

Persian Perception Verbs

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Background & Goals

Background

Sensory perception verbs (e.g., *hear, listen, sound*) have been an ongoing topic of research in linguistics and philosophy of language (e.g., Dretske 1969, Akmajian 1977, Barwise 1981, Viberg 1984, Evans and Wilkins 2000, Jackendoff 2007, Gisborne 2010, Asudeh and Toivonen 2012, Poortvliet 2018).

- Syntax: one of the central issues has been defining what types of complements these verbs take and how and why these complements vary among perception verbs.
- Semantics: one of the key questions is to determine the sorts of macro-roles (ACTOR, UNDERGOER, LOCATION; Foley and Van Valin 1984) and thematic roles (e.g., EXPERIENCER, AGENT, STIMULUS) to assign the subjects and complements of perception verbs and to determine what relationship they have to the event or situation described by the clause that the perception verb heads.

- (1) Max listened to the music.
- (2) Max heard the music.
- (3) *Context: Max is heard coughing. Max sounds ill.*

Table 1: Persian Perception Verbs

Active (ACTOR, STIMULUS)	Experiencer (EXPERIENCER, STIMULUS)	Percept (STIMULUS, EXPERIENCER)
guš kard-an ear do.INF X listen to Y	šenid-an hear.INF X hear Y	be guš āmad-an/resid-an to ear come.INF/arrive.INF Y was heard by X
negāh kard-an look do.INF X looked at Y	did-an see.INF X see Y	be česm āmad-an to eye come.INF Y was seen by X
bu kard-an smell do.INF X smell Y	(bu) hes kard-an (smell) sense do.INF X smell Y	bu dād-an smell give.INF Y emitted a smell to X
maze kard-an taste do.INF X taste Y	maze hes kard-an taste sense do.INF X taste Y	maze dād-an taste give.INF Y emitted a taste to X
lams kard-an touch do.INF X touch Y (\diamond inadvertently)	dast zad-an hand hit.INF X feel Y (intentionally)	hes dād-an sense give.INF Y emitted a (physical) feel to X

Goals

1. An analysis of perception verbs in Persian (including complex predicates) that also accounts for semantic entailments of perception verbs
2. An account of Persian complex predicates using Glue Semantics
3. A discussion of how the structure of Persian perceptual complex predicates reveals the conceptual/ argument structure of perception constructions with regards to languages, like English, where this is hidden by fuller lexicalization

Complex Predicates

Background

- Persian verbal constructions are of two main kinds: simplex/fully lexicalized verbs (4) and complex predicates (CPREDS) (5).

- (4) Max mādar-aš-rā mi-bin-ad
Max mother-POSS.3S-OM DUR-see.PRES-3S
'Max sees her/his/its mother.'
- (5) Max be mādar-aš [negāh mi-kon-ad]_{CPRED}
Max to mother-POSS.3S look DUR-do.PRES-3S
'Max looks at her/his/its mother.'

- Parts of complex predicates
 - PVEs: Persian CPREDS can be made of various preverbal elements of a bare predicative category, including nouns, adjectives, and verbal stems (which are like nominals), or oblique-marked nouns in the form of prepositional nouns/PPs.
 - LVs: The verbal element in a CPRED is a light verb. It is the light verb that determines the argument structure of the CPRED. Light verbs are challenging since they otherwise also function as full, lexical verbs.
- For sample accounts of Persian CPREDS, see Barjasteh 1983, Khanlari 1986, Bateni 1989, Mohammad and Karimi 1992, Ghomeshi and Massam 1994, Goldberg 1996, Karimi-Doostan 1997, Müller 2010, Megerdooian 2012, Nash and Samvelian 2016, and Rafiee Rad 2019, among others.
- For previous accounts of complex predicates in LFG, see Butt 1995, Mohanan 1994, Alsina et al., eds., 1997.

