# Loose talk, negation and commutativity: A hybrid static-dynamic theory[1]

Sam CARTER — *Rutgers, The State University of New Jersey*

**Abstract.** This paper investigates the interaction of phenomena associated with loose talk with embedded contexts. §1 introduces core features associated with the loose interpretation of an utterance and presents a sketch of how to theorise about such utterances in terms of a relation of 'pragmatic equivalence'. §2 discusses further features of loose talk arising from interaction with 'loose talk regulators', negation and conjunction. §§3-4 introduce a hybrid static/dynamic framework and show how it can be employed in developing a fragment which accounts for the data surveyed in §§1-2.

**Keywords:** loose talk, order effects, dynamic semantics, pragmatic equivalence, inexactness, granularity, imprecision, slack regulators, non-literal language use.

## 1. Introduction: Loose talk phenomena

Loose talk is an example of the non-literal use of language. In cases of loose talk, the **communicated content** of an utterance (i.e., the proposition with which a hearer can be expected to update their doxastic state) deviates from its **literal content** (i.e., the proposition corresponding to the truth conditions of the utterance). Relatedly, the conditions under which the uttered sentence is true can differ from the conditions under which an utterance of that sentence is felicitous.

This paper examines a number of ways in which the communicated content and felicity conditions of loose utterances interact with operators and logical connectives in English. In particular, it is argued that, while sensitive to conversational context, the communicated content of such utterances can be derived compositionally in a dynamic framework and is dependent upon aspects of the lexical meaning of constituent expressions which outstrip their contribution to truth conditions.

An utterance of (1) in its specified context can be expected to exhibit loose talk phenomena.

(1) The British Library owns 14 million books.
*Context.1*: The interlocutors are trying to determine roughly how many books are owned by a range of major world libraries.
*Circumstances.1*: The British Library owns (approximately) 13,950,000 books.[2]

In *Context.1*, the communicated content of (the utterance of) (1) will be a proposition true iff the number of books owned by the British Library falls within some non-trivial interval of 14 million. Whereas the literal content of the utterance will be false if the British Library in fact

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[2] *British Library thirty-seventh annual report and accounts 2009/10.* ⟨https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/247725/0153.pdf⟩

owns 13,950,000, its communicated content will be true. Similarly, the utterance of (1) in *Context.1* and *Circumstances.1* appears felicitous, despite the falsehood of its literal content.

### 1.1. Pragmatic equivalence

The degree to which the communicated content of a loose utterance differs from its literal content depends, in part, upon the conversational interests of the interlocutors. In *Context.1*, since the conversational participants are trying to determine only roughly how many books each major library owns, (1) can be expected to communicate a proposition which is true if it owns 13,950,000 books. In contrast, let *Context.2* be a context in which the conversational participants are trying to determine whether the British Library owns more books than the Library of Congress, which owns, say, 13,990,000. In *Context.2*, the proposition communicated by (1) can be expected to be false.

Say that two worlds are pragmatically equivalent at a context iff they do not differ in any way which is relevant to the conversational interests of the interlocutors. For example, at *Context.1*, a world in which the BL owns 13,950,000 and one in which it owns 14 million will be pragmatically equivalent. In contrast, at *Context.2*, they will not, since the worlds differ with respect to a state of affairs relevant to the interlocutors' interests, namely whether the BL owns more books than the Library of Congress. Pragmatic equivalence can be expected to be reflexive and symmetric, but need not be transitive. No world differs from itself in ways which are pragmatically relevant, and if $w$ does not differ from $w'$ in any way which is pragmatically relevant, then $w'$ does not differ from $w$ in any way which is pragmatically relevant. However, $w$ may differ from $w''$ in ways which are pragmatically relevant, despite being pragmatically equivalent to some $w'$ which is itself pragmatically equivalent to $w''$; pragmatically irrelevant differences can add up to form a pragmatically relevant difference.

