Implementing Frames in the *Phrase-based Active Dictionary*: why Frames are needed but FrameNet can only be a partial solution

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Abstract

This paper explores the differences between the *Phrase-based Active Dictionary* (PAD) and FrameNet in their approaches to meaning representation, focusing on the verbs *agree* and *follow*. The PAD, a component of the PhraseBase project, adopts a splitting-friendly methodology that emphasizes granularity and ontological consistency, ensuring a more comprehensive coverage of polysemy. In contrast, FrameNet prioritizes broader conceptualization, often leaving finer distinctions unaddressed. Through a detailed matching process, this analysis reveals that several senses traced in the PAD are not covered or not distinguished in FrameNet, highlighting the need for an extended concept of Frame. The proposed extension of the system includes increased granularity, the incorporation of encyclopedic knowledge by using ostensive aids, and cultural sensitivity. These enhancements would improve the visual representation of Frames or enhance their representation potential, making them more accessible and informative for users of the PAD. The paper concludes by addressing open questions about the systematic implementation of these extensions and their implications for linguistic analysis and lexicographic practice. By combining theoretical insights with practical applications, the PAD aims to offer a model for deepening meaning representation for advanced language learners and translators.

Keywords: Phrase-based Active Dictionary (PAD); FrameNet; Frame's application;

encyclopaedic information in lexicography

1. Introduction

PhraseBase is a model of a phraseologically and cognitively oriented Linguistic Information System for different languages, developed by Giacomini and DiMuccio-Failla since 2020 (cf. Giacomini, 2025; DiMuccio-Failla, 2025). The *Phrase-based Active Dictionary* (PAD) is one of the three components of PhraseBase. It is a new kind of advanced learner's dictionary in which the Lexical Units (LUs) are not single words but typical linguistic expressions (*Normal Word Usage Patterns*). A LU in the PAD corresponds to a sense of a given word. A PAD entry may therefore contain multiple LUs.

In this paper, I will show that according to the results of a matching process between the LUs of *follow* and *agree* in the PAD, and the four Frames available in FrameNet for these verbs, the methodology used to formulate the LUs in the PAD proves to guarantee a better coverage of polysemy across the semantic spectrum of a given lexeme – meaning that the Frames available in FrameNet so far do not cover all the senses traced in the PAD. I will also outline a proposal for an extension of the Frame concept, which is necessary for visual meaning representation in the PAD. Illustrated frames, along with pictures, diagrams, animations, videos, and other ostensive aids enhance meaning comprehension and disambiguation in (learner's) dictionaries. One of the broader goals of the project is to systematically incorporate these elements in the PAD in a way that is both theoretically grounded and practically feasible.

In Section 2, I will give an overview of the theoretical and methodological background of PhraseBase and FrameNet, particularly highlighting their differences. In Section 3, I will explain the methodology used for the matching process, discussing the results for *agree* and *follow* in detail. In Section 4, I will outline the proposal for an extended Frame concept. Finally, in Section 5, I will address open questions that still need to be solved.

2. Comparing the PAD and FrameNet

A practical introduction to the work of the FrameNet project is given in Ruppenhofer et al. (2016), while for PhraseBase, the project description is developed in several publications by DiMuccio-Failla & Giacomini (among others, DiMuccio-Failla & Giacomini, 2017a; 2017b; 2022; Giacomini & DiMuccio-Failla, 2019; DiMuccio-Failla, 2025; Giacomini, 2025). Both Ruppenhofer et al. (2016) and DiMuccio-Failla & Giacomini present methodologies for understanding and documenting the semantics of words, but they differ significantly in their fundamental units of analysis, granularity of distinctions, and approaches to semantic categorization.

The PAD needs Frames to illustrate "scenes" that are visually representable. If the Frames of FrameNet happen to match the needs of the PAD, they could be integrated into the PAD as an additional clue for learners and translators to meaning disambiguation. The aim of the comparison between FrameNet and the PAD lies in finding out whether the Frames available in FrameNet could be directly inserted in the PAD for representing the meanings of words, and, in doing so, to find out where the limitations of the current Frames in FrameNet lie from the perspective of learner's lexicography.

In this section, I will give an overview of the theory, methodology, and data behind PhraseBase (Section 2.1) and FrameNet (Section 2.2), and explain in detail some of their key differences (Section 2.3).

2.1 Theory, methodology, and data in PhraseBase

PhraseBase is a research project for the design of a new kind of Linguistic Information System to support second language learning and natural language processing. It combines a *Phrase-based Active Dictionary* (PAD), a phraseologically disambiguated wordnet, and a construction grammar model. PhraseBase is currently being built for German, Italian, and English by a small team of researchers at the Universities of Innsbruck, Hildesheim, and Heidelberg (cf. Giacomini, 2025). Each language has its own monolingual PAD. The ideal users are advanced and proficient language learners (C1-C2) and professional translators.

The theory behind PhraseBase merges usage pattern lexicology with cognitive lexical semantics, with the primary goal of describing conventional everyday language production through the study of *Normal Word Usage Patterns* (WUPs) (cf. DiMuccio-Failla, 2025: 19). These phraseological expressions are considered to be the most fundamental and frequently univocal units of language, meaning that the primary unit of language (i.e. the LU) is a multi-word expression in nature[1]. The approach of Giacomini & DiMuccio-Failla translates into lexicographic practice what Hanks (cf. 2013: 82–83) stated about meaning distinctions: asking for the meaning of a word turns out to be asking for the meaning of a pattern, and words in isolation have only potential meanings. In the PAD, the LUs are patterns. And also, it applies what Hanks (2013: 5) stated about "a better dictionary": "[i]n a better dictionary, it should be listed what is linguistically (semantically) normal, and not what is ever semantically possible. A distinction should be made between normal meaning variations and exploitations." In PhraseBase, "normal" means typical: a normal pattern is a common, conventional, idiomatic pattern associated with one meaning within a specific linguistic community (cf. DiMuccio-Failla, 2025: 61–63).

