Kyrsten Sinema **is thinking** of running.
- (31) A saffron red thread called a tilak, worn around the wrist **is considered** to have deep religious significance among Hindus,

³All examples in this section are from the 2016 NAACL Events Workshop shared task news corpus.

- (32) I **thought** the point of an ecumenical council was to clarify essentially (*sic*) there is a dispute (*sic*) over the right faith and the council “decide” what is.

Examples 29 and 30 construe the mental event as dynamic and hence they describe the experiencer directing their cognitive attention towards the event, that is, the Attend relation. In contrast, examples 31 and 32 are stative and hence they describe the Experience relation holding between the experiencer and the stimulus situation. In addition, the latter two also express the situation as a finite complement clause, the typical expression of the propositional content of the cognitive experience. In contrast, 29 and 30 use event nominals to express the state of affairs being considered. Although the argument structure constructions are sometimes idiosyncratic in what mental dynamic relation they encode, the occurrence of the Progressive is a reliable cue that the mental dynamic relation is Attend as opposed to Experience.

A third issue that arose in the test annotation pertains to the difference between adjectival passives—an adjective with a passive participle form—and verbal passives (Wasow, 1977). A verb like *annoy* is usually construed as a causative, and the passive with *by* for the stimulus/causing participant is simply the passive voice version of the causative (Affect) construal. However, there also exists an adjectival form which is identical to the passive participle, but governs the stimulus with a lexically idiosyncratic preposition, one of the metaphorical locative prepositions typically found with the stimulus of mental events. The adjectival form is an instance of the Experience construal.

- (33) He was **annoyed by** her hectoring. (COCA News corpus) [Affect]

- (34) I was **annoyed at** him, for interfering in the elections, giving statements here and there. (COCA News corpus) [Experience]

Wasow (1977) observes that the adjectival and verbal passive forms are mostly easily distinguished in their syntactic behavior, with one exception: *known*; but *known* with a predicative complement, such as example 35, is the verbal passive (cf. the active counterpart *They know him as/to be an expert on national defense*). Example 35 and two other examples of *be known* in the test annotation were labeled Experience instead of (passive) Affect.

- (35) Skelton, who was first elected to the House in 1976, **was known as** an expert on national defense

6 Conclusion

Mental events have not been studied in detail in approaches to a finer-grained annotation of events. The verbal semantics literature in theoretical linguistics has identified three common construals of events, which we have annotated as Attend, Affect and Experience (including Experience* for the alternative linking of the stimulus to the subject grammatical role). However, we needed to add two other mental dynamic construals, Intend and Judge, plus two construals, Engage and Refrain, for subevents.

The text annotation provided fairly reliable interannotator agreement. Error analysis indicated a number of subtle annotation judgements that can be honed with more explicit guidelines to distinguish cognition from communication events when the latter have an unexpressed addressee, adjectival passives from verbal passives, and to exploit aspectual as well as argument structure cues in the syntactic constructions. In sum, however, the task of annotating VerbNet mental event classes and annotating news corpora has led to a relatively stable annotation scheme for mental event structure.

Acknowledgements

This research was partly funded by grant number HDTRA1-15-0063 from the Defense Threat Reduction Agency to the first author.

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