Simple and Phrasal Implicatives

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Abstract

This paper complements a series of works on implicative verbs such as *manage to* and *fail to*. It extends the description of simple implicative verbs to phrasal implicatives as *take the time to* and *waste the chance to*. It shows that the implicative signatures of over 300 verb-noun collocations depend both on the semantic type of the verb and the semantic type of the noun in a systematic way.

1 Introduction

There is a substantial body of literature on the semantics of English complement constructions starting with (Kiparsky and Kiparsky, 1970) and (Karttunen, 1971; Karttunen, 1973), including (Rudanko, 1989; Rudanko, 2002; Nairn et al., 2006; Egan, 2008). These studies have developed a semantic classification of verbs and verb-noun collocations that take sentential complements. They focus on constructions that give rise to implied commitments that the author cannot disavow without being incoherent or without contradicting herself. For example, (1a) presupposes that Kim had not rescheduled the meeting, (1b) entails that she didn't and presupposes that she intended to reschedule it.

(1) a. Kim forgot that she had not rescheduled the meeting.

    b. Kim forgot to reschedule the meeting.

FACTIVE constructions like *forget that X* involve presuppositions, IMPLICATIVE constructions like *forget to X* give rise to entailments and may carry presuppositions.

Presuppositions persist under negation, in questions and if-clauses, entailments do not. For example, the negation of (1b), *Kim did not forget to reschedule the meeting*, entails that Kim did reschedule the meeting and presupposes, as (1b) does, that it was her intention to do so.

Implicative constructions involve entailments. The entailment may be positive or negative depending on the polarity of the containing clauses. Replacing *forget* by *didn't forget* in (1b) gives an entailment of the opposite polarity. Questions and if-clauses do not yield any entailments.

2 Simple implicatives

The constructions *forget to X* and *remember to X* are two-way implicative constructions. They yield an entailment about the truth or falsity of X both in affirmative and in negative sentences. We use the notation $+ - | - +$ for the verb *forget to* to indicate that *forget to X* yields a negative entailment for X in a positive context, $+-$, and a positive entailment in a negative context, $-+$. The first sign stands for the polarity of the embedding context, the second sign for the polarity of the entailment. We code the verb *remember to* as $+ + | - -$ because in a positive context *remember to X* yields a positive entailment about X, $++$, and the opposite, $--$, in a negative context.

There are two major types of implicative constructions. TWO-WAY IMPLICATIVES like *forget to* and *remember to* yield an entailment both in positive and negative contexts, ONE-WAY IMPLICATIVES yield an entailment only under one polarity. Karttunen (1971; 1973) and Nairn *et al.* (2006) list verbs of both types. Table 1 gives a few examples of two-way implicatives.

$++|--$ implicatives	$+-|-+$ implicatives
turn out that	
manage to	fail to
succeed in	neglect to
remember to	forget to
deign to	refrain from ...ing
happen to	avoid ...ing

Table 1: Types of two-way implicative verbs

2.1 Two-way implicatives

The type of the complementizer that a verb takes may change the semantic type of the construction. *forget that X* is factive but *forget to X* is a $+-|-+$ implicative construction. (1a) presupposes that Kim had not rescheduled the meeting, (1b) entails that she didn't.[1] If we replace *forgot* in (1) by *didn't forget*, the presupposition of (1a) remains intact but the entailment of (1b) reverses polarity: Kim did reschedule the meeting.[2] In contrast to *forget*, *pretend that X* and *pretend to X* are both counterfactive. The sentences in (2) and their affirmative counterparts presuppose that Kim did not have everything figured out.

(2) a. Kim didn't pretend that she had everything figured out.

   b. Kim didn't pretend to have everything figured out.

The polarity of a clause is determined from top down. (3) entails that Kim ate breakfast because the two negative polarities of *almost* and *fail* cancel out and *fail to X* and *remember to X* are both two-way implicative constructions.

(3) Kim almost failed to remember to eat breakfast.

