Persian perception verbs

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1 Background[1]

- The syntax, semantics, and syntax–semantics interface of sensory perception verbs has been an ongoing topic of research in linguistics.
- In terms of syntax, defining what types of grammatical arguments these verbs take and how and why the types of these arguments vary among perception verbs have been the main topics of discussion.
- In terms of semantics, one of the main questions has been to determine the thematic roles of the arguments of perception verbs and, relatedly, to determine what relationship they have to the event that they predicate of.
- Perception verbs in Persian are mainly complex predicates, although there are a few simplex/lexicalized perception verbs.
  - (1) exemplifies the aural paradigm, which has both complex (1a,c) and simplex cells (1b).

(1) a. Active ⟨ACTOR,STIMULUS⟩
guš kard-an
ear do-INF
X listen to Y

b. Experiencer ⟨EXPERIENCER,STIMULUS⟩
šenid-an
hear-INF
X hear Y

c. Percept ⟨STIMULUS,(EXPERIENCER)⟩
sedāh dād-an
sound give-INF
Y emitted a sound (to X)

be guš āmad-an
to ear come-INF
Y was heard (by X)

[1]Glosses are abbreviated as follows: AUX–auxiliary, IPFV–imperfect, INF–infinitive, OM–object marker,PP–past participle, PRES–present tense, PAST–past tense, SBJV–subjunctive mood, SG–singular, PL–plural.

- This paper makes three contributions.

  1. We present a novel analysis of perception verbs in Persian, many of which involve complex predicates. There are two main challenges:
     (a) It requires a general syntax/semantics for complex predicates that works in both perceptual and non-perceptual contexts; and
     (b) The generalized analysis must account for semantic entailments (which we here discuss only in the context of perception verbs).
  2. In meeting challenge 1, we provide a novel account of Persian complex predicates using Glue Semantics.
  3. We discuss how the structure of Persian perceptual complex predicates give important clues to the conceptual/argument structure of perception constructions[2] more generally, especially with regards to languages, like English, where this is hidden by fuller lexicalization.

2 Main question

1. How can we give a consistent semantics for (the relevant) Persian light verbs that covers both perceptual constructions like (1) as well as their uses in physical contexts, like (2–3)?

(2) Max ketab-ra be Sam da-d.
Max book-DO to Sam give-PAST.3SG
'Max gave the book to Sam.'

(3) Max be madrese ama-d.
Max to school come-PAST.3SG
'Max came to school.'

3 The semantics of perception verbs

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

- In terms of syntax, defining what types of grammatical arguments these verbs take and how and why the types of these arguments vary among perception verbs have been the main topics of discussion.

- In terms of semantics, one of the main questions has been to determine the sorts of macro-roles (e.g. ACTOR; 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.

- Consider (4):

(4) a. Max listened to the music.
b. Max heard the music.
c. Context: Max is heard coughing badly.
Max sounds ill.

  - In (4), the subjects of the perception verbs play different roles.
  - In (4a), Max is the ACTOR in the predication,[3] whereas in (4b), Max is the EXPERIENCER.

[2] We use this term only descriptively/pre-theoretically.

[3] We treat this as an ACTOR not an AGENT, because the verb that introduces the role in Persian, *kardan* ('do'), is compatible with predications that are non-agentive, e.g. *Max gerye kard* ('Max cried.')

- Indeed, in (4a) Max is both the ACTOR and EXPERIENCER. In (4c), Max is a STIMULUS.

- Table (5) categorizes English perception verbs based on the thematic roles of their arguments (following Viberg 1984):

(5)

Active ⟨ACTOR,STIMULUS⟩	**Experiencer** ⟨EXPERIENCER,STIMULUS⟩	**Percept** ⟨STIMULUS,EXPERIENCER⟩
listen — X listen to Y	hear — X hear Y	sound — Y sound P to X
look — X look at Y	see — X see Y	look — Y look P to X
smell — X smell Y	smell — X smell Y	smell — Y smell P to X
taste — X taste Y	taste — X taste Y	taste — Y taste P to X
touch/feel — X touch/feel Y	feel — X feel Y	feel — Y feel P to X

  - This table illustrates that paradigm cells can be filled by the same form.
  - Take the verb *smell*, whose form is three-ways ambiguous between Active, Experiencer and Percept, which have distinctive conceptual/argument structures.
  - Similarly, a verb may be distinguished in a single cell, but not be distinguished in two others, such as *look*, whose form is ambiguous between Active and Percept, but cannot correspond to an Experiencer argument structure, since there is a dedicated verb, *see*, in that cell.
  - It is therefore useful to refer not to particular verbs but rather to the underlying sensory modalities: respectively, *aural*, *visual*, *olfactory*, *gustatory*, *tactile* (following Asudeh and Toivonen 2012); this will also be a feature in our analysis, in order to capture semantic entailments.

