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## **Object-Based Truthmaker Semantics and Its Applications to Intensional Transitive Verbs**

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### **1. Truthmaker Semantics**

#### **1. 1. Sentence-based and object-based truthmaker semantics**

##### Notions of truthmaker semantics

Exact truthmaking and falsemaking,

Truthmaking and falsemaking conditions for complex sentences

(Bilateral) sentence meanings as pairs consisting of a set of verifiers and a set of falsifiers

Partial content, subject matter and aboutness

##### Sentence-based truthmaker semantics (Fine 2017)

Truthmaking (just) a relation between situations or actions and sentences

##### Object based truthmaker semantics (Moltmann 2013, 2017, 2018a, b, c)

Truthmaking (also) as a relation between sentences or actions and objects

Attitudinal objects: claims, requests, promises, beliefs, judgments, decisions, intentions, fears

Modal objects: obligations, permissions, needs

Other, similar objects: purchases, searches, hirings, debts, recognitions

##### Motivations for object-based truthmaker semantics

- General intuitions of what bears truth or satisfaction conditions or more generally content
- Particular satisfiers may have to relate to the object they satisfy in a particular way in which they could not relate to sentences:

- Sometimes situations as satisfiers require a causal connection to the object (Section 3).
- Sometimes only actions can act as satisfiers that are performed with the intention of satisfying the attitudinal object (intention, request etc.) (Searle 1983).
- Explanation of different types of satisfaction predicates applying to different modal and attitudinal objects
- Application of truthmaker semantics to the ontology of the mind
- New semantics of attitude reports without using propositions and without regarding actions (action types) as truth bearers
- New semantics of modals, based on a variety of modal objects and their satisfaction conditions
- New semantics of embedded sentences more generally
- The semantics of intensional NPs: *the book John needs to write, the house John is looking for, the bottle of wine John bought on the internet*
- The semantics of intensional transitive verbs: *need, look for, hire, buy, find*

## 1.2. Basics of truthmaker semantics (Fine 2017)

Exact truth-making/satisfaction  $s \Vdash S / s \Vdash d$ :

The situation or action  $s$  is an *exact truthmaker/satisfier* of the sentence  $S$  / the attitudinal or modal object  $d$ .

Standard truthmaking conditions for complex sentences:

(1) a.  $s \Vdash S \text{ and } S'$  iff for some  $s'$  and  $s''$ ,  $s = \text{sum}(s', s'')$  and  $s' \Vdash S$  and  $s'' \Vdash S'$ .

b.  $s \Vdash S \text{ or } S'$  iff  $s \Vdash S$  or  $s \Vdash S'$ .

Truthmaking for negations:

(1) c.  $s \Vdash \text{not } S$  iff  $s \not\Vdash S$ .

Bilateral propositions:

A sentence  $S$  has as its meaning a pair  $\langle \text{pos}(S), \text{neg}(S) \rangle$  consisting of a positive denotation, the set  $\text{pos}(S)$  of verifiers of  $S$ , and a negative denotation, the set  $\text{neg}(S)$  of falsifiers of  $S$ .

Partial content

(2) For sets of situations or actions  $A$  and  $B$ ,  $B$  is a partial content of  $A$  iff every satisfier of

A contains a satisfier of B and every satisfier of B is contained in a satisfier of A.

### 1.3. Object-based truthmaker semantics

#### New logical form of attitude reports

- (3) a. John claims that it is raining.  
 b.  $\exists e(\text{claim}(e, \text{John}) \ \& \ [\textit{that it is raining}](\text{att-obj})(e))$   
 c. John makes the claim that it is raining.  
 d.  $\exists e \exists ! d(\text{make}(e, \text{John}, d) \ \& \ \text{claim}(d) \ \& \ [\textit{tha it is raining}](d))$

#### New logical form of modal sentences

- (4) a. John needs to leave.  
 b. John has a need to leave.  
 c.  $\exists d(\text{need}(d) \ \& \ [\textit{John to leave}](d))$
- (5) a. John is permitted to leave.  
 b. John has permission to leave.  
 c.  $\exists d(\text{is permitted}(d) \ \& \ [\textit{John to leave}](d))$

#### Difference between obligations and permissions (and other modal / or attitudinal objects of necessity and possibility):

Obligations have both satisfiers and ‘violators’; permissions have only ‘satisfiers’

Same for demands vs invitations, suggestions.