The chain of inferences is sketched in (4) where [+] marks the top-level expression as true. The subsequent [+] and [−] signs indicate the entailed polarity of each subordinate clause.

(4) [+] almost(fail-to(remember-to(X)))
    [−] fail-to(remember-to(X))

[+] remember-to(X)
[+] X

In short, *almost(X)* and *fail-to(X)* switch the polarity of the entailment, *remember-to(X)* preserves it. Omitting *almost* (or *fail to*) from (3) reverses the entailed polarity of the eat-clause.

(5) Kim failed to remember to eat breakfast.

(6) [+] fail-to(remember-to(X))
    [−] remember-to(X)
    [−] X

2.2 One-way implicatives

Constructions such as *manage to X* and *fail to X* are perfectly symmetrical in that they yield an entailment both in affirmative and negative contexts. As noted early on, (Karttunen, 1971; Karttunen, 1973), there are four types of verbs that yield an entailment about their complement clause only under one or the other polarity.

$++$ implicatives	$+-$ implicatives
cause NP to	refuse to
force NP to	prevent NP from
make NP to	keep NP from
$--$ implicatives	$-+$ implicatives
can (= be able to)	hesitate to

Table 2: Types of one-way implicative verbs

The $++$ and some of the $+-$ implicatives in Table 2 are causatives.[3] (7a) entails that Mary left, (7b) entails that she didn't. (7c) and (7d) are consistent with Mary leaving or not leaving.

(7) a. Kim forced Mary to leave. (*but she didn't)

   b. Kim prevented Mary from leaving.

   c. Kim did not force Mary to leave.

   d. Kim did not prevent Mary from leaving.

The $+-$ implicatives switch the polarity of the entailment from positive to negative. (8) does not tell us whether Dave left or not because *force to* does not yield any entailment under negative polarity about its complement.

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[1]All the two-way implicatives in Table 1 also give rise to a presupposition. (1b) and its negative counterpart presuppose that Kim had intended to reschedule the meeting.

[2]It is possible to interpret the example differently by focusing the negation on the word *forget*: *Kim did not* FORGET *to reschedule the meeting. She never intended to do that.* See (Karttunen and Peters, 1979), (Horn, 1985) for further discussion of this type of "metalinguistic negation" that objects to the use of a particular word or locution but not necessarily to what the sentence entails.

[3]Rudanko (2002) points out that there is a causative construction that is not associated with any particular verb: *She bullied him into marrying her* entails that he married her. It appears that all constructions of the type TV NP *into X* are $++$ implicatives.

(8) Kim prevented Mary from forcing Dave to leave.

(9) [+] prevent-to(X, force-to(Y, Z))
    [−] force-to(Y, Z)
    [ ] Z

The −− implicatives express a necessary condition for the truth of the complement clause. If the host clause is under negative polarity, the complement clause is false. (10) entails that Kim did not finish her sentence.

(10) Kim could not finish her sentence.

It appears that *hesitate to* is the only −+ implicative verb in English. (11) entails that Kim spoke her mind.

(11) Kim did not hesitate to speak her mind.

Omitting the negation in (11) makes it non-committal as to whether Kim spoke her mind or not.[4] There are other verbs such as *shy away from* and *shrink from* that yield a positive entailment under negation but they are two-way implicatives like *avoid to*. The verb *wait to* has one interpretation that has the same implicative signature as *not hesitate to* but the construction *not wait to* is ambiguous.

2.3 Ambiguity of *not wait to X*

The construction *not wait to X* can be understood in two ways. The example in (12a) could be continued either with (12b) or (12c).

(12) a. Ed did not wait to call for help.

    b. ... Instead he left the scene in a hurry.

    c. ... But it was too late.

The continuation (12b) implies that Ed did not call for help, (12c) implies that Ed called for help right away. The word *instead* in (12b) and the anaphoric *it* in (12c) are clues that indicate whether Ed made a call or not.

A Google search finds numerous examples of both types. The sentences in (13) contain *wait to X* in the −− sense, in the the examples in (14) it has the −+ interpretation.

