Definite meaning and definite marking

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Abstract

We look at definite marking in Esperanto, Papiamentu, and Yiddish considering three semantically definite contexts: the referential use of proper names and unique nouns, as well as anaphoric definites. Based on the typological study of languages with multiple definite articles in Am-David (2016), we argue for a three-dimensional decomposition of the ι-operator: an individual denotation, an existence presupposition, and a uniqueness conventional implicature. We present an HPSG encoding of this system and model the central aspects of the definite marking systems of our three object languages.

1 Introduction

In this paper, we will look at the way in which three languages express definiteness in three selected contexts. We will not be able to do justice to the rich literature on definiteness in linguistics and beyond, but rather concentrate on the discussion of the data and the development of a particular encoding. We will argue that definite meaning should be expressed as a combination of an asserted content, a presupposition, and a conventional implicature. The object languages of this paper will be Esperanto, Papiamentu, and Yiddish. These languages have been chosen as they represent different types of systems of definite marking, they are very well documented, and there is easily accessible data (corpora and internet).

We will provide general information on the definiteness systems of our three object languages in the introduction. In Section 2, we will show how they mark definiteness in three semantically definite environments: the referential use of proper names and unique nouns as well as anaphoric definites. In Section 3, we will look at one of the ways in which definite meaning is analyzed in the literature and identify a basic problem of the standard use of the ι (*iota*) operator for this purpose. We will present our own, three-dimensional, semantics of definiteness in Section 4. We will then move to the HPSG part of the paper. We will sketch the relevant aspects of the framework to be used here, *Lexical Resource Semantics* (Richter & Sailer, 2004), in Section 5 and extend it to our multi-dimensional semantics. In Section 6, we will apply this framework to the definiteness systems of Esperanto, Papiamentu, and Yiddish. We will end the paper with a conclusion.

Esperanto (Eo) is a constructed language that was created by Ludwik Leyzer Zamenhof (1859–1917) and first published in Warsaw as Zamenhof (1887). It has been shown, for example in van Oostendorp (1993), that Esperanto has all

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properties of a natural language from a linguistic perspective. Therefore, we will treat it just as any other natural language that can and should be described by the means of formal linguistic theory.

There are two important reference grammars for Eo: Kalocsay & Waringhien (1985) and Wennergen (2016), both of which provide good information on the use of the definite article. Wennergen (2016) is strongly corpus based and uses primarily naturally occurring example sentences. In addition to these resources, the discussion of Eo will be based on data derived from the corpus *Tekstaro de Esperanto* (http://www.tekstaro.com/) and from web pages written in Eo.

Eo has an uninflected definite article, *la*, which is roughly used in the same way as the English *the*. Contrary to English, however, Eo has no indefinite article. A contracted form of the definite article, *l'*, exists, which can be used following a preposition that ends in a vowel, such as *de l'* 'of the' or *pri l'* 'about the'. These contracted forms are mainly used in poetry and not in spoken or prose Eo (Wennergen, 2016, p. 102). They will be ignored in the following.

Papiamentu (Pap), the second language to be discussed here, is a creole language spoken on the so-called ABC islands, Aruba (where the language is called "Papiamento"), Bonaire, and Curaçao. According to Kouwenberg (2013), its main lexifier languages are (Afro)Portuguese, Spanish, and Dutch. Pap is among the official languages of all three ABC islands. There is a vast linguistic literature on Pap, and it is highly present on the internet. Our data discussion is based on a reference grammar (van Putte & van Putte-de Windt, 2014) and a textbook (van Putte & van Putte-de Windt, 1992) as well as on data from web pages in Pap. In addition, we will rely on the discussion of the Pap article system in Kester & Schmitt (2007).

Pap has an uninflected definite article, *e* and an indefinite article, *un*. There exists a contracted form of the definite article when following the preposition *di* 'of': *dje* 'of-the'. We could not find a systematic discussion of when the contracted form is used and will, therefore, ignore it in this paper.

Finally, Yiddish (Yid) is an Indo-European language belonging to the Germanic branch. It is closely related to the High German dialects but has been in strong language contact with its surrounding languages. We will base our discussion on two reference grammars, Mark (1978) and Katz (1987). In addition, we use the *Corpus of Modern Yiddish* (CMY), which is available at http://web-corpora.net/YNC.

Yid has both a definite and an indefinite article. The definite article shows gender, number, and case agreement. In addition to the full forms of the articles, there are contracted forms with some prepositions, such as *tsum* 'to-the.MASC.SG'. The distribution of the contracted forms seems to be similar to what has been observed for standard German, for example in Schwarz (2009). There are also article-less uses with some preposition-noun combinations, such as *in gas* 'in the street' (Katz 1987: 80–81). We will not discuss the article-less forms in this paper.

After these preliminaries on the three languages, we can, now, look at how they use their definite articles in three semantically definite contexts.

2 Definite marking in Eo, Pap, and Yid

In this section, we will look at whether the three languages under consideration use a definite article in contexts in which we can assume a semantic definiteness. In particular, we will look at proper names, unique nouns, and anaphoric definites. We go through these three contexts one by one.

2.1 Proper names

We will look at proper names in their primary use only, i.e., as referring to an individual that bears the particular name (von Heusinger, 2010). In all three languages, no article is used in the standard case. This is shown in (1)–(3).

(1) En 1873 li transloĝis al Varsovio kun la tuta familio
in 1873 he moved to Warsaw with the entire family (Eo, tekstaro)

(2) I Korsou ta un isla chiki, ...
and Curaçao is an island small
'And Curaçao is a small island ...' (Pap)[1]

(3) khaym kumt bald.
Khaim comes soon
'Chaim is coming soon.' (Mark, 1978: 120)

While our three languages do not use an article with simple proper names, an article occurs when the noun is modified. This is illustrated for Yid in (4).[2]

(4) *(der) royter khaim kumt bald.
the red Khaim comes soon
'The red Chaim comes soon.' (Mark, 1978: 120)

2.2 Unique nouns

Unique nouns have exactly one individual satisfying their descriptive content. Löbner (2011: 284) lists *sun*, *pope*, *US president*, *weather*, etc. as nouns that are typically used as unique nouns.