An attitudinal or modal object  $d$  has a positive denotation  $\text{pos}(d)$  and a (possibly empty) negative denotation  $\text{neg}(d)$ .

#### (6) Sentence meanings as properties of attitudinal and modal objects (of all sorts)

$\lambda d[\text{pos}(S) \text{ is a partial content of } \text{pos}(d) \ \& \ \forall s(s \Vdash S \rightarrow s \Vdash d) \text{ in case } \text{neg}(d) \neq \emptyset]$

#### Motivation for the partial content condition

Underspecification of the satisfaction conditions of desires, hopes, and needs:

- (7) a. Fiona wants to catch a fish (that she can eat). (Fara 2007)  
 b. Bill needs to hire an assistant (that speaks French).

It is the modal or attitudinal object that specifies what the exact satisfiers are, the sentence underspecifies them

#### 1.4. Possible-worlds-based account of the content of sentences as properties of objects

An attitudinal (or modal) object  $d$  is associated with a set of alternative worlds  $f(d)$ :

(8)  $[S] = \lambda d[\forall w(w \in f(d) \leftrightarrow S \text{ is true in } w)]$

The difficulty (Moltmann 2018b)

The account cannot apply to modal objects of possibility.

(9) a. John forced Mary to leave.

b. John allowed Mary to leave.

Difficulty for possible worlds-account as such:

Cannot apply to explicit (heavy) permissions (*John gave Mary permission to leave*), as opposed to implicit (light) permissions (*it is permitted to leave*).

Object-based truthmaker semantics:

Heavy and light permissions are different objects with differently individuated content.

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## 2. Explaining different Satisfaction Predicates for different attitudinal and modal objects (Moltmann 2018c)

### 2.1. Satisfaction vs truth conditions

Some attitudinal objects have satisfaction rather than truth conditions:

(10) a. John's requests / demand / promise was satisfied / fulfilled.

b. Mary's desire was fulfilled.

(11) a. The demand was as ignored.

b. The promise was broken.

(12) a. John fulfilled the demand by handing in the paper in time.

b. John followed / ignored the advice by staying home.

What characterizes attitudinal objects that have satisfaction conditions rather than truth conditions?

Attitudinal objects that require the world to fit the representation, rather than the representation fit the world – a ‘world-word/mind-direction of fit’, rather than a ‘word/mind-world direction of fit’ (Searle 1969, 1983)

But what exactly is a direction of fit?

#### Normative account of the notion of direction of fit using truthmaker theory

An attitudinal object with a word-world direction of fit is correct in case there is a part of the world that makes it true.

An action performed by way of satisfying an attitudinal object with a world-word direction is correct in case it satisfies the attitudinal object.

A word-world direction of fit means that the attitudinal object itself needs to fulfil a norm.

Attitudinal objects with a world-word/mind direction of fit comes with an action-guiding norm, imposed on its satisfiers.

#### (13) Characterization of direction of fit for illocutionary products (Moltmann to appear)

- i. An illocutionary product *o* has a *word-world direction of fit* just in case *o* satisfies its intrinsic norm (is correct) in a world *w* iff *w* makes *o* true.
- ii. An illocutionary product *o* has a *world-word direction of fit* just in case any action *a* performed in recognition of *o* satisfies the norm imposed by *o* (is correct) in a world *w* iff *a* is part of *w* and satisfies *o*.

Essential reference to actions as satisfiers, hence use of truthmaker semantics

What to do about nonfactive future-oriented emotive attitudinal objects, which take situations as satisfiers?

(14) John’s hope / desire that he would win was fulfilled / ??? true.

Also have a world-word/mind-direction of fit: require part of the world to trigger a positive emotive response in the subject, which in this case is the norm/standard to be fulfilled.

## **2.2. Fullfilment vs acceptance**

Modal and attitudinal objects of possibility and their satisfaction predicates

- (15) a. The obligation was satisfied / fulfilled / complied with / ??? was taken up / ??? was accepted.
- b. The offer / invitation was taken up / accepted / ??? satisfied / ??? fulfilled / ??? complied with.

Attitudinal and modal objects that have a world-word/mind direction of fit can be ‘satisfied’ or ‘fulfilled’ only if their modal force is that of necessity.

Proposals, permissions, offers, and invitations cannot be ‘satisfied’ or ‘fulfilled’; instead an offer may be ‘taken up’ and an invitation ‘accepted’.