In each PAD entry, the various senses (i.e. LUs) of a polysemous word are identified thanks to the collocates they appear with (Giacomini & DiMuccio-Failla, 2019). First, the collocations of a given lexeme are extracted using the Word Sketch Tool in Sketch Engine (Kilgarriff et al., 2004) and are gathered from dictionaries. These patterns are then validated and grouped together according to their syntactic structure. Secondly, within a syntactic construction, the collocates are grouped together according to a given conceptual category corresponding to a given mental image ("following a person who is going somewhere" is conceptually different from "following the development of certain events"). Thirdly, a semantic type that holds together all the collocates of the conceptual category is chosen (it could be the hyperonym of the collocates). And finally, a phraseological LU is formulated: it contains the lexical item in its typical syntactic-semantic environment. For example, in the PAD, the first LU of the verb *follow* is formulated as: *to follow a person (/animal/vehicle) (who is going somewhere)*. This LU identifies the most concrete sense of *follow*, i.e. spatially going behind someone/something who/which is moving and going somewhere, and it specifies its

[1] This approach adopts Sinclair's view of language: "not isolated words, but words in their contextual patterns of normal usage are the most common lexical units of language" (2004: 133).

semantic preferences (i.e. person/animal/vehicle). This pattern is neatly distinguishable from another, e.g. *a person/object follows another person/object*, referring to spatial sequence.

The LUs appear in the PAD entry ordered according to their cognitive salience: the LU with the most concrete, literal meaning comes first, and then its extensions (metonymic and metaphorical meanings). This mapping corresponds to a radial network of prototypical senses/concepts and their derivations (cf. DiMuccio-Failla, 2025: 29 following the cognitivist account of polysemy of Brugman & Lakoff, 1988: 3–4).

2.2 Theory, methodology, and data in FrameNet

FrameNet is an online lexical resource for English rooted in Frame Semantics, which posits that the meaning of words is primarily understood by the conceptual frames they evoke. A Frame delineates a specific type of situation, object, or event, along with its associated participants and props, termed Frame Elements (FEs) (Ruppenhofer et al., 2016: 7). The FEs are the fillers of the roles involved in a Frame.

In contrast to PhraseBase, a LU in FrameNet is an isolated word (or a multi-word expression, but still in isolation) and is defined as a specific "pairing of a word with a meaning" (ibid.). A LU may evoke as many Frames as its meanings. The LU is the fundamental unit in FrameNet. While a LU is associated with one or more semantic Frames (depending on its polysemy), a single Frame can be evoked by different LUs (i.e. a Frame groups together several LUs). LUs are grouped into the same Frame if they share: the same number and types of syntactically prominent FEs[2]; the same FE profiling (emphasizing the same participant's point of view, e.g. *buy* vs. *sell*); the same relations among FEs, and the same aspectuality (2016: 12–13).

Frames were proposed by Fillmore (1975) as an alternative approach to what he calls the "checklist theories of meaning", which he had originally developed from the case frames. The focus of meaning comprehension is based on two pillars: the conceptualization of word meanings embedded in a broader surrounding of background information, and the underlying syntactic constructions which define the relations between the frame-evoking element (i.e. the LU) and the role-filling elements (i.e. the FEs) (Ruppenhofer et al., 2016: 7).

[2] But consider Ruppenhofer et al. (2016: 14): "[h]owever, the desideratum that all the LUs in a frame share selectional restrictions on a frame element is often relaxed in practice, as it would result in very fine-grained frames that are impractical to manage." And also (2016: 17): "[...] the amount of work and or complexity introduced by these finer-grained distinctions is not worth the loss of similarity provided by putting them in the same frame." It is said that in FrameNet, only the basic distinctions for the word senses are shown (ibid.), but it is nowhere specified when semantic distinctions cease to be *basic* and are too specific to be covered. For example, it is not clear why the sense of *follow* in the following sentence, "Next week's weather will follow a trend of increasing temperature", should not be considered *basic* (this sense is, in fact, not covered in FrameNet). This is a major point of divergence with the PAD (cf. Section 2.3.3).

The creation of a Frame starts either with an idea or with a word: the goal is to record the range of semantic and syntactic combinatory possibilities (valences) of each word and each sense (2016: 8). The first step is to extract sentences from a corpus containing words thought to share a semantic overlap, and group these together (2016: 11). Secondly, within a single group, words with the same number and types of FEs are grouped together. The process of profiling the FEs making up a Frame involves both syntactic and semantic analysis. When two different syntactic constructions show a semantic difference (thus meaning the presence of different FEs), a new Frame is created, i.e. the original Frame is split (2016: 12). FrameNet does not, however, split Frames based on purely grammatical differences (like passive voice, tense/aspect, part-of-speech), scalar or polar antonymy (e.g. *high* vs. *low*), or usage differences (like register or dialect) (2016: 15).

FrameNet applies a hierarchy of *semantic (ontological) types* for classifying FE fillers (see Section 2.3.3). Many of the semantic (ontological) types created in FrameNet align with synset nodes in WordNet and can be mapped onto ontologies like Cyc or the Knowledge Graph; however, their hierarchy is not guaranteed to correspond fully to that of WordNet or any other resource (cf. 2016: 86)[3]. It seems that valency takes precedence over semantic differentiations. For example, ontologically speaking, the products of *frying* and *boiling* are different, but in FrameNet are considered to be similar enough (2016: 11). Additionally, the object NP in *to want [NP]* and the VP in *to want [VP]* both belong to the Frame *Desiring*, but are treated as two distinct FEs. These FEs are related to each other through the *Excludes* relation because they refer to different ontological categories: the NP to an *entity* and the VP to an *event* (2016: 12–13). FrameNet includes a network of relations between frames, such as *Inheritance*, *Using*, and *Subframe*, which provide a hierarchical structure similar to those found in other ontologies (2016: 9). However, since many nouns denoting artifacts and natural kinds are not annotated, FrameNet is not readily usable as an ontology of things – in these areas, FrameNet defers to WordNet (ibid.).

