A propositionalist semantics for imagination and depiction reports[1]

Kristina LIEFKE — *Goethe University Frankfurt*

Abstract. We present a formal semantics for physical and mental depiction reports (e.g. *Penny is painting a penguin*, *Uli is imagining a unicorn*) that interprets the complements of these reports as propositionally coded situations. Our semantics improves upon Zimmermann's (2016) property-based semantics for such reports (see Zimmermann, 1993) by blocking unwarranted inferences to a common objective and by capturing the semantic interaction of DPs and CPs in depiction complements. At the same time, it preserves the merits of Zimmermann's semantics, especially the compositional interpretation of depiction reports and the ability to account for missing *de dicto*-readings of reports with a strong quantificational object DP. Our semantics shows that – contrary to the received view (e.g. Forbes, 2006; Zimmermann, 2016) – depiction complements are *not* evidence against a propositionalist analysis of attitude complements.

Keywords: depiction reports, property-based semantics, situation semantics, missing *de dicto*-readings, inference to a common objective, semantic DP/CP interaction.

1. Introduction

Depiction reports are representational readings[2] of reports like (1a) and (2a) whose complements describe the content of pictures or mental images (see Zimmermann, 2016: 430–431; cf. Forbes, 2006: Ch. 7; Moltmann, 1997). On the representational reading of (1a), the object DP *a penguin* partially describes the content of Penny's painting (see (1b)); on the relevant reading of (2a), the DP *a unicorn* partially describes the content of Uli's mental image (see (2b)):

(1) a. Penny is painting (/drawing/sculpting) $[_{\text{DP}}$a penguin$]$
$\equiv$ b. Penny is pictorially (/plastically) representing a penguin

(2) a. Uli is imagining (/visualizing/envisioning) $[_{\text{DP}}$a unicorn$]$
$\equiv$ b. Uli is mentally depicting a unicorn

Depiction reports pose a special challenge for the formal interpretation of natural language. This challenge is reflected in the inability of existing semantics (see Zimmermann, 1993, 2006, 2016; Moltmann, 1997) to account for all of the following semantic properties of these reports:

Property (i): missing *de dicto*-readings. Depiction reports with an indefinite object DP (e.g. (1a), copied in (3)) are ambiguous between a specific/*de re*-reading (on which the DP takes wide scope with respect to the depiction verb; see (3b)) and a non-specific/*de dicto*-reading

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[2] We follow Zimmermann (2016) in excluding, from this class, creation readings (cf. Dowty, 1977; see the reading of (1a) in (∗)). The latter are readings that describe the physical object produced in an act of depiction.

(∗) Penny is painting a picture (with a penguin in it)

We deviate from Zimmermann (2016) in assuming that representational readings also include specific/*de re*-readings (i.e. Zimmermann's *portrait readings*; see Goodman, 1969). The specific reading of (1a) is given in (3b).

of the indefinite (on which the DP takes narrow scope with respect to this verb; see (3a)) (see Zimmermann, 2016: 428–430; cf. Zimmermann, 1993: 149–152):

(3) Penny is painting [$_{\text{DP}}$a penguin]
   a. *non-specific:* Penny is painting some penguin, but no particular one
   (≡ Penny is painting a penguin picture) (see Goodman, 1969)
   b. *specific:* There is a particular penguin that Penny is painting
   (≡ Penny is painting a penguin portrait) (see Goodman, 1969)

In contrast to the above, depiction reports with a strong quantificational object DP (e.g. (4)) only have a specific reading (here: (4b)). For such reports, the non-specific reading (cf. (4a)) is not available (see Zimmermann, 1993: 160–161).

(4) Penny is painting [$_{\text{DP}}$every penguin]
   a. *non-specific:* ??Penny is painting all penguins, whichever they are
   b. *specific:* For each particular penguin in a given domain, Penny is painting it

Property (ii): no inferences to a common objective. Depiction reports allow existential quantification over their non-specific objects (e.g. (5); see Zimmermann, 2006: 718–720, 725–726) and allow inferences that are based on the upward monotonicity of their complement (e.g. (6); see *ibid.*: 726, 730):

(5) a. Uli is imagining [$_{\text{DP}}$a (non-specific) unicorn]
   ⇒ b. There is [$_{\text{DP}}$some (non-specific) thing] (viz. some unicorn) that Uli is imagining

(6) a. Uli is imagining [$_{\text{DP}}$a (non-specific) unicorn] b. All unicorns are things (= objects)
   ⇒ c. Uli is imagining [$_{\text{DP}}$some (non-specific) thing]

The above properties notwithstanding, depiction reports intuitively block inferences to a common objective (e.g. (7); see Zimmermann, 2006: 730–731):

(7) a. Uli is imagining [$_{\text{DP}}$some (non-specific) thing], viz. some unicorn (see (6))
   b. Ede is imagining [$_{\text{DP}}$some (non-specific) thing], viz. some griffin (see (6))
   ⇒ c. There is [$_{\text{DP}}$some (non-specific) thing] that Uli and Ede are imagining (cf. (5))
   (≡ Uli and Ede are imagining the same (non-specific) thing)

Property (iii): DP/CP interaction. Depiction verbs license DP and (certain kinds of)[3,4] CP complements (see (8)) and witness the semantic interaction of DPs and CPs in their complements (see Liefke and Werning, 2018: 644–648; Liefke, 2019). This interaction is evidenced by the possibility of coordinating DPs with finite CPs in depiction complements[5] (see (9a))

[3]In particular, some depiction verbs (incl. *paint*) do not accept *that*-clause complements (see (⋆)):

(⋆) *Penny is painting [$_{\text{CP-FIN}}$that a penguin is diving into the sea]

For a motivation of the restrictions on the selection of CP complements, the reader is referred to (Liefke, 2020).
[4]Notably, most depiction verbs also license non-finite complements (incl. gerund complements). For reasons of scope, we defer the treatment of gerund-taking occurrences of depiction verbs to another paper (viz. Liefke, 2019).
[5]Such coordinations are well-attested, as is shown by the following examples: *imagine a black television screen*

and of specifying the DP through a finite CP in these complements (see (9b); cf. Liefke and Werning, 2018: 647–648).

(8) a. Uli is imagining $[_{\text{DP}}$a unicorn$]$
b. Uli is imagining $[_{\text{CP}}$that a unicorn is basking in the sun$]$

(9) a. Uli is imagining $[[_{\text{DP}}$a unicorn$]$ and $[_{\text{CP}}$that it is basking in the sun$]]$
b. Uli is imagining $[[_{\text{DP}}$a unicorn$]$, in particular, $[_{\text{CP}}$that it is basking in the sun$]]$

This paper provides an alternative semantics for depiction reports that adequately captures the above properties. The paper is organized as follows: to show the semantic challenges that are posed by these properties, we first describe existing semantics for depiction reports and identify their shortcomings (in Section 2). We then present our alternative semantics for depiction reports (in Section 3) and show that this semantics avoids these shortcomings (in Section 4). The paper closes by discussing the relevance of our semantics for the recent debate about propositionalism (i.e. the view that all intensional constructions can be interpreted as cases of truth-evaluable, clausal embedding).

2. Existing Semantics and Their Challenges

Current semantics for depiction reports fall in one of two classes: traditional accounts (e.g. Moltmann, 1997) follow Montague[6,7] (1970: 394 ff.) in interpreting the complements of depiction verbs as *intensional generalized quantifiers* (i.e. as type-$\langle s, \langle\langle s, \langle e,t\rangle\rangle, t\rangle\rangle$ functions from an index to a set of properties that are jointly exemplified at this index). Modern accounts (see Zimmermann, 1993, 2016; cf. Van Geenhoven and McNally, 2005; Schwarz, 2006; Deal, 2008) interpret depiction complements instead as *properties* of individuals (type $\langle s, \langle e,t\rangle\rangle$).

A streamlined variant of the traditional, Montague-style, semantics for *paint* is given in (10), where *paint′* is a non-logical constant of type $\langle s, \langle \boldsymbol{\langle s, \langle\langle s, \langle e,t\rangle\rangle, t\rangle\rangle}, \langle e,t\rangle\rangle\rangle$. (For better readability, the type of the complement is printed in boldface.)[8] To distinguish the Montague-style interpretation of depiction reports from Zimmermann's (1993, 2016) property-based interpretation

and that white light appears … (`https://tinyurl.com/y7pjqdzk`, accessed April 27, 2019) and *imagine a very large arena and that the thousands of cubic feet of space inside that arena represent eternity* (`https://tinyurl.com/ybhzyl2q`, accessed April 27, 2019).

[6]Montague's original semantics is restricted to the interpretation of the intensional transitive verbs [ITVs] *seek*, *conceive*, *worship*, and *owe*. However, since depiction verbs show the same intensional behavior as ITVs (see Zimmermann, 1993: 151), we assume with Zimmermann (2006, 2016) that they admit of the same analysis.

[7]Following Quine (1956), Montague has also proposed an alternative semantics for ITVs (see Montague, 1969: 174–177) that decomposes these verbs into clause-taking constructions. Such decompositions include the analysis of *seek* as *try to find*, where the complement of *try* denotes a proposition. However, since many depiction verbs do not have a straightforward lexical decomposition, we here focus on the interpretation of depiction complements as intensional quantifiers. We will return to the propositional interpretation of depiction complements in Section 4.4.

