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Revisiting Polysemy in Terminology

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Abstract

For many, the success of specialized communication is achieved when it is devoid of ambiguity. However, polysemy is quite common in specialized corpora and needs to be managed when compiling domain-specific resources. In this paper, we show that polysemy affects many lexical items in specialized texts and review specific cases of polysemy, some of which are seldom discussed in terminology literature. We also show how different types of polysemy can be handled in terminological resources. Methods include: 1. accounting for meaning distinctions using well known tests in lexical semantics; 2. representing links and differences between meanings with lexical relations and labelled argument structures. We also explain how Frame Semantics (Fillmore (1982) and the methodology used in the FrameNet project (Ruppenhofer et al. 2016) can provide a broader perspective on meaning distinctions in specialized fields. Methods are applied to examples found in the English versions of two terminological dictionaries in the fields of computing and the environment.

Keywords: terminology; polysemy; predicative units; alternation; terminological resource; semantic frame

1 Introduction

For many, the success of specialized communication is achieved when it is devoid of ambiguity. This is why some approaches to terminology seek to reduce polysemy as much as possible using standardization methods or by creating new names to distinguish two concepts. These methods are often necessary in knowledge representation systems in which concept classes are mutually exclusive.

Paradoxically, looking up a single-word term in a term bank can produce a surprisingly high number of hits. For instance, the noun *file* appears in 20 different records in *Le grand dictionnaire terminologique* (2020) and 15 different terms records in *IATE* (2020) and *Termium* (2020) (other term records deal with verb senses). Some records describe the same meaning, i.e. "a collection of related information in electronic form," but then *file* is associated with different subject fields: information technology, documentation, management, etc. To account for this phenomenon, terminologists have conveniently redefined the concept of "homonymy" to refer to polysemy across domains.[1] Traditionally, terminologists have distinguished "homonymy" (multiple meanings in different domains) from "polysemy" per se (multiple meanings in the same domain) (Felber 1987).

Polysemy, even when it is considered within specialized domains, is quite common and the topic has been repeatedly debated in terminology literature. Part of this literature advocates ways to prevent polysemy. Another smaller portion presents examples of lexical items that can be defined in a surprisingly high number of different ways depending of the perspective taken on them. Seldom, however, are compilers of domain-specific resources offered solutions to manage polysemy.

In this paper, we focus mainly on polysemy observed within specialized fields of knowledge, as we are concerned with the management of polysemy when compiling domain-specific resources. This being said, we do not adhere to the traditional homonymy/polysemy distinction that can still be made in terminology. Looking at senses within a single subject field only provides a partial picture of the different senses lexical items can carry. Theoretically, connections between senses across domains or between specialized and general usage should also be taken into consideration since they explain how specialized meanings are situated within the lexicon of a language. In practice, however, terminologists focus on senses that are relevant in given domains and need to find ways to account for them.

In this paper, we first explain that polysemy affects many lexical items in specialized domains (Section 2). We also review specific cases of polysemy that can be observed in these domains (Section 3). Some of these cases are seldom discussed in terminology literature. We also suggest methods to handle and describe polysemous lexical items in terminological resources (Section 4). Examples are based on entries that can be found in the English versions of two terminological dictionaries in the fields of computing and the environment.

2 Reduced Polysemy in Terminology?

Managing polysemy is certainly a less intricate matter for terminologists than it is for lexicographers. For instance, in an environment dictionary (DiCoEnviro 2020), 1,045 meanings were identified for 882 English lexical items (a 1.18 ratio). Similarly, in a computing dictionary (DiCoInfo 2020), the ratio observed is 1.25 (1,896 meanings for 1,511 English

[1] This indeed differs from the way "homonymy" is defined in lexical semantics and lexicography where homonymy is distinguished from polysemy when no intersection between senses can be identified.

lexical items).[2] These figures can give an indication of the presence of polysemy in domain-specific resources, but it must be kept in mind that dictionary word lists reflect choices made by their compilers. In text, specialized meanings can interact with other senses that can be associated with general language of other fields of knowledge. Nevertheless, the meaning/lexical item ratio is still lower than in general language dictionaries which is around 2.0 with some variation from one dictionary to another (Cooper 2005).
A number of factors explain why polysemous items are less common in terminological resources. Firstly, the focus is placed on specialized meanings and other ones can be ignored to a certain extent. Terminologists compile domain-specific corpora in which many lexical items carry a single or a reduced number of meanings. Even when lexical items convey multiple domain-specific meanings, their number is reduced when compared to the senses recorded in general language dictionaries. Table 1 gives a summary of the senses recorded for the verb *recover* in a general language dictionary (Merriam-Webster 2020), a computing dictionary (DiCoInfo 2020) and an environment dictionary (DiCoEnviro 2020). The Merriam-Webster makes up to 12 meaning distinctions as opposed to the computing dictionary which records a single meaning and the environment dictionary that describes three different senses.