Complex predicates and Persian perception verbs

- The light verbs in the vast majority of Persian complex predicates are the following (see also Table 1 above):

- (6) a. *kardan* (to do/cause) b. *dādan* (to give) c. *zadan* (to hit) d. *āmadan* (to come) e. *residan* (to arrive)

Analysis

V' → PVE V
 @COMP-PRED(↓, _) @COMP-PRED(_, ↓)

Complex predicate c-structure rule

$$PVE = \{A \mid N \mid PP\}$$

PVE metacategory

$$\text{COMP-PRED}(X, Y) := (\uparrow \text{ PRED FN}) = (X \text{ PRED FN}) - (Y \text{ PRED FN})$$

$$(\uparrow_{\sigma} \text{ PVP}) = X_{\sigma}$$

$$\uparrow = Y \backslash \text{PRED}$$

COMP-PRED template

kardan ($\uparrow \text{ PRED}$) = 'do'

$$\lambda R \lambda x \lambda v. R(x)(v) \wedge \text{ACTOR}(v) = x :$$

$$\left[\left(\uparrow_{\sigma} \text{ SUBJ} \right)_{\sigma} \rightarrow \left(\uparrow_{\sigma} \text{ EVENT} \right) \rightarrow \uparrow_{\sigma} \right] \rightarrow \left[\left(\uparrow_{\sigma} \text{ SUBJ} \right)_{\sigma} \rightarrow \left(\uparrow_{\sigma} \text{ EVENT} \right) \rightarrow \uparrow_{\sigma} \right]$$

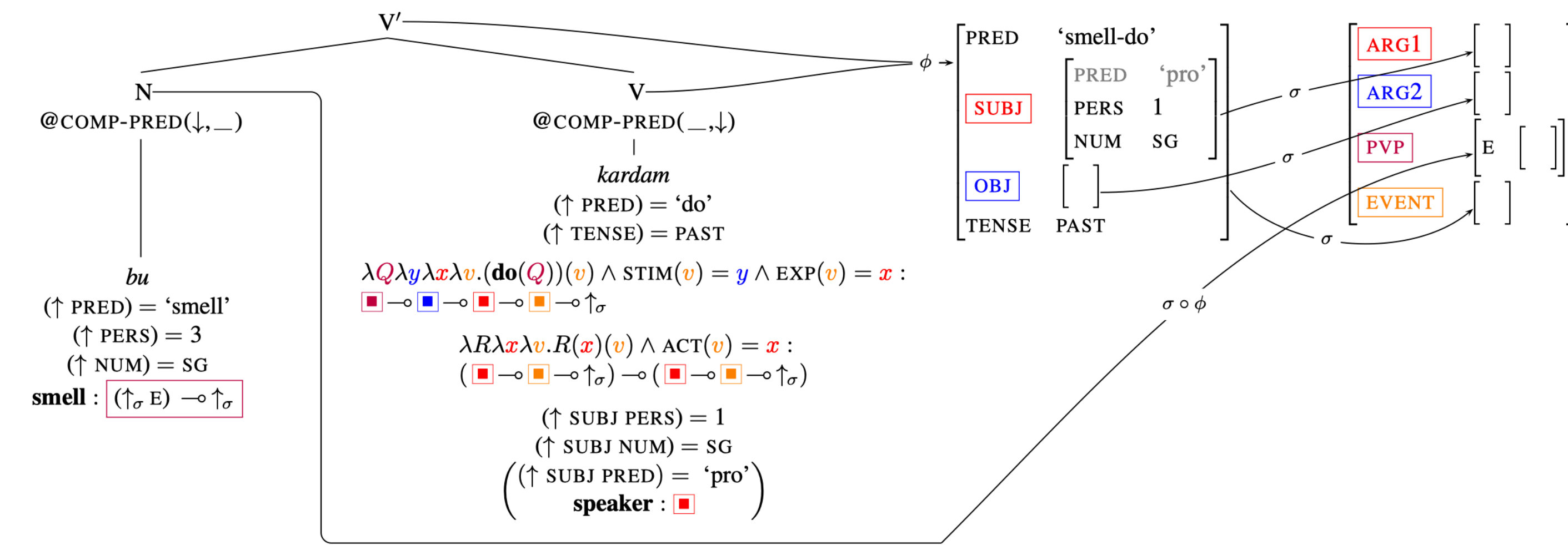
$$\left(\left(\lambda Q \lambda y \lambda x \lambda v. (\text{do}(Q))(v) \wedge \text{PATIENT}(v) = y \wedge \text{AGENT}(v) = x : \right. \right. \left. \left. \left(\uparrow_{\sigma} \text{ PVP} \right) \rightarrow \left(\uparrow_{\sigma} \text{ OBJ} \right)_{\sigma} \rightarrow \left(\uparrow_{\sigma} \text{ SUBJ} \right)_{\sigma} \rightarrow \left(\uparrow_{\sigma} \text{ EVENT} \right) \rightarrow \uparrow_{\sigma} \right) \right.$$

$$\left. \left(\lambda Q \lambda y \lambda x \lambda v. (\text{do}(Q))(v) \wedge \text{STIMULUS}(v) = y \wedge \text{EXPERIENCER}(v) = x : \right. \right.$$

$$\left. \left. \left(\uparrow_{\sigma} \text{ PVP} \right) \rightarrow \left(\uparrow_{\sigma} \text{ OBJ} \right)_{\sigma} \rightarrow \left(\uparrow_{\sigma} \text{ SUBJ} \right)_{\sigma} \rightarrow \left(\uparrow_{\sigma} \text{ EVENT} \right) \rightarrow \uparrow_{\sigma} \right)$$