[8]In what follows, we use a partial variant of Gallin's type logic TY_2 with basic types e (for individuals), s (for indices/situations), and t (for truth-combinations). We adopt Montague's notation for function types: $\langle \alpha, \beta\rangle$ is the type for (partial) functions from objects of type α to objects of type β. Below, we follow the convention that a function's simultaneous application to a sequence of arguments indicates successive application in the reverse order of the arguments ('Currying'). We adopt the following typing convention for variables: x, y, z, u, v and i, j, j', k, l are individual resp. situation variables, where i denotes the default point of evaluation. P, P', Q and T, T' are variables over type-$\langle s, \langle e,t\rangle\rangle$ resp. type-$\langle s, \langle\langle s,t\rangle, t\rangle\rangle$ properties. $\mathscr{P}$ and $\mathscr{Q}$ are variables over type-$\langle s, \langle\langle s, \langle e,t\rangle\rangle, t\rangle\rangle$ quantifiers. Σ and Π are variables over quantifier-properties (type $\langle s, \langle\langle s, \langle\langle s, \langle e,t\rangle\rangle, t\rangle\rangle, t\rangle\rangle$).

and from our own interpretation (in Section 3–4), we hereafter annotate semantic brackets with the superscript ‘MS’ to indicate a Montague-style interpretation. The superscript ‘PS’ indicates a property-based interpretation. Absence of a superscript indicates our own interpretation.

(10) $^{\text{MS}}[\![\text{paint-DP}]\!]^{i} = \lambda\mathscr{Q}\lambda z[\mathit{paint}'_i(z,\mathscr{Q})]$

The Montague-style interpretation in (10) assumes that transitive occurrences of depiction verbs (here: *paint*) denote a relation between an index (above: *i*), an individual (i.e. the depicting agent, *z*), and an intensional quantifier (i.e. a representation, $\mathscr{Q}$, of the depicted content). The interpretation of the non-specific reading of (1a) is given in (11a). The specific interpretation of (1a) (in (11b)) is obtained by raising the quantifier above the verb:

(11) a. $^{\text{MS}}[\![(1\text{a})]\!]^{i}_{\text{non-specific}} = \mathit{paint}'_i(\mathit{penny}, \lambda j\lambda P\,\exists x.\mathit{penguin}_j(x) \wedge P_j(x))$

b. $^{\text{MS}}[\![(1\text{a})]\!]^{i}_{\text{specific}} \equiv {}^{\text{MS}}[\![[\text{a penguin}]\,[\lambda_1\,[\text{Penny is painting } t_1]]]\!]^{i}$
$= (\exists x)[\mathit{penguin}_i(x) \wedge \mathit{paint}'_i(\mathit{penny}, \lambda j\lambda P.\,P_j(x))]$

In contrast to the above, Zimmermann’s (1993, 2016) semantics interprets the indefinite objects of depiction verbs as the properties that are denoted by the restrictor nouns of these objects (see the property-based interpretation of *paint* in (13)). In Zimmermann’s (1993) dynamic semantic system, these properties are identified with the standard DRT-interpretation of indefinites (type $\langle s,\langle e,t\rangle\rangle$). Zimmermann (1993) hence assigns *paint* the interpretation in (12), where `paint` is a non-logical constant of type $\langle s,\langle\boldsymbol{\langle s,\langle e,t\rangle\rangle},\langle e,t\rangle\rangle\rangle$:

(12) $^{\text{PS}}[\![\text{paint-DP}]\!]^{i}_{\text{original}} = \lambda P\lambda z[\mathtt{paint}_i(z,P)]$

To stay as close as possible to Montagovian semantics, we hereafter replace (12) by de Swart’s reconstruction from (de Swart, 2000) (in (13)). In this reconstruction, $BE := \lambda\mathscr{Q}\lambda j\lambda x[\mathscr{Q}_j(\lambda k\,\lambda y.\,y = x)]$ is an intensional version of the identically named type-shifter from (Partee, 1987).

(13) $^{\text{PS}}[\![\text{paint-DP}]\!]^{i} = \lambda\mathscr{Q}\lambda z[\mathtt{paint}_i(z, BE(\mathscr{Q}))]$
$\equiv \lambda\mathscr{Q}\lambda z[\mathtt{paint}_i(z, \lambda j\lambda x[\mathscr{Q}_j(\lambda k\lambda y.\,y = x)])]$

The property-based interpretations of the different readings of (1a) are given in (14):

(14) a. $^{\text{PS}}[\![(1\text{a})]\!]^{i}_{\text{non-specific}} = \mathtt{paint}_i(\mathit{penny}, \lambda j\lambda y\exists x.\mathit{penguin}_j(x) \wedge y = x)$
$\equiv \mathtt{paint}_i(\mathit{penny}, \mathit{penguin})$

b. $^{\text{PS}}[\![(1\text{a})]\!]^{i}_{\text{specific}} = (\exists x)[\mathit{penguin}_i(x) \wedge \mathtt{paint}_i(\mathit{penny}, \lambda j\lambda y.\,y = x)]$

This completes our presentation of existing semantics for depiction reports. We now turn to the shortcomings of these semantics. We will see that Properties (ii) and (iii) pose a challenge for both Montague- and property-style semantics. Property (i) is problematic only for the former.

Challenge (i): capturing missing *de dicto*-readings

We have seen above that Montague-style semantics interprets depiction verbs as relations to an intensional quantifier (incl. universal quantifiers). The same-type interpretation of referential and quantificational DPs in this semantics (here: *a penguin* and *every* penguin) then enables the interpretation of the specific and the non-specific reading of (4) as (15b) resp. (15a):

(15) a. $^{\text{MS}}[\![(4)]\!]^i_{\text{non-specific}} = \mathit{paint}'_i(\mathit{penny}, \lambda j \lambda P \forall x.\mathit{penguin}_j(x) \to P_j(x))$ (??)
b. $^{\text{MS}}[\![(4)]\!]^i_{\text{specific}} \equiv (\forall x)[\mathit{penguin}_i(x) \to \mathit{paint}'_i(\mathit{penny}, \lambda j \lambda P.P_j(x))]$ (✓)

The above interpretation of (4) is fully analogous to the interpretation of (1a) in (11). However, as a result of this analogy, Montague-style semantics wrongly predicts the availability of the non-specific reading, i.e. (4a), of (4).

Property-based semantics blocks the non-specific interpretation of (4) by assuming that *paint* presupposes that its semantic complement is the property-correspondent of an existential quantifier. Such correspondents result from applying *BE* to a quantifier of the form $\lambda j \lambda P(\exists x)[B_j(x) \wedge P_j(x)]$, where *B* is a non-logical constant of type $\langle s, \langle e, t \rangle \rangle$. Since $BE\big([\![\text{every penguin}]\!]\big)$ $(= \lambda j \lambda y\ \forall x.\mathit{penguin}_j(x) \to x = y$; see (16a)) is <u>not</u> the property-correspondent of an existential quantifier, *paint* is undefined for this property. This explains the non-availability of the non-specific reading of (4). Since $BE\big(LIFT\big([\![t_1]\!]\big)\big)$ $(= \lambda j \lambda y.x = y$; see (16b)) <u>is</u> the property-correspondent of an existential quantifier (viz. of the quantifier $\lambda j \lambda P(\exists y)[y = x \wedge P_j(y)]$), *paint* is still defined for $\lambda j \lambda y.x = y$. This explains the availability of the specific reading, i.e. (4b), of (4).

(16) a. $^{\text{PS}}[\![(4)]\!]^i_{\text{non-specific}} = \texttt{paint}_i(\mathit{penny}, \lambda j \lambda y \forall x.\mathit{penguin}_j(x) \to x = y)$ (undefined!)
b. $^{\text{PS}}[\![(4)]\!]^i_{\text{specific}} \equiv (\forall x)[\mathit{penguin}_i(x) \to \texttt{paint}_i(\mathit{penny}, \lambda j \lambda y.x = y)]$ (defined; ✓)

Challenge (ii): blocking inferences to a common objective

We have shown above that Montague- and property-style semantics allow for the non-specific interpretation of indefinite DPs in depiction complements (see (11a), (14a)). To validate the upward monotonicity inference in (6), Zimmermann assumes (for MS) that the depicting agent stands in the depiction relation to all intensional quantifiers whose restrictor properties are more general than the restrictor of the quantifier to whom the agent has been established to stand in this relation.[9] This assumption takes the form of a condition on admissible models. In Zimmermann's specification of this condition (in (17a); see Zimmermann, 2006: 722), '$P \sqsubseteq Q$' (:= $(\forall j)(\forall x)[P_j(x) \to Q_j(x)]$) asserts that *Q* is a more general property than *P*; $\exists_P$ and $\exists_Q$ are existential quantifiers that are restricted by the properties *P* and *Q*, respectively. The PS-counterpart of Zimmermann's condition is given in (17b):

(17) a. for MS: $(\forall P)(\forall Q)(\forall z)[P \sqsubseteq Q \to (\mathit{imagine}'_i(z, \exists_P) \to \mathit{imagine}'_i(z, \exists_Q))]$
b. for PS: $(\forall P)(\forall Q)(\forall z)[P \sqsubseteq Q \to (\texttt{imagine}_i(z, P) \to \texttt{imagine}_i(z, Q))]$

The greater generality of the property 'being a/some thing' than the property 'being a unicorn', i.e. $\mathit{unicorn} \sqsubseteq (\lambda j \lambda y.y = y)$, then supports the validity of the monotonicity inference in (6) (see (19) resp. (20)). The interpretation of (6c) as (19c) (in MS), respectively as (20c) (in PS) is enabled by the familiar, lower-order (LO), interpretation of the DP *something* (in (18)).