Merriam-Webster (2020)		
recover (Entry 1 of 2)	transitive verb	
	1	to get back **:** regain
	2a	to bring back to normal position or condition stumbled, then recovered himself
	2b	archaic **:** rescue
	3a	to make up for recover increased costs through higher prices
	3b	to gain by legal process
	4	archaic **:** reach
	5	to find or identify again recover a comet
	6a	to obtain from an ore, a waste product, or a by-product
	6b	to save from loss and restore to usefulness **:** reclaim
	intransitive verb	
	1	to regain a normal position or condition (as of health) recovering from a cold
	2	to obtain a final legal judgment in one's favor
recover (Entry 2 of 2)	transitive verb	to cover again or anew
Computing dictionary		
recover	transitive verb	
	1	user recovers data: *In a "globalizing" economy, today's work force is necessarily becoming more mobile with the need to reliably store, access, and **recover** data from any location.*
Environment dictionary		
recover	transitive verb	
	1	official organization recovers materials: *the USA landfilled 54% of MSW, incinerated 14%, and recovered, recycled or composted the remaining 32 %*
	intransitive verb	
	2a	species recover: *species and their habitats are able to survive and recover in a warmer world.*
	transitive verb	
	2b	human recovers species: *to the contrary, the intent was to conserve and recover species.*

Table 1: Meanings recorded for recover in a general language dictionary and two domain-specific dictionaries

The second factor which explains why polysemy is reduced in domain-specific resources is that it is customary for terminologists to collect multiword expressions. In fact, in most specialized resources, the majority of entries describe multiword nouns, such as *climate change*, *expert system*, *configuration file*, etc. A potentially polysemous item is often disambiguated when considered within a longer sequence.
Finally, the conceptual approach with which most terminologists comply often compel them to focus on nouns or noun phrases. This impacts the perspective taken on polysemy that is chiefly concerned with diverging denotations (Béjoint & Thoiron 2000). Other types of polysemy that affect other parts of speech, alternations for example, are often ignored.

[2] It should be mentioned that these two domain-specific resources include several single-word terms, which is not common practice in terminology as we will see further on. It is to be expected that the meaning/lexical item ratio is even lower in traditional resources.

3 Cases of Polysemy

Even if polysemy is reduced when considering the meaning of lexical items from the perspective of a single subject field, it can still be found in specialized corpora and needs to be managed by terminologists. Furthermore, it takes many different forms that are described in the following subsections.

3.1 Domain-specific versus other meanings

Terminology textbooks often mention the fact that many terms are created on the basis of more common meanings. Adding new meanings to existing lexical items is a commonly used method for creating terms (Sager 1990; Kocourek 1991; Aldestein & Cabré 2002; L'Homme & Polguère 2008). The addition can be the result of a metaphorical extension. In computing, there are multiple cases of the sort: *client* (defined as "hardware that uses a service given by a server"); *declare* (defined as "to state the content of a variable") (see also Meyer et al. 1997).

The original lexical item can be part of general usage or taken from another special subject field. The environmental meanings of the adjectives *green* and *clean* ("that has a low impact on the environment") illustrate the first situation. The meaning extensions of *virus* and of its collocates *infect* and *contaminate* in computing borrowed from medical terminology illustrate the second one.

In practice, however, this first case of textbook polysemy is not the most difficult that terminologists must tackle since, as was said above, they usually focus on domain-specific meanings.

3.2 Multiple Meanings in the Same Field

Polysemy also occurs within domains and these are the cases that will need to be managed in practice. For instance, *environment* can designate "a global set of meteorological, biological conditions …" or "a place where species carry out activities". Both meanings are linked to the more general field of the environment. Similarly, *extinct* can mean "that is no longer active" or "that no longer exist". (Examples from corpora are given in Table 2 for each of these meanings.)