The definiteness marking of unique nouns is particularly interesting for us as we see a great degree of variation here. As shown in (5), Eo requires a definite marking with unique nouns. In Pap, no article can be used, see (6). An article is used in Yid, but, where possible, this will be the contracted form of the article, illustrated in (7). If no contracted form exists in a given constellation, the full form is used, see (8).

[1] http://www.aav.cw/2014/02/07/spich-di-director-di-aav-na-okashon-di-nan-evento-di-anja-nobo-2014/, last consulted: 24.7.2016.

[2] Other languages use the definite article with proper names obligatorily (such as Modern Greek) or optionally (such as the varieties of Standard German spoken by the present authors).

(5) *(La) suno subite sin montris el la nuboj, ...
the sun suddenly itself showed from the clouds
'Suddenly the sun showed itself out of the clouds ...' (Eo, tekstaro)

(6) (*E) Solo ta kima sin miserikòrdia.
(the) sun PRES burn without mercy
'The sun is burning without mercy' (Pap, Kester & Schmitt, 2007: 113)

(7) un zey hobn geshikt tsum meylekh
and they have sent to-the king
'and they sent to the king' (Yid, CMY)

(8) az der meylekh hot gehert di zakh, ...
as the king has heard the affair ...
'as the king has heard about the affair, ...' (Yid, CMY)

2.3 Anaphoric definites

When a definite NP refers to a previously introduced referent, we speak of an anaphoric definite. In Eo, the definite article is used in these cases, see (9). Similarly, Pap uses its definite article in such contexts, see (10). The antecedent is dotted in our examples.

(9) Mi havas grandan domon. La domo havas du etaĝojn.
I have big house the house has two floors
'I have a big house. The house has two floors.' (Eo, Wennergen, 2016: 80)

(10) Mi a kumpra un bolo. 'I bought a cake'

*(E) bolo a wòrdu kome den 10 minüt.
the cake PART been eat in 10 minutes

'The cake was eaten in 10 minutes.' (Pap, Kester & Schmitt, 2007: 119)

We find a definite article with anaphoric definites in Yid as well, as shown in (11). However, the contracted form does not occur in these contexts, even in cases where a preposition-article contraction, *funem*, would be possible, see (12).

(11) hot im gefunen a man, ...; un der man hot im gefregt, azoy tsu zogn:
has him found a man and the man has him asked so to say
'A man found him and the man asked him to say: ...' (Yid, CMY)

(12) un a man iz gegangen .... 'And a man left ...'

un der nomen fun dem man iz gewen elimelekh ...
and the name of the man is been Elimelekh

'And the name of the man was Elimelekh ...' (Yid, CMY)

	proper name	unique noun	anaphoric definite
Esperanto	–	la	la
Papiamentu	–	–	e
Yiddish	–	der, di, dos, … tsum, … (P-Det)	der, di, dos, …

Table 1: Definiteness marking in Esperanto, Papiamentu, and Yiddish

The distribution of the marking for the three languages in the three contexts is given in Table 1. It will be the task of the rest of this paper to provide a semantic characterization of the three contexts and lexical entries for the determiners and nouns that, in combination, produce the patterns found in the data.

3 Previous approaches

It is impossible to even summarize the most important contributions to the linguistic analysis of definites in the present paper—see Am-David (2014, 2016) for a systematic presentation of the state of the art. What we will do instead is to provide the basic ingredients of a semantics of definites as used in the literature and to point out some problematic aspects. We will start with the ι-operator (Section 3.1), then turn to the semantics of our three contexts (Section 3.2).

3.1 Definite meaning: The ι-operator

The most popular formalization of semantic definiteness uses the ι-operator. An ι-expression has the form $(\iota x : \phi)$ and refers to the single individual, a, that makes ϕ true, given that there is such a unique individual. If there is no such unique individual, the denotation of the ι-expression is undefined. This is stated more formally in (13).

(13) a. Syntax: For each type τ, for each variable x of type τ and for each formula ϕ, $(\iota x : \phi)$ is an expression of type τ.

b. Semantics: $[\![(\iota x : \phi)]\!]$

(i) is only defined if there is exactly one individual a such that $[\![\phi]\!]^{g[x \mapsto \mathsf{a}]} = 1$

(ii) when defined, then $[\![(\iota x : \phi)]\!] = \mathsf{a}$.

It is important to see that the definition in (13) combines three ingredients of meaning: First, the denotational aspect that the ι-expression refers to an individual. Second, the requirement that there exists such an individual and, third, the requirement that there is exactly one such individual. We will call the last two the *existence* requirement, and the *uniqueness* requirement. We will argue that it is more adequate to treat these three meaning components separately.

This separation is done in (14), where we redefine the semantics of ι-expressions. An ι-expression denotes an individual satisfying the description ϕ, (14-a), the existence requirement is expressed in (14-b), the uniqueness requirement in (14-c). When both existence and uniqueness are satisfied, (14) yields the same semantics as (13). We follow Coppock & Beaver (2015) in formulating uniqueness as "not more than one" instead of "exactly one" to keep it independent of existence.

(14) The semantics of $[\![(\iota x : \phi)]\!]$

a. Denotation: $[\![(\iota x : \phi)]\!] \in \{\mathsf{a} \mid [\![\phi]\!]^{g[x \mapsto \mathsf{a}]} = 1\}$

b. Existence: there exists some individual a satisfying ϕ, i.e. $\left\{\mathsf{a} \mid [\![\phi]\!]^{g[x \mapsto \mathsf{a}]} = 1\right\} \neq \emptyset$

c. Uniqueness: If there is an individual a satisfying ϕ, there is exactly one such individual, i.e. $\left|\left\{\mathsf{a} \mid [\![\phi]\!]^{g[x \mapsto \mathsf{a}]} = 1\right\}\right| \leq 1$

We will now argue that the existence requirement should be treated as a presupposition and the uniqueness requirement as a conventional implicature (CI).