Given the relation of pragmatic equivalence, we can outline an approach to thinking about the communicated content and felicity conditions of loose utterances of simple sentences such as (1). A loose utterance of a simple sentence φ is felicitous at a context C and world $w$ iff there is some world pragmatically equivalent to $w$ at C at which the literal content of φ is true.[3] At any world in which the BL owns 13,950,000 books, a loose utterance of (1) would be felicitous at *Context.1*, but infelicitous at *Context.2*. Stated succinctly, a loose utterance of a simple sentence is felicitous iff any difference between the world of utterance and one in which the sentence is true is pragmatically irrelevant.

Correspondingly, a loose utterance of a simple sentence φ at a context C and world $w$ communicates the proposition true at all worlds $w'$ such that there is some world pragmatically equivalent to $w'$ at which the literal content of φ is true. If determining the number of books owned by major libraries were exhaustive of the conversational interests in *Context.1*, then (1) might be expected to communicate the proposition that the number of books the BL owns is between $13.5\times10^6$ and $14.5\times10^6$. Likewise, if determining whether the

[3] Strictly speaking, only the left-to-right direction of the biconditional is true, since other conditions on felicity unrelated to loose talk might fail to be satisfied. For present purposes, we can treat the biconditional as embedded under a *ceteris paribus* clause.

British Library or the Library of Congress owns more books were exhaustive of the conversational interests in *Context.2*, then (1) might be expected to communicate the proposition that the number of books owned by the BL exceeds 13,990,000.

For simple sentences, the truth of φ at a world pragmatically equivalent to the world of utterance appears necessary and sufficient for both the felicitous utterance of φ and the truth of that utterance's communicated content. However, as §2 demonstrates, the same generalisations cannot be extended to account for the loose utterance of complex constructions.

## 2. Loose talk: Further data

### 2.1. LT-regulators

As has been noted elsewhere (Lasersohn, 1999; Sauerland and Stateva, 2011; Solt, 2014; a.o.), there exist a range of expressions which function lexically to modify the relation between the communicated and literal contents of loose utterances. Call such expressions **loose talk (LT-) regulators**.[4] The class of LT-regulators can be subdivided into **LT-strengtheners** (e.g., 'exactly' in (2a)) and **LT-weakeners** (e.g., 'roughly' in (2b)).

(2) a. The British Library owns exactly 14 million books.
b. The British Library owns roughly 14 million books.

As Lasersohn notes, in contrast to (1), when uttered in context the communicated contents of sentences like (2a)-(2b) coincide with their literal content (1999: 545). The communicated content of an utterance of (2a) is strictly stronger than (i.e. asymmetrically entails) the communicated content of (1) and the utterance is, intuitively, infelicitous if the BL owns less than 14 million books. In contrast, the literal content of (2b) is strictly weaker than (i.e., asymmetrically entailed by) the literal content of (1), and the utterance is, intuitively, true if the BL owns 13,950,000 books. Stated informally, the effect of the LT-strengthener in (2a) is to assimilate the communicated content of the utterance to its literal content, whereas the effect of the LT-weakener in (2b) is to assimilate the literal content of the utterance to its communicated content.[5] Note that 'exactly' also appears to have an effect on the truth-conditional meaning of numerical determiners, making them 'upper-bounded'. For present purposes, this effect can be set aside. Note that despite differing in felicity, both (1) and (2a) communicate a literal content which is false in *Circumstance.1*, regardless of whether the numerical determiner is upper-bounded. Hence the effect of LT-strengtheners on numerical determiners is clearly not exhausted by their truth-conditional contribution.

As the contrast between (3a-b) suggests, LT-regulators such as 'exactly'/'roughly' do not function as sentential operators, but rather take sub-clausal complements:

[4] Lasersohn uses the terminology 'slack regulators' whereas Solt, following Sauerland and Stateva, adopts 'approximators'.

[5] LT-weakeners also appear to have a non-trivial effect on the communicated content of loose talk utterances. For example, the communicated content and felicity of (ia-b) differ:

(i) a. ?? The British Library does not own exactly 14 million books, but it does own 14 million.
b. The British Library does not own exactly 14 million books, but it does own roughly 14 million.

(3) a. Exactly/roughly 100 libraries own 1 million books.
b. 100 libraries own exactly/roughly 1 million books.

This suggests that whatever treatment of LT-regulators is developed, it will need to account for the contrast between (3a-b) compositionally, in terms of the difference in constituent structure.