- Sensory perception verbs in Persian have not received sustained formal linguistic analysis to the same extent as physical predication.

- As noted previously, Persian verbal constructions in general are of two main kinds: simplex/fully lexicalized verbs and complex predicates (CPREDs) as shown in (6) and (7) respectively.

(6) Max mādar-aš-rā mi-bin-ad
Max mother-POSS.3S-OM DUR-see.PRES-3S
'Max sees her/his/its mother.'

(7) Max be mādar-aš [negāh mi-kon-ad]$_{\text{CPRED}}$
Max to mother-POSS.3S look DUR-do.PRES-3S
'Max looks at her/his/its mother.'

  - The sentence in (6) illustrates the use of a simplex verb, whereas (7) contains a CPRED, consisting of a noun, *negāh*, as its Preverbal Element (PVE) and a Light Verb (LV), *kard-an* ('do', which can also be a main verb in some cases).

- Persian CPREDs can be made of various PVEs of bare predicative category, including nouns, adjectives, and verbal stems, or oblique-marked nouns in the form of prepositional nouns.

- The verbal element, LV, in CPREDs can vary, since several lexical verbs contribute to forming CPREDs, making such constructions very productive (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, Megerdoomian 2012, Nash and Samvelian 2016, and Rafiee Rad 2019, among others).

- The particular simplex verbs that contribute to the formation of the principal CPRED perception verbs, with informal glosses of their meanings, are presented in (8):[4]
(8)

[4] See footnote 5.

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

- Table (9) presents a somewhat simplified list of Persian perception verbs (both simplex and CPREDs).[5,6]

(9)

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	sedāh dād-an sound give.INF Y emitted a sound to X	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 češm 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 tase 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 (◊ inadvertently)	dast zad-an hand hit.INF X feel Y (intentionally)	ehsās kard-an sense do.INF X feel Y	hes dād-an sense give.INF Y emitted a (physical) feel to X	

- This table shows that the use of complex predicates is prevalent in Persian perception constructions.

4 Analysis: A general semantics for light verbs

- Space restrictions preclude inclusion of our full compositional analysis.
- The Glue meaning constructors for the five LVs in table (9) are show in (12).
- The main intuition to keep in mind is that each LV has a meaning constructor that has been factored out of its physical and perceptual guises, such that it applies to either as a modifier.
- The resulting interpretations for corresponding sample physical light verb constructions and perceptual light verb constructions involving these LVs are shown in (13).
- Before turning to these, let's also specify the following entailment relations between thematic roles and macro-roles, in (10), and between different perceptual predicates, in (11).

(10) a. AGENT, EXPERIENCER, SOURCE $\subseteq$ ACTOR & AGENT $\cap$ EXPERIENCER $\cap$ SOURCE $= \varnothing$ SUBJ roles
b. THEME, STIMULUS $\subseteq$ UNDERGOER & THEME $\cap$ STIMULUS $= \varnothing$ OBJ roles
c. GOAL, EXPERIENCER $\subseteq$ LOCATION & GOAL $\cap$ EXPERIENCER $= \varnothing$ OBL roles

(11) $\mathbf{P}_{(a)ural}, \mathbf{P}_{(v)isual}, \mathbf{P}_{(o)lfactory}, \mathbf{P}_{(g)ustatory}, \mathbf{P}_{(t)acticle} \subseteq \mathbf{P}_{sense}$ (=**P**)

[5] There are many other verbal constructions used to express perception in Persian, such as *be guš āmad-an* 'sound', *be guš resid-an* 'sound', *be mašām resid-an* 'smell', among others.

[6] This table is based on the one provided by (Viberg 1984: 131, table 6). Note that Viberg uses *be nazar resid[-]an* in the cell for visual percept, but this is actually closer to the English verb *seem*.

- A consequence of the entailments in (10) is that something can be, e.g., an AGENT and and ACTOR or an EXPERIENCER and an ACTOR without inconsistency.
- Similarly, the entailments in (11) allow particular verbs to control which perceptual verbs they are compatible; combinations that don't support the modality in question are blocked pragmatically.

(12) a. *kardan* (↑ PRED) = 'do'

$$\lambda\mathcal{R}\lambda x\lambda v.\mathcal{R}(y)(x)(v) \wedge \textsc{undergoer}(v) = y \wedge \textsc{actor}(v) = x :$$
$$[(\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)] \multimap$$
$$[(\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)]$$
$$\left(\left\{\begin{array}{l} \lambda y\lambda x\lambda v.\mathbf{do}(v) \wedge \textsc{patient}(v) = y \wedge \textsc{agent}(v) = x : \\ (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \\ \lambda y\lambda x\lambda v.\mathbf{P}(v) \wedge \textsc{stimulus}(v) = y \wedge \textsc{experiencer}(v) = x : \\ (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \\ @\textsc{cause-become} \\ @\textsc{cause-event} \end{array}\right\}\right)$$