(13) a. Deena did not wait to talk to anyone. Instead, she ran home.

    b. He did not wait to hear Ms. Coulter's response, but immediately walked up the balcony stairs and left.

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[4]Although *not hesitate to X* seems to deny that there was any hesitation to X, many examples from the web suggest otherwise: *When I got the paper back I almost hesitated to see the grade, but when I saw the A on the title page, that hesitation quickly turned into relief. Not hesitate to X is an idiom, it is not compositional.*

c. He was so excited to get his Thomas set that he didn't wait to take off his coat.

(14) a. It hurt like hell, but I'm glad she didn't wait to tell me.

    b. Kalamazoo didn't wait to strike back. The K-Wings scored two goals in less than 90 seconds.

    c. I didn't wait to open the gift. Heck, I didn't even wait to wear them. They're the softest most comfy overalls I've ever owned.

The construction *not wait to X* is not vague about the truth or falsity of the complement. Either it means that X was not done at all or it means that X was done right away without delay. In most contexts it is immediately clear which interpretation the author has in mind. The ambiguity mostly goes unnoticed.

The source of the ambiguity can be seen in examples where *wait to* has two infinitival complements.

(15) a. "My biggest regret is that I didn't wait [to get married] [to have kids]" says Gerald, a father of three. "If I had it to do over again, I'd wait until I was married to become a father."

    b. Chances are, you probably didn't wait [to get permission from the scientific establishment] [to start believing in the creative power of thought and the underlying spirituality of the universe].

    c. I raised my hand above my head, as if I were in school or something, but didn't wait [for anyone to give me the "okay"] [to start talking].

The examples in (15) have the form *not wait [to X] [to Y]*. They entail that X did not happen but Y is true. In other words *wait to* is −− with respect to its first complement and −+ with respect to the second. In (15a) Gerald did not get married but had kids. In (15b) the addressee probably started believing without the permission of the scientific establishment.

The implicit assumption in these cases is that one might see X as a precondition for Y but the protagonist skipped X and proceeded directly to Y. The ambiguity arises from the fact that syntactically the two complements of *wait to* are both optional.

In the case of (15a), Gerald might have said *My greatest regret is that I didn't wait to get married* leaving out the second complement, or he might have said *My greatest regret is that I didn't wait to have kids* leaving out the first.

(13c) came with a picture of a boy with his blue coat still on playing with his new Thomas train set. (14c) came with a picture of a girl wearing her comfy birthday gift overalls in advance of her birthday.

In the case of (12a) that is ambiguous without a context, the reader has to guess whether it should be read as *Ed did not wait [to call for help][. . .]* or *Ed did not wait [. . .] [to call for help]*. The continuation (12b) is consistent with the first option, (12c) with the second.

The fact that the ambiguity of (12a) is syntactic rather than semantic explains why it is not possible to translate this sentence to languages such as Finnish, German and French in a way that preserves the ambiguity. The translator has to decide which of the two interpretations is the right one because they translate differently. In this respect (12a) is similar to well known examples such as *time flies like an arrow* and *I saw her duck* that have no ambiguity-preserving translations in other languages because the ambiguity comes from accidental lexical and syntactic overlaps that are language-specific.

2.4 Invited inferences

Although one-way implicatives yield a definite entailment only under one polarity, in many contexts they are interpreted as if they were two-way implicatives. For example, the complement of *prevent from* in negative sentences such as (16) is likely to be understood to be true and the author probably intended the sentence to be interpreted in that way.

(16) The language barrier did not prevent us from having a few laughs together.

If something was not prevented or if someone could do it, it may have happened. If someone was not forced to do something or hesitated doing it, maybe she did not do it. However, an explicit denial is possible as in (17) showing that the inference about the veridicality of the complement is pragmatically based, not truth-conditional.

(17) a. Her mother did not prevent her from visiting her father, but she never did.

b. He showed he could jab, but didn't. He showed he could work the body, but didn't.

c. The school had not forced the students to leave, but they left on their own.

d. She hesitated to ask, but had to: "Stateside?"