In (2a-b), the LT-regulator combines with numerical determiner '14 million'.[6] However, we can also identify apparent LT-regulators taking quantified DPs (e.g. (4b)), PPs (e.g., (5b)), adjectives/APs (e.g. (6b)), and temporal NPs (e.g. (7b)) as complements.

(4) a. Everybody likes the new Scorsese film.
b. Absolutely/pretty much everybody likes the new Scorsese film.

(5) a. The helicopter landed in the centre of the field.
b. The helicopter landed precisely/roughly in the centre of the field.

(6) a. The bin is full.[7]
b. The bin is completely/effectively full.

(7) a. Katja arrived at 6pm.
b. Katja arrived at exactly/roughly 6pm.

Correspondingly, the potential for contrast in felicity between utterances of (4-7a) and (4-7b) suggests that, in appropriate contexts, (4-7a) all permit a loose interpretation.

While many of the features of loose talk and LT-regulators addressed above have been discussed in previous work, most notably in Lasersohn (1999), little attention has been paid

[6] The ability of 'exactly' and 'roughly' to combine with numerical determiners as in (3a) might be thought to motivate an analysis on which they take '6' as their complement in (2a-b), before combining with 'pm' to form a temporal NP. On this account, 'exactly'/'roughly' could be understood as univocally taking numerical arguments. However, constructions such as (i) demonstrate the possibility of their combining directly with temporal NPs, and suggest that they are equivocal across (3a-b).

(i) Katja arrived at exactly/roughly the same time as Jonas.

[7] Here I follow Kennedy (2007) and Kennedy and McNally (2005) in assuming that, as constructions such as (i) suggest, absolute gradable adjectives such as 'full' require their subject to possess a maximal degree of the relevant property.

(i) ??The bin is full but it could be more full.

They argue that the possibility of felicitously of predicating such adjectives of subjects with only a close-to-maximal degree of the relevant property then needs to be explained in terms of loose talk. Correspondingly, in (6b) and (ii), 'completely' will need to be understood as an LT-regulator rather than a degree modifier. Similar examples with non-gradable adjectives can be constructed (as in (iii)):

(ii) The bin is full but it is not completely full.
(iii) The result is (effectively) unprecedented, but it is not completely unprecedented.

to their behaviour in complex constructions. §2.2-3 survey novel phenomena involving the interaction of loose talk with negation and conjunction.

## 2.2. Negation

As uttered in context, the communicated content of (1) is asymmetrically entailed by its literal content. This has frequently been taken to be amongst the defining features of loose talk (Lasersohn, 1999; Yablo, 2014; Lauer, 2012; though cf. Davis, 2007: 411). For example, Lauer claims that "loose talk is a phenomenon in which the communicated content is weaker than the semantic content" (p. 389).

However, the loose utterances of sentences embedded under negation generate counter-examples to this claim.[8] If the communicated content of an utterance of φ is *weaker* than its literal content, the communicated content of an utterance of ¬φ will be *stronger* than its literal content.

(8) The British Library doesn't own 14 million books.[9]

In *Context.1*, the communicated content of (the utterance of) (8) is a proposition true iff the number of books owned by the BL does not fall within some non-trivial interval of 14 million. Whereas the literal content of the utterance will be true if the library owns 13,950,000 books, its communicated content will, plausibly, be false. Similarly, whereas in *Context.1*, an utterance of (1) is felicitous despite being false, in the same context, an utterance of (8) will be infelicitous but true.

The observed effect of negation suffices to demonstrate that the explanation of communicated content/felicity conditions for loose utterance of simple sentences in terms of literal truth at a pragmatically equivalent world cannot be trivially generalised to the utterance of sentences embedded under negation. There if the BL owns 13,950,000 books, then there is a world pragmatically equivalent at *Context.1* to *w* in which the literal content of (8) is true (since every world is trivially pragmatically equivalent to itself). Nevertheless, under these

[8] Not all counter-examples to the claim involve negation, and not all utterances of sentences embedded under negation constitute counter-examples to the claim. The communicated content of loose utterances of sentences such as (ia-b) involving minimal standards gradable adjectives will be strictly stronger than their literal content (in an appropriate context):

(i) a. The stick is curved.
b. The road is wet.