b. *dādan* (↑ PRED) = 'give'

$$\lambda\mathbb{R}\lambda z\lambda y\lambda x.\mathbb{R}(z)(y)(x)(v) \wedge \textsc{location}(v) = z \wedge \textsc{undergoer}(v) = y \wedge \textsc{actor}(v) = x :$$
$$[(\uparrow \textsc{obl})_\sigma \multimap (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)] \multimap$$
$$[(\uparrow \textsc{obl})_\sigma \multimap (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)]$$
$$\left(\left\{\begin{array}{l} \lambda z\lambda y\lambda x\lambda v.\mathbf{give}(v) \wedge \textsc{goal}(v) = z \wedge \textsc{theme}(v) = y \wedge \textsc{agent}(v) = x : \\ (\uparrow \textsc{obl})_\sigma \multimap (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \\ \lambda z\lambda y\lambda x\lambda v.\mathbf{P}_{\neg v}(v) \wedge \textsc{experiencer}(v) = z \wedge \textsc{stimulus}(v) = y \wedge \textsc{source}(v) = x : \\ (\uparrow \textsc{obl})_\sigma \multimap (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \end{array}\right\}\right)$$

c. *zadan* (↑ PRED) = 'hit'

$$\lambda y\lambda x\lambda\mathcal{R}\lambda v.\mathcal{R}(y)(x)(v) \wedge \textsc{undergoer}(v) = y \wedge \textsc{actor}(v) = x :$$
$$[(\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma) \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)] \multimap$$
$$[(\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma) \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)]$$
$$\left(\left\{\begin{array}{l} \lambda y\lambda x\lambda v.\mathbf{hit}(v) \wedge \textsc{patient}(v) = y \wedge \textsc{agent} = x : \\ (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \\ \lambda y\lambda x\lambda v.\mathbf{P}_t(v) \wedge \textsc{stimulus}(v) = y \wedge \textsc{experiencer}(v) = x : \\ (\uparrow \textsc{obj})_\sigma \multimap (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \end{array}\right\}\right)$$

d. *āmadan* (↑ PRED) = 'come'

$$\lambda y\lambda R\lambda x\lambda v.R(x)(v) \wedge \textsc{location}(v) = y \wedge \textsc{undergoer}(v) = x \wedge$$
$$\textsc{proximal}(v, y, \mathbf{origo}) :$$
$$(\uparrow \textsc{obl})_\sigma \multimap [(\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)] \multimap [(\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)]$$
$$\left(\left\{\begin{array}{l} \lambda x\lambda v.\mathbf{arrive}(v) \wedge \textsc{theme}(v) = x : (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \\ \lambda x\lambda v.\mathbf{P}_{a \vee v}(v) \wedge \textsc{stimulus}(v) = x : (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \end{array}\right\}\right)$$

e. *residan* (↑ PRED) = 'arrive'

$$\lambda y\lambda R\lambda x\lambda v.R(x)(v) \wedge \textsc{location}(v) = y \wedge \textsc{undergoer}(v) = x :$$
$$(\uparrow \textsc{obl})_\sigma \multimap [(\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)] \multimap [(\uparrow \textsc{subj})_\sigma \multimap ((\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma)]$$
$$\left(\left\{\begin{array}{l} \lambda x\lambda v.\mathbf{arrive}(v) \wedge \textsc{theme}(v) = x : (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \\ \lambda x\lambda v.\mathbf{P}_a(v) \wedge \textsc{stimulus}(v) = x : (\uparrow \textsc{subj})_\sigma \multimap (\uparrow_\sigma \textsc{event}) \multimap \uparrow_\sigma \end{array}\right\}\right)$$

(13) a. i. Max in kār-rā kard.
Max this work-OM do.PAST.3SG
'Max did this work.'

Physical (main verb or light verb)
$\exists v.\textbf{do}(v) \wedge \text{UNDERGOER}(v) = \textbf{this.work} \wedge \text{ACTOR}(v) = \textbf{max} \wedge \text{PATIENT}(v) = \textbf{this.work} \wedge \text{AGENT}(v) = \textbf{max}$

ii. Max ghazā bu kard.
Max food smell do.PAST.3SG
'Max smelled food.'

Perceptual (light verb; experiencer type)
$\exists v.\textbf{P}(v) \wedge \text{UNDERGOER}(v) = \textbf{*food} \wedge \text{ACTOR}(v) = \textbf{max} \wedge \text{STIMULUS}(v) = \textbf{*food} \wedge \text{EXPERIENCER}(v) = \textbf{max}$

b. i. Max be Sam ketāb-rā dād.
Max to Sam book-OM give.PAST.3SG
'Max gave Sam the book.'