The promotion of *can* and *be able to* from a one-way implicative to a two-way implicative is similar to the phenomenon that (Geis and Zwicky, 1971) discuss under the label of INVITED INFERENCE. What they observe is the tendency to read conditionals as biconditionals. For example, *If you mow my lawn I will give you $5* is usually interpreted as *I will give you $5 if and only if you mow my lawn*. Invited inferences may be explicitly cancelled. as in (17), and they do not even arise in contexts where they would conflict with what is known: *Firms were allowed to earn more than they did earn*. Obviously, firms did not

earn more than they earned. No invited inference in this case.

The phenomenon of invited inferences is much more prevalent than has been recognized and it has not been systematically studied except for SCALAR IMPLICATURES for which there is a vast literature.[5]

3 Phrasal implicatives

There is a large class of multiword constructions that are semantically similar to the single verbs in Tables 1 and 2. We call them PHRASAL IMPLICATIVES. They are composed of a transitive verb such as *have*, *make*, *take* and *use*, and a noun phrase headed by a noun such as *attempt*, *effort* and *opportunity* that can take sentential complements. The "implicative signature" of such a phrase depends both on the type of verb and the type of the noun. We organize the presentation by the nouns.

3.1 attempt, effort, trouble, initiative

In the case of *attempt* the relation between a single verb implicative and a phrasal one is obvious. For example, *attempt to X* and *make an attempt to X* are virtually synonymous.[6]

(18) a. Kim didn't attempt to hide her feelings.

b. Kim didn't make any attempt to hide her feelings.

c. Kim made no effort to hide her feelings.

All the examples in (18) entail that Kim did not hide her feelings. The affirmative versions of these sentences are non-committal with respect to the complement clause. Attempts and efforts can fail. Consequently, *attempt to X*, *make an attempt to X* and *make an effort to X* are all −− implicatives like *allow* NP *to X* in Table 2. The phrasal version provides more ways to express negation than the simple verb. It can be expressed by the determiner as in (18c).

Another way to bring about a negative entailment in this construction is to indicate by an adjective such as *futile* that an attempt was made but it failed.

(19) Convair made a futile attempt to save their bomber program.

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[5]http://en.wikipedia.org/wiki/Scalar_implicature

[6]We assume here that the infinitival clause is syntactically a complement to the noun. In (18b), (18c) and in all the later examples in this section there is an alternative syntactic analysis under which the to-complement expresses a purpose. In that sense it does not modify the noun but the verb. The purpose clause could be fronted separately, as in *To hide her feelings, Kim turned away*. Purpose clauses are non-committal as to whether the intended purpose was achieved.

Conversely, *make a successful attempt to X* entails that X came about. Attempts can be described as bungled, defeated, foiled, etc. that all yield a negative entailment for the complement.

Complement taking nouns tend to occur with specific verbs. *Attempt* can appear with *have*, *make* and *take* but *make* is by far the most common collocate verb for this noun. Semantically *have/make/take an attempt to X* are all −− implicatives.

The choice of the collocate verb makes a difference for many other nouns. In particular, *make an effort to X* is a −− implicative but *take an effort to X* is a two-way implicative. It has the signature $++ \mid --$ as illustrated in (20).

(20) a. He took an effort to bring me to the butterfly garden.

     b. She took no effort to dress in style.

In these examples *take an effort to X* is an equi-construction. They are in contrast with the *take an effort* sentences in (21).

(21) a. Before people had computers, it took an effort to infringe copyright.

     b. It took no effort to unscrew the bolt.

     c. Did it take an effort to be so clever?

The examples in (21) do not contain phrasal implicatives, they have an extraposed complement clause. Extraposition is a factive construction. The extraposed infinitival clauses in (21) are presupposed.

The nouns *trouble* and *initiative* are like *effort* in that they form a $++ \mid --$ implicative phrase with *take*.

(22) a. She took the trouble to iron all the clothes.

     b. Napoleon didn't take the trouble to study the country he was going to invade.