[9] Zimmermann (2006: 2–725) derives this condition by combining a Quinean lexical-decomposition account of opacity (see Quine, 1956) with a Hintikka-style approach to propositional attitudes (see Hintikka, 1969). However, since we do not (yet) want to commit to a propositionalist analysis of depiction reports, we adopt (17a) resp. (17b) directly. We will see in Section 4.2 that depiction reports, in fact, allow for a propositionalist analysis.

(18) a. $[\![\text{thing}_{\text{LO}}]\!] = \lambda j\lambda y.\, y = y$ b. $[\![\text{some}_{\text{LO}}]\!] \equiv [\![\text{a}_{\text{LO}}]\!] = \lambda Q\lambda j\lambda P(\exists x)[Q_j(x) \wedge P_j(x)]$

b. $[\![\text{something}_{\text{LO}}]\!] \equiv [\![\text{a/some}_{\text{LO}}]\!]\big([\![\text{thing}_{\text{LO}}]\!]\big)$
$= \lambda Q\lambda j\lambda P(\exists x)[Q_j(x) \wedge P_j(x)](\lambda k\lambda y.\, y = y)$
$\equiv \lambda j\lambda P(\exists x)[x = x \wedge P_j(x)] \quad \equiv \quad \lambda j\lambda P(\exists x)[P_j(x)]$

(19) a. ${}^{\text{MS}}[\![(6a)]\!]^i = \mathit{imagine}'_i(\mathit{uli}, \lambda j\lambda P\exists x.\, \mathit{unicorn}_j(x) \wedge P_j(x))$

b. (17a) & $\mathit{unicorn} \sqsubseteq (\lambda j\lambda y.\, y = y)$

⇒ c. ${}^{\text{MS}}[\![(6c)]\!]^i \equiv {}^{\text{MS}}[\![\text{Uli is imagining } [_{\text{DP}}\text{some-thing}_{\text{LO}}]]\!]^i$ (by (17a))
$= \mathit{imagine}'_i(\mathit{uli}, \lambda j\lambda P\exists x.\, P_j(x))$

(20) a. ${}^{\text{PS}}[\![(6a)]\!]^i \equiv {}^{\text{MS}}[\![\text{Uli is imagining } [_{\text{DP}}\text{a unicorn}_{\text{LO}}]]\!]^i = \texttt{imagine}_i(\mathit{uli}, \mathit{unicorn})$

b. (17b) & $\mathit{unicorn} \sqsubseteq (\lambda j\lambda y.\, y = y)$

⇒ c. ${}^{\text{PS}}[\![(6c)]\!]^i \equiv {}^{\text{PS}}[\![\text{Uli is imagining } [_{\text{DP}}\text{some-thing}_{\text{LO}}]]\!]^i$ (by (17b))
$= \texttt{imagine}_i(\mathit{uli}, \lambda j\lambda y.\, y = y)$

The above interpretations already provide the semantics for the premises of (5) (i.e. (19a)/(20a)) and (7) (i.e. (19c)/(20c)). To interpret the conclusion of (5) resp. (7), Zimmermann (2006: 727) assumes that *something* is ambiguous between the familiar lower-order reading $\mathit{something}_{\text{LO}}$ (on which it quantifies over specific objects; see (18)) and a higher-order reading $\mathit{something}_{\text{HO}}$ (on which it quantifies over *non*-specific objects, represented by intensional quantifiers; s. (21)):

(21) a. $[\![\text{thing}_{\text{HO}}]\!] = \lambda j\lambda \mathscr{Q}.\, \mathscr{Q} = \mathscr{Q}$

b. $[\![\text{some}_{\text{HO}}]\!] \equiv [\![\text{a}_{\text{HO}}]\!] = \lambda\Sigma\lambda j\lambda\Pi(\exists\mathscr{Q})[\Sigma_j(\mathscr{Q}) \wedge \Pi_j(\mathscr{Q})]$

c. $[\![\text{something}_{\text{HO}}]\!] \equiv [\![\text{a/some}_{\text{HO}}]\!]\big([\![\text{thing}_{\text{HO}}]\!]\big)$
$= \lambda\Sigma\lambda j\lambda\Pi(\exists\mathscr{Q})[\Sigma_j(\mathscr{Q}) \wedge \Pi_j(\mathscr{Q})]\big(\lambda k\lambda\mathscr{P}.\, \mathscr{P} = \mathscr{P}\big)$
$\equiv \lambda j\lambda\Pi(\exists\mathscr{Q})[\mathscr{Q} = \mathscr{Q} \wedge \Pi_j(\mathscr{Q})] \quad \equiv \quad \lambda j\lambda\Pi(\exists\mathscr{Q})[\Pi_j(\mathscr{Q})]$

Zimmermann's semantics for $\mathit{something}_{\text{HO}}$ enables the compositional Montague-style interpretation of (5b) and (7c) (in (22) resp. (23)). This interpretation works on a higher-order non-specific reading of (5b) and (7c), where $\mathscr{T}_1$ is a trace that ranges over intensional quantifiers.

(22) ${}^{\text{MS}}[\![(5b)]\!]^i \equiv {}^{\text{MS}}[\![[\text{something}_{\text{HO}}]\, [\lambda_1\, [\text{Uli is imagining } \mathscr{T}_1]]]\!]^i$
$= \lambda\Pi(\exists\mathscr{Q})[\Pi_i(\mathscr{Q})]\big(\lambda j\lambda\mathscr{Q}_1[\mathit{imagine}'_j(\mathit{uli}, \mathscr{Q}_1)]\big) \equiv (\exists\mathscr{Q})[\mathit{imagine}'_i(\mathit{uli}, \mathscr{Q})]$

(23) ${}^{\text{MS}}[\![(7c)]\!]^i \equiv {}^{\text{MS}}[\![[\text{something}_{\text{HO}}]\, [\lambda_1\, [\text{Uli is imagining } \mathscr{T}_1 \text{ and Ede is imagining } \mathscr{T}_1]]]\!]^i$
$= \lambda\Pi(\exists\mathscr{Q})[\Pi_i(\mathscr{Q})]\big(\lambda j\lambda\mathscr{Q}_1[\mathit{imagine}'_j(\mathit{uli}, \mathscr{Q}_1) \wedge \mathit{imagine}'_j(\mathit{ede}, \mathscr{Q}_1)]\big)$
$\equiv (\exists\mathscr{Q})[\mathit{imagine}'_i(\mathit{uli}, \mathscr{Q}) \wedge \mathit{imagine}'_i(\mathit{ede}, \mathscr{Q})]$

The property-based interpretation of (5b) and (7c) (in (26) resp. (27)) can be obtained by using a property-version of the non-specific higher-order reading of *something*, along the lines of (Zimmermann, 2006: 732). This reading results from interpreting the occurrence of *something* in (5b) and (7c) as '$\mathit{some}_{\text{HO}}(\uparrow \mathit{thing}_{\text{LO}})$' (see (25)), where $\uparrow$ is an intensional variant of the identically named type-shifter from (Zimmermann, 2006: 733, (41)):

(24) $\uparrow \;:=\; \lambda P'\lambda j\lambda\mathscr{Q}(\exists P)[\mathscr{Q} = (\lambda k\lambda Q\exists y.\, P'_k(y) \wedge P_k(y) \wedge Q_k(y))]$

(25) $[\![\text{some}_{\text{HO}}]\!]\big(\uparrow([\![\text{thing}_{\text{LO}}]\!])\big)$
$= \lambda\Sigma\lambda j\lambda\Pi(\exists\mathscr{Q})[\Sigma_j(\mathscr{Q})\wedge\Pi_j(\mathscr{Q})]\big(\lambda j\lambda\mathscr{P}(\exists P)[\mathscr{P}=\lambda k\lambda Q\exists y.P_k(y)\wedge Q_k(y)]\big)$
$\equiv \lambda j\lambda\Pi(\exists P)[\Pi_j(\lambda k\lambda Q\exists y.(P_k(y)\wedge Q_k(y)))]$

The above enables the property-based interpretation of (5b) and (7c) as follows:

(26) ${}^{\text{PS}}[\![(5b)]\!]^i \equiv {}^{\text{PS}}[\![[\textit{some}_{\text{HO}}(\uparrow\textit{thing}_{\text{LO}})]\,[\lambda_1\,[\text{Uli is imagining }\mathscr{T}_1]]]\!]^i$
$= \lambda\Pi(\exists P)[\Pi_i(\lambda j'\lambda Q\exists u.P_{j'}(u)\wedge Q_{j'}(u))]$
$\big(\lambda j\lambda\mathscr{Q}_1[\mathtt{imagine}_j(uli,\lambda l\lambda x[\mathscr{Q}_{1,l}(\lambda k\lambda y.y=x)])]\big)$
$\equiv (\exists P)[\mathtt{imagine}_i(uli,\lambda j\lambda x\exists y.P_j(y)\wedge y=x)] \equiv (\exists P)[\mathtt{imagine}_i(uli,P)]$