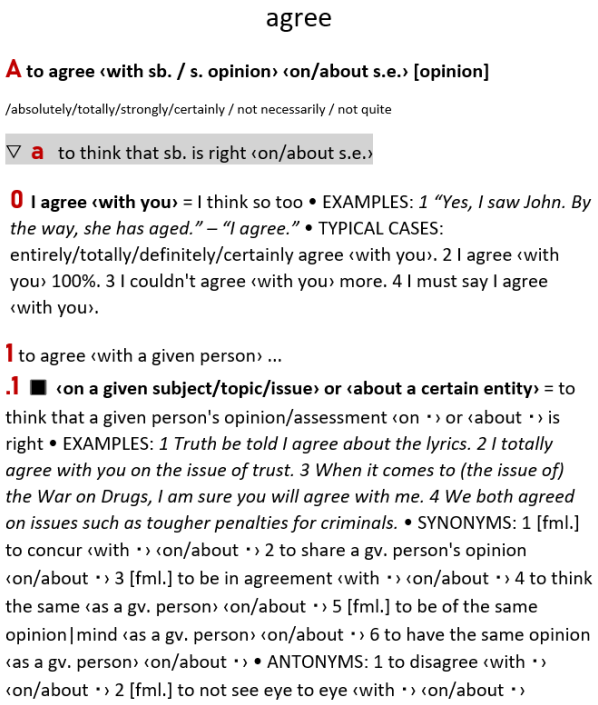
2.3 Key differences between FrameNet and the PAD

In order to understand in detail how the two lexical resources differ from one another, I will give a concise explanation of some concepts that may appear similar but are, in fact, distinct.

In Figure 1, I show a simplified excerpt of the PAD entry for *agree*[4].

[3] Cyc (http://www.cyc.com, addressed 5 July 2025; until 2017 "opencyc", i.e. OpenSource Cyc) or the Knowledge Graph are ontologies and knowledge bases.

[4] This excerpt includes uppercase/lowercase characters and numbers (in red) intended to facilitate the understanding of the PAD's hierarchical microstructure. These characters are not present in the original PAD entry.


agree

A to agree ‹with sb. / s. opinion› ‹on/about s.e.› [opinion]

/absolutely/totally/strongly/certainly / not necessarily / not quite

▽ **a** to think that sb. is right ‹on/about s.e.›

0 I agree ‹with you› = I think so too • EXAMPLES: *1 "Yes, I saw John. By the way, she has aged." – "I agree."* • TYPICAL CASES: entirely/totally/definitely/certainly agree ‹with you›. 2 I agree ‹with you› 100%. 3 I couldn't agree ‹with you› more. 4 I must say I agree ‹with you›.

1 to agree ‹with a given person› ...

.1 ■ ‹on a given subject/topic/issue› or ‹about a certain entity› = to think that a given person's opinion/assessment ‹on •› or ‹about •› is right • EXAMPLES: *1 Truth be told I agree about the lyrics. 2 I totally agree with you on the issue of trust. 3 When it comes to (the issue of) the War on Drugs, I am sure you will agree with me. 4 We both agreed on issues such as tougher penalties for criminals.* • SYNONYMS: 1 [fml.] to concur ‹with •› ‹on/about •› 2 to share a gv. person's opinion ‹on/about •› 3 [fml.] to be in agreement ‹with •› ‹on/about •› 4 to think the same ‹as a gv. person› ‹on/about •› 5 [fml.] to be of the same opinion|mind ‹as a gv. person› ‹on/about •› 6 to have the same opinion ‹as a gv. person› ‹on/about •› • ANTONYMS: 1 to disagree ‹with •› ‹on/about •› 2 [fml.] to not see eye to eye ‹with •› ‹on/about •›

Figure 1: An excerpt of the PAD entry for *agree*

In Figure 1, (A) constitutes the first *syntactic construction*. The letter in lower case next to the text highlighted in grey corresponds to the *sense field*. The number of sense fields varies from construction to construction. The annotation always begins with (a) for the first sense field of a construction. A sense field groups together various semantically related LUs. The red numbers under the sense field indicate the LUs. The notation (.1) indicates the first ending of the LU number 1; this avoids repeating the beginning of the LU "to agree ‹with a given person›" multiple times. If LUs do not share any part of the formulation, they are simply assigned whole numbers.

There are six syntactic constructions in total for *agree*, labeled A–F. The LUs are numbered consecutively throughout the entry[5]. For a detailed description of the PAD's microstructure see Giacomini & DiMuccio-Failla (2022: 486–494).

2.3.1 PAD's *syntactic constructions* vs. FrameNet's Frames

In the PAD, the syntactic constructions are the first disambiguating level[6]. The constructions are constituted by a grammatical structure filled with the ontological

[5] I will use alphanumeric codes to refer to the LUs during the analysis. An alphanumeric code like Aa-1.1 means "construction A, sense field a, lexical unit 1.1"; an alphanumeric code like Ea-8 means "construction E, sense field a, lexical unit 8". The fact that (a) is repeated does not mean that the sense field is the same, it means that that sense field is the first one in the given construction.

[6] This level was termed "phraseme level" in DiMuccio-Failla & Giacomini (2022: 487–489), but the terminology was subsequently changed.

(top) category of their subjects and objects (DiMuccio-Failla & Giacomini 2022: 487)[7]. Each construction carries a different meaning: there is, in fact, "a tight correlation between syntactic and semantic distinctions at the highest level of generality […]" (ibid.).

Syntactic structures play an important role in the PAD. They are useful to the user in the first place when they are decoding. The polysemy of a given syntactic structure is then disambiguated in the LUs that are grouped under it.