3.2 opportunity, chance, occasion

The phrase *take the/an opportunity to X* is a two-way $++ \mid --$ implicative whereas *have the/an opportunity to X* is only a −− implicative. (23a) entails that Kim expressed her feelings, (23b) entails the opposite.

(23) a. Kim took the opportunity to express her feelings.

     b. Kim didn't take the opportunity to express her feelings.

Replacing *took* by *have* as in (24) takes away the positive entailment. (24a) is non-commital with respect to the veridicality of the complement, (24b) has the same negative entailment as (23b).

(24) a. Kim had the opportunity to express her feelings.

     b. Kim didn't have the opportunity to express her feelings.

In (24) one could substitute *get* for *have* as getting something entails having it and not getting something entails not having it. The substitution of *lack* or *miss* or *lose* for *have* in (24) turns the −− implicative into a +− implicative. In (25) we get a negative entailment in the affirmative and no entailment under negation.

(25) a. The Belarusians lacked the opportunity to create a distinctive national identity.

     b. I didn't lack the opportunity to engage in a relationship, I just felt no desire to.

There are several verbs that can substitute for *take* in (23) without changing the entailments. They include more descriptive synonyms for *take* such as *seize*, *grab* and *snap*. There is also another family of verbs, *use*, *utilize*, *exploit* and *expend*, that yield a two-way $++ \mid --$ implicative phrase with *the/an opportunity to X*.

(26) a. Randy used the opportunity to toot his own horn.

     b. Randy didn't use the opportunity to toot his own horn.

Here *use* could be replaced by *make use of*, itself a $++ \mid --$ implicative phrase.

Another class of verbs that yield implicative constructions with *the/a opportunity to X* consists of *lose*, *miss*, *squander* and *waste* that entail either not having or not using an opportunity.

(27) a. Mr. Spitzer wasted the opportunity to drive a harder bargain.

     b. Galileo did not waste the opportunity to aim a funny mock-syllogism at Grassi's flying eggs.

Although *WordNet* classifies the verb *waste* as a hyponym of the verb *use*, the two constructions, *use the opportunity to X* and *waste the opportunity to X*, have opposite entailment signatures. (27a) entails that Spitzer did not drive a harder bargain. Replacing *waste* by *did not use* in (27a) yields the same entailment as the original: he didn't. Similarly, (27b) entails that Galileo aimed a mock syllogism at this opponent but replacing *waste* by *use* in (27b) entails that he did not do that. In other words, *use the/an opportunity to X* is a $++ \mid --$ implicative, but *waste the/an opportunity to X* is a $+- \mid -+$ implicative construction.

Table 3 below summarizes the observations in this section. HAVE stands for *have* and *get*; LACK for *lack*, *miss*, *give up*, *throw away* and *discard*; TAKE for *take*, *seize*, *grab* and *snap*; USE for *use*, *utilize*, *exploit* and *expend*;

WASTE for *waste*, *squander* and *drop*; OPPORTUNITY for *opportunity*, *chance* and *occasion*. Altogether Table 3 lists the signatures of 54 implicative constructions.

Construction	Implicative signature
HAVE OPPORTUNITY to X	$--$
LACK OPPORTUNITY to X	$+-$
TAKE/USE OPPORTUNITY to X	$++\mid --$
WASTE OPPORTUNITY to X	$+-\mid -+$

Table 3: Phrasal implicatives with OPPORTUNITY nouns

3.3 asset, money, time

As the the contrast between examples in (27) and (28) show, wasting money is different from wasting a chance.

(28) a. I wasted the money to buy a game that I cannot play.

b. I wasted $10 to buy it.

c. I am thrilled I didn't waste $10 to see it in the theater.

d. I'm so glad I didn't waste money to have someone else do it.

(28a) and (28b) entail that I bought the game, (28c) and (28d) yield a negative entailment.

Constructions *waste* NP *to X* where NP is headed by a noun that describes something of value like *asset*, *money*, *time*. *perks* seem all to be $++\mid --$ implicatives.