Term	Example
environment$_1$	*the government's broader environmental vision aimed at supporting a healthy environment and a competitive economy*
environment$_2$	*many endangered freshwater fish and mussels need clean, clear, cold water to survive, and are sensitive to changes in their aquatic environment*
extinct$_1$	*species must be considered extinct if they are listed as endangered for 15 or more years.*
extinct$_2$	*This extinct volcano has woken up*

Table 2: Polysemous lexical items in the environment

3.2.1 Regular Polysemy

Within special subject fields, different meanings can be more closely connected than those mentioned in Table 2 and lead to regular polysemy (Apresjan 1974;[3] Barque 2008). Different cases of regular polysemy in computing and the environment are illustrated below:

- Activity – result: *pollution*$_1$ (*these include forest fires, floods, oil spills and pollution of waterways*); *pollution*$_2$ (*extensive inshore and coastal pollution*).
- Concrete – abstract: *server*$_1$ (*Computers are linked together, or "networked", many of the programs and files can be stored centrally on a more powerful computer called a "server"); server*$_2$ (*In the client-server model, the term "server" describes the application that offers a service that can be utilized by any other application over the network*).
- Whole – part: *sea*$_1$ (*containers can be transported by sea*); *sea*$_2$ (*the coastal seas*); *email*$_1$ (*do not send us email asking for information); email*$_2$ (*a programming student sent this email to some friends*).
- Entity – instrument: *email*$_2$ (*a programming student sent this email to some friends*); *email*$_3$ (*email is a means of sending messages from one person to another using the Internet as the transmission mechanism*).

It is likely that some cases of regular polysemy are more productive or occur more specifically in given domains. For instance, the concrete – abstract polysemy is quite prevalent in computing. In the environment, lexical items can first designate a natural entity and a resource exploited by men:

(1) a fish$_1$: Do not release snails, fish, or other aquatic animals or plants into our lakes, creeks, or rivers
(2) fish$_2$: The changes in aquatic habitat have also affected fisheries in lower valleys and deltas; the absence of nutrient-rich sediments has a detrimental effect on fish productivity.

[3] Polysemy of the word A with the meanings a_i and a_j is called regular if, in a given language, there exists at least one other word B with the meanings b_i and b_j, which are semantically distinguished from each other in the same way as a_i and a_j and if a_i and b_i, a_j and b_j are non-synonymous. (Apresjan 1974:16)

In contrast, it can also be expected that other cases of regular polysemy do not appear at all in certain domains of knowledge.

3.2.2 Alternations

Another common phenomenon affecting lexical items, and especially verbs, are syntactic alternations that introduce meaning distinctions as shown below with *crash*, *pollute* and *compile*. Interestingly, *compile* lends itself to two different alternations in computing.

(3) … many programs cannot handle time trouble and many crash.
(4) The programs can crash PCs on their own, if they conflict with other programs ...

(5) Pesticides pollute waterways and can harm animals and other plants.
(6) We are destroying the earth by polluting the atmosphere with toxic emissions.

(7) The above code compiles properly.
(8) … the GNU software and libraries compile and run the kernel.
(9) A programmer types programming statements and then "compiles" them with this compiler.

Cases of inchoative/causative alternations (illustrated by (3) and (4) and by (7) and (8)) are usually recognized as introducing polysemy, as they correspond to an important syntactic distinction (intransitive vs. transitive). However, other cases are less unanimously considered as polysemous occurrences of lexical items. These latter cases include agent/instrument alternations (as in (5) and (6) and in (8) and (9)) and agent/location locations.