(27) ${}^{\text{PS}}[\![(7c)]\!]^i \equiv {}^{\text{PS}}[\![[\textit{some}_{\text{HO}}(\uparrow\textit{thing}_{\text{LO}})]\,[\lambda_1\,[\text{Uli is imagining }\mathscr{T}_1\text{ and Ede is imagining }\mathscr{T}_1]]]\!]^i$
$= \lambda\Pi(\exists P)[\Pi_i(\lambda j'\lambda Q\exists u.P_{j'}(u)\wedge Q_{j'}(u))]\big(\lambda j\lambda\mathscr{Q}_1[\mathtt{imagine}_j(uli,\lambda l\lambda x$
$[\mathscr{Q}_{1,l}(\lambda k\lambda y.y=x)])\wedge\mathtt{imagine}_j(ede,\lambda l\lambda x[\mathscr{Q}_{1,l}(\lambda k\lambda y.y=x)])]\big)$
$\equiv (\exists P)[\mathtt{imagine}_i(uli,P)\wedge\mathtt{imagine}_i(ede,P)]$

(24) and its Montague-style variant (in (30)) can also be used to interpret the higher-order non-specific reading of (5a) and (7a/b):

(28) ${}^{\text{PS}}[\![(5a)]\!]^i \equiv {}^{\text{PS}}[\![[\text{a}_{\text{HO}}(\uparrow\text{unicorn}_{\text{LO}})]\,[\lambda_1\,[\text{Uli is imagining }\mathscr{T}_1]]]\!]^i$
$\equiv (\exists P)[\mathtt{imagine}_i(uli,\lambda j\lambda x.unicorn_j(x)\wedge P_j(x))]$

(29) ${}^{\text{PS}}[\![(7a)]\!]^i \equiv {}^{\text{PS}}[\![[\text{some}_{\text{HO}}(\uparrow\text{thing}_{\text{LO}})]\,[\lambda_1\,[\text{Uli imagines }\mathscr{T}_1]]]\!]^i = (\exists P)[\mathtt{imagine}_i(uli,P)]$

(30) $\uparrow_{\mathscr{Q}} := \lambda P\lambda j\lambda\mathscr{Q}[\mathscr{Q}=(\lambda k\lambda Q\exists y.P_k(y)\wedge Q_k(y))]$

(31) ${}^{\text{MS}}[\![(5a)]\!]^i \equiv {}^{\text{MS}}[\![[\text{a}_{\text{HO}}(\uparrow_{\mathscr{Q}}\text{unicorn}_{\text{LO}})]\,[\lambda_1\,[\text{Uli is imagining }\mathscr{T}_1]]]\!]^i$
$= \lambda\Pi(\exists\mathscr{Q})[\mathscr{Q}=(\lambda k\lambda P\exists y.unicorn_k(y)\wedge P_k(y))\wedge\Pi_i(\mathscr{Q})]\big(\lambda j\lambda\mathscr{P}[imagine_j(uli,\mathscr{P})]\big)$
$\equiv (\exists\mathscr{Q})[imagine_i(uli,\mathscr{Q})\wedge\mathscr{Q}=(\lambda k\lambda P\exists y.unicorn_k(y)\wedge P_k(y))]$

(32) ${}^{\text{MS}}[\![(7a)]\!]^i \equiv {}^{\text{MS}}[\![[\text{some}_{\text{HO}}(\uparrow_{\mathscr{Q}}\text{thing}_{\text{LO}})]\,[\lambda_1\,[\text{Uli is imagining }\mathscr{T}_1]]]\!]^i$
$= (\exists\mathscr{Q})[imagine_i(uli,\mathscr{Q})\wedge\mathscr{Q}=(\lambda k\lambda P\exists y.P_k(y))] \equiv (\exists\mathscr{Q})[imagine_i(uli,\mathscr{Q})]$

The above straightforwardly validates the inference in (5), which now comes out as an instance of higher-order existential weakening (see Zimmermann, 2006: 733):

(33) a. $\underline{{}^{\text{MS}}[\![(5a)]\!]^i = (\exists\mathscr{Q})[imagine_i(uli,\mathscr{Q})\wedge\mathscr{Q}=(\lambda k\lambda P\exists y.unicorn_k(y)\wedge P_k(y))]}$
$\Rightarrow$ b. ${}^{\text{MS}}[\![(5b)]\!]^i = (\exists\mathscr{Q})[imagine'_i(uli,\mathscr{Q})]$

(34) a. $\underline{{}^{\text{PS}}[\![(5a)]\!]^i = (\exists P)[\mathtt{imagine}_i(uli,\lambda j\lambda x.unicorn_j(x)\wedge P_j(x))]}$
$\Rightarrow$ b. ${}^{\text{PS}}[\![(5b)]\!]^i = (\exists P)[\mathtt{imagine}_i(uli,P)]$

However, the above also validates the unwarranted inference in (7). This is due to the fact that Montague- and property-style semantics interpret the DP *something* in (6c) as the most general abstract object: $\lambda j\lambda P(\exists x)[P_j(x)]$ (MS) resp. $\lambda j\lambda y[y=y]$ (PS). As a result, these semantics assign *the same* interpretation to the two occurrences of *something* in (7a) and (7b) (see (35a/b) resp. (36a/b)). This interpretation then serves as a witness for the conclusion in (7c), such that (7) comes out valid. But this is counterintuitive.

(35) a. $^{\text{MS}}[\![(7a)]\!]^i \equiv {}^{\text{MS}}[\![\text{Uli is imagining } [_{\text{DP}}\text{something}]]\!]^i = \mathit{imagine}'_i(\mathit{uli}, \lambda j \lambda P \exists x. P_j(x))$

b. $^{\text{MS}}[\![(7b)]\!]^i \equiv {}^{\text{MS}}[\![\text{Ede is imagining } [_{\text{DP}}\text{someth.}]]\!]^i = \mathit{imagine}'_i(\mathit{ede}, \lambda j \lambda P \exists x. P_j(x))$

⇒ c. $^{\text{MS}}[\![(7c)]\!]^i \equiv {}^{\text{MS}}[\![[\text{something}]\,[\lambda_1\,[\text{Uli is imagining } \mathscr{T}_1 \text{ and Ede is imagining } \mathscr{T}_1]]]\!]^i$
$= (\exists \mathscr{Q})[\mathit{imagine}'_i(\mathit{uli}, \mathscr{Q}) \wedge \mathit{imagine}'_i(\mathit{ede}, \mathscr{Q})]$

(36) a. $^{\text{PS}}[\![(7a)]\!]^i \equiv {}^{\text{PS}}[\![\text{Uli is imagining } [_{\text{DP}}\text{something}]]\!]^i = \texttt{imagine}_i(\mathit{uli}, \lambda j \lambda y. y = y)$

b. $^{\text{PS}}[\![(7b)]\!]^i \equiv {}^{\text{PS}}[\![\text{Ede is imagining } [_{\text{DP}}\text{something}]]\!]^i = \texttt{imagine}_i(\mathit{ede}, \lambda j \lambda y. y = y)$

⇒ c. $^{\text{PS}}[\![(7c)]\!]^i \equiv {}^{\text{MS}}[\![[\text{something}]\,[\lambda_1\,[\text{Uli is imagining } \mathscr{T}_1 \text{ and Ede is imagining } \mathscr{T}_1]]]\!]^i$
$= (\exists P)[\texttt{imagine}_i(\mathit{uli}, P) \wedge \texttt{imagine}_i(\mathit{ede}, P)]$

Challenge (iii): capturing DP/CP interaction

Property-based semantics for depiction reports have traditionally focused on the DP complements of depiction verbs (see (10), (13)). This focus has distracted researchers' attention from the difficulty of this semantics to interpret the clausal complements of depiction reports: property-type semantics suggests – but does not explicitly claim – that clausal depiction complements are also interpreted as properties. However, for CPs with *multiple* non-specific indefinites, this strategy fails[10] to yield a unique interpretation (see Zimmermann, 2005). For example, this strategy interprets the doubly non-specific reading of (37) as (38a) and/or (38b):[11]

(37) Uli is imagining $[_{\text{CP}}$that $[_{\text{DP}}$a girl$]$ is riding $[_{\text{DP}}$a unicorn$]]$

(38) a. $\texttt{imagine}_i(\mathit{uli}, \lambda j \lambda x. \mathit{unicorn}_j(x) \wedge (\exists y)[\mathit{girl}_j(y) \wedge \mathit{ride}_j(y,x)])$

b. $\texttt{imagine}_i(\mathit{uli}, \lambda j \lambda y. \mathit{girl}_j(y) \wedge (\exists x)[\mathit{unicorn}_j(x) \wedge \mathit{ride}_j(y,x)])$

One could try to avoid the above problem by interpreting clausal depiction complements instead as type-$\langle s,t \rangle$ propositions. (This is indirectly suggested by the treatment in (Schwarz, 2006) and (Deal, 2008).) However, the resulting *different-type* interpretation of nominal complements

[10]This failure can be remedied by interpreting the complement of (37) as a *pair* of properties. However, since property-pairs typically have a different type from properties, this strategy would prevent a uniform-type interpretation of nominal and clausal depiction complements.