In FrameNet, a Frame can be associated with several syntactic realizations – or better: the FEs can be instantiated by different syntactic structures as long as they fulfil the specific role associated with the given FE. Frames are split if the FEs are different in meaning or number, but in a given Frame instantiations like "In late January 2004, North Corea and Nigeria reportedly ***agreed to a missile deal*** […] [my emphasis, LR]", and "They had ***agreed to meet*** at Attigny on 8 May [my emphasis, LR]" can coexist (cf. FrameNet, 2025: *make agreement on action*-frame). Both these constituents, i.e. the direct object and the infinitive clause, are equally instantiations of the FE "Obligation". In the PAD, instead, the constructions are semantically further disambiguated at the level of the *lexical unit*.

In the FrameNet database, *grammatical functions* (GFs) are annotated. For instance, for verbs, the following GFs are provided: "external argument", "object" [passivizable Nps], and "dependent" [adverbs, PPs, VPs, clauses, and non passivizable NPs] (cf. Ruppenhofer et al., 2016: 70−72). These GFs, however, are not semantically disambiguated.

2.3.2 PAD's *lexical units* vs. FrameNet's Frames

In the comparison of the PAD's and FrameNet's components, the highest correspondence potential can be found between the PAD's LUs and the Frames in FrameNet. Both identify a main sense of the target lexeme. However, the PAD's LUs are formulated unambiguously, and each of them correspond to a specific sense of the lexeme. On the contrary, a Frame remains polysemous. First, a single Frame can be evoked by various lexical items, and, second, within a Frame that is associated with a given lexical item (e.g. the Frame *make agreement on action*), various instantiations of semantic ambivalence can be found. In Ruppenhofer et al. (2016), it is not explicitly stated how a given sentence/running text is assigned to an already existing Frame, nor which criteria possibly play a role in this process:

> FN lexicographers can one by one declare each word in a sentence a target, **select a frame relative to which the new target is to be annotated** [my emphasis,

[7] In the PAD, simple infinitives in the construction always have the ontological category *somebody* (i.e. a *person*) as a subject. This notational convention increases look-up speed (DiMuccio-Failla & Giacomini, 2022: 488).

> LR], get a new set of annotation layers (frame element, grammatical function, phrase type) and appropriate frame element tags, and then annotate the relevant constituents. (Ruppenhofer et al., 2016: 8)

It seems that assigning a Frame to sentences extracted from the corpus is strongly subject to the interpretation of the lexicographer. Consider the following examples (1-2).

(1) "I AGREED to get photos of the fuel rods for the Union in Washington. DNI[8]" (FrameNet, 2025: *make agreement on action*-frame)
(2) "Syria AGREED to pay compensation. DNI" (FrameNet, 2025: *agree or refuse to act*-frame)

(1-2) were assigned to two different Frames even though they display the same syntactic structure and patently share the same (general) underlying meaning (i.e. "saying yes to a proposed action to perform something"). It is probable that the lack of subtle distinctions in the definitions of the Frames (and of their FEs) leads to this decision. The blurred difference between these two Frames will be further discussed in Section 3.

PAD's LUs are formulated after a deep analysis of the polysemy of a lexeme that goes beyond the traditional lexicographic methodology. This semantic variation becomes discernible and definable when the lexeme is considered in conjunction with its conventional lexical surroundings, rather than in isolation, and each LU corresponds in the PAD to a distinct sense of the given lexeme. In contrast, FrameNet's Frames are identified by grouping diverse words (treated as standalone items) that evoke the same conceptual scene with the same number and type of participants (i.e. FEs). The semantic variation among these participants is not seen as an indication of polysemy, as long as their role within the given Frame remain consistent (Ruppenhofer et. al., 2026: 14). This is a crucial difference between the PAD and FrameNet.

2.3.3 PAD's *semantic types* vs. FrameNet's Frame Elements

In the PAD, the *semantic types* are categories of entities that typically fill an argument slot within a usage pattern, i.e. a LU. For instance, for the verb *toast*, the semantic type [Breadstuff] is used, which is—although being a relatively uncommon word—the best representative for the most frequent types of direct objects collocating with *toast,* i.e. bread, buns, bagels, sandwiches, etc. (cf. DiMuccio-Failla & Giacomini, 2017b: 6, 8). Semantic types represent the kind of thing acting in or being acted upon by the lexeme in that specific pattern and are components within the formulation of the lexical unit itself. For example, the PAD's LU for *toast* would be *to toast breadstuff*. It is important to note that a semantic type is the most informative hypernym of the selectional-

[8] "DNI" is an acronym for "Definite Null Instantiation" (Ruppenhofer et al., 2016: 28), which refers to an anaphoric type of omission where the omitted FE "must be something that is already understood in the linguistic or discourse context" (ibid.).

semantic preferences of the given lexeme: the focus lies on its semantic specificity (in this case, [Food] is too general and too uninformative in comparison to [Breadstuff], cf. 2017b: 6). In short, the PAD's semantic types specify the "roles/arguments" requested by a given lexeme. However, these terms should not be confused with the ones of FrameNet.

In FrameNet, *frame elements* are roles within a conceptual frame (e.g. "Cook" is a role in the *Apply_heat* Frame) (cf. Ruppenhofer et al., 2016: 8). While these roles are filled by entities that can be semantically typed, the FE itself is the participant slot in the scenario. There is no specification of the semantic range underlying a FE. If the semantic range is not specified, it is difficult to represent it unambiguously: a Cook can be a professional cook, or a person who cooks; it can also refer to multiple people, e.g. to the whole chef's team. In other cases, such as for the FEs "Party_1"/"Party_2", the polysemy is even greater, ranging from single individuals to groups of individuals to entire nations.

An important specification about the term *semantic type* is needed. In FrameNet, there are *semantic types* too, but these are designed to record information that is not best represented in its frame and frame element hierarchies (Ruppenhofer et al., 2016: 85), to aid frame parsing and automatic FE recognition, and to classify the denotation of LUs, Frames, and FEs (2016: 86). For example, the semantic type "Container" can be applied to LUs in the *Container*-frame (evoked by LU like *jar.n* and *box.n*), to the *Container*-frame itself, and to the "Source" of the *Emptying*-frame (2016: 86–87). This indicates that the head-nouns filling the FE "Source" in the *Emptying*-frame are likely to be words that belong to the *Container*-frame. Regardless of whether a filler is inherently a container, its occurrence in that role means it is being used as a "Container" in that context (2016: 86). However, there may be fillers that occur in a particular role despite the fact that they have features clashing with the semantic types associated with that role (2016: 87, footnote): this happens every time the target LU is used metaphorically or metonymically. FrameNet does not account for these meaning extensions in a systematic way (2016: 101).