3.2.3 Microsenses

Other semantic modulations affecting lexical items are more difficult to characterize than the cases listed in the previous sections. Terminology literature has referred to these phenomena as *multidimensionality*, which is defined as a phenomenon whereby different perspectives are taken on what could be considered a single concept. León Araúz & Reimerink (2010) discuss the example of "sand" that can be defined as "a kind of sediment located in the sea, rivers or soil layers." However, looking at contexts in which *sand* appears, the authors note that the term could be associated with other concepts. In geology, for instance, although "sand" is still defined as a kind of sediment, it is further characterized according to grain size, and is viewed as a part of larger natural entities, such as valleys, deserts, etc. In another domain, that authors call the *coastal domain*, "sand" is also a part of larger natural entities, but these are restricted to coastal ones, such as beaches, and sand barriers. In addition, "sand" is viewed as something involved in natural processes, such as waves, and storms. And the list goes on as other differences are identified in coastal defense and water treatment. Each of these areas seem to trigger different conceptualizations of the concept "sand" and would require that new definitions be written for each of them. However, it is difficult to see on what grounds these conceptualizations are identified and at what point the distinctions should stop.
Cruse (1995) offers a different explanation under the label *microsense* that seems to cover some of the phenomena terminologists consider as manifestations of multidimensionality. In contrast with "standard" polysemy, microsenses are not completely incompatible since they can be linked to the same superordinate. However, they remain mutually exclusive since they can hold paradigmatic relations with different sets of lexical units. With the example *knife*, Croft & Cruse (2004: 127) explain that although *knife* usually denotes a kind of instrument (not completely incompatible), it can be linked, first, to *cutlery*, *fork*, *spoon* and, secondly, to *weapon*, *gun*, etc. (among other readings).
The following examples with the verb *introduce* shows how these subtle differences can occur between the common language reading and a domain-specific reading of a lexical item.

(10) … introduce changes directly into the text.
(11) … political resistance to introducing an endangered species to unoccupied habitat.

Although *introduce* carries the general meaning of "placing something somewhere", it appears in a specific lexical paradigm when considered from the perspective of endangered species. It is linked to terms such as *reintroduce*, *introduction*, *colonize*, *inhabit*. In contrast, the more general meaning would trigger associations such as *insert*, *insertion*, *delete* and *remove*.
Other cases, which we are concerned with in this article, concern distinctions that would be relevant from the point of view of specialized domains. Consider the verb *hunt* in the following sentences, both extracted from a corpus on endangered species. Does the verb have two distinct meanings with respect to this topic?

(12) Predatory birds include the snowy owls that hunt waterbirds and lemmings.
(13) A limited number of licenses to hunt game animals are sold.

In both sentences, *hunt* designates an activity that consists in "pursuing a living organism". However, a hunting situation associated with animals would be linked to feeding and survival and to terms such as *to prey*, *predation*, *predator*, whereas the hunting situation associated with human beings would trigger associations with *hunter*, *poach*, *poacher*, *capture*, etc. and the fact that it can be a threat to the survival of species.

4 Handling and Representing Polysemy in Terminological Resources

For cases of polysemy listed above, meaning distinctions can be made with relational evidence used in lexical semantics (such as synonymy, near synonymy, opposition, or other kinds of paradigmatic relations (Cruse 1986)). For instance, the two meanings of *fish* mentioned earlier can be differentiated based on two different sets of lexical units as shown below. (The appendix summarizes meaning distinctions for lexical items that were mentioned in this article and lists lexical units that were used to validate distinctions.)

(14) fish$_1$ as a species: hypernyms: *species; vertebrate*; co-hyponyms: *mammal, bird*; types of fish: *freshwater ~, cartilaginous ~*; meronyms: *fin, scale*

(15) fish$_2$ as a resource: hypernym: *resource*; typical place: *fishery*; holonym: *stock*; typical activity that f. can undergo: *to fish, to capture*; meronym: *meat*

Once these distinctions are made, different methods can be used in resources to: 1. explain separate meanings; 2. represent how some of these meanings are connected. In most domain-specific resources, different meanings are described in individual entries; in others, they are listed in a single entry. Usually, no real attempt is made to show how some senses are linked in a way that could be helpful for users. In the following sections, we first explain why connecting meanings is not always possible in domain-specific resources. Terminologist must thus make a distinction between: 1. polysemous items whose meanings are only remotely connected within the domain; 2. polysemous items whose meanings are closely related. We then suggest methods for highlighting both similarities and differences between meanings in both situations.

4.1 Why it can be difficult to link different meanings in a domain-specific resource

General language resources use different methods to account for meaning distinctions and the way different meanings are connected, from hierarchical alphanumeric systems to more sophisticated mechanisms that consist in checking cohesiveness between definitions (Barque 2008).

In domain-specific resources, the use of these devices can be hindered by the fact that some meanings of polysemous items are only remotely linked. An example taken from the field of the environment will illustrate this problem. The adjective *green* in this domain conveys two different meanings: *green$_1$* "covered with vegetation" (*a green neighbourhood*) and *green$_2$* "that has a low impact on the environment" (*green vehicle*). Table 3 show the definitions given for *green* in the Oxford English Dictionary (OED 2020) that correspond to the domain-specific senses we just mentioned.

