



FRAME-BASED REPRESENTATION OF MENTAL AND PERCEPTION VERBS

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Abstract. This study examines the frame-based representation of mental and perception verbs from a cognitive-semantic perspective. The research focuses on the conceptual structures underlying mental states, cognitive activities, and perceptual events and considers how these structures are encoded through verbal meanings. Within the framework of Frame Semantics, mental verbs are analyzed in relation to frames representing such aspects as evaluation, attitude, belief, desire, intention, and certainty, while perception verbs are examined according to sensory modality, spatial and temporal parameters, stimulus source, and perceptual medium.

Keywords: frame semantics; mental verbs; perception verbs; cognitive semantics; mental states; perceptual events; sensory modality; conceptual frames; belief; desire; intention; cognition and perception.

Introduction

Verb meaning representation has been a longstanding topic of research dating back to the earliest works in semantics. Some of the first written accounts on the behavior of mental verbs already highlighted their peculiar patterns of usage compared to common action verbs. Yet despite early recognition of the uniqueness of mental verbs, research remains limited compared to other verb types. An examination of frame-based representations on mental and perception verbs reveals that significant formal distinctions are connected to their functional peculiarities across multiple languages. This observation reinforces their unique characteristics not merely at the grammatical level but also through their formal and conceptual representation needs in language systems. The notion that distinct types of mental or perceptual representations naturally lead to verb types is rooted in frame semantics. Frames represent structured knowledge, encompassing various roles and evoking associated concepts. The distinct patterns of mental and perception verbs can be interpreted in terms of specific frame types. Each system possesses its own set of frames with corresponding roles and specifications. The influence of general perceptual structures on perception verbs, the impact of sociocultural systems on mental verbs, and the intertwined connections between mental cognition and perception highlight the essential need to establish representations for mental and sensory language systems.

The senses of vision, touch, hearing, smell, and taste support the direct perception of the external physical world by speakers of all languages. Perception verbs designate individual perceptual events as reported by observers. All sentences containing perception verbs provide some minimum conceptual information about the entity that produces or originates the stimulating agent, including the identity of the stimulator, the location where stimulus exists or occurs, the perceptual medium or conduit through which stimulation is conveyed, the sensory modality through which the stimulus is discerned by the observer, and the perceptual delivery

of the stimulus in terms of time, frequency, or tense. Whether using visual, auditory, haptic, olfactory, or gustatory modalities, languages across the world report perception or perception-like cognitive semantics in broadly similar conceptual packaging. Even though pedagogical grammars of perception verbs in many languages overlook agency distinctions, there exist definite typological contrasts among verbal expressions of sensory impressions. These conceptual and relational properties, among others, govern the determination of perceptual medium, sensory modality, spatial and temporal framing, and so forth in the wider language of perception with other verbs. Perception verbs allow speakers to differ as to the degree of perceptual stimulus that admits reference to the agency involved. Rather than surface modifications in a single frame-structure assembly of perception events, modular frames for such notions arise from broader cross-linguistic surveys that extend beyond inspection of a single language's assets.

Materials and Methods

In total, four frame sets were constructed for mental verbs, and their full definitions are presented in the following subsections. These sets offer a characterization of the fundamental entities involved in the expressions of the mental states considered. One of the central insights of the framework is that mental events can occur without their externalized expressions being termed mental verbs. An explicit wording can nevertheless be required to provide the information about the mental state in question. To account for such notions, the remainder of the section therefore presents a few additional frames which describe a mental state without explicitly mentioning it.

These frames are aligned with the primary sets defining the frames of mental verbs, and they represent further degrees of freedom available in the encoding of mental states¹.

The frames included represent three different but related aspects of thoughts and intentions: evaluation, attitude, and certainty². The first two frame sets describe exposition and myopia from the vantage point of either desire or belief; they are influenced by alternative lexical titling adopted in several languages. The last frame set focusses on the epistemic stance taken towards a topic when issuing a statement or comment — expressed through auxiliary or modal verbs — in conditions of uncertainty.

Through a frame-based approach, this study annotates a range of verbs in use and defines the corresponding frames in detail.

The analysis of perception verbs is organized around a table of verbal frame structures for perception specification and sensory modalities, encoded beyond the mental frame class. Frame-based analysis defines the reception and exploitation of perceptual experience according to (A) the original sensory modality of the stimulus, (B) schematic spatial tools for framing stimulus location, (C) temporal metrics of stimulus delivery, (D) source marking as probe or agent specification, and (E) the deliberate intention of associate creation.

Results

The annotations reveal that verbs such as believe, want, and intend commonly facilitate beliefs, desires, and intentions on the part of a subject, whereas mental state phenomena like

¹Д'Амбросио Дж. Depictive Verbs and the Nature of Perception. PhilArchive. 02.09.2026.