[11]This interpretation is obtained by adopting a non-clausal semantics for the occurrence of *imagine* in (38). Such a semantics is given in (‡ a). The adoption of a non-clausal approach is motivated, in some detail, in (Liefke, accepted).

(‡) a. $^{\text{PT}}[\![\text{imagine-CP}]\!]^i \equiv {}^{\text{PT}}[\![\text{imagine-DP VP}]\!]^i = \lambda \mathscr{Q} \lambda P \lambda z[\texttt{imagine}_i(z, \lambda j \lambda x[\mathscr{Q}_j(\lambda k \lambda y. P_k(y) \wedge y = x)])]$

b. $^{\text{PT-alt}}[\![\text{imagine-CP}]\!]^i = \lambda p \lambda z[\texttt{imagine}_i(z, p)]$

To obtain a unique interpretation of (37) (as (×), below), one could instead adopt the semantics for CP-taking *imagine* in (‡ b). However, this semantics fails to capture the intuitive truth-conditions of (9a).

(×) $\texttt{imagine}_i(\mathit{uli}, \lambda j\, (\exists x)[\mathit{unicorn}_j(x) \wedge (\exists y)[\mathit{girl}_j(y) \wedge \mathit{ride}_j(y,x)]])$

(type $\langle s,\langle e,t\rangle\rangle$) and clausal complements (type $\langle s,t\rangle$) disables an easy (i.e. type-shift-free) modelling of DP/CP coordinations like (9a).

Since Montague-style semantics does not abstract over the referents of indefinites, it assigns a single/unique interpretation to CPs with multiple non-specific indefinites. For example, Montague-style semantics assigns to (37) the interpretation in (39):

(39) $imagine'_i(uli, \lambda j\lambda P \exists x.\, unicorn_j(x) \wedge (\exists y.\, girl_j(y) \wedge ride_j(y,x)))$

However, because this semantics interprets embedded DPs in a different type from CPs (type $\langle s,\langle\langle s,\langle e,t\rangle\rangle,t\rangle\rangle$ resp. $\langle s,t\rangle$), it is still challenged by the coordination data from (9). This challenge is particularly acute since most depiction verbs resist a straightforward lexical decomposition into a clause-taking structure.[12] We close this section with a note on the interpretation of depiction reports in the semantics from (Zimmermann, 2006):

2.1. A Note on (Zimmermann, 2006)

Zimmermann (2006) has presented an alternative to the property-based semantics in (Zimmermann, 1993) (below, 'PS′') that avoids the challenge from inferences to a common objective. This semantics interprets the non-specific objects of ITVs (incl. depiction verbs; see Zimmermann, 2006: 758–759) as existentially quantified sub-properties of the properties that are denoted by the ITVs' DP object. The different readings of (1a) are then interpreted as (40):

(40) a. $^{PS'}[\![(1a)]\!]^i_{\text{non-specific}} = (\exists P)[P \sqsubseteq penguin \wedge \texttt{paint}_i(penny, P)]$
b. $^{PS'}[\![(1a)]\!]^i_{\text{specific}} = (\exists x)[penguin_i(x) \wedge \texttt{paint}_i(penny, \lambda j\lambda y.\, y = x)]$

Zimmermann (2006) blocks inferences to a common objective by allowing the non-specific occurrences of *something* in (7a)/(7b) to denote different (existentially quantified) sub-properties of the maximally general property $\lambda j\lambda y.\, y = y$. This semantics models (7) as (41) (*ibid.*: 741):

(41) a. $[\![(7a)]\!]^i = (\exists P)[P \sqsubseteq (\lambda j\lambda y. y = y) \wedge \texttt{imagine}_i(uli, P)]$
b. $\underline{[\![(7b)]\!]^i = (\exists Q)[Q \sqsubseteq (\lambda j\lambda y. y = y) \wedge \texttt{imagine}_i(ede, Q)]}$
$\not\Rightarrow$ c. $[\![(7c)]\!]^i = (\exists P)[\texttt{imagine}_i(uli, P) \wedge \texttt{imagine}_i(ede, P)]$

The above notwithstanding, Zimmermann's revised property-based semantics has its own problems. For one thing, the replacement of restrictor-denotations by their more specific sub-properties places overly strong demands on the truth of reports like (42). For example, PS′ counterintuitively demands that (42) is only true if Harry stands in the admiration and the painting relation to the same sub-property of 'being a hummingbird' (see (43)).

(42) Harry $[_{\text{VP}}$[admired and painted] $[_{\text{DP}}$a hummingbird]]

(43) $[\![(42)]\!]^i = (\exists P)[P \sqsubseteq hummingbird \wedge (\texttt{admire}_i(harry, P) \wedge \texttt{paint}_i(harry, P))]$

For another thing, Zimmermann's account of Property (ii) only answers a proper part of a more general problem. As Zimmermann himself points out (see 2006: 729, fn. 29), higher-order non-

[12] We will return to the propositional, clausal interpretation of transitive uses of depiction verbs in Section 4.4.

specific readings like (7c) can also arise in the complement of transparent verbs (e.g. *eat*):

(44) I ate something that you ate, too: a slice of pumkin pie

Given its restriction to ITVs, Zimmermann's account is unable to account for such readings. Since Zimmermann himself has, in the meantime, abandoned his (2006) semantics, we exclude it from our further considerations. We expect that our presented semantics has a straightforward application to cases like (44) (see Section 4.3). We leave a proof of this expectation for another occasion.

3. Proposal and Background

We propose to account for Properties (i)–(iii) by replacing properties or intensional quantifiers by propositionally coded situations as the denotations of depiction complements. This move is motivated by the view (defended in Stephenson, 2010 for *imagine*) that nominal occurrences of depiction reports like (1a) and (2a) have a semantic situation- (event-, or state-)argument. For (2a), the existence of such argument is supported by the possibility of modifying the relevant occurrence of *imagine* through modifiers like *vividly* or *in* $[_{\text{ADJ}}\ ]$ *detail* (see (45); cf. Stephenson, 2010: 156) and by the observation that physical and mental images typically do not represent isolated items of information, but informationally richer objects (see Zimmermann, 2016: 433).

(45) a. Uli is *vividly* imagining a unicorn
b. Uli is imagining a unicorn *in vivid/lifelike detail*

Arguably, the identity of the depicted situation depends on the particular manner of depicting (e.g. painting vs. imagining), the depicting agent, and the time of depicting. To capture this dependence, we use a subset selection function, f (see von Fintel, 1999; cf. Kratzer, 1998). This function chooses a subset from a given set of situations $\lambda j[\ldots]$ in dependence on a parameter, e, for the described depiction event. This subset then represents the depicted situation, event, or state. Our use of *sets of* situations – rather than of a single situation – is motivated by the observation that – in contrast to visual scenes – depicted situations are often not anchored in a particular world or time (see Pustejovsky, 2016), and by the possibility of representing, or *coding*, non-anchored situations by sets of isomorphic (= qualitatively identical) situations (see Kratzer, 2002: 667; cf. Fine, 1977: 136). For the interpretation of the non-specific reading of (2a), these are situations with different worldly anchors that are inhabited by a/some unicorn that exhibits the same properties in all of these situations. The interpretation of the non-specific reading of (2a) is given in (46). Below, *imagine* is a non-logical constant of type $\langle s, \langle \langle \boldsymbol{s}, \boldsymbol{t} \rangle, \langle e, t \rangle \rangle \rangle$.

(46)
$$[\![(2a)]\!]^{i}_{\text{non-specific}} \equiv [\![\text{Uli is imagining } [_{\text{DP}}\text{a unicorn}]]\!]^{i} = (\exists e)[\mathit{imagine}_i(e, \mathit{uli}, \underbrace{f_e(\lambda j \exists x.\mathit{unicorn}_j(x))}_{\text{Uli's imagined situation in } i \text{ (coded as a set of situations)}})]$$

The above suggests that DP-taking occurrences of depiction verbs (here: *paint*) have the semantics in (47). There, E is a situation-relative existence predicate (see Liefke, 2014: 117 ff.). This predicate applies to an individual and an index to assert the individual's existence in this index. Our use of E ensures that the individual referent of the object DP inhabits (all members of the set that represents) the situation selected by f.

(47) $[\![\text{paint-DP}]\!]^i = \lambda\mathscr{Q}\lambda z(\exists e)[paint_i(e,z,f_e(\lambda j.\mathscr{Q}_j(\lambda k\lambda y.E_k(y))))]$

As is apparent from the above, our semantics for *paint* converts intensional quantifiers (i.e. the classical denotations of DPs; see Montague, 1970, 1973) into propositionally coded situations during semantic composition. In particular, the function in (47) applies to the quantifier that is denoted by the object DP to assert the obtaining of a painting relation to (the set of situations representing) a situation that is inhabited by the individual referent of this quantifier.

4. Explaining the Properties

With our basic semantics for depiction verbs in place, we are now ready to show that this semantics accounts for Properties (i) to (iii).