Correspondingly, the communicated content of loose utterances of their negations will be strictly weaker than the literal content.

[9] The same effect can be elicited in other constructions which exhibit loose talk phenomena in appropriate contexts:

(i) Not everybody likes the new Scorsese film.
(ii) The helicopter did not land in the centre of the field.
(iii) The bin is not full.
(iv) Katja did not arrive at 6pm.

circumstances its utterance would be infelicitous in *Context.1* and its communicated content false.

### 2.3. Commutativity

The felicity of loose utterances of certain conjunctive sentence is dependent upon to order of the conjuncts. Whereas (9a) is felicitous in any context in which the LH-conjunct has a true communicated content but a false literal content, (9b) is infelicitous in every context.

(9) a. The British Library owns 14 million books, though it does not own exactly 14 million.
b. ??The British Library does not own exactly 14 million books, though it does own 14 million.[10]

We can describe this phenomenon by saying that conjunction fails to commute with respect to the felicity of loose utterances. The felicity of a loose utterance of $\varphi \wedge \psi$ does not entail the felicity of a loose utterance of $\psi \wedge \varphi$.

§3, below, introduces a framework in which to theorise about loose talk, employing both a static and dynamic interpretation function. §4 presents a fragment in this framework and shows how it accounts for the phenomena in §2.

## 3. Dynamic Loose Talk (DLT)

### 3.1 Overview

This section presents a hybrid static-dynamic framework for theorising about loose talk. The primary idea behind the framework is that the lexically encoded meaning of a loose utterance of a sentence is not exhausted by its truth conditions. For example, (1) and (2a) have the same **truth conditions**, but they differ in total **compositional meaning**. In addition to explaining the difference in their felicity conditions/communicated content, this difference in meaning can account for the difference in the effect they have in embedded contexts, as demonstrated in (8) and (9a-b).

[10] The same effect can be elicited in constructions with LT-regulators taking expressions of different lexical categories:

(i) a. Everybody, but not absolutely everybody, likes the new Scorsese film.
b. ?? Not absolutely everybody, but everybody, likes the new Scorsese film.

(ii) a. The helicopter landed in the centre of the field but it did not land precisely in the centre.
b. ?? The helicopter did not land precisely in the centre of the field, but it landed in the centre.

(iii) a. The bin is full, but it is not completely full.
b. ?? The bin is not completely full, but it is full.

(iv) a. Katja arrived at 6pm, but she did not arrive at exactly 6pm.
b. ?? Katja did not arrive at exactly 6pm, but she arrived at 6pm.

This idea can be seen as analogous to observations made in dynamic treatments of anaphora (e.g., Kamp, 1981; Heim, 1982, 1983; Roberts, 1989; Groenendijk and Stokhof, 1991a; a.o.), modals (e.g., Veltman, 1996; Roberts, 1989; Groenendijk and Stokhof, 1991b; a.o.) and presupposition (Karttunen, 1973; Heim, 1983; a.o.). For example, on the basis of the contrast between (10a-b), Heim concludes that "the salience-shifting potential of an utterance is not predictable from its truth-conditions and the surrounding circumstances alone" (1982, 22).

(10) a. I dropped ten marbles and found all of them, except for one. It is probably under the sofa.
b. I dropped ten marbles and found only nine of them. ??It is probably under the sofa.[11]

That is, in (10a-b) the first sentences of the discourses are truth-conditionally equivalent, but differ in meaning.

In the Dynamic Loose Talk (DLT) framework, every utterance of a sentence is treated as playing a dual role: (i.) it expresses a proposition, corresponding to its literal content; and (ii.) it modifies, potentially trivially, the relation of pragmatic equivalence at the context. Since the effect of an utterance on the relation of pragmatic equivalence is not a function of its literal content, it must be included independently as an additional part of the lexically encoded meaning of the sentence uttered.[12]

A DLT-model contains two interpretation functions: a static interpretation function $[\![\cdot]\!]$, mapping a sentence to its literal content, and a dynamic interpretation function $[\cdot]$, mapping it to its effect on a context. The static denotation of a sentence is a **proposition** – a function from worlds to truth values. The dynamic denotation of a sentence is a **context change potential** - a function from contexts to contexts. In DLT, a context C is identified with an **accessibility relation** $R^C$ – a relation between worlds. Intuitively, $\langle w,w'\rangle \in R^C$ iff $w'$ is pragmatically equivalent to $w$ in C.