²Kann K., Warstadt A., Williams A., Bowman S. R. Verb Argument Structure Alternations in Word and Sentence Embeddings // Proceedings of the Society for Computation in Linguistics. 2019. P. 287–297.

doubt and fear typically fall outside a more elaborate descriptive scope. An extensive set of example sentences demonstrates that a greater variety of relevant terminology, phenomena, and grammar is linked to these restricted — yet conceptually natural — sets.

Verbs of perception are marked by multisensory features as well as their temporal and spatial location³.

In the Russian language, the verbs of perception fall into two central classes: one of these classes is the so-called “non-perceptual” (apparent) semantic type, which denotes the class of “have”, “see”, “hear”. The other central class is that of mental activities, cf. “think”, “know”. A similarity in other languages can be seen in the use of the same verb “to see” in connection with “to know”, “to think”. The comparative data show that beside the “physical” modality of perception there is also a “non-physical” modality, and besides the basic physical perceived modality, this is mostly provided by the mental aspect, under which the basic verbal ground of semantics under such circumstances appears in the demonstration of the “physical modality” of perception⁴.

Discussion

Consequently, frame semantics often denotes these three frame sets using nested structures, where the outermost level of frames represents the conventional practice of including other variables, phenomena, and modalities alongside the core specification.

An extensive body of research addresses the detailed understanding of belief, desire, and intention, as well as their interaction, within cognitive science⁵. A significant portion of this work concerns the nature of belief and more fundamentally epistemic states. Certain studies endeavour to elucidate the notion of belief by treating it as a probabilistic estimate of the likelihood that a particular proposition *P* holds, conditioned on a body of knowledge.

These beliefs remain open to change in light of new, potentially disconfirming, observations but also incrementally adapt to any new information⁶. More generally, varied but intensively studied models of these concepts are available in the existing literature, attesting either to the wealth of research on the core ideas or to a consensus that this triad of frames captures the central issues through widely applicable notions.

Cognitions and perceptions interact in complex ways. On the one hand, perceptual input can trigger automatic, cognitive formation of beliefs, desires, and intentions. On the other hand, cognitively influenced perception can shape what is perceived, how attention is allocated, and how incoming sensory inputs are evaluated. The interplay of perceptions and cognitions gathers increasing linguistic and psychological interest. Perceptions can initiate cognitive events, such as belief formation, even in the absence of cognitive intention: “She saw Mary’s

³Moiseeva S. A. Polymodality of the Verbs of Perception (as Exemplified by the Western Romance Languages) // Journal of Language and Literature. 2014. Vol. 5, No. 3. P. 314–317.

⁴Girju R., Peng D. Exploring the Sensory Spaces of English Perceptual Verbs in Natural Language Data. 2021.

⁵Ying L., Zhi-Xuan T., Wong L., Mansinghka V., Tenenbaum J. B. Grounding Language about Belief in a Bayesian Theory-of-Mind // Proceedings of the Annual Meeting of the Cognitive Science Society. 2024. Vol. 46.

⁶Stephenson T. Vivid attitudes: Centered situations in the semantics of 'remember' and 'imagine' // Proceedings of SALT 20. 2010. P. 147–160.

smile, so she thought..." Similarly, Joyce Psyche was inspired by the wail of a child, while Blake's experience of seeing the plague in London "after these choruses had been delivered, made the same narrative appear to him, as the song of a ruined city..." However, the cognitive content of the perceptual source is seldom part of the event expressed by the mental predicate, even in such cases where the perceptual event almost calls for a corresponding belief, desire, or intention. Sentences such as *John heard Mary's request, so he noticed it* and *She saw Jack's cry and shunned him* sound equally odd.

Conclusion

The analysis presented in this study demonstrates that mental and perception verbs represent semantically and conceptually complex categories that require a structured approach to their description. Frame Semantics provides an appropriate theoretical framework for identifying the conceptual configurations underlying these verbs and for establishing the semantic roles involved in the representation of mental and perceptual events. The examination of mental verbs shows that their meanings can be organized around several interconnected frame types, particularly those associated with evaluation, attitude, belief, desire, intention, and certainty. These frames demonstrate that mental events are not restricted to explicitly expressed mental predicates. Rather, mental states may also be represented indirectly through linguistic structures that encode the attitudes, evaluations, intentions, or epistemic positions of participants. Consequently, frame-based analysis makes it possible to describe both explicitly expressed mental states and related conceptual structures. The analysis of perception verbs further indicates that perceptual events involve a number of interconnected parameters. These include the sensory modality through which a stimulus is perceived, the source or stimulator of the perceptual experience, its spatial location, the medium through which the stimulus is conveyed, and its temporal characteristics. Thus, verbs of seeing, hearing, touching, smelling, and tasting do not simply denote acts of sensory perception; they activate broader conceptual structures involving an experiencer, stimulus, source, perceptual medium, and relevant spatial and temporal conditions. The multisensory organization of these verbs also demonstrates the importance of distinguishing different modalities in the semantic representation of perception

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