4.1. Explaining Property (i): missing *de dicto*-readings

Our semantics for *paint* in (47) enables the interpretation of the different readings of depiction reports with indefinite object DPs as desired (see the interpretation of (1a) in (48a/b)):

(48) a. $[\![(3a)]\!]^i \equiv [\![\text{Penny is painting [a penguin]}]\!]^i$
$= \lambda\mathscr{Q}\lambda z(\exists e)[paint_i(e,z,f_e(\lambda j.\mathscr{Q}_j(\lambda k\lambda y.E_k(y))))]$
$(\lambda l\lambda P(\exists x)[penguin_l(x)\wedge P_l(x)])(penny)$
$\equiv (\exists e)[paint_i(e,penny,f_e(\lambda j\exists x.penguin_j(x)\wedge E_j(x)))]$
$\equiv (\exists e)[paint_i(e,penny,f_e(\lambda j\exists x.penguin_j(x)))]$

b. $[\![(3b)]\!]^i \equiv [\![\text{[a penguin] [}\lambda_1\text{ [Penny is painting }t_1]]]\!]^i$
$= \lambda P(\exists x)[penguin_i(x)\wedge P_i(x)]\big(\lambda j\lambda x_1(\exists e)[paint_j(e,penny,f_e(\lambda j.E_j(x_1)))]\big)$
$\equiv (\exists x)[penguin_i(x)\wedge(\exists e)[paint_i(e,penny,f_e(\lambda j.E_j(x)))]]$

To account for the non-availability of the non-specific reading of (4) (i.e. *Penny is painting every penguin*), we follow Zimmermann's (1993) assumption that the denotation of *paint* (here: *paint*) is only defined for the interpretations of object DPs that can be represented by an existential quantifier (see Section 2, Challenge (i)). This assumption takes the form of a presupposition on the quantifier $\mathscr{Q}$ in (47). This presupposition is specified in (49), where it is underlined:

(49) $[\![\text{paint-DP}]\!]^i_{\text{revised}} = \lambda\mathscr{Q}:\underline{(\exists P)[\mathscr{Q}\equiv\exists_P]}.\lambda z(\exists e)[paint_i(e,z,f_e(\lambda j.\mathscr{Q}_j(\lambda k\lambda y.E_k(y))))]$

Since (4a) does not meet this presupposition on the non-specific reading of its object DP, this reading is not available in our semantics. However, since the trace of this DP has an interpretation (i.e. $LIFT\big([\![t_1]\!]\big)$ $(=\lambda l\lambda Q.Q_l(x_1)))$ that can be represented by an extensional quantifier (here: by $\lambda l\lambda Q\exists x.Q_l(x)\wedge x=x_1$), the specific reading of (4), i.e. (4b), is still available in our semantics. This reading receives the interpretation in (50):

(50) $[\![(4)]\!]^i_{\text{specific}} \equiv [\![\text{[every penguin] [}\lambda_1\text{ [Penny is painting }t_1]]]\!]^i$
$= \lambda P(\forall x)[penguin_i(x)\rightarrow P_i(x)]\big(\lambda j\lambda x_1[\lambda\mathscr{Q}\lambda z(\exists e)[paint_j(e,z,$
$f_e(\lambda j.\mathscr{Q}_j(\lambda k\lambda y.E_k(y))))]\underline{(\lambda l\lambda Q.Q_l(x_1))}(penny)]\big)$
$\equiv \lambda P(\forall x)[penguin_i(x)\rightarrow P_i(x)]\big(\lambda j\lambda x_1(\exists e)[paint_j(e,penny,f_e(\lambda k.E_k(x_1)))]\big)$
$\equiv (\forall x)[penguin_i(x)\rightarrow(\exists e)[paint_i(e,penny,f_e(\lambda j.E_j(x)))]]$

4.2. Explaining Property (ii): no inferences to a common objective

The above considerations suggest that (7a/b) receive an interpretation along the lines of (52). This interpretation uses a semantics for *imagine* (see (51)) that is fully analogous to that of *paint*. For simplicity, we will hereafter drop the 'existential quantifier'-presupposition from (51).

(51) $[\![\text{imagine-DP}]\!]^i = \lambda\mathscr{Q} : \underline{(\exists P)[\mathscr{Q} \equiv \exists_P]}.\,\lambda z\,(\exists e)[imagine_i\,(e,z,f_e(\lambda j.\,\mathscr{Q}_j\,(\lambda k\lambda y.\,E_k(y))))]$

(52) $[\![(7a)]\!]^i_{\text{non-specific}} \equiv [\![\text{Uli is imagining [something]}]\!]^i$
$= \lambda\mathscr{Q}\lambda z\,(\exists e)[imagine_i\,(e,z,f_e(\lambda j\exists u.\,\mathscr{Q}_j\,(\lambda k\lambda y.\,E_k(y)\wedge u=y)))](\lambda l\lambda P\,(\exists x)[P_l(x)])(uli)$
$\equiv\ (\exists e)[imagine_i\,(e,uli,f_e(\lambda j\,\exists x.\,E_j(x)))]$

We have explained in Section 3 that our semantics interprets the direct objects of depiction verbs as propositionally coded situations. Our interpretation suggests that situations have propositional content (i.e. the conjunction of the propositions that are true in the situation). A (proper) part of this content is made explicit in the domain of the parametrized choice function f_e. For example, in (50), this 'explicit content' is the proposition/set of worlds $\lambda j\,(\exists x)[penguin_j(x)]$. As a result, it holds for all propositionally coded[13] situations $f_e(p)$ that $f_e(p) \subseteq p$.

In virtue of the above, (coded) situations serve a double role in our semantics: as the semantic arguments of depiction verbs and as carriers of the propositional content that is represented in the relevant act of depiction (cf. Kratzer, 2002). In virtue of this double role, (7c) has two different 'readings' in our semantics: one of these readings (hereafter called the *situation reading*, abbreviated 'SR') reports the existence of a situation that Uli and Ede are both imagining. The other reading (called the *partial content reading*, 'PCR') reports the existence of a partial propositional content (i.e. $\lambda j\exists x.\,E_j(x)$) that characterizes both Uli and Ede's imagined situations. Since situations are informationally richer objects that 'classical' propositions (see Section 3), the situation reading is the stronger one of the two readings, i.e. SR entails PCR, but not *vice versa*.

We assume that (7c) saliently has a situation reading.[14] To interpret this reading, we use the semantics for 'propositional' occurrences of *imagine* in (53). Our use of this semantics is motivated by the fact that this semantics assumes *the same* object as the witness of the existential quantifier 'there is some-thing' and as the semantic argument of the depiction verb. We will see in Section 4.4 that (53) also provides the semantics for finite CP-taking occurrences of *imagine*.

(53) $[\![\text{imagine-CP}]\!]^i = \lambda p\,\lambda z\,(\exists e)[imagine_i\,(e,z,p)]$

To obtain the suitably typed higher-order reading of the occurrence of *something* in (7c) (see (55)), we use the type-shifter $\looparrowright$. This shifter sends intensional quantifiers to parametrized sets of objects of type $\langle s,\langle\langle s,t\rangle,t\rangle\rangle$ that apply to an existentially quantified proposition:

(54) $\looparrowright\ :=\ \lambda\mathscr{Q}\lambda j\lambda T\,(\exists p)[p = (\lambda k.\,\mathscr{Q}_k(\lambda l\lambda y.\,y=y))\wedge T_j(p)]$

[13]Since we already work with propositional representations of situations, we do not need a designated function (e.g. Kratzer/Hacquard's (2006: 138) function CON) that identifies the propositional content of an entity/situation.
[14]This assumption is motivated by the intuitive non-validity of (7) (see Zimmermann, 2006). The partial content reading of (7c) will be discussed in Section 4.3.

(55) $\looparrowright\left([\![\text{something}_{\text{LO}}]\!]\right) \equiv \looparrowright\left([\![\text{some situation}_{\text{LO}}]\!]\right)$
$= \lambda j \lambda T(\exists p)[p = (\lambda k \exists x. E_k(x)) \wedge T_j(p)]$

The situation reading of (7c) then has the interpretation in (56):

(56) $[\![(7c)]\!]^i_{\text{SR}} \equiv [\![[\text{some (coded) situation}]\ [\lambda_1\ [\text{Uli is imagining } t_1 \text{ and Ede is imagining } t_1]]]\!]^i$
$= \lambda T(\exists p)[p = (\lambda j \exists x. E_j(x)) \wedge T_i(p)]$
$\left(\lambda k \lambda q\,[(\exists e)[imagine_k(e, uli, q)] \wedge (\exists e')[imagine_k(e', ede, q)]]\right)$
$\equiv (\exists p)[[(\exists e)[imagine_i(e, uli, p)] \wedge (\exists e')[imagine_i(e', ede, p)]] \wedge p = (\lambda j \exists x. E_j(x))]$
$\equiv (\exists p)[(\exists e)[imagine_i(e, uli, p)] \wedge (\exists e')[imagine_i(e', ede, p)]]$

The above asserts the existence of a maximally general situation[15] that Uli and Ede are both (simultaneously) imagining. However, since depiction verbs choose their argument-situation in dependence on a particular depicting event (here: Uli's resp. Ede's imagining in *i*; see Section 3) and since different cognitive agents rarely share the same imagining event (even if their imagining happens at the same time and has the same (kind of) content), Uli's imagined situation in *i* is typically different from Ede's imagined situation in *i* – to the extent that it may even be part of a different world. The inference from (7a) and (7b) to (7c) is thus not valid in our semantics:[16]

(57) a. $[\![(7a)]\!]^i_{\text{non-specific}} \equiv [\![\text{Uli is imagining } [_{\text{DP}}\text{some (non-specific) thing}]]\!]^i$
$= (\exists e)[imagine_i(e, uli, f_e(\lambda j \exists x. E_j(x)))]$

b. $[\![(7b)]\!]^i_{\text{non-specific}} \equiv [\![\text{Ede is imagining } [_{\text{DP}}\text{some (non-specific) thing}]]\!]^i$
$= (\exists e')[imagine_i(e', ede, f_{e'}(\lambda j \exists x. E_j(x)))]$

$\not\Rightarrow$ c. $[\![(7c)]\!]^i_{\text{SR}} \equiv [\![\text{There is } [_{\text{DP}}\text{a situation] that Uli and Ede are (both) imagining}]\!]^i$
$= (\exists p)[(\exists e)[imagine_i(e, uli, p)] \wedge (\exists e')[imagine_i(e', ede, p)]]$

4.3. Excursus: criteria for 'same-imagining'

We have mentioned above that our semantics admits two different readings of (7c): a situation reading (SR; see (56)) and a partial content reading (PCR). We show below that PCR solves a problem concerning the generalizability of our approach to inferences to a common objective. This problem regards the observation that, on the conclusion's situation reading, our semantics also blocks inferences like (58) that would intuitively be regarded as valid. In blocking (58), our semantics follows Zimmermann's (2006) property-based semantics (see *ibid.*: 741).