To conclude, in essence, FrameNet's FEs define what roles exist in a conceptual scene, while DiMuccio-Failla & Giacomini's semantic types define what kinds of entities fill argument slots in specific conventional linguistic patterns.

3. Matching Frames with the PAD entries

In this section, I will explain the methodology used for matching the four Frames each connected to *agree.v* and to *follow.v* on FrameNet with the entries of *agree* and *follow* in the PAD (Section 3.1). I will show and discuss the results of the matching process for *agree* in Section 3.2, and for *follow* in Section 3.3.

3.1 Methodology

The methodology used for the matching process of *agree* differs slightly from the one used for *follow*, since the second one was optimized after assessing the application of the first. I will explain which step was omitted after giving an overview of the pieces of information available in FrameNet, which build the starting point of the analysis.

In the *LU Index* of FrameNet, one finds out that *agree.v* and *follow.v* are each associated each with four different Frames. There is no indication about the ordering of these Frames – which Frame comes first is supposedly random. Each of these Frame is provided with:

- A definition that delivers a description of the given Frame and contains the Core FEs involved in the Frame; the definition comes with 2-3 examples (i.e. annotated sentences) illustrating the interplay between the FEs involved in the Frame.
- A list of Core and Non-core FEs along with their definitions and 1-2 annotated examples each.
- A list of Frame-to-Frame relations featuring the given Frame.
- A list of LUs connected with the given Frame, whose parts of speech can vary (meaning that a Frame is not exclusive to a part of speech only: verbs, nouns, adjectives, and adverbs can be associated with the same Frame if they are semantically coherent)[9].
- A list of annotated examples assigned to each of these LUs, which vary in quantity and length.

The methodology used for the matching process consisted of four steps. **Step 1** consisted of analyzing the definitions of the Frame and FEs and understanding their application in the examples of the given LUs (*agree.v* and *follow.v*). The annotated examples, in fact, do not always "translate" unambiguously the indications given in the Frame definition and, in more than one case, a given example could be eligible for more than one Frame. In Step 1, the goal is to understand the boundaries of the Frames, and, in doing so, to learn to recognize them in explicit examples, and get a general overview of the polysemy as covered and traced in FrameNet for the given LU.

In **Step 2**, a simplified version of the PAD entry was prepared for the matching process, listing exclusively *constructions*, *sense fields* and *lexical units* (including *special cases* and *variations*). Next, every LU in the PAD entry was associated with an appropriate Frame, based on the Frames' definitions. However, as some PAD's LUs proved challenging to match, the analysis shifted to examining each example of the PAD's LUs and assigning these a Frame. This decision was relevant for accuracy, so as to carefully determine whether any seemingly missing matches with a Frame had indeed been

[9] The list of annotated examples assigned to each of these LUs is accessible by clicking on it.

missing. The analysis of the examples proved to be crucial in determining the matches.

In **Step 3**, a plain list containing only examples of the PAD entry (without the indication of the corresponding LU they belong to) was prepared, and every example was associated with an appropriate Frame – once again, taking the Frame's and FEs' definitions as a compass. I intentionally emphasize this aspect because, although the FEs are defined too, their semantic specificity remains vague, which consequently allows the assignment of a single Frame to multiple examples that actually belong to different LUs in the PAD.

In **Step 4**, the boundaries of the LU's were mapped again, i.e. the examples were re-ordered according to the LU they belong to, and these results were the final results of the matching process.

For the matching process of *follow*, Step 2 was omitted, and the analysis was conducted starting directly from the examples (**Step 3**)[10].

I will now present and discuss the results of both matching processes in detail.

3.2 Matching *agree*

The LU *agree.v* is represented in FrameNet through four different frames: 1. *Compatibility*, 2. *Make agreement on action*, 3. *Be in agreement on assessment*, and 4. *Agree or refuse to act*. In Table 1, I quote the Frames' definitions as in FrameNet (2025).

The information listed in Table 1, along with the definitions of the FEs (not included in Table 1 but in FrameNet), describes the interplay of the core FEs involved in each Frame. Due to space constraints, I cannot list the definitions of all Core-FEs. However, I provide in (3-4) the definitions of Core-FEs "Item_1" and "Item_2", which belong to the Frame *compatibility*, to illustrate the semantic vagueness of the definitions themselves.

(3) "Item_1: The Frame Element Item_1 marks the grammatically more prominent of the two entities, i.e. the subject in active clauses, when they are expressed separately."
(4) "Item_2: The Frame Element Item_2 marks the grammatically less prominent of the Items when they are expressed separately."

[10] At the current stage of the project, the present study is preliminary and aims to ascertain the potential suitability of FrameNet's Frames to represent meanings in a leaner's dictionary. In order to make claims of a more general character, broader empirical testing might be carried out in the future (expanding the range of analyzed lexemes), also assuring inter-rater validation in the matching process.