Oxford English Dictionary (2020)	I With reference to colour.	
	2. Of a colour intermediate between blue and yellow in the spectrum; of the colour of grass, foliage, an emerald, etc.	
	2a	Covered with or abundant in foliage or vegetation; verdant; (of a tree) in leaf. Also in extended use.
	III In extended uses.	
	13b	Of a product, service, etc.: designed, produced, or operating in a way that minimizes harm to the natural environment.

Table 3: Environmental meanings of *green* recorded in the OED (2020)

In the OED, the two environmental-relevant meanings of *green* appear in the broader spectrum of all the meanings that *green* can convey. (The OED makes over 30 distinctions for this adjective.) A hierarchical alphanumeric system accounts for how the senses recorded in the dictionary are organized. Looking at the gap between the two environmental senses of *green* as recorded in the OED, even if there is a remote metaphorical connection between the "covered with vegetation" and the "that has a low impact on the environment" meanings, it would be difficult to account for it in a domain specific environmental resource without considering other senses that the adjective carries outside the domain of the environment. The hierarchical alphanumeric system used in the OED is informative only to the extent that we have access to the entire structure. This also applies to systems for checking definitional content (Barque 2008). In our environmental resource, there would be a gap that only a reference to an external resource could fix as shown in Figure 1.

We thus suggest alternative tools to make differences and similarities between senses more explicit in domain-specific resources (Sections 4.2 to 4.4).

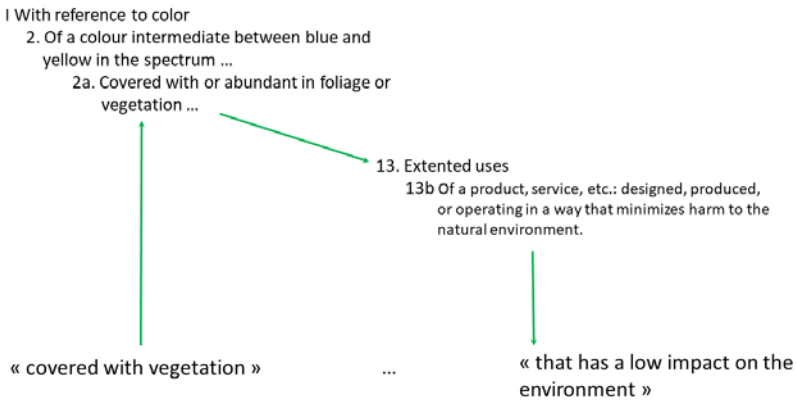

Figure 1: Remotely connected environmental meanings

4.2 Lexical relations

One classic method to make meaning distinctions explicit consists in displaying the lexical relations in which each meaning is involved (as shown in Figure 2 for the two environmental meanings of *environment*[4]). The meaning relations are those that validate meaning distinctions. Figure 2 displays the lexical sets graphically but other textual displays can also be used.