(58) a. Lea is imagining $[_{\text{DP}}$a (non-specific) lion]

b. Paul is imagining $[_{\text{DP}}$a (non-specific) lion]

$\Rightarrow$ c. There is $[_{\text{DP}}$some (kind of) thing] that Lea and Paul are both imagining
($\equiv$ Lea and Paul are imagining the same (kind of) non-specific thing)

[15]The equivalence of the final and the penultimate line in (56) is due to the non-emptiness of imagined situations. The latter is the assumption that every situation is inhabited by at least one individual.

[16]Note that, in each depiction event *e*, the depicting agent stands in the depiction relation to exactly one (propositionally coded) situation. As a result, (57c) cannot be taken to assert (truly) that Uli's and Ede's imagining situations share the same generalization.

Zimmermann defends the predictions of his semantics by referring to the strict requirements on two agents sharing the (exact) same target of depiction (see Zimmermann, 2006: 745–747). According to (an adapted version[17] of) his argument, if Lea is imagining an Asiatic lion and Paul is imagining a (now extinct) Cape lion, the premises in (58) are both true on their non-specific readings, while the conclusion is false (see Zimmermann, 2006: 742).

Zimmermann's argument notwithstanding, it seems that – in a way – Lea and Paul could still be described as imagining the same thing, viz. a lion. Our semantics captures the validity of this inference by using PCR: to obtain the higher-order reading of the DP *something* as a quantifier over partial propositional contents of situations (cf. (23)), we use a modified version, $\Uparrow$, of Zimmermann's type-shifter $\uparrow$. Like $\looparrowright$, this version replaces the quantifier over properties, '$(\exists P)$', in (24) by a quantifier over propositions, '$(\exists p)$'. To ensure the desired interpretation of $some_{\text{HO}}(\Uparrow thing_{\text{LO}})$, we replace the conjunct '$P_k(y)$' in (24) by 'p_k':

(59) $\Uparrow \;:=\; \lambda Q \lambda j \lambda \mathscr{Q}(\exists p)[\mathscr{Q} = (\lambda k \lambda P \exists y.\, Q_k(y) \wedge p_k \wedge P_k(y))]$

(60) $$\begin{aligned}[\![\text{some}_{\text{HO}}]\!]\big(\Uparrow([\![\text{thing}_{\text{LO}}]\!])\big) &= \lambda \Sigma \lambda j \lambda \Pi (\exists \mathscr{Q})[\Sigma_j(\mathscr{Q}) \wedge \Pi_j(\mathscr{Q})] \\ &\quad \big(\lambda Q \lambda l \lambda \mathscr{P}(\exists p)[\mathscr{P} = (\lambda k \lambda P \exists y.\, Q_k(y) \wedge p_k \wedge P_k(y))](\lambda l \lambda z.\, z = z)\big) \\ &\equiv \lambda j \lambda \Pi (\exists \mathscr{Q})[(\exists p)[\mathscr{Q} = (\lambda k \lambda P \exists y.\, p_k \wedge P_k(y))] \wedge \Pi_j(\mathscr{Q})] \\ &\equiv \lambda j \lambda \Pi (\exists p)[\Pi_j(\lambda k \lambda P \exists y.\, p_k \wedge P_k(y))]\end{aligned}$$

The above enables the compositional interpretation of the partial content reading of (7c):

(61) $$\begin{aligned}[\![(7c)]\!]^i &\equiv [\![[\text{some propositional content}]\ [\lambda_1\ [\text{Lea is imagining } \mathscr{T}_1 \text{ and Paul is imagining } \mathscr{T}_1]]]\!]^i \\ &= \lambda \Pi (\exists p)[\Pi_i(\lambda j \lambda P \exists y.\, p_j \wedge P_j(y))]\big(\lambda k \lambda \mathscr{Q}[(\exists e)[imagine_k(e, lea, f_e(\lambda j \exists x. \\ &\qquad \mathscr{Q}_j(\lambda l \lambda y.\, x = y)))] \wedge (\exists e')[imagine_i(e', paul, f_{e'}(\lambda j \exists z.\, \mathscr{Q}_j(\lambda l \lambda u.\, z = u)))]]\big) \\ &\equiv (\exists p)[(\exists e)[imagine_i(e, lea, f_e(p))] \wedge (\exists e')[imagine_i(e', paul, f_{e'}(p))]]\end{aligned}$$

(61) asserts the existence of a proposition that is part of the propositional content both of Lea's and of Paul's imagined situation. Since this proposition indeed exists (witness $\lambda j\,(\exists x)[lion_j(x)]$), the inference in (58) comes out valid, as desired:

(62) a. $[\![(58a)]\!]^i_{\text{non-specific}} \equiv [\![\text{Lea is imagining } [_{\text{DP}}\text{some (non-specific) lion}]]\!]^i = (\exists e)[imagine_i(e, lea, f_e(\lambda j \exists x.\, lion_j(x)))]$

b. $[\![(58b)]\!]^i_{\text{non-specific}} \equiv [\![\text{Paul is imagining } [_{\text{DP}}\text{some (non-specific) lion}]]\!]^i = (\exists e')[imagine_i(e', paul, f_{e'}(\lambda j \exists x.\, lion_j(x)))]$

$\Rightarrow$ c. $[\![(58c)]\!]^i_{\text{SR}} \equiv [\![\text{There is } [_{\text{DP}}\text{a proposition] whose content Lea and Paul are imagining}]\!]^i = (\exists p)[(\exists e)[imagine_i(e, lea, f_e(p))] \wedge (\exists e')[imagine_i(e', paul, f_{e'}(p))]]$

Arguably, on the partial content-reading of its conclusion, (7) also comes out valid. We explain this validity by pointing to the observation that, given the PC-reading of (7c), the inference is indeed more likely to be judged valid by native speakers. The intuitive invalidity of (7) can still be explained with reference to the salience of the situation reading (see Section 4.2).

[17] The adaptation is to our example.

4.4. Explaining Property (iii): DP/CP interaction

We have suggested in Section 4.1 that our semantics assumes different lexical entries for DP- (see (51)) and CP-taking occurrences of depiction verbs (see (53), copied below). These different entries are required by our assumption that DPs and finite CPs have their usual denotation in our semantics (i.e. intensional quantifiers resp. propositions). Since our semantics uniformly interprets depiction complements as propositions/propositionally coded situations (type $\langle s,t\rangle$), it requires different verb-internal type-shifters, viz. functions from intensional quantifiers to propositions (i.e. $\lambda\mathscr{Q}\lambda j(\exists x)[\mathscr{Q}_j(\lambda k\lambda y.E_k(y)\wedge y=x)]$; see (51)) and functions from propositions to themselves/to propositions (i.e. $\lambda p\lambda j[p_j]$; see (53)).

(51) $[\![\text{imagine-}\textsc{dp}]\!]^i = \lambda\mathscr{Q}\lambda z(\exists e)[\mathit{imagine}_i(e,z,f_e(\lambda j\exists x.\mathscr{Q}_j(\lambda k\lambda y.E_k(y)\wedge y=x)))]$

(53) $[\![\text{imagine-}\textsc{cp}]\!]^i = \lambda p\lambda z(\exists e)[\mathit{imagine}_i(e,z,p)]$

Our semantics for CP-taking occurrences of *imagine* enables the interpretation of (8b) as (64). This interpretation treats *that* as the trivial complementizer, $\mathit{that}_{\mathrm{T}}$ (see (63); cf. Kratzer, 2006):

(63) $[\![\text{that}_{\mathrm{T}}]\!] = \lambda p\lambda j[p_j]$

(64) $[\![(8\text{b})]\!]^i \equiv [\![\text{Uli is imagining }[_{\mathrm{CP}}\text{that}_{\mathrm{T}}\ [_{\mathrm{TP}}\text{a unicorn is basking in the sun}]]]\!]^i$
$= (\exists e)[\mathit{imagine}_i(e,\mathit{uli},\lambda j\exists x.\mathit{unicorn}_j(x)\wedge \mathit{bask}_j(x))]$

The uniform(-type) interpretation of DP and CP complements of depiction verbs correctly predicts that these complements allow for coordination and specification (see (9)). This prediction notwithstanding, the modelling of DP/CP coordinations in depiction complements is challenged by the fact that the DP and the CP conjunct provide different-type inputs to the compositional machinery. As a result, the DP conjunct requires embedding by IMAGINE-DP (see (52); cf. (50)) while the CP conjunct requires embedding by IMAGINE-CP (see (53); cf. (64)).