Both presuppositions and CIs are types of projective meaning (Tonhauser et al., 2013), as they both can project in so-called *S-family contexts* (Gazdar, 1979), such as negation, *if*-clauses, and *yes/no*-questions. This means that if the trigger of the inference is embedded in such a context, the inference can be valid outside the effect of the operator that constitutes the context.

We will apply two criteria to distinguish between presuppositions and CIs that have been introduced already in Karttunen & Peters (1979) and are also discussed in Potts (2005, 2007). First, CIs obligatorily project in S-family contexts, whereas presuppositions can either project or be accommodated in the scope of the relevant operator. Second, if a presupposition projects, it needs to be satisfied for a sentence to be interpretable. A CI, on the other hand, has a truth value that is independent of that of the rest of the sentence.

In the standard definition of ι-expressions as in (13), both existence and uniqueness are expressed as definedness conditions, i.e., as presuppositions. Consequently, we are led to expect that the existence and the uniqueness requirements behave the same.

Let us turn to the first diagnostics. Horn & Abbot (2013) and Coppock & Beaver (2015) argue that existence need not project out of negation, but uniqueness always does. This is shown with the contrast in (15), from Horn & Abbot (2013: 341). In (15-a), the existence of a king of France is cancelled. In (15-b), the uniqueness of a consul of Illocutia is challenged. The example in (15-a) is rather natural, whereas (15-b) is not. This shows that existence and uniqueness project differently. Thus, approaches that glue them together, such as Elbourne (2005) and Schwarz (2009), are problematic.

(15) a. The king of France isn't bald—(because) there isn't any.

b. #The consul of Illocutia isn't bald—(because) there are two of them.

When looking at the formulations of denotation, existence, and uniqueness in (14), it becomes evident that the denotation of the expression, (14-a), is only defined if the existence requirement, (14-b), is met. Thus, existence is a pre-condition for the expression to be interpretable. The uniqueness requirement in (14-c), however, is independent. If there is no element that satisfies ϕ, the uniqueness requirement (in the sense of "at most one") is satisfied. On the other hand, if there are two or more elements that satisfy ϕ, there would be a denotation according to our definition, but the uniqueness requirement would be violated. Thus, the first two meaning components of ι-expressions in (14) are interdependent, whereas the third one is independent.[3]

3.2 The semantics of our three contexts

While we propose to reconsider ι-expressions, we largely base our analysis of the three definite contexts on existing proposals. In this subsection, we will start with unique nouns, then look at proper names, and, finally, at anaphoric definites.

We will relate our approach primarily to two recent proposals for the semantics of definites, Elbourne (2005) and Schwarz (2009). Just as these, we will adapt a version of situation semantics proposed in Kratzer (1989), which views situations as partial worlds. We will assume that there is a special variable, s_0, that is used for the situation under consideration—analogously to w_0 used in Montague grammar. All predicates have a situation argument, which we will use as the last argument of a predicate. So, instead of being a 1-place predicate, **student** is a 2-place predicate that is true of an individual a and a situation s if and only if a is a student in s.

Unique nouns Elbourne (2005) and Schwarz (2009) stress that the uniqueness of a unique noun is to be understood with respect to a referent situation, i.e., it is always situational uniqueness. In the case of so-called "globally unique nouns" such as *sun*, the situation is just taken to be considerably large. So, for the NP *the sun*, Schwarz assumes the semantics given in (16), i.e., a function that maps any reference situation (s_r) to the unique sun in that situation.

(16) the sun: $\lambda s_r.\iota x : \mathbf{sun}(x, s_r)$

We see a conceptual problem with uniqueness with respect to a particular reference situation. Instead, we think that what is at stake here is uniqueness in the common ground. This means that the communication partners know that uniqueness holds in all relevant situations.[4]

[3] See Horn & Abbot (2013) for more arguments in favor of the CI status of the uniqueness requirement. Coppock & Beaver (2015) take the predicative use of definite NPs as their starting point. They base their analysis on a distinction between the existence and the uniqueness requirement, but treat the uniqueness requirement as a presupposition, in contrast to us, who regard it as a CI.

[4] In the case of global uniques, the relevant situations would be all typical situations. This allows us to account for the global uniqueness of nouns like *pope* even if there had been untypical situations with two popes or situations with no pope.

Proper names Elbourne (2005) contains a recent approaches to the semantics of proper names. He follows Burge (1973) and proposes the analysis sketched in (17).

(17) Moseo/Moisés/moyshe (Eo/Pap/Yid): $(\iota y : (\textbf{moses}(y, s_0) \wedge y = x))$

Here, a name-predicate, **moses**, is used that is true of an individual if and only if that individual bears the indicated name. A proper name is, then, assumed to refer to an individual y that bears the name in a given situation, $\textbf{moses}(y, s_0)$, and that is co-referential with the value of some free variable, $y = x$. The value of x is either contextually instantiated or bound by some quantifier. Since Elbourne (2005) assumes a definition of ι-expressions as in (13), the name-bearing and the coreference are presuppositions.[5]

We will follow the basic insights of these approaches that proper names refer to an individual and that there is a naming predication that is a presupposition. We will deviate from them by our treatment of uniqueness as a CI. We will also assume that proper names are, basically, like unique nouns: if we use a proper name, we assume that there is a single bearer of this name in the common ground, i.e., in all situations that are relevant for the current conversation.