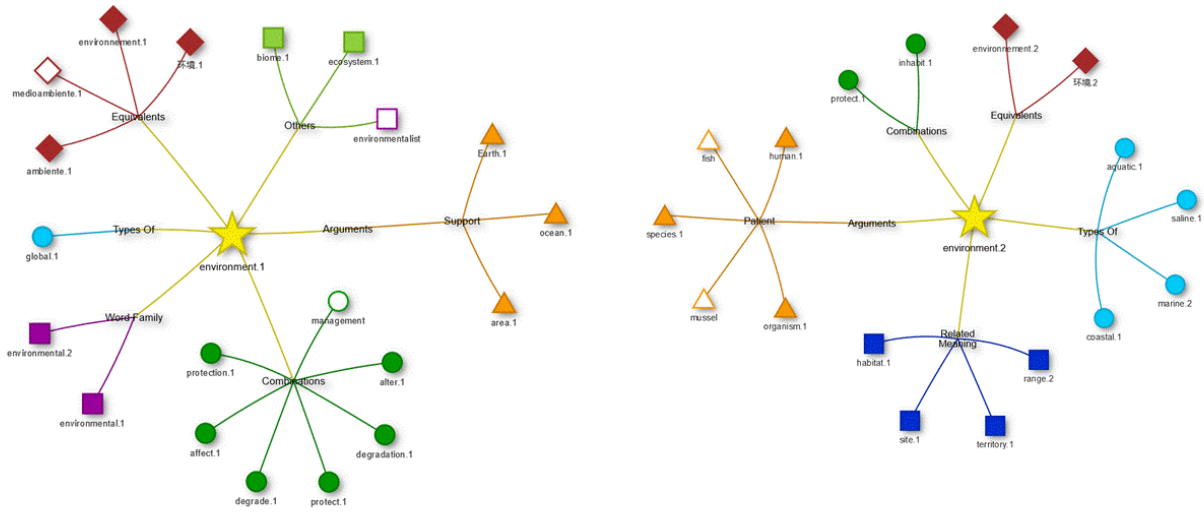

Figure 2: Lexical relations shared by two meanings of *environment* (NeoVisual 2020)

Figure 2 shows that the first meaning of *environment* informally explained as: "a global set of meteorological, biological conditions …" is connected to units such as *ecosystem*, *biome*, *environmental*, *global*, etc. When it designates "a place where species carry out activities", *environment* is linked to *site*, *territory*, *habitat*, *range*, *coastal*, *marine*, etc. Figure 2 also shows that the arguments of each meaning are realized with different terms (*environment*$_1$: *ocean, Earth, area*; *environment*$_2$: *organism*, *species*, *fish*, etc.) (the next section says more about the argument structure and how it can be used to represent semantic distinctions).

[4] Graphs in this figure also show equivalents in other language. It should be mentioned that, although they appear in the graph, equivalents are not used to support meaning distinctions since equivalents can be polysemous themselves.

4.3 Labelling of arguments

The different meanings of polysemous predicative units can be also be represented in terminological resources with an explicit and consistent labelling of arguments. Hanks & Pustejovsky (2005) suggest labelling arguments with types and roles. A similar method labeling arguments of predicative units with semantic roles and typical terms as shown below with the verbs *compile* and *recover*.

(16) compile$_{1a}$: program$_{[Patient]}$ compiles (Computing)
(17) compile$_{1b}$: compiler$_{\{Instrument]}$ compiles program$_{[Patient]}$ (Computing)
(18) compile$_{1c}$: programmer$_{[Agent]}$ compiles program$_{[Patient]}$ with compiler$_{[Instrument]}$ (Computing)

(19) recover$_{1}$: user$_{[Agent]}$ recovers data$_{[Patient]}$ (Computing)
(20) recover$_{1}$: municipality$_{[Agent]}$ recovers material$_{[Patient]}$ (Environment)
(21) recover$_{2a}$: species$_{[Patient]}$ recovers (Environment)
(22) recover$_{2b}$: human$_{[Agent]}$ recovers species$_{[Patient]}$ (Environment)

In these examples, semantic roles appear between brackets. Typical terms are units that should be representative of the types of arguments that can fulfil an argument position. As can be seen with *compile*, *program* was chosen as the typical term that can realize the Patient (the argument that undergoes the process of compiling). It appears consistently in all three arguments structures of *compile*, albeit in different positions. The same applies to *compiler* labelled as an instrument which appears in the argument structures of two entries for *compile*. The consistent labelling can also be made explicit in definitions, as explained in San Martín & L'Homme (2014).
This method can be used not only for alternations, but for other meanings distinctions as shown below with *select* in computing.

(23) user$_{[Agent]}$ selects option$_{[Patient]}$ (Computing)
(24) user$_{[Agent]}$ selects string$_{[Patient]}$ (Computing)

4.4 Assignment to semantic frames

The identification of lexical relations and the explicit labelling of arguments can be exploited in a third method with the aim of providing a broader perspective on meaning distinctions in specialized fields. This method consists in modeling semantic frames (as understood in Frame Semantics, Fillmore 1982).[5] We cannot give here the full methodological details of how semantic frames are identified based on the terminology used in specialized fields of knowledge (for details, see L'Homme et al. 2020). Rather, we illustrate how the modelling of frames can highlight meaning distinctions in a way that complements the two first methods examined in Sections 4.2 and 4.3. We will use the examples given earlier for the verb *hunt* considered from the perspective of the environment.