Frame	Frame Definition	Core and Non-core FEs
1 – compatibility	**Item_1** and **Item_2** are compatible with each other if they can exist or function together in some context without problems, conflict, or other undesirable situation[s]. The set of **Item_1** and **Item_2** may be expressed jointly as **Items**. The Degree to which the Items are compatible may also be indicated, as may be a **Parameter** along whose lines the Items are compatible.	ITEM_1 ITEM_2 ITEMS PARAMETER Non-core: DEGREE
2 – make agreement on action	Two (or more) people (the **Parties**, also encodable as **Party_1** and **Party_2**) negotiate an agreement. Both sides are construed as making a commitment to assume an **Obligation** – the process is understood to be symmetrical or reciprocal. Instead of a specific mention of the Obligation, a **Topic** expression may be used to indicate the domain covered.	OBLIGATION PARTIES PARTY_1 PARTY_2 TOPIC Non-core: DESCRIPTOR; MANNER; MEDIUM; PLACE; TIME
3 – be in agreement on assessment	The **Cognizers** have a similarity (or dissimilarity) in their **Opinion**. The **Cognizers** may be expressed separately, with **Cognizer_2** being the basis for establishing the Opinion of **Cognizer_1**. Rather than a specific Opinion, a phenomenon about which a similar or differing Opinion is held, the **Topic**, may be specified. A specific Opinion may also go unmentioned when the Opinions of the Cognizers are understood as answers to a **Question**.	COGNIZER_1 COGNIZER_2 COGNIZERS OPINION QUESTION TOPIC Non-core: CIRCUMSTANCES; DEGREE; DEPICTIVE; EXPLANATION; MANNER; PLACE; TIME

4 – agree or refuse to act	A **Speaker** either agrees to or refuses to engage in a **Proposed_action**, proposed by an **Interlocutor**.	INTERLOCUTOR PROPOSED_ACTION SPEAKER Non-core: CO-TIMED_EVENT; DEPICTIVE; EVENT_DESCRIPTION; EXPLANATION; FREQUENCY; INTERNAL_CAUSE; MANNER; MEANS; MEDIUM; PARTICULAR_ITERATION; PLACE; PURPOSE; ROLE; TIME

Table 1: The four Frames associated with *agree.v* in FrameNet

In (3-4) "Item_1" and "Item_2" can have any semantic realization. In order to understand which kind of entities can qualify for "Item_1" and "Item_2", one can take a look at the examples. In the examples given for this Frame 1 (*compatibility*), these FEs are in 15 out of 17 cases abstract entities (e.g. *findings*, *results*, *predictions*, *observations*); in 1 out of 17 concrete entities, animate and inanimate (i.e. "Item_1" = *vodka*; "Item_2" = *you*); in 1 out of 17, *people*[11]. The fact that only a single example refers to the physiological effects ("Vodka obviously doesn't AGREE with you") makes the semantic spectrum of this Frame vague because the presence of this example suggests a meaning extension of "Item_1" and "Item_2" that goes beyond an otherwise homogeneous set of examples.

In Table 2, I show an excerpt of the PAD's example-list with the matching Frames and the indication of the corresponding LU in the third column (this is the final table resulting after Step 4). The original table contains 141 examples. The LU is indicated through an alphanumeric code due to space constraints.

Example	Frame	PAD's LU
1. Albertson said witnesses' accounts agreed with the accounts given by the two truck drivers.	1	Ea-8
2. String theory is false, because no consistent version of the theory exists or no version agrees with all experimental results.	1	

[11] The example is: "He replied that he recognized that 'there are **those who** [Item_1] AGREE with **me** [Item_2] politically but who disagree with me religiously' and he said he wanted their political support". However, I think this example is in the wrong Frame and should be better listed under Frame 3 (*be in agreement on assessment*).

3. According to a famous researcher, John Smith died of TB at the age of ten. This also agrees with the accepted history of his family.	1	
4. Thus Voltaire: "The adjective is the enemy of the noun, though it agrees with it in number and gender".	-	Ea-9
5. In 'Tom likes jazz', the singular verb 'likes' agrees with the subject 'Tom'.	-	
6. She ate something that didn't agree with her.	1 ?	Fa-10

Table 2: Excerpt of the matching results for *agree* (PAD's LUs and Frames)

In Table 2 I listed the examples of the PAD that match with Frame 1. Examples 4 and 5 refer to grammatical agreement. Even though Item_1 and Item_2 are semantically vague and could possibly be instantiated as parts of speech, the relation existing between parts of speech does not align with the Frame's definition. This is because grammatical agreement is either given or not, and there is no "conflict" involved (cf. definition in Table 1). Example 6 could potentially match if we interpret physiological effects as possible instantiations of the FEs. However, the basis of this interpretation would rely solely on the single example about *vodka* discussed earlier.

In Table 3, I list the full results of the matching process.

PAD's LUs	Frame
All 20 LUs of construction A	3
All 8 LUs of construction B	2
Ca-4.1 *[constructed like 'to choose'] Two+ people agree on*[US] *a pt. thing ‹for a ct. function›*	Missing match
Ca-4-SP1 *Two+ people agree on*[US] *a time/date/place ‹for a ⌜ct. [already planned]⌝/⌜sp. [in planning]⌝ event›*	Missing match
Ca-4-SP2 *Two+ people agree on*[US] *a pt. plan/criterion ‹⟨for a pt. course of action⟩ for a sp. purpose›*	Missing match
Ca-4-SP3 *The parties to a ct. transaction [in the making]*	Missing match

agree on[US] *a pt. price/wage/pay/pay rise/remuneration ‹for a ct. thing›*	
Ca-4-SP4 *The members of a gv. organization/ruling body (/ by majority rule / unanimously) (/officially) agree on*[US] *a pt. thing ‹for a ct. function›*	Missing match
Ca-5 *Two+ people agree on*[US] *(constructed like 'to choose') a gv. person ‹for a sp. role›*	3 ?
Da-6.1 *to agree ‹to a gv. request/proposal/suggestion›*	Missing match
Da-6.2 *to agree ‹(to the request/proposal/suggestion) that one should*[UK] *do a sp. thing or (more general) that a sp. event/situation should*[UK] *occur›*	3 ?
Da-6.3 *to agree ‹to do a sp. thing [as requested/proposed/suggested by sb.]›*	4
Da-6.4 *to agree ‹to a sp. event/situation [as requested/proposed/suggested by sb.]›*	4
Da-6.4-SP1 [*said of a party to a ct. binding agreement]* *to agree ‹to do sth. / that... / to sth.› ‹as (/a term of) a ct. binding agreement›*	4
Da-7 *to agree to a ct. thing ‹for a ct. function›*	2 ?
Da-7-SP1 *a party to a ct. transaction agrees to a ct. amount of money ‹as the price for sth.› or ‹as a wage/pay/pay rise› or ‹for a sp. action›*	Missing match
Ea-8 *A gv. description/representation of something agrees with another description/representation of the same thing*	1
Ea-9 *a gv. word form agrees with another word form*	Missing match
Fa-10 *a ct. type of food does not agree with a gv. person*	1 ?