#### Explaining the difference in terms of truthmaker semantics

Unlike requests and obligations, proposals, permissions, offers, and invitations do not have violators. Not taking up an offer or accepting an invitation is not a violation, but whatever action is performed in virtue of which the demand or request fails to be satisfied, that action is a violator of the request or demand.

### **2.3. Realization condition vs fulfillment**

Intentions and decisions cannot be satisfied, but only realized, implemented, or execute.

Difference to requests, promises and obligations: do not impose a (social) norm on the actions that satisfy them.

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### **3. Intensional noun phrases (INPs)**

(16) a. The book John needs to write must have impact.

b. the book John promised he would write

c. the report John asked Bill to write

#### Traditional approach

INPs stand for individual concepts: semantic values of type  $\langle\langle e, t \rangle, t \rangle$  (or higher) (cf.

Krifka/Grosu 2007)

#### Present approach (Moltmann 2013, to appear)

INPs stand for *variable objects* whose manifestations are entities in particular truthmaking situations.

#### Variable objects / variable embodiments (Fine 1999)

entities (of type  $e$ ) associated with functions from times to manifestations

Variable objects inherit existence and location properties as well as circumstance-relative properties from their manifestations (at circumstances).

Properties inherited from manifestations in other worlds/situations require a modal:

The Modal Compatibility Requirement (MCR)

- (17) a. The book John needs to write must / may have a greater impact than the book he has already written.  
 b. ??? The book John needs to write has a greater impact than the book he has already written.

Support for the objectual status of the semantic value of INPs:

Anaphora support:

(18) The book John needs to write must have impact. It must be widely read.

Predicates of objects:

- (19) a. John described the personnel that the company needed to hire.  
 b. John enumerated the things that he needed to buy.  
 c. John counted the assistants he needs to hire

Intuitive description of the variable object ‘the book John needs to write’

associated with a function mapping a situation exactly satisfying John’s need to the book John has written in that situation

The need may impose more specific conditions that the book needs to meet, which the speaker need not know about.

There may be different situations as part of the same world that contain different books and that meet the need.

→ The variable object involves situations that are exact truthmakers/satisfiers of the need.

The denotation of the relative clause *book John needs to write* (Moltmann 2013, to appear)

- (20) a.  $\lambda v[\exists d(\text{need}(d) \ \& \ \forall i(i \Vdash d \rightarrow (\text{write}_i(\text{John}, v) \ \& \ \text{book}_i(v))))]$   
 b. The property of being a variable object  $d$  such that for some need of John’s, in any satisfaction situation of that need,  $d$  is a book John writes.

Compositional semantics:

Head noun has a syntactic representation inside the relative clause (Vergnaud, Kayne, ...), and is interpreted in the lower position, in the scope of the modal:

- (21) a. book that John needs to write  
 b. [that John needs to write  $[[e]_D$  [book] $_{NP}$ ] $_{DP}$ ] $_{CP}$

[e book] interpreted as restricted variable, with the empty determiner e contributing the variable and *book* the restriction

To get uniqueness: use of ordering among variable objects and minimality operator with respect to that ordering. F: manifestation function:

(22) a. For variable objects d and d',  $d \leq d'$  iff  $F(d) \subseteq F(d')$ .

b.  $\min_{\leq} d[\exists e(\text{promise}(e, \text{John}) \ \& \ \forall i(i \Vdash \text{product}(e) \rightarrow \text{write}_i(\text{John}, d) \ \& \ \text{book}_i(d)))]$

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### 3. Intensional transitive verbs

Intensional transitive verbs: *need, look for (three readings), want, own, buy, sell, offer, give, find (three readings), recognize, hire, see, paint, represent, imagine*

Interpretation of weak quantifiers:

(23) a. John needs an assistant / at least two assistants / exactly two assistants / at most two assistants / more assistants than secretaries.

b. John needs no assistant.

Moltmann (1997)

Complement in (23a, b) specifies what John must have in a minimal situation in which his needs are satisfied – better: in a situation exactly satisfying his needs:

(24) a. For every minimal situation s (maximally similar to w in the respects relevant in s) such that John is P in s, John stands in R ('have') to exactly three assistants in s  
<now better: exactly satisfying John's need>

b. For every minimal situation s such that  $P_s(\text{John}), \{x \mid R_s(\text{John}, x)\} \in [\textit{exactly two}]_s([\textit{assistants}]_s)$  (quantifiers as functions from situations to sets of properties)

Other examples:

(25) John saw at most ten trees.

'John takes the situation he sees to have the property of having at most ten trees in its domain.'

