Paths and airways:
A frame-based representation of spatial concepts in aviation terminology

Ana Ostroški Anić, Ivana Brač
Institute for Croatian Language and Linguistics

Keywords: aviation terminology, spatial concepts, specialized knowledge representation

Any domain of specialized knowledge is defined by various types of categories and conceptual relations that bind them together. However, the rapid development of large lexical resources, such as BabelNet, which includes general language dictionaries and specialized resources such as terminological databases, glossaries, and encyclopedias, has highlighted the need for linking general and specialized knowledge using a clear and precise model.

This idea is not new in the area of specialized knowledge representation, where a number of resources have been developed following the theory of Frame Semantics (e.g. Vintar & Martinc, 2022; L'Homme, Robichaud & Subirats, 2020; Pilitsidou & Giouli, 2020; L'Homme, Subirats & Robichaud, 2016), or its terminological application in the form of Frame-Based Terminology (Faber, 2015; Faber & San Martin, 2011). Unlike traditionally organized specialized resources that define professional knowledge through hierarchically organized data categories, frame-based representations provide a better description of dynamic specialized categories, e.g. activities and processes that can be broken down into steps, which are abundant in technical domains.

AirFrame (Ostroški Anić & Brač, 2022) is a specialized lexical database in which aviation terminology is defined in the form of semantic frames by adapting the FrameNet's methodology (Ruppenhofer et al., 2016) to terminology work. The most significant processes, events, and entities characterizing the domain of aviation are defined by core and non-core frame elements (FEs), lexical units or terms, and relations between frames. A preliminary conceptual modeling of the field, with the Flight as the central event of the domain, is followed by a corpus-based analysis of the most frequent terms. Whereas traditional terminological databases are centered around hierarchically ordered data categories, knowledge bases such as AirFrame allow for expanding the hierarchical structure to chronological and associative relations, especially at the level of frame-to-frame relations. These particularly relate to the *precedes*, *is preceded by* and *see also* FrameNet relations, as well as to those referring to perspective.

This paper describes the representation of spatial concepts in the field of aviation, following the conceptual structure of the relevant frames defined in the Berkeley FrameNet. The focus is put on frame element types as a kind of thematic semantic roles that are a particular feature of the database. Terms related to the frames of Airspace and Aerodrome are given in more detail, with examples of annotated sentences extracted from a specialized corpus compiled within the project. The function of FE types is to organize fine grained, frame specific roles into semantically connected groups, as in the sentence *The trajectory allows the helicopter to continue its flight from the height of the cruise to an altitude of 300 m (1000 ft) above the heliport*., where the FE altitude is used in different FE type positions, i.e. as initial_location and final_location. Multi-word terms are also discussed, with the aim to underline the need for expanding the original FN structure to better accommodate contextual information (Torrent et al., 2022).

The AirFrame database serves as a model for enabling linking lexical resources of different theoretical frameworks compiled for different users. Terminology defined this way could be used in developing domain ontologies or for NLP applications, such as extracting relations from unstructured sources.

References

Baker, Collin F. 2016. FrameNet: Frame Semantic Annotation in Practice. In Ide, Nancy & James Pustejovsky (eds.), *Handbook of Linguistic Annotation*. Springer Science+Business Media, Dordrecht.

Faber, Pamela. 2015. Frames as a Framework for Terminology. In Kockaert, Hendrik J. & Frieda Steurs (eds.), *Handbook of Terminology*, 1. John Benjamins, Amsterdam/Philadelphia. 14–33.

Faber, Pamela & Antonio San Martin. 2011. Linking specialized knowledge and general knowledge in EcoLexicon. In *Actes de la conférence Terminologie & Ontologie: Théories et Applications (TOTh) 2011.* Annency. 47–61.

L'Homme, Marie-Claude, Benoit Robichaud & Carlos Subirats. 2020. Building Multilingual Specialized Resources Based on FrameNet: Application to the Field of the Environment. In Torrent, Tiago, Colin F. Baker, Oliver Czulo, Kyoko Ohara & Miriam R. L. Petruck (eds.), *International FrameNet Workshop 2020. Towards a Global, Multilingual FrameNet. Proceedings, Workshop of the Language Resources and Evaluation, LREC 2020*. 94–102.

L' Homme, Marie-Claude, Carlos Subirats & Benoît Robichaud. 2016. A Proposal for combining "general" and specialized frames. *Proceedings of the 5th Workshop on Cognitive Aspects of the Lexicon (CogALex – V).* The COLING 2016 Organizing Committee. Osaka. 156–165.

Ostroški Anić, Ana & Ivana Brač. 2022. AirFrame: Mapping the field of aviation through semantic frames. In Klosa-Kückelhaus, Annette, Stefan Engelberg, Christine Möhrs & Petra Storjohann (eds.), *Dictionaries and Society. Proceedings of the XX EURALEX International Congress*. IDS-Verlag. 334–345.

Pilitsidou, Vera & Voula Giouli. 2020. Frame Semantics in the Specialized Domain of Finance: Building a Termbase to Aid Translation. In Gavriilidou, Zoe, Maria Mitsiaki & Asimakis Fliatouras (eds.), *Proceedings of XIX EURALEX Congress: Lexicography for Inclusion, Vol. I.* Democritus University of Thrace. 263–272.

Torrent, Tiago Timponi, Ely Edison da Silva Matos, Frederico Belcavello, Marcelo Viridiano, Maucha Andrade Gamonal, Alexandre Diniz da Costa & Mateus Coutinho Marim. 2022. Representing Context in FrameNet: A Multidimensional, Multimodal Approach. *Frontiers in Psychology* 13:838441. doi: 10.3389/fpsyg.2022.838441.

Vintar, Špela & Matej Martinc. 2022. Framing karstology: From definitions to knowledge structures and automatic frame population. *Terminology. International Journal of Theoretical and Applied Issues in Specialized Communication*, 28(1). 129–156.