Table 3: Results of the matching process for *agree*

In Table 3, a Frame indication accompanied by a question mark signifies that the PAD's LU does not fully match with the given Frame definition, but some of the Frame-examples (and, in some cases, only one) exhibit the same syntactic construction with

the same meaning as the PAD's LU. This fact shows that it is unclear how the Frame's definition was interpreted and applied during the annotation process in FrameNet: can we conclude that the annotated examples for a Frame must be considered as semantically equivalent, even when, in that list, we find single or multiple examples which are totally different from a syntactic point of view? For this reason, the match with the PAD's LU can only be claimed to be "possible".

The LUs of construction C (*to agree on sb./sth. ‹for s. role/function›*) do not match with either Frame because no Frame conveys this specific sense. The LUs belonging to construction C share the meaning "choosing/selecting something together", where "something" is specified/semantically restricted through an appropriate semantic type in each LU (cf. Table 3). In FrameNet, the two most eligible Frames for a match with these LUs display some issues. Frame 2 (*make agreement on action*) describes and refers to the negotiation of an agreement that subsequently becomes an obligation for both parties: this does not align with the LUs of construction C because choosing something together does not necessarily imply an obligation. In contrast, Frame 4 (*agree or refuse to act*), focuses on the decision to act or refuse to act, which a Speaker makes after receiving a suggestion or proposal from an Interlocutor. In Frame 4, the subject (i.e. the Speaker) may be singular or plural (as we learn from the examples for Frame 4), and the "Proposed_action" is always expressed using infinitive clauses. All examples for Frame 4 involve infinitive clauses, so diverging from the syntactic construction of the PAD's LUs of construction C. Additionally, in Frame 4, the Interlocutor never shows up in the examples provided, and some of them seem to qualify more appropriately for Frame 2[12]. Consequently, Frame 4 does not comply with any LUs of construction C due to syntactic-semantic incongruence.

The missing match of Da-6.1 is due to its syntax. Semantically, it could match Frame 2, but in Frame 2, "two (or more) people negotiate an agreement […]" (cf. definition of Frame 2 in Table 1). On the contrary, in Da-6.1 the subject is singular and says yes to a request/proposal. The presence of a singular subject could match with Frame 4, but in this Frame the object is an action expressed through infinitive clauses. This syntactic construction of Frame 4 does not match the presence of a direct object in Da-6.1, and therefore, there can be no match.

The missing match of Da-7-SP1 mirrors the reasons of Da-6.1, with the difference that the direct object in Da-7-SP1 is semantically different from the one in Da-6.1.

The missing match of Ea-9 was discussed earlier in this section in the contest of the polysemy of "Item_1" and "Item_2".

[12] All examples of Frame 4 are marked with "DNI". The issue is that the precise classification of the distinctive factors between Frame 2 and Frame 4 is blurred. In Frame 2, 19 out of 33 examples also involve a type of Null Instantiation, either qualifying them for Frame 4 or clearly showing that the disambiguation between Obligation (cf. definition of Frame 2 in Table 1) and Proposed_action (cf. definition of Frame 4 in Table 1) is weak to translate into practice.

3.3 Matching *follow*

The analysis for *follow* will be presented more concisely because many aspects are similar in nature to the previous ones of *agree* and this would not be repeated. In FrameNet, *follow.v* is represented through four different Frames: 1. *Cotheme*; 2. *Relative_time*; 3. *Compliance*; 4. *Grasp*. After analyzing their definitions, their FEs, and their examples (**Step 1**), the 74 examples of the 16 LU's (and 40 *special cases*) from the PAD entry for *follow* were matched with the Frames in a blind process (**Step 3**). The boundaries of the LUs were subsequently re-mapped (**Step 4**), finding out that only 9 LUs and 14 special cases could be matched.

The missing senses in FrameNet that are instead traced in the PAD include the following meanings[13]:

- Movement that it is not bodily, i.e. not intended in its literal sense, but in a metaphorical sense: for instance, the PAD's LU Ab-3 *to follow a person('s example/lead),* and Ac-5 *(also of things) to follow a course of development* do not express physical movement, but rather the sense of "imitating somebody" in the first case, and "following a trend" in the second[14].
- The cognitive distinction between "grasping/paying attention to" and "being interested in/supporting": while Frame 4 (*grasp*) covers only the first sense, i.e. "paying attention to", the PAD includes three LUs that illustrate this semantic distinction. This distinction is significant because, in the second case, the person does not necessarily acquire new knowledge (as stated for the FE "Cognizer" in Frame 4: "The sentient animate being who acquires new knowledge").
- The distinction between temporal and logical following: Frame 2 describes solely "the relative ordering of two events or times", whereas the PAD includes 15 LUs that illustrate both semantic distinctions. These are grouped as follows: four LUs in the *sense field* "come after"; five LUs in "happen after"; and one in "do after". Under the intransitive construction D, the *sense field* "ensue" groups the LU Da-13 *to follow (on) from sth.*; the special case Da-13-SP1 *a situation/event follows (on) from another situation/event (for ex. inevitably/naturally)*; two special cases specifying logical consequences, Da-13-SP2 *a statement follows (on) from another statement (for ex. logically/automatically/necessarily)*; and Da-13-SP3 it *follows (from sth.) that... .*

[13] The LUs containing phrasal verbs (i.e. LU14 *follow through* + one SP; LU15 *follow up* + two SPs; LU16 *follow along*) are also included in the PAD in the entry of *follow*, and they do not match any of the Frames for *follow.v*. I will not discuss them here, as the analysis focuses solely on *follow*.