Anaphoric definites Elbourne (2005) assimilates anaphoric definites to unique nouns. He uses minimal situations that are established by the context that contain the antecedent of an anaphoric definite. In such a minimal situation, the anaphoric definite is, then, a situational unique. Schwarz (2009) treats anaphoric definites parallel to pronouns, emphasizing the anaphoric aspect. As a consequence, he largely ignores the descriptive content of anaphoric definites. We will use a variant of Elbourne's approach here: in the case of an anaphoric definite, uniqueness is established within a particular situation, s_0, the situation currently considered.[6]

We have shown in this section that we disagree with how uniqueness is often treated in the analysis of definite noun phrases. First, we argued that it needs to be separated from the existence requirement. Second, we argued that, depending on the type of definite context, the uniqueness requirement holds for all relevant situations (for unique nouns and proper names) or for a single, prominent situation (for anaphoric definites).

[5]The basic assumptions of this approach are also shared by Maier (2009). In Maier's analysis, a proper name introduces a discourse referent and a naming presupposition that is applied to that discourse referent. A DRT-style mechanism of presupposition accommodation allows for non-referring interpretations of proper names.

[6]So-called *bishop sentences* as in (i) are a potential problem to uniqueness-based theories of anaphoric definites. In such examples, there are two bishops given in the discourse, so the minimal situation needs to be defined carefully. Elbourne argues in Elbourne (2005) and subsequent papers that this is possible.

(i) If a bishop meets a(nother) bishop, the bishop blesses the (other) bishop.

4 Formalization of definite meaning

In this section, we will present a semantic analysis of definiteness that expresses our assumptions on uniqueness. We proceed in two steps. First, we clarify the relation among the three meaning components of a definite description as sketched above in (14). Second, we look at the various uniqueness inferences that we will need, in order to distinguish different kinds of definites contexts.

It became clear in Section 3.1 that the existence requirement of a definite noun phrase has the properties of a presupposition and the uniqueness requirement those of a CI. Rather than using a version of an ι-expression, we will split the three meaning component into three dimensions, see (18). The denotation of such an expression is an individual variable x. The presuppositional dimension contains an existential quantification binding this variable and the descriptive content ϕ. The CI content expresses the uniqueness requirement.

(18) The three-dimensional semantics of definite descriptions

a. Asserted content (AC): x
b. Presupposition (Presup): $\exists x(\phi \wedge \ldots)$
c. Conventional implicature (CI): $(\exists x\phi) \supset (\exists!x\phi)$

By distinguishing the three meaning dimensions, we can account for the differences in how the various meaning components project. The asserted content does not project at all. When a projective meaning stops being projected, it is integrated into the asserted content (see Section 5). Presuppositions can project in S-family contexts, but they need not do so. CIs obligatorily project in these contexts.

The interaction of the three meaning dimensions is shown in (19). The asserted content of the definite NP *the ambassador*, x, occurs as the second argument of the predicate **meet**. The existence presupposition is accommodated in the scope of the negation. The accommodation mechanism needs to be formulated in such a way that the variable x is bound by the existential quantifier contributed by the presupposition. Finally, the CI content is added conjunctively at the sentence level.

(19) Alex hasn't met the ambassador (because there is no ambassador).

$$\neg(\exists x(\textbf{amb}(x, s_0) \wedge \textbf{meet}(\textbf{alex}, x, s_0))) \wedge ((\exists x\, \textbf{amb}(x, s_0)) \supset (\exists!x\, \textbf{amb}(x, s_0)))$$

In (18-c) we only gave a very schematic uniqueness inference. Looking at languages with more than one definite article, Am-David (2016) arrives at three different uniqueness inferences, which are stated informally in (20): (A) uniqueness in the situation under consideration, (B) uniqueness in the common ground, and (C) uniqueness in the current universe of discourse.

(20) Three uniqueness inferences for *the N*:

a. A (Maximality): If there is an object satisfying $[\![N]\!]$ in the current

situation, there is exactly one such maximal object.[7,8]

b. B (Common ground uniqueness): In every situation $\mathtt{s}$ in the common ground, if an object satisfying $[\![N]\!]$ exists in $\mathtt{s}$, then there is exactly one such object in $\mathtt{s}$.

c. C (Anaphoricity): If there is an object satisfying $[\![N]\!]$ in the current situation $\mathtt{s}$, then there is exactly one such object in $\mathtt{s}$ that is part of the current universe of discourse.

For the three definite contexts considered in this paper, we only need to be concerned with the inferences (B) and (C): while proper names and unique nouns satisfy (B), anaphoric definites satisfy (C).

We can now provide the semantic analysis for the three definite contexts. We assume that the semantics of the relevant nouns is the same in all three languages discussed in this paper, irrespective of the way in which they mark definiteness. We will start with unique nouns. The semantics of the noun *sun* in our three languages is given in (21). We use the generic quantifier, **Gn**, to quantify over all relevant situations from the common ground.

(21) *suno/solo/zun* 'sun' (Eo/Pap/Yid):

a. AC: x

b. Presup: $\exists x(\textbf{sun}(x, s_0) \wedge \ldots)$
(There is a sun in the current situation.)

c. CI: $(\ldots \wedge \textbf{Gn}\ s\ (\exists x(\textbf{sun}(x, s)) \supset \exists! x(\textbf{sun}(x, s))))$
(Every situation in the common ground that contains a sun, contains exactly one sun.)

The next type of definite NP are proper names. Again, the same semantics is assumed for our three languages. Proper names are like unique nouns: They denote an individual. There is a presupposition that an individual with that name exists in the current situation. There is a CI that typically, we have only one person with that name in a given situation. This is formalized in (22).

(22) *Moseo/Moisés/moyshe* 'Moses' (Eo/Pap/Yid):

a. AC: x
(The name refers directly to an individual)

b. Presup: $\exists x(\textbf{moses}(x, s_0) \wedge \ldots)$
(There is a person that is called Moses in the current situation)

c. CI: $(\ldots \wedge \textbf{Gn}\ s(\exists x(\textbf{moses}(x, s)) \supset \exists! x(\textbf{moses}(x, s))))$
(Every situation in the common ground that contains a person called Moses contains exactly one such person.)