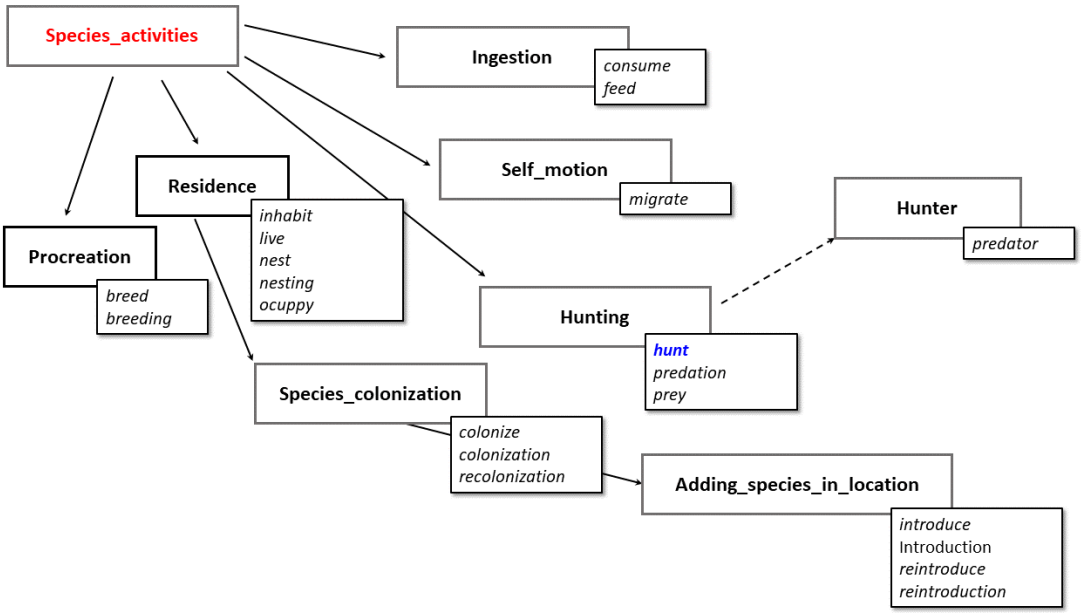

Figure 3: Frame Hunting, lexical content and related frames (based on Framed DiCoEnviro 2020)

[5] Frame Semantics (FS) assumes that the meanings of lexical units (LUs) are construed against a background of experience, beliefs or practices that are based at least partly on social and cultural institutions. Our understanding of lexical units involves a larger background, a broader situation that comprises participants and presuppositions.

Figure 3 shows how the frame Hunting that captures a situation whereby meat eaters chase other animals to feed appears within the broader context of species activities (only part of these activities, such as Procreation, Self_motion, are reproduced in the figure). The terminological content of frames is also presented.
Figure 4 depicts part of the activities carried by human beings, again from the perspective of the environment (such as Manufacturing and Using_resources). When comparing Figures 2 and 3, it can be seen that the frame Human_hunting contains terms that differ from the ones listed in the Hunting frame (associated with species). More importantly, the broader context in which the Human_hunting frame appears differs drastically from the one surrounding Hunting. Human_hunting is one if the uses of natural resources that humans carry out, while Hunting appears within a set of activities that species need to do to live, reproduce and survive.