(29) a. I wasted the time to read through the whole thing.

b. He didn't waste time to stop and look for signs of her trail.

c. I read that it did not work, so didn't waste perks to get it.

d. I'm glad I didn't waste 90 minutes to see this film.

e. I wasted an hour to play this game.

But *waste time to X* is a special case. It has an alternative idiomatic reading in negative sentences as illustrated in (30).

(30) a. Dunning didn't waste any time to begin writing his second film.

b. Madonna didn't waste time to move on to her next single.

c. Secularists wasted no time to jump in flawed study's bandwagon.

Wasting no time to X in the sense of 'quickly do X' is an idiomatic use of *waste*. The examples in (30) do not mean the opposite if the negation is removed. To express the idea opposite to (30b), for example, you have to resort to another idiom, *Madonna took her time to move on to her next single*, it is not correct to say that she wasted time. Without the possessive, *take the time to X* is a straightforward $++\mid --$ implicative construction, *have the time to X* is $--$.

3.4 ability, power, means, oomph

Having the ability to do something is a precondition for doing it. Lacking or losing the ability to X precludes doing X. Both examples in (31) yield a negative entailment for the complement clause.

(31) a. The defendant had no ability to pay a fine.

b. The crickets were there, but they had lost the ability to sing.

The affirmative cases are less clear. (32a) does not entail that Google has been tracking you, but an affirmative answer to the on-line survey in (32b) would interpreted by the author of the survey to mean that the Helpdesk actually solved your issues.

(32) a. Google has had the ability to track your online behavior.

b. The Helpdesk had the ability to solve your issues. Yes or No?

We classify *have the ability to X* as a $--$ implicative and *lose the ability to X* as a $+-$ implicative. But perhaps *ability* and *power* should also be included in the next class of nouns to accommodate the interpretation of (32b) and similar cases.

3.5 courage, audacity, guts, gall, impudence, chutzpah, gumption, good sense, foresight, wisdom, nerve, stamina, endurance

This set of nouns describes character traits that "manifest themselves" in acts that presuppose them. That is, if someone had the courage to testify, she must have testified. If she didn't testify, then she didn't have the courage to do so, or she lacked whatever other quality the act would have required in her.

(33) a. Julie had the chutzpah to ask the meter maid for a quarter.

b. I didn't have the courage to tell her I love her.

have COURAGE *to X* is a $++\mid --$ implicative construction. It also carries the presupposition that the act in question requires the character trait described by the noun. *Did you have the foresight to invest in Apple?* asks

whether the addressee invested in Apple and presupposes that it would have been a good idea. *I managed to get the courage to brave the hot tub* has two presuppositions, one coming from *manage to*, the other from *get the courage to*.

3.6 hesitation, reluctance, qualms, scruples

Like the simple implicative *hesitate to X*, under negative polarity *have/show/display hesitation/reluctance/qualms/scruples to X* entail the complement clause. They are $-+$ implicative constructions.

(34) a. She did not have any hesitation to don the role of a seductress.

b. Fonseka displayed no reluctance to carry out his orders.

c. Lauren showed no qualms to confess that she fell for it.

3.7 obligation, responsibility, duty

Responsibilities and obligations to do something can be accepted and taken on, or refused and declined. The examples in (35) are future-oriented statements. They do not entail the truth or falsity of the complement clause at the time referred to by the sentence even if there is an invited inference about what might or might not be the case.

(35) a. The Government accepted the obligation to see that fair and reasonable wages were paid to railwaymen.

b. The bank who owns the foreclosed property has refused the responsibility to maintain and clean it up.

But statements about meeting or doing an obligation, responsibility or duty are $++\,|\,--$ implicative constructions.

(36) a. We clearly met the obligation to pass a balanced, on-time budget.

b. Strausser hasn't met his responsibility to make improvements.

c. The cyclist met his duty to be seen, and the motorist did not meet his corresponding duties to keep a proper lookout and to exercise due care.

d. Gosling certainly did his duty to pitch the movie to the masses.