(26) a. John hired at most two assistants.

'In the minimal situation resulting from the hiring, John has at most two assistants.'

Moltmann (2008)(27) The modal account of ‘need’

$x$  needs  $Q$  is true in  $w$  iff for every minimal situation  $s$  such that  $wR_{\text{need},x} s$ , for some property  $P \in [Q]$ ,  $\{y \mid \langle x, y \rangle \in R_c(s)\} = P(s)$ . (quantifiers as set of properties)

Sharing of the ‘object’ of transitive verbs (Moltmann 2008, 2013)

Extensional and intensional verb cannot generally share their object:

- (28) a. ??? John met what Bill is looking for, namely a rich heiress.  
 b. ??? John talked to what Bill needs, a competent assistant.  
 c. ?? John weighed what he was looking for, a suitcase.

(Apparent) extensional verbs and intensional verb can sometimes share their object

- (29) a. John bought what he needed, a car.  
 —> actual situation is satisfaction situation  
 b. John bought what Mary really needs. (But John did not buy it for her)  
 —> type of situation is satisfaction situation  
 c. I found what I needed, a competent assistant.
- (30) a. John has what Mary needs. (Thus Mary should ask John for it).  
 —> actual situation is possible satisfaction situation  
 b. John has what Mary once needed.  
 —> type of situation is satisfaction situation

Two intensional verbs can sometimes share their object

- (31) a. John promised Mary only what she really needed, namely a car.  
 b. Mary needs what she lacks.  
 c. John offered Mary what she wanted (namely a glass of wine—he actually did not get to pour her one).  
 d. I now own what I needed (namely half the estate).  
 e. He accepted what I offered him (namely a glass of wine, but before I could pour him one, a fire broke out).
- (32) a. ?? John painted what Mary needs / recognized / owns / described, namely a castle.  
 b. ?? John recognized (when looking at the picture) what Mary needs, a castle.  
 c. ?? John found what Mary mentioned, a large suitcase.

Sharing of type of situation:

- (33) a. John promised Mary what Sue really needs, namely a car.  
 b. John himself lacks what Mary needs.  
 c. John has found what Bill is still looking for, namely a person who can do the job.

Conditions on when apparent extensional and intensional verbs can ‘share’ their object

1. The ‘extensional’ verb describes a situation that is a satisfaction situation of the modal object / product associated with the intensional verb.
2. The ‘extensional verb’ represents the type of situation whose instances are satisfaction situations of the product described by the intensional verb.

Shift from modal objects or kinds of them to satisfiers:

- [1] a. John’s need of a horse  
 b. the need of a horse  
 [2] a. the satisfaction of John’s need of a horse  
 b. the satisfaction of the need of a horse

What intensional transitive verbs share are variable objects or rather variable satisfiers of their respective products, construed on the basis of shared satisfaction situations (Moltmann 2013).

Sharing of the object of two intensional transitive verbs

Sharing of a variable satisfier of the products associated with the two verbs.

Sharing of variable satisfiers of findings and searches

- (34) a. John found what he was looking for, a house. (finding as ‘coming across’)  
 b. John found what he was looking for, an assistant. (finding as ‘hiring’)  
 c. John found what he was looking for, a role model. (finding as ‘recognizing’)

Sharing of satisfaction situations relating to the same modal object or connected modal objects: situations of finding are satisfaction situations of the search.

Satisfaction situations of findings and searches require causal relations to the product

Situations of finding (which may involve events of coming across, of nomination, or recognition) can satisfy a search only if they are caused by the search, not if they are just of the right sort.

Variable objects that are ‘generated’ by a purchase

- (35) a. the bottle of wine John bought over the internet

b. John now owns what he bought over the internet

Purchases as modal objects:

The purchase described in (35) is realized only by situations of John's 'having' a bottle wine that are caused by the purchase.

The variable object that is 'the bottle of wine John bought' will be realized only by bottles of wine in such situations, not by bottles of wine in other (actual) situations.

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#### 4. Conclusion

Four types of motivations for object-based truthmaking

- explaining the selection of different types of attitudinal and modal objects by different satisfaction predicates
  - the semantics of intensional NPs,
  - the interpretation of weak quantifiers with intensional transitive verbs and the sharing of the objects of intensional transitive verbs
  - accounting for particular conditions on actions as satisfiers imposed by particular modal or attitudinal objects (causal connections, Searle's 'by way of'-conditions).
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