Sample lexical entry: *kardan* ('do')

Qazā-ro bu kar-d-am
 food-OM smell do-PAST-1.SG
 'I smelled the food.'



Example

$$\text{smell} : \lambda Q \lambda y \lambda x \lambda v. (\text{do}(Q))(v) \wedge \text{STIM}(v) = y \wedge \text{EXP}(v) = x :$$

$$\lambda x \lambda v. (\text{do}(\text{smell}))(v) \wedge \text{STIM}(v) = \text{food}(x) \wedge \text{EXP}(v) = x :$$

$$\lambda x \lambda v. (\text{do}(\text{smell}))(v) \wedge \text{STIM}(v) = \text{food}(x) \wedge \text{EXP}(v) = x \wedge \text{ACT}(v) = x :$$

$$\lambda v. (\text{do}(\text{smell}))(v) \wedge \text{STIM}(v) = \text{lx.food}(x) \wedge \text{EXP}(v) = \text{speaker} \wedge \text{UND}(v) = \text{lx.food}(x) \wedge \text{ACT}(v) = \text{speaker} :$$

$$\exists v. (\text{do}(\text{smell}))(v) \wedge \text{STIM}(v) = \text{lx.food}(x) \wedge \text{EXP}(v) = \text{speaker} \wedge \text{UND}(v) = \text{lx.food}(x) \wedge \text{ACT}(v) = \text{speaker} :$$

Proof

Some Consequences

- Our analysis assumes a general framework for argument structure roles in which there are both macro-roles (Foley & Van Valin 1984) and thematic roles, similarly to the use of macro-roles in HPSG, although without the more granular predicate-specific 'micro-roles'.
- From the perspective of general neo-Davidsonian event semantics, the use of macro-roles is less familiar.
 - Our approach addresses this by defining macro-roles as simple, set-theoretic generalizations over thematic roles:
 - AGENT, EXPERIENCER \subseteq ACTOR
 - THEME, STIMULUS \subseteq UNDERGOER
 - GOAL, EXPERIENCER \subseteq LOCATION
- This allows EXPERIENCERS to be both an ACTOR and a LOCATION.
 - We can restrict the consequence of this by stating that ACTOR \cap LOCATION = \emptyset .
- This in turn has the consequence that some EXPERIENCERS are ACTORS, while others are LOCATIONS.
 - Similarly, we restrict thematic roles to be non-overlapping subsets of macro-roles:
 - AGENT \cap EXPERIENCER = \emptyset
 - THEME \cap STIMULUS = \emptyset
 - GOAL \cap EXPERIENCER = \emptyset
- This in turn allows us to make simple, high-level mapping generalizations (the original motivation behind macro-roles):
 - SUBJECT $\stackrel{e_1}{\rightarrow}$ ACTOR
 - OBJECT $\stackrel{e_2}{\rightarrow}$ UNDERGOER
 - OBLIQUE $\stackrel{e_3}{\rightarrow}$ LOCATION