Physical (main verb or light verb)[7]
$\exists v.\textbf{give}(v) \wedge \text{LOCATION}(v) = \textbf{sam} \wedge \text{UNDERGOER}(v) = \textbf{the.book} \wedge \text{ACTOR}(v) = \textbf{max} \wedge$
$\text{GOAL}(v) = \textbf{sam} \wedge \text{THEME}(v) = \textbf{the.book} \wedge \text{AGENT}(v) = \textbf{max}$

ii. Max bu-ye xub mi-dād.
Max smell-EZ good DUR-give.PAST.3SG
'Max smelled good.'

Perceptual (light verb; percept class)
$\exists v\mathbf{G}x.\mathbf{P}_{\neg v}(v) \wedge \text{LOCATION}(v) = x \wedge \text{UNDERGOER}(v) = \textbf{N}(\textbf{good}(\textbf{smell})) \wedge \text{ACTOR}(v) = \textbf{max} \wedge$
$\text{EXPERIENCER}(v) = x \wedge \text{STIMULUS}(v) = \textbf{N}(\textbf{good}(\textbf{smell})) \wedge \text{SOURCE}(v) = \textbf{max}$

c. i. Max Sam-rā zad.
Max Sam-OM hit.PAST.3SG
'Max hit Sam.'

Physical (main verb or light verb)
$\exists v.\textbf{hit}(v) \wedge \text{UNDERGOER}(v) = \textbf{sam} \wedge \text{ACTOR}(v) = \textbf{max} \wedge \text{PATIENT}(v) = \textbf{sam} \wedge \text{AGENT}(v) = \textbf{max}$

ii. Max lebās-rā dast zad.
Max clothes-OM touch hit.PAST.3SG
'Max felt the clothes.'

Perceptual (light verb; active class)
$\exists v.\mathbf{P}_t(v) \wedge \text{UNDERGOER}(v) = \textbf{the.clothes} \wedge \text{ACTOR}(v) = \textbf{max} \wedge$
$\text{STIMULUS}(v) = \textbf{the.clothes} \wedge \text{EXPERIENCER}(v) = \textbf{max}$

d. i. Max be madrese āmad.
Max to school come.PAST.3SG
'Max came to school.'

Physical (main verb or light verb)
$\exists v.\textbf{arrive}(v) \wedge \text{LOCATION}(v) = \textbf{school} \wedge \text{ACTOR}(v) = \textbf{max} \wedge$
$\text{PROXIMAL}(v, \textbf{school}, \textbf{origo}) \wedge \text{THEME}(v) = \textbf{max}$

ii. nur-i az dur be češm āmad.
light-INDEF from afar to eye come.PAST.3SG
'A light was seen from afar.'

Perceptual (light verb; percept class)
$\exists v \exists x \exists y.\mathbf{P}_{a \vee v}(v) \wedge \textbf{light}(y) \wedge \text{UNDERGOER}(v) = y \wedge \text{ACTOR}(v) = x \wedge$
$\text{STIMULUS}(v) = y \wedge \text{EXPERIENCER}(v) = x$

e. i. Max be madrese resid.
Max to school arrive.PAST.3SG
'Max arrived at school.'

Physical (main verb or light verb)
$\exists v.\textbf{arrive}(v) \wedge \text{LOCATION}(v) = \textbf{school} \wedge \text{ACTOR}(v) = \textbf{max} \wedge \text{THEME}(v) = \textbf{max}$

ii. Sedā-ye ajib-i az ānjā be guš resid.
sound-EZ strange-INDEF from there to ear arrive.PAST.3SG
'A strange sound was heard from there.'

Perceptual (light verb; percept class)
$\exists v \exists x \exists y.\mathbf{P}_a(v) \wedge \textbf{sound}(y) \wedge \textbf{strange}(y) \wedge \text{UNDERGOER}(v) = y \wedge \text{ACTOR}(v) = x \wedge$
$\text{STIMULUS}(v) = y \wedge \text{EXPERIENCER}(v) = x$

[7] In the second example below, we assume a nominalizing function that maps the object common noun of type $\langle e, t \rangle$ to the type e entity in question. In other word, **N** is just the ι function. This would be associated with another modifying meaning constructor, which we leave aside here to avoid (even more) clutter.

5 Conclusion

- *How can we give a consistent semantics for (the relevant) Persian light verbs that covers both perceptual constructions like (1) as well as their uses in physical contexts?*

  ⇒ We can provide lexical semantics for the required predicates in Glue Semantics such that they can be used in both physical and perceptual contexts. This approach also builds on previous work on perception verbs more generally and work on macroroles and thematic roles. Although it may not be obvious from our presentation, our ultimate touchstone for the kind of lexical semantics we are doing is the work of John Beavers and Andrew Koontz-Garboden (among others, Beavers and Koontz-Garboden 2020, Beavers et al. 2021).

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