4 Conclusion and future work

Table 4 summarizes the findings of the previous section for some of the most common verbs that appear in phrasal implicative constructions and the semantic types of nouns they collocate with.

Verb family	Noun family	Implicative signature
HAVE	ABILITY	$--$
HAVE	COURAGE	$++\,|\,--$
HAVE	OPPORTUNITY	$--$
LACK	ABILITY	$+-$
LACK	COURAGE	$+-$
LACK	OPPORTUNITY	$+-$
MAKE	EFFORT	$--$
MEET	OBLIGATION	$++\,|\,--$
SHOW	HESITATION	$-+$
TAKE	EFFORT	$++\,|\,--$
TAKE	ASSET	$++\,|\,--$
TAKE	OPPORTUNITY	$++\,|\,--$
USE	ASSET	$++\,|\,--$
USE	OPPORTUNITY	$++\,|\,--$
WASTE	ASSET	$++\,|\,--$
WASTE	OPPORTUNITY	$+-\,|\,-+$

Table 4: Implicative signatures for verb-noun collocations

This table lists the implicative signatures of over three hundred phrasal implicative verb-noun collocations. On the level of surface strings the number of constructions is of course much larger because of different tenses for the verb and the many ways of fleshing a noun into a noun phrase. For example, the verb *waste* expands to *wasted*, *has wasted*, *did not waste*, etc. The noun *chance* expands to *a chanche*, *the chance*, *his chance*, *her last chance*, etc.

The verb-noun collocations are publicly available.[7] It is a much larger class than the simple implicatives discussed in Section 2 but it is not complete. From a linguistic point of view finding all the specimens is not important if the conceptual classification is done correctly. For computational applications completeness does matter. We plan to continue to expand the list in the near future.

The noun and verb classes discussed in Section 3 contain items that are not together in any *WordNet* (Fellbaum, 1998) SYNSET class. For example, *acquit*, *fulfill*, *meet*, and *perform* are interchangeable in sentences such as

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(37) a. He conscientiously acquitted his duty to inform and educate the Court.

b. He fulfilled his duty to cremate his dead brother's body.

c. The officer met his duty to investigate and had probable cause to arrest Kim.

As far as *WordNet* is concerned, the verbs *acquit*, *fulfill*, *meet*, and *perform* are totally unrelated. Nevertheless they constitute an equivalence class for this particular phrasal implicative collocation, the MEET OBLIGATION to X construction.

The same holds for the noun classes in Section 3. The class in 3.5 includes *chutzpah* and *foresight*. Substituting *foresight* for *chutzpah* in (33a) would retain the entailment, that Julie asked the meter maid for a quarter, but it would bring in a different presupposition.

Some computational systems already take advantage of the semantic classification of simple and phrasal implicatives. PARC's *Bridge* system (Nairn et al., 2006) implements the simple implicatives discussed in Section 2. A few of the phrasal implicatives discussed in Section 3 have also been implemented in *Bridge* (Pichotta, 2008). The *NatLog* system (MacCartney, 2009) implements the same simple implicatives as *Bridge* but in a different way.

But neither *Bridge* nor *NatLog* does anything with presuppositions. *NatLog* takes (1b), *Kim forgot to reschedule the meeting*, as a paraphrase of what it entails, *Kim did not reschedule the meeting*, *Bridge* doesn't. But neither system recognizes the presupposition of intent that comes with the construction *forget to X*.

One area that remains to be systematically explored is the complements of adjectives. It is known that there are factive adjectives such as *strange*, as in *It is strange that Federer has never suffered a major injury*, and two-way implicative adjectives such as *lucky*, as in *He was lucky to break even*, and phrasal adjective $++|--$ constructions such as *see (it) fit to X*, as in *He saw fit to laugh and sneer at us*.

Another unexplored topic is phrasal factives such as *make pretense to X* that is counterfactive, a paraphrase of *pretend to X*.

We will address these issues in future work with the Language and Natural Reasoning group at CSLI.[8]

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[8] http://www.stanford.edu/group/csli_lnr/

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