[7] The mentioning of a *maximal* individual in (20-a) is intended to include plural definites, as done in Sharvy (1980). In the present paper, we stick to singular definites and ignore this aspect.

[8] The *if*-part of (A) and (C) is not given in Am-David (2016) but seems to be adequate if we want to keep existence and uniqueness separated as much as possible.

In order to treat anaphoric definites, we need to introduce a new predicate, **d-acc** (**discourse-accessible**). This predicate holds of an individual a and the currently considered situation s if and only if a has been mentioned in the current discourse. The use of this predicate is illustrated in (23).

(23) *la studento/e studiante/der student* 'the student' (Eo/Pap/Yid):

a. AC: x

b. Presup: $\exists x(\mathbf{stud}(x, s_0) \wedge \ldots)$
(There is a student in the current situation)

c. CI:
$(\ldots \wedge (\exists x(\mathbf{stud}(x, s_0)) \supset (\exists! x(\mathbf{stud}(x, s_0) \wedge x = y \wedge \mathbf{d\text{-}acc}(y, s_0)))))$
(If there is a student in the current situation, there is a unique such student that is identical with some y which is accessible within the current discourse.)

The asserted content and the presuppostion in (23) are analogous to those for the other two contexts. The major difference lies in the CI content. Anaphoric definites have a uniqueness CI with respect to the currently considered situation, s_0, only. If there is an individual that satisfies the descriptive content (ϕ) of the NP, then there is exactly one individual that satisfies this description and that is coreferential with an individual y that has been mentioned in the discourse.

5 Framework

Now that the semantics of definite NPs has been introduced, we can turn to the integration into a formal theory of the syntax-semantics interface. We will assume HPSG (Pollard & Sag, 1994), enhanced with *Lexical Resource Semantics* (LRS, Richter & Sailer, 2004), a framework of underspecified semantics.

The basic idea of LRS is that words and phrases constrain the semantic representation of their utterance. These constraints specify what must occur in the representation and where. The constraints are given in the PARTS list of a sign.

For illustration, we provide an AVM for the NP *every student* in (24). The combinatorial semantic features are collected in the LRS attribute. The PARTS list is given in a short form, i.e., as a compact formula that contains meta-variables, represented by lower case Greek letters, α in (24).

(24) every student:

$$\begin{bmatrix} \text{PHON} \langle \textit{every, student} \rangle & \\ \text{SYNS} \mid \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{noun} \end{bmatrix} \\ \text{CONTEXT} & \begin{bmatrix} \text{SPEAKER} & \ldots \\ \text{HEARER} & \ldots \end{bmatrix} \end{bmatrix} \\ \text{LRS} & \begin{bmatrix} \text{EXCONT} & \forall x(\mathbf{student}(x, s_0) \supset \alpha) \\ \text{PARTS} & \langle \forall x(\mathbf{student}(x, s_0) \supset \alpha) \rangle \end{bmatrix} \end{bmatrix}$$

The EX(TERNAL-)CONT(ENT) value of a sentence expresses the sentence's

truth conditions. The *External Content Principle* requires that logical form of the sentence consists exactly of the material that is introduced by the lexical constraints. Technically, it is specified that all and only the elements of the PARTS list constitute the EXCONT value of a sentence, i.e. its logical form.

According to Richter & Sailer (2004), the EXCONT of a nominal element binds the discourse referent associated with the NP, x, in our example. For this reason, the quantifier $\forall x(\ldots)$ appears on both, the PARTS and the EXCONT values.[9]

So far, LRS publications did not discuss presuppositions and CIs, but there are proposals to build on: Bonami & Godard (2007) provide an encoding of CIs for evaluative adverbs using *Minimal Recursion Semantics* (Copestake et al., 2005). Hasegawa & Koenig (2011) propose a structured-meaning analysis for focus within LRS. Pollard & Sag (1994: 334) already mention that projective meaning could be treated in HPSG by applying a percolation mechanism, just as they use a SLASH percolation for extraction and Cooper storage mechanism for scope. We will adopt this suggestion.

We introduce two new list-valued features inside the LRS value of a sign: PRESUP(POSITIONS) for the presuppositions and CI for the CI content. The elements of PRESUP and CI also occur on the PARTS list. We assume special percolation principles for the new features, which are given in a preliminary form in (25) and (26). The percolation and retrieval principle for PRESUP states that presuppositions percolate unless they are retrieved in the scope of some appropriate operator.

(25) Percolation and retrieval for PRESUP:
In each phrase: All elements from the daughters' PRESUP lists are on the mother's PRESUP list unless the phrase is a clause and they appear in the clause's EXCONT value. In the latter case, they occur in the scope of some appropriate semantic operator.

CIs can only be retrieved in utterance-like contexts. Consequently, the percolation and retrieval mechanism in (26) says that elements of the CI list percolate unless they are retrieved at some utterance-like phrase (including indirect speech).

(26) Percolation and retrieval for CI:
In each phrase: All elements from the daughters' CI lists are on the mother's CI list unless the phrase is a matrix or an embedded utterance and they appear in the phrase's EXCONT value. In the latter case, they must occur in the immediate scope of some speech-act operator.

For illustration, consider the sentence in (27). We indicate the reading of the sentence, where we ignore the semantics of the proper names and only focus on the NP *the ambassador*. We will derive the reading in which the existence presupposition is accommodated inside the embedded clause, and the uniqueness CI

[9]The difference between PARTS and EXCONT will become more visible in later examples, where it will be clear that the PARTS value is a list, whereas the EXCONT value is always a single formula.

projects all the way up. In (28), we provide the three-dimensional encoding of the semantics of the definite NP *the ambassador*.