[14] The FE's definitions leave no doubt that the intended meaning is "moving" concretely: cf. FrameNet (2025: *Cotheme*-frame): "Cotheme = This frame element is the second moving object, expressed as a direct object or an oblique" and "Theme = This is the entity, frequently a living being, which moves in relation to the Cotheme. Normally the Theme frame element is expressed as an external argument."

The difference in granularity of the PAD's distinctions is even more evident for *follow* than for *agree*.

4. Extension of the Frame concept

FrameNet generally aims for a broader, more abstract level of conceptualization for its Frames and FEs, explicitly stating that frames are not split based on fine-grained usage or grammatical variations, prioritizing similarity over differences (Ruppenhofer et al., 2016: 17). In contrast, the PAD adopts a splitting-friendly approach, also due to its commitment to ontological consistency, which, as we have seen, is looser in FrameNet. The dispute between the lumpers' and splitters' approaches will not be addressed here (cf. Svensén 2009: 206 footnote), but it is clear that, in the PAD, an extension of the Frame's concept is needed. Granularity serves the purpose of representability, and representability is easier to achieve when we deal with well-specified concepts.

One of the future goals to achieve in the PhraseBase project is to add ostensive aids (i.e. multimedia elements such as pictures, videos, GIFs, animations, illustrated frames) to the entries of the PAD. Because of polysemy, the choice of the most appropriate ostensive aid revolves around definitions of concepts. Since every LU of the PAD corresponds to a specific sense of the given lexeme (i.e. to a specific concept), the focus is on the lexeme level[15]. The utility of frames becomes most apparent when a concrete scene needs to be described, as the roles participating in the scene are representable, in the same way as their environment is (e.g. through a prototypical picture or video of the scene). The prerequisite is that the roles must be semantically specified (as they are in the PAD). Whenever a Frame can be associated with a LU in the PAD, and the roles can be filled with the semantic types of the PAD's LU, the Frame becomes representable.

Additionally, there are some cases in which the pieces of information that make up the prototypical scene are not contained in the LU's formulation or lexicographic definition, but belong to someone's encyclopedic knowledge. Providing "visual voice" to this type of information would help users to better disambiguate the different senses of a lexeme and gain additional information that, while not necessary to formally identify the concept, is beneficial for learners.

For instance, the mental image we associate with "a binding agreement between two people" differs from that of "a binding agreement in a political/institutional context", where both the environment and the process of agreeing are different. In political or governmental settings (e.g. parliament, cabinets, or assemblies), a proposal is typically part of an agenda that has been previously approved. There need not be a single designated "Interlocuter" who makes a "Proposal"; instead, the topic of discussion is a

[15] In this paper, it is not possible to explore the questions about meaning representation and its criteria in depth. However, these issues are being addressed in much greater detail within the framework of my PhD dissertation.

proposal submitted at an earlier point in time. The process of agreeing can take months, and the agreement itself often requires voting. This specific sense is traced in the PAD as a special case (Ba-3.3-SP2) and falls under the broader Frame 2. Illustrating this sense with a prototypical picture or video—such as a parliamentary session deliberating on a proposed law—would provide users with additional information not explicitly mentioned in the LU itself. Furthermore, cultural aspects should not be overlooked, as they can be highlighted through the choice of appropriate ostensive aid that align with the language and culture of the given dictionary.

In FrameNet, new Frames could be created, such as an *Institutional_Agreement*-frame, where Core-FEs might include "Parties", "Binding_agreement", and "Institutional_context". Additional Frames could be developed for all missing senses identified in the analysis in Section 3. However, as already mentioned, such a degree of granularity is not the goal of FrameNet. It is claimed that "the ultimate test of these decisions [i.e. about finer distinctions] is utility, and we believe that we largely achieve our goal of showing the basic semantic distinctions for the word senses we have described" (Ruppenhofer et al., 2016: 17). Nevertheless, even setting aside special cases, the methodology used in FrameNet does not guarantee a full coverage of "basic meaning distinctions" (cf. the semantic spectrum of *follow* in Section 3.3).

An extended concept of Frame would therefore entail:

- An increased granularity: the possibility to trace more fine-grained distinctions between frames to account for nuanced differences in meaning, context, and usage (splitting/creating more frames to better represent specific senses or contexts).
- The incorporation of encyclopedic knowledge through ostensive aids to provide a richer understanding of the concepts.
- Multimedia representation: semantically specified Frames are better representable, and the users can more easily map linguistic expressions to their corresponding conceptual structures. The visual aids can help users better grasp the prototypical scenes and roles associated with a frame.
- Cultural sensitivity: the choice of multimedia and examples should be culturally appropriate and relevant to the target audience. It must align with the linguistic and cultural context of the dictionary in question. The different cultures associated with a language should be treated equally, identified in a systematic way, and presented consistently to the users.

This extension would not only improve the utility of Frames for linguistic analysis but also make them more accessible and informative for a broader range of users.

5. Open questions and conclusion

This paper has shown that the PAD offers a more granular, cognitively oriented approach to meaning representation compared to FrameNet. More LUs and Frames will

be compared in the future to support these findings more quantitatively. The PAD's splitting-friendly methodology ensures a more comprehensive coverage of polysemy, as evidenced by the analysis of *agree* and *follow*. However, several open questions remain. Two key questions need to be addressed in the future:

- How can the proposed extension of the Frame concept be systematically implemented to balance granularity with usability? Usability tests will follow to ensure that the needs of advanced learners are met.
- What criteria should guide the integration of encyclopedic knowledge and multimedia elements into the PAD to ensure both linguistic accuracy and cultural relevance?

By addressing these open questions, the PhraseBase project can further refine its approach to meaning representation, making it not only a valuable resource for advanced language learners but also a model for lexicographic innovation. Ultimately, the PAD's emphasis on well-specified concepts and representability highlights the importance of bridging linguistic theory with practical applications, paving the way for more effective and user-friendly linguistic information systems.

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