Sentences are evaluated in DLT relative to a pair $\langle w,R\rangle$ consisting of world and accessibility relation. Where $[\![\varphi]\!](w)=1$, we say that φ is **true-at-**$\langle w,R\rangle$. Where $R[\varphi](w)$ is non-empty, we say that φ is **consistent-at-**$\langle w,R\rangle$. Stated alternatively, a sentence is consistent-at-$\langle w,R\rangle$ iff $R[\varphi]$ – the result of updating R with $[\varphi]$ – relates $w$ to at least one world. An utterance of φ is held to be **felicitous** in a conversation C and world $w$ iff φ is consistent-at-$\langle w,R^C\rangle$. The communicated content of a sentence φ at R is (the characteristic function of) the set of worlds at which φ is consistent relative to R.

## 3.2. DLT-models

The set T of DLT-types is defined recursively from basic types s, e, and t (corresponding to worlds, individuals and truth-values, respectively).

[11] Attributed to Partee, p.c., Heim (ibid).

[12] Grice's non-detachability constraint, which states that any content conveyed in a non-conventionalised manner by an utterance must be conveyed by any utterance with the same conventionalised meaning (with a proviso for implicatures generated by Manner) (1975, 43-6), can be seen as articulating this point.

(DEF.1) s, e, and t are **DLT-types**. If $\tau,\tau'$ are **DLT-types**, then $\langle\tau,\tau'\rangle$ is a **DLT-type**. Nothing else is a DLT-type.

A DLT-model $\mathcal{M}$ is a tuple consisting of a set $\mathcal{D}^{\mathcal{M}}$ of domains of each **DLT-type**, plus static and dynamic interpretation functions, $[\![\cdot]\!]^{\mathcal{M}}$ and $[\cdot]^{\mathcal{M}}$, which map a set $\mathcal{L}$ of expressions into the corresponding domain. Indexation to a model is disregarded where no confusion arises.

(DEF.2) $\mathcal{M}=\langle\mathcal{D}, [\![\cdot]\!],[\cdot]\rangle$ is a **DLT-model**, s.t.:
- $\mathcal{D}=\bigcup\{\mathcal{D}_\tau: \tau\in T\}$
  - $\mathcal{D}_s$, $\mathcal{D}_e$ and $\mathcal{D}_t$ are pairwise disjoint non-empty sets.
  - $\mathcal{D}_t=\{0,1\}$.
  - $\mathcal{D}_{\langle\tau,\tau'\rangle}=\mathcal{D}_\tau\rightarrow\mathcal{D}_{\tau'}$.
- $[\![\cdot]\!]: \mathcal{L}\rightarrow\mathcal{D}$.
- $[\cdot]: \mathcal{L}\rightarrow\mathcal{D}$.

Contexts are identified with **accessibility relations.**

(DEF.3) Let $\langle s\langle s,t\rangle\rangle=\sigma$.
- $R,R',\ldots\in\mathcal{D}_\sigma$ are **accessibility relations**.

(DEF.4) Where $\varphi\in\mathcal{L}$ is a **sentential expression**:
- $[\![\varphi]\!]\in\mathcal{D}_{\langle s,t\rangle}$
- $[\varphi]\in\mathcal{D}_{\langle\sigma,\sigma\rangle}$.

The static denotation of a **sentential expression** $\varphi\in\mathcal{L}$ is a **proposition** – a function from worlds to truth values. The dynamic denotation of a **sentential expression** $\varphi\in\mathcal{L}$ is a **context change potential (CCP)** – a function from accessibility relations $R,R',\ldots\in\mathcal{D}_\sigma$ to accessibility relations.