(27) [Context: There is no ambassador.]
Chris believes that Alex has met the ambassador.
$\textbf{believe}(\textbf{chris}, \lambda s_1 \exists x(\textbf{amb}(x, s_1) \wedge \textbf{meet}(\textbf{alex}, x, s_1)), s_0)$
$\wedge \textbf{Gn}\, s(\exists x\, \textbf{amb}(x, s) \supset \exists! x\, \textbf{amb}(x, s)))$

(28) The semantics of *the ambassador*:

$$\left[\begin{array}{ll} \text{LRS} & \left[\begin{array}{ll} \text{PARTS} & \langle x, \boxed{1}, \boxed{2}\rangle \\ \text{PRESUP} & \langle \boxed{1}\, \exists x(\textbf{amb}(x, s_1) \wedge \alpha)\rangle \\ \text{CI} & \langle \boxed{2}\, (\beta \wedge \textbf{Gn}\, s(\exists x\, \textbf{amb}(x, s) \supset \exists! x\, \textbf{amb}(x, s)))\rangle \end{array}\right] \end{array}\right]$$

The semantics of the embedded clause is shown in (29). Here, the presupposition is retrieved. The PRESUP list is empty and the presupposition appears in the clause's EXCONT value.

(29) The semantics of *Alex met the ambassador*:

$$\left[\begin{array}{ll} \text{LRS} & \left[\begin{array}{ll} \text{EXCONT} & \exists x(\textbf{amb}(x, s_1) \wedge \textbf{meet}(\textbf{alex}, x, s_1)) \\ \text{PARTS} & \langle x, \boxed{1}, \boxed{2}, \textbf{meet}(\textbf{alex}, x, s_0)\rangle \\ \text{PRESUP} & \langle\rangle \\ \text{CI} & \langle \boxed{2}\, (\beta \wedge \textbf{Gn}\, s(\exists x\, \textbf{amb}(x, s) \supset \exists! x\, \textbf{amb}(x, s)))\rangle \end{array}\right] \end{array}\right]$$

The semantics of the overall sentence is given in (30). Now, the CI list is also empty. The CI is added to the overall EXCONT. This overall EXCONT consists exactly of the elements of the PARTS list.

(30) The semantics of *Chris believes that Alex has met the ambassador*:

$$\left[\begin{array}{ll} \text{LRS} & \left[\begin{array}{ll} \text{EXCONT} & \textbf{believe}(\textbf{chris}, \lambda s_1 \exists x(\textbf{amb}(x, s_1) \wedge \textbf{meet}(\textbf{alex}, x, s_1)), s_0) \\ & \wedge \textbf{Gn}\, s(\exists x\, \textbf{amb}(x, s) \supset \exists! x\, \textbf{amb}(x, s))) \\ \text{PARTS} & \langle x, \boxed{1}, \boxed{2}, \textbf{meet}(\textbf{alex}, x, s_1), \textbf{believe}(\textbf{chris}, \lambda s_1 \gamma, s_0)\rangle \\ \text{PRESUP} & \langle\rangle \\ \text{CI} & \langle\rangle \end{array}\right] \end{array}\right]$$

In this section, we have shown how our three-dimensional analysis of semantic definiteness can be integrated into LRS. Since percolating feature values is one of the major analytic techniques of HPSG and LRS, we have a technique at hands to encode projective meaning. It is important for the rest of the paper that we assume the same semantics for the nouns in the three languages discussed in Section 2. The language-specific differences will, then, be attributed to differences in the semantics of the articles and to syntactic differences.

6 Analysis of definite marking in Eo, Pap, and Yid

We can, now, look at the analysis of definite NPs in Eo, Pap, and Yid. We will provide lexical entries for nouns of various types and determiners and, in the case

of Yid, of preposition-determiner combinations. Since we focus on the occurrence of an article, we will only mention the SPR value among the valence features.

We saw in Section 2 that proper names normally do not take an article in Eo, Pap, or Yid. Consequently, we specifiy the SPR list as only optionally containing a determiner.[10] We already gave the semantics of proper names in (22), which re-appears in the LRS value in the lexical entry (31).

(31) Relevant parts of the lexical entry of the name *Moseo/Moisés/moyshe*:

$$\begin{bmatrix} \text{PHON} \langle \textit{Moseo/Moisés/moyshe} \rangle \\ \text{SYNS} \mid \text{LOC} \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{VAL} & \left[\text{SPR} \left\langle \boxed{\text{Det}} \right\rangle \right] \end{bmatrix} \\ \text{LRS} \begin{bmatrix} \text{PARTS} & \langle x, \boxed{1}, \boxed{2} \rangle \\ \text{PRESUP} & \langle \boxed{1} \exists x(\textbf{moses}(x, s_0) \wedge \alpha) \rangle \\ \text{CI} & \langle \boxed{2} (\beta \wedge \textbf{Gn}\ s\ (\exists x(\textbf{moses}(x, s)) \supset \exists! x(\textbf{moses}(x, s)))) \rangle \end{bmatrix} \end{bmatrix}$$

Unique nouns look like proper names with respect to their semantic representation. Therefore, in Pap, the lexical entry of a unique noun such as *solo* 'sun' would look very similar to the one in (31). In Eo and Yid, unique nouns require a determiner. In (32), we sketch the lexical entry for the noun *suno/zun* 'sun'.

(32) Relevant parts of the lexical entry of *suno/zun* 'sun' (Eo/Yid):

$$\begin{bmatrix} \text{PHON} \langle \textit{suno/zun} \rangle \\ \text{SYNS} \mid \text{LOC} \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{VAL} & \left[\text{SPR} \left\langle \text{Det} \right\rangle \right] \end{bmatrix} \\ \text{LRS} \begin{bmatrix} \text{PARTS} & \langle x, \boxed{1}, \boxed{2} \rangle \\ \text{PRESUP} & \langle \boxed{1} (\exists x(\textbf{sun}(x, s_0) \wedge \alpha)) \rangle \\ \text{CI} & \langle \boxed{2} (\beta \wedge \textbf{Gn}\ s\ (\exists x(\textbf{sun}(x, s) \supset \exists! x(\textbf{sun}(x, s))))) \rangle \end{bmatrix} \end{bmatrix}$$

An ordinary singular count noun such as *studento/studiante/student* 'student' has a lexical entry as in (33): A determiner is required and the PRESUP and CI lists are empty.