To accommodate these different type-requirements, we use the semantics for coordinating *and* in (65). This semantics interprets the conjunction of a DP and a finite CP as an intensional quantifier of the form '$\lambda j\lambda P\left[[\![\textsc{dp}]\!]^j(P)\wedge[\![\textsc{cp-fin}]\!]^j\right]$':[18]

(65) $[\![\textsc{dp}\text{-and-}\textsc{cp-fin}]\!] = \lambda p\lambda\mathscr{Q}\lambda j\lambda P[\mathscr{Q}_j(P)\wedge p_j]$

The above enables the interpretation of (9a) as (67). This interpretation uses the step in (66):

(66) $[\![[\text{a unicorn}]\,[\lambda_1[\mathscr{T}_1\text{ and that}_{\mathrm{T}}\ \mathscr{T}_1\text{ is basking in the sun}]]]\!]$
$\equiv \big(\lambda_1.[\![\text{and}]\!]\big([\![\text{that}_{\mathrm{T}}]\!]\big([\![\mathscr{T}_1\text{ is basking in the sun}]\!]\big)\big([\![\mathscr{T}_1]\!]\big)\big)\big([\![\text{a unicorn}]\!]\big)$
$= \big(\lambda\mathscr{Q}\big(\lambda p\lambda\mathscr{P}\lambda j\lambda P[\mathscr{P}_j(P)\wedge p_j]\big(\lambda k.\mathscr{Q}_k(\mathit{bask})\big)(\mathscr{Q})\big)\big)$
$\big(\lambda l\lambda Q\exists x.\mathit{unicorn}_l(x)\wedge Q_l(x)\big)$
$\equiv \lambda j\lambda P[(\exists x.\mathit{unicorn}_j(x)\wedge P_j(x))\wedge(\exists y.\mathit{unicorn}_j(y)\wedge \mathit{bask}_j(y))]$

[18] Alternatively, we could try to interpret this conjunction by shifting the quantifier-denotation of the DP to the type for propositions, $\langle s,t\rangle$. This could be achieved by the function $\lambda\mathscr{Q}\lambda j[\mathscr{Q}_j(\lambda k\lambda y.E_k(y))]$. The value of this function would qualify as input to the familiar, generalized interpretation of conjunction (i.e. $\lambda q\lambda p\lambda j[p_j\wedge q_j]$). However, since this function is not an admissible type-shift (for example, it is not injective; see Zimmermann, 2015) and since it could also be used to resolve a (well-motivated!) type-mismatch between propositional attitude verbs (e.g. *think*) and non-content DPs (e.g. *a penguin*; thus blocking a type-theoretic explanation of the deviance of **Uli is thinking a penguin*), we refrain from using this option.

(67) $[\![(9a)]\!]^i \equiv [\![\text{Uli imagines-}\textsc{dp}\ [[\text{a unicorn}]\ [\lambda_1\ [\mathscr{T}_1 \text{ and that}_\text{T}\ \mathscr{T}_1 \text{ is basking in the sun}]]]]\!]$
$= \lambda \mathscr{Q} \lambda z\, (\exists e)[imagine_i\,(e, z, f_e(\lambda j \exists x.\, \mathscr{Q}_j\,(\lambda k \lambda y.\, E_k(y) \wedge y = x)))]$
$\big(\lambda l \lambda P\, [(\exists u.\, unicorn_l(u) \wedge P_l(u)) \wedge (\exists v.\, unicorn_l(v) \wedge bask_l(v))]\big)\,(uli)$
$\equiv (\exists e)[imagine_i\,(e, uli, f_e(\lambda j\, (\exists x.\, unicorn_j(x) \wedge E_j(x)) \wedge (\exists y.\, unicorn_j(y) \wedge bask_j(y))))]$
$\equiv (\exists e)[imagine_i\,(e, uli, f_e(\lambda j \exists y.\, unicorn_j(y) \wedge bask_j(y)))]$

We close this section with an observation about the relation between *imagine*-CP and *imagine*-DP: the attentive reader may have noticed that our translations of both kinds of occurrences use the same non-logical constant, *imagine*. Together with (51) and (53), this observation supports the meaning postulate in (68):

(68) $(\forall \mathscr{Q})(\forall z)\big[[\![\text{imagine-}\textsc{dp}]\!]^i(\mathscr{Q})(z) \equiv$
$[\![\text{imagine-}\textsc{cp}]\!]^i(\lambda j.\, \mathscr{Q}_j(E) \wedge (\forall q.\, (f_e(p) \subseteq q) \rightarrow q_j))(z)\big]$

In its relevant instance, (68) asserts the semantic equivalence of (2a) with the result of replacing its object DP with a complex finite clause (or a coordination of finite clauses) that denotes the complete propositional content which serves as the interpretation of this DP. For example, if the propositional content of Uli's imagined situation in *i* is fully characterized by the proposition *A white unicorn with a spiralled horn is basking in the sun*, (2a) is equivalent to (69b) and (69c):

(69) a. Uli is imagining [$_{\text{DP}}$a unicorn]
$\equiv$ b. Uli is imagining [$_{\text{CP}}$that a white unicorn with a spiralled horn is basking in the sun]
$\equiv$ c. Uli is imagining [[(that there is) [a white unicorn]^1], [$_{\text{CP}}$that it$_1$ has a spiralled horn], and [$_{\text{CP}}$that it$_1$ is basking in the sun]]

The semantic equivalence of transitive with certain clausal occurrences of depiction verbs has important consequences for the recent debate about the defensibility of propositionalism in linguistic semantics. Propositionalism is the claim that all intensional constructions (incl. depiction reports) can be interpreted as cases of truth-evaluable, clausal embedding.[19] There are today several different forms of propositionalism. These differ with respect to whether the propositional interpretation of the object DP is achieved by lexical decomposition (*weak propositionalism*; see Quine, 1956), by syntactic restructuring (*sententialism*; see Larson, 2002; den Dikken et al., 2018), by ellipsis resolution (see Parsons, 1997), or by a type-shift to a proposition (*Propositionalism* (with a capital 'P'); see Zimmermann, 2016).

Since they deny that depiction reports can be decomposed, restructured, or resolved into a clausal structure – and since there is no injective function from properties or intensional quantifiers to propositions –, most existing semantics for depiction reports (see Zimmermann, 1993, 2006, 2016; Moltmann, 1997) are in line with some form or other of anti-propositionalism. Things are different for our proposed semantics for depiction reports: admittedly, this semantics still refutes the decomposition, restructuring, or resolution of depiction reports into a clause-embedding construction.[20] However – as we have shown in Section 3 –, our semantics interprets the object DPs of depiction verbs as (propositionally coded) situations. Since these stand in a one-to-one correspondence to propositions, our semantics still supports Propositionalism.

[19]The term *propositionalism* is due to Forbes (2000: 148) who, however, defends an anti-propositionalist view.
[20]For an argument against Parsons' ellipsis analysis of depiction reports, the reader is referred to (Liefke, 2020).

5. Conclusion

In this paper, we have observed that the compositional interpretation of depiction reports faces several challenges regarding available readings, entailment patterns, and DP/CP interaction. We have shown that our proposed semantics answers these challenges by interpreting the object DP in 'nominal' depiction reports as a propositionally coded situation that depends on the relevant depicting event, and by interpreting the finite CP in clausal depiction reports as a classical proposition: the former effects that non-specific DPs in inferences to a common objective do (typically) not receive the same interpretation, such that these inferences come out invalid. Because of the same-type interpretation of nominal and clausal depiction complements, the latter enables the semantic interaction of DPs and CPs in the complements of depiction verbs.

We close this paper with two pointers to future research. The first of these concerns the extension of our defense of a Propositionalist account of intensional constructions to other verbs: our adoption of Stephenson's evidence for the presence of a semantic situation argument suggests that all intensional verbs that select for a semantic situation argument allow for a Propositionalist treatment. These verbs include – next to other depiction verbs (e.g. *draw*, *visualize*) – epistemic verbs (e.g. *remember*, *notice*, *observe*), quasi-perceptual intentional verbs (e.g. *dream* (*about/of*), *hallucinate*), and perception verbs (e.g. *see*, *hear*, *feel*).

Our second pointer regards the same-type interpretation of DP and CP complements of depiction verbs. This interpretation opens up new possibilities for the explanation of the distribution of DPs and CPs: since this interpretation predicts that depiction verbs combine with both DPs and CPs, it suggests that their selectional restrictions (e.g. the fact that – in contrast to *imagine* – *paint* rejects finite CP complements) can be accounted for in terms of independently observable semantic properties of these verbs.[21] For an initial attempt at such an account, the reader is referred to (Liefke, 2019). We leave the development of this account to future work.

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[21] I thank Floris Roelofsen for directing my attention to this point.

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