Comparison to Previous Approaches

- Alsina (1993, 1996, 1997) and Butt (1995, 2014) set the standard for subsequent LFG analyses of complex predicates, also building on noteworthy earlier work by Mohanan (1994).
- We have built on many of their insights, but taking into account not just the interaction between lexicon, c-structure, and f-structure, as in their syntactically focused work, but adding compositional semantics and a unified event semantics analysis of verbs as light verbs and main verbs.
- In contrast, the syntax-only approaches either do not say much about lexical semantics and its interaction with compositional semantics (Alsina) or else use an ad hoc lexical semantic formalism whose compositional properties are under-explored (Butt).
 - Similarly, the separately stipulated principles of Event Fusion and Argument Fusion in Butt (1995) simply fall out of our compositional event semantics.
 - Moreover, the notion of an incomplete predicate that Butt introduces also falls out, because each light verb has a core/common meaning that is so radically underspecified that it does not contain a contentful predicate over events and so is incomplete in this sense.
- Our use of the restriction operator in complex predicate formation is anticipated by Butt (1995), based on initial suggestions by Kaplan and Wedekind (1993), but her criticism that it leads to lexical stipulation does not apply, because a) there are only a small number of light verbs that each consistently behave in the same way and b) complex predicate formation occurs in the syntax, as in Butt's system.
- Butt (1995) also mentions a then-nascent LFG+Glue sketch of complex predicate formation (Dalrymple et al. 1993), but the modern avatar of this approach is Lowe (2015).
- Lowe (2015) proposes a theory of complex predicates in which complex predication is not reflected in the f-structure at all and is instead handled by a co-headed c-structure rule, which eschews restriction, and lexical specifications of Glue meaning constructors for complex predicates.
- This amounts to a regular lexical entry for the main verb, including a non-complex PRED value (contra prior approaches by Alsina and Butt).
- The light verb's entry in contrast has no PRED and contributes only a modification meaning constructor, which introduces the predication (e.g., *let*) only in the semantics.
- Note that Lowe strips the subcategorization information out of the f-structure, assuming like us and much other LFG+Glue work that subcategorization is handled at the syntax-semantics interface, i.e. directly captured by the requirements of resource-sensitive composition (Kuhn 2001, Asudeh 2004).
- The various parts of Lowe's analysis are thus:
 - A c-structure co-head rule for complex predication formation
 - Regular lexical entries for main verbs like Urdu *likh* ('write').
 - Special lexical entries for light verbs like Urdu *dē* ('let').
 - Argument structure and linking are handled at the syntax-semantics interface and s(ematic)-structure, based on Asudeh & Giorgolo (2012) and subsequent work by various LFG+Glue scholars.
- We are offering a synthesis of the 'traditional' LFG approach, to use Lowe's term, of Alsina/Butt/Mohanan and the LFG+Glue approach.
 - We agree with Lowe that Argument Fusion is poorly understood and its lack of formalization in the XLE perhaps reflects deep problems with any potential formalization.
 - However, we do not assume a principle of Argument Fusion (or Event Fusion).
 - These instead follow directly from our formalization.
 - We disagree with Lowe that complex predication should *only* be reflected in the semantics.
 - The role of f-structure has sometimes been taken to include aspects of semantics (probably because of the misleading term 'semantic form' to refer to values), but it really represents syntactic predication.
 - In other words, we take it as truer to the spirit of LFG to reflect the *complexity* of complex predication at the level that represents syntactic predication, which is f-structure.
- Lowe also implicitly appeals to lexical ambiguity in his treatment of light verbs, since non-light uses of these verbs *do* contribute syntactic predication and other f-structural information.
- Lastly, the traditional approach emphasizes the syntax of complex predication and the LFG+Glue approach of Lowe emphasizes the semantics, but neither camp gives a full and general picture of the syntax and compositional semantics of complex predicates.
- In contrast, our approach accounts for the light verbs in Persian in their light *and* non-light uses, *and* captures *both* the syntax and semantics of complex predication.
- The consideration of perception verbs proved crucial in this regard, because it more fully revealed the properties of complex predication in Persian, a closely related language to Urdu that similarly makes extensive use of complex predication and whole complex predicates have also formed a focus of study in linguistic theory.

Conclusion

- We have provided a novel analysis of complex perception verbs in Persian, which presents a challenge due to the overlap of physical and perceptual uses of the same LVs.
- This requires a general syntax/semantics for complex predicates that works in both contexts.
- We provided this in terms of LFG+Glue; an important consequence is that the semantic parts is actual compositional semantics.
- We also relied on a process of complex-predication formation in the syntax, contra Lowe, but in line with the traditional approaches.
- We factored out the common information as macro-roles in a modifier that can compose either with the physical or perceptual meaning constructor; these meaning constructors then fix the thematic roles such that they are consistent with the macro-roles.
- This also captures entailments. Members of the active class entail corresponding members (low-mates) of the experiencer class, which in turn entail corresponding members of the percept class.
 - We capture the entailment from *āmadan* to *residan*, since the former has a proximal conjunct that the latter does not (see handout).
- Lexicalized perception verbs (also in English and other languages) should yield to an equivalent analysis, using the complex predicate analysis as a guide.
- Complex predicates can serve as a guide to limited lexical decomposition of lexicalized perception verbs cross-linguistically.

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