(33) Relevant parts of the lexical entry of a singular count noun (Eo, Pap, Yid):

$$\begin{bmatrix} \text{PHON} \langle \textit{studento/studiante/student} \rangle \\ \text{SYNS} \mid \text{LOC} \left[\text{VAL} \left[\text{SPR} \left\langle \text{Det} \right\rangle \right] \right] \\ \text{LRS} \begin{bmatrix} \text{PARTS} & \langle x, \textbf{student}(x, s_0) \rangle \\ \text{PRESUP} & \langle \rangle \\ \text{CI} & \langle \rangle \end{bmatrix} \end{bmatrix}$$

We can now consider the lexical entries of the definite articles. We showed in

[10] All lexical entries in this paper are considerably simplified. In particular, we would need to allow for additional semantic material in the definite description, as in (4). We would write, for example, $\exists x(\gamma[\textbf{moses}(x, s_0)] \wedge \alpha)$ in the PRESUP value. There, γ is a meta-variable over formulæ and $\gamma[\textbf{moses}(x, s_0)]$ describes a formula γ that contains $\textbf{moses}(x, s_0)$ and possibly other material. There could, then, be a condition that the SPR list is empty if and only if $\gamma \equiv \textbf{moses}(x, s_0)$.

Section 2 that the article *la* is used in all definite contexts in Eo except for proper names. The lexical entry of this word is sketched in (34).[11]

(34) Relevant parts of the lexical entry of the Eo definite article *la*:

$$\begin{bmatrix} \text{PHON} \langle la \rangle \\ \text{SYNS} \mid \text{LOC} \left[\text{HEAD} \ \textit{det} \right] \\ \text{LRS} \begin{bmatrix} \text{PARTS} & \langle x, \boxed{1}, \boxed{2} \rangle \\ \text{PRESUP} & \langle \boxed{1} \exists x(\phi \wedge \alpha) \rangle \\ \text{CI} & \langle \boxed{2}(\beta \wedge (\exists x \phi \supset \exists! x \phi)) \rangle \end{bmatrix} \end{bmatrix}$$

When the words from (33) and (34) combine to form the NP *la studento*, the general LRS combinatorics ensure that their referential variables are identified, x here, and that the descriptive content of the head noun, **student**(x, s_0), appears in ϕ, i.e., as part of the existence and uniqueness requirements. No situation is mentioned in (34), but, since the noun *studento* uses the situation under consideration, s_0, existence and uniqueness will be required for s_0 as well.

In Eo, the definite article is also required with unique nouns. When the definite article *la* combines with a unique noun like *suno* from (32), ϕ will be identified with **sun**(x, s_0). The noun and the article, then, have identical presuppositions. In LRS, various elements can make identical contributions to the overall logical form—a property used extensively in the LRS analysis of negative concord in Richter & Sailer (2004), for example. The NP *la suno* inherits the CIs of both the article and the noun. The noun requires uniqueness in all relevant situations, and the article requires uniqueness in the considered situation, s_0. Since the considered situation is clearly relevant for a conversation, the article's uniqueness requirement is subsumed under that of the noun. In this sense, the use of an article with a unique noun is semantically redundant.

We saw above that Pap uses its definite article *e* only with anaphoric definites. Unique nouns can be used with *e* if they are used anaphorically. The lexical entry of *e* is sketched in (35). It has the same existence presupposition as Eo *la* in (34), but it has the anaphoric uniqueness requirement as its CI. Consequently, a unique noun can only combine with the article in anaphoric definite contexts, which is why the example in (6) above is ungrammatical unless the unique noun is used explicitly as an anaphoric definite. When the noun *studiante* combines with *e*, we arrive at exactly the semantics given for anaphoric definites in (23).

(35) Relevant parts of the lexical entry of the P definite article *e*:

$$\begin{bmatrix} \text{PHON} \langle e \rangle \\ \text{SYNS} \mid \text{LOC} \left[\text{HEAD} \ \textit{det} \right] \\ \text{LRS} \begin{bmatrix} \text{PARTS} & \langle x, \boxed{1}, \boxed{2} \rangle \\ \text{PRESUP} & \langle \boxed{1} \exists x(\phi \wedge \alpha) \rangle \\ \text{CI} & \langle \boxed{2}(\beta \wedge \exists x \phi \supset \exists! x(\phi \wedge x = y \wedge \textbf{d-acc}(y, s_0))))) \rangle \end{bmatrix} \end{bmatrix}$$

[11] For our purpose, it is not important whether it is just the head noun selecting a determiner or whether there is also selection of the noun by the determiner. Therefore, we will ignore all valence and other selectional attributes in our descriptions of determiners.

In Yid, we saw that there is a full form of the definite article but also, in some cases, a reduced form which is contracted with a preposition. It is a lexical idiosyncrasy of individual prepositions whether such a contracted form exists for some definite articles or not. The preposition *af* 'on', for example, has a contracted form with the article *dem* (masculine singular dative/accusative; neuter singular dative), but not with any other definite article. We saw above that the contracted form is only used with unique nouns, i.e., nouns that require a determiner (not proper names) and that require uniqueness for all relevant situations.

To model this distribution, we assume that the lexical entry of the full form of the definite article looks as for Eo *la* in (34). The contracted P-Det form *afn* has a lexical entry as in (36). This word is a preposition but selects for a noun that requires a determiner. The P-Det contraction has the presupposition and the CI of a unique noun. Consequently, it only combines with unique nouns. In the PARTS list in (36), we write "..." for whatever is the genuine lexical semantics of *af* 'on'.