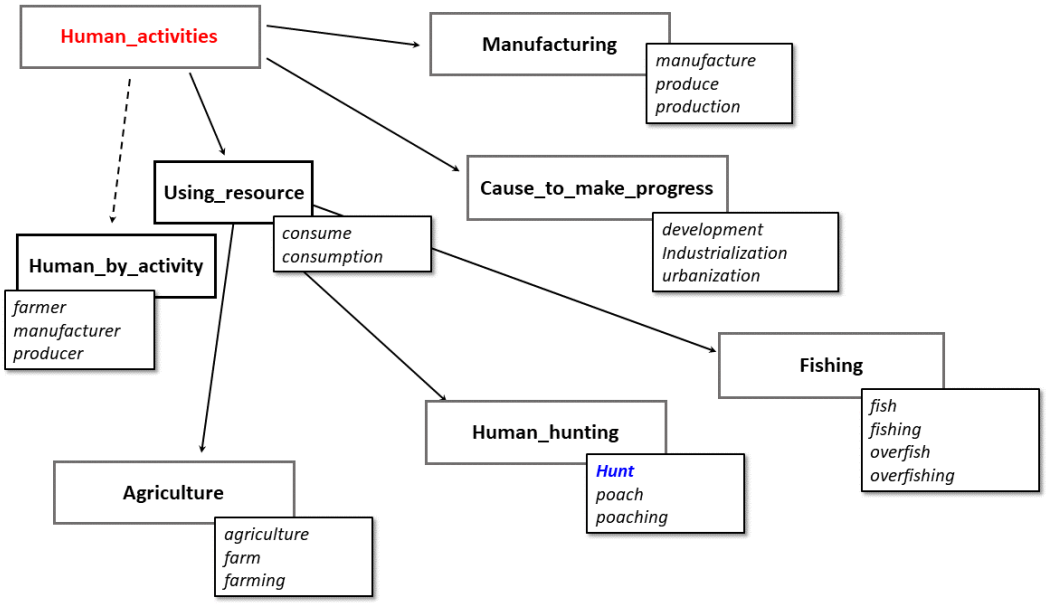

Figure 4: Frame Human_hunting, lexical content and related frames (based on Framed DiCoEnviro 2020)

5 Conclusion

In this paper, we presented different cases of polysemy that can be found within specialized domains, i.e. regular polysemy, alternations, microsenses. When considered from the perspective of specialized domains, it is to be expected that polysemy is reduced when compared to situations that lexicographers need to manage. However, it is still prevalent in many domains and terminologists need to find ways to represent it adequately in domain-specific resources. It can also be surmised that specific phenomena such as microsenses are more common when considering the senses of lexical items from the perspectives of special subject fields. The latter phenomenon should be investigated more thoroughly to better characterize them and define precise criteria in order to determine when distinctions are truly needed.
We also described methods to represent different meanings in domain-specific resources, i.e. list lexical relations (or present them in a graph), label argument structures explicitly, and provide a broader perspective with semantic frames. Use of lexicographic systems, such as hierarchical alphanumeric systems and checking definitional content, is not always possible in domain-specific resources, since some meanings are only remotely connected. The methods we suggest can be used for both closely and remotely linked meanings. The first two methods were implemented in two domain-specific resources: the first one (DiCoInfo 2020) contains terms in the field of computing, the second (DiCoEnviro 2020) records environment terms. The third method was used for terms in the environment (Framed DiCoEnviro 2020. The use of labels in argument structure can also be implemented in definitions.
In this paper, the focus was placed on meaning distinctions from the point of view of specific subject fields. A further extension of this work would be to find ways to better model the interconnections between meanings across domains and across “general” language and specialized areas of knowledge.

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Appendix

Term	Domain	Paradigmatic relations
compile 1a	Computing	*Run*
compile 1b	Computing	*Compiler*
compile 1c	Computing	*Translate*
crash 1a	Computing	*fail, terminate*
crash 1b	Computing	*shut down, run, start*
email 1	Computing	*mailbox, inbox*
email 2	Computing	*message, hoax, post*
email 3	Computing	*program, application*
environment 1	Environment	*ecosystem, biosphere*
environment 2	Environment	*habitat, territory, site*
extinct 1	Environment	*extant, surviving*
extinct 2	Environment	*Active*
fish 1	Environment	*species, vertebrate, freshwater, cartilaginous*
fish 2	Environment	*fishery, stock, resource*
introduce 1	Environment	*insert, place, remove*
introduce 2	Environment	*reintroduce*, *introduction*, *colonize*, *inhabit*
hunt 1	Environment	*predator, prey*
hunt 2	Environment	*poach, hunter, capture*
pollute 1a	Environment	*acidify, contaminate*
pollute 1b	Environment	*spill, contaminate, depollute, polluter*
pollution 1	Environment	*contamination, acidification, polluter*
pollution 2	Environment	*pollutant, contaminant, toxic, gaseous*
recover 1	Computing	*restore, corrupt, damage*
recover 1	Environment	*recycle, dispose, eliminate*
recover 2a	Environment	*recovery, survive*
recover 2b	Environment	*reintroduce, restore, decimate*
sea 1	Environment	*ocean 1, land, at ~*
sea 2	Environment	*lake, river, Black, Mediterranean*
select 1	Computing	*choose, deselect*
select 2	Computing	*activate, highlight*
server 1	Computing	*computer, remote, to network*
server 2	Computing	*application, client, email*