(36) Relevant parts of the lexical entry of *afn* 'on-the' (Yid):

$$\left[\begin{array}{ll}
\text{PHON} & \langle \textit{afn} \rangle \\
\text{SYNS} \mid \text{LOC} & \left[\begin{array}{ll}
\text{HEAD} & \textit{prep} \\
\text{VAL} & \left[\begin{array}{ll}
\text{SUBJ} & \langle\rangle \\
\text{SPR} & \langle\rangle \\
\text{COMPS} & \left\langle \text{N}\left[\begin{array}{ll}\text{HEAD} & \left[\begin{array}{ll}\text{NUM} & \textit{sg} \\ \text{GEN} & \textit{(masc \textbf{or} neutr)}\end{array}\right] \\ \text{VAL SPR} & \langle \text{Det} \rangle\end{array}\right] \right\rangle
\end{array}\right]
\end{array}\right] \\
\text{LRS} & \left[\begin{array}{ll}
\text{PARTS} & \langle x, \boxed{1}, \boxed{2}, \ldots \rangle \\
\text{PRESUP} & \langle \boxed{1} \exists x(\phi \wedge \alpha) \rangle \\
\text{CI} & \langle \boxed{2} (\beta \wedge \textbf{Gn}\ s\ (\exists x \phi \supset \exists! x \phi)) \rangle
\end{array}\right]
\end{array}\right]$$

The lexical entry in (36) guarantees that the contracted form P-Det only occurs with unique nouns. We do not restrict the non-contracted form of the preposition, because it can occur with proper names, with feminine unique nouns, and with anaphoric definites.

With this characterization, both the contracted form *afn* and the form *af dem* are compatible with unique nouns. We find a clear preference for the contracted form with plain unique nouns. If a unique noun occurs with a post-nominal PP, the non-contracted form is preferred.[12] This suggests that (36) should also include a constraint on the syntactic or the semantic complexity of the nominal complement. In addition, a performance strategy might have to be evoked: Since the contracted form is more restricted, and, thus, less ambiguous, it is preferred over the non-contracted form whenever possible.

The basic assumption of the present analysis is that the semantics of definiteness is encoded in the same way in the three languages that we have been addressing. Consequently, the semantic specifications for proper names, unique nouns, and

[12] In the consulted Yid corpus, CMY, there is no occurrence of the contracted form *tsum meylekh fun* 'to.the king of', but 48 occurrences of the non-contracted *tsu dem meylekh fun* 'to the king of'.

ordinary nouns are the same in all three languages. However, the languages differ with respect to their inventory of articles: Eo and Yid have very general definite articles. Pap has an article that is restricted to anaphoric definites, and Yid has P-Det contractions that are restricted to unique nouns. In Eo and Yid, unique nouns require an article syntactically, even though they already carry definite meaning (i.e., an existence and uniqueness requirement). This can easily be captured in LRS, as LRS allows for identical semantic contributions.

7 Conclusion

In this paper, we have implemented the theory of definiteness from Am-David (2016) in HPSG and applied it to three languages, namely Esperanto, Papiamentu, and Yiddish. We have argued for a three-dimensional analysis of definiteness, which distinguishes between denotation, presupposition, and conventional implicature. All definite contexts that we considered make the same existential presupposition, but they differ with respect to their uniqueness requirements: while proper names and unique nouns require uniqueness in all relevant situations, anaphoric definites require uniqueness only in the currently considered situation.

The question of whether or not a determiner is required syntactically is orthogonal to this semantic difference. The definite article in Eo is neutral with respect to the type of definite. Therefore, it is the syntax of the head noun that determines whether an article is present or not. The definite article in Pap is semantically restricted to anaphoric definites. Therefore, its use is constrained both syntactically and semantically. In Yid, the contracted P-Det combinations are semantically constrained, whereas the full form is only constrained syntactically and by the contrast to the contracted form.

We see the following differences between our approach and previous studies on definites: First, the separation of existence and uniqueness allows for an empirically more adequate formal modelling of definiteness. It also helps us to identify the differences between various definite contexts, which we relate to differences in the uniqueness requirement. Second, while the literature often concentrates on either the determiner (Hawkins, 1991; Elbourne, 2005; Schwarz, 2009) or the noun (Löbner, 2011), we can locate definite meaning in both the article and the noun if required. Third, we do not need to assume phonologically empty determiners for a comparable analysis across several languages, as done, for example, in Kester & Schmitt (2007) for Pap, because we can associate definiteness directly with lexical nouns. Fourth, whereas Schwarz (2009) has extensively discussed the meaning of P-Det combinations in German, we have tried to sketch a more complete picture for the similar cases in Yid, also covering the combination of a full article with a unique noun.

Our HPSG implementation of the theory of definiteness relies on standard mechanisms of the theory: different types of projective meaning are encoded by

individual feature percolation principles. This technique has been the basis of the HPSG analyses of unbounded dependencies, quantifier scope, and other phenomena (Pollard & Sag, 1994). Our analysis of the semantically redundant—but syntactically required—use of a definite article with a unique noun exploits another basic analytic device of HPSG: token identity. Identities have been used in HPSG for Binding Theory and agreement (Pollard & Sag, 1994) and, in LRS, for negative concord and other phenomena of semantic concord.

The present paper is, admittedly, programmatic and leaves room for elaboration and extensions. Natural extensions would be to include more languages from the typological discussion in Am-David (2016), but also to adapt our analysis to languages without a definite article, such as Polish. Hawkins (1991) saw the main difference between definite articles and demonstrative determiners in the fact that demonstratives require uniqueness with respect to the sensually perceivable domain, whereas definites work on the domains of discourse. Our approach provides a good starting point for an implementation of this idea.

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