A sentential expression denotes an **update** iff for some $w$,R, it returns a non-empty subset of R($w$) when the result of applying it to R is applied to $w$. It denotes a **test** iff for all $w$ it returns either R($w$) or $\emptyset$ when the result of applying it to R is applied to $w$.[13]

(DEF.5) Where $[\varphi]\in\mathcal{D}_{\langle\sigma,\sigma\rangle}$:
- $[\varphi]$ is an **update** iff $\exists R,w: \emptyset\subset R[\varphi](w)\subset R(w)$.
- $[\varphi]$ is a **test** iff $\forall R,w: R[\varphi](w)=R(w) \vee R[\varphi](w)=\emptyset$.

Truth, $\vDash_T$, and consistency, $\vDash_C$, are defined relative to world,context-pairs. Where $w,R\vDash_T\varphi$, we say that $\varphi$ is true-at-$\langle w,R\rangle$. Where $w,R\vDash_C\varphi$, we say that $\varphi$ is consistent-at-$\langle w,R\rangle$. $\Gamma\vDash_T\varphi$ iff $\varphi$ is true at $\langle w,R\rangle$ only if every $\psi\in\Gamma$ is true-at-$\langle w,R\rangle$. *Mutatis mutandis* for $\Gamma\vDash_C\varphi$.

(DEF.6) Where $w\in\mathcal{D}_S$ and $R\in\mathcal{D}_\sigma$:
- $w,R\vDash_T\varphi$ iff $[\![\varphi]\!](w)=1$.
- $w,R\vDash_C\varphi$ iff $R[\varphi](w)\neq\emptyset$.

[13] Under the requirement that, for all $\varphi$, $[\varphi]$ is eliminative (i.e., $R[\varphi]\subseteq R$), every sentential expression denotes either an update or a test.

- $\Gamma \vDash_T \varphi$ iff $\forall w,R, (\forall \psi \in \Gamma\ w,R \vDash_T \psi) \supset w,R \vDash_T \varphi$.
- $\Gamma \vDash_C \varphi$ iff $\forall w,R, (\forall \psi \in \Gamma w,R \vDash_C \psi) \supset w,R \vDash_C \varphi$.

For every $R \in \mathcal{D}_\sigma$, $\mathcal{C}^R$ is a function from sentential expressions $\varphi \in \mathcal{L}$ into $\mathcal{D}_{\langle st \rangle}$. $\mathcal{C}^R(\varphi)$ is the proposition which maps $w$ to 1 iff $\varphi$ is consistent-at-$\langle w,R \rangle$.

(DEF.7) Let $\mathcal{C}^R(\varphi) \in \mathcal{D}_{\langle s,t \rangle}$ be the **communicated content** of $\varphi$ at R:
- $\mathcal{C}^R(\varphi) = (\lambda w.\ w,R \vDash_C \varphi)$

§4 presents a fragment of English in the DLT-framework and shows how it is able to account for the data presented in §1-2.

## 4. Fragment

### 4.1. Basic sentences

We assume that the static and dynamic interpretation functions coincide for singular terms, verbs and common nouns in the fragment. Singular terms are treated as denoting individuals (type e), whereas common nouns and verbs denote (intensions of) properties (type $\langle e\langle st \rangle\rangle$) and relations (type $\langle e\langle e\langle st \rangle\rangle\rangle$), respectively.

(I.) a. $[\![\text{The British Library}]\!] = [\text{The British Library}] = \text{THE BRITISH LIBRARY}$.
b. $[\![\text{book}]\!] = [\text{book}] = \lambda x \lambda w.\ \text{BOOK}(x)(w)$.
c. $[\![\text{owns}]\!] = [\text{owns}] = \lambda x \lambda y \lambda w.\ \text{OWN}(y)(x)(w)$.

The static and dynamic interpretation functions diverge in value for numerical determiners. The static denotation assigned to '14 million' will be its standard value as a determiner (type $\langle\langle e\langle st \rangle\rangle\langle e\langle st \rangle\rangle t\rangle$). For simplicity, we will assume the upper-boundedness of bare numerical determiners. In contrast, the dynamic denotation of '14 million' will be a function from a pair of (intensions of) properties to a CCP. Let F,G,… be variables over $\mathcal{D}_{\langle e\langle st \rangle\rangle}$:

(II.) a. $[\![14\text{ million}]\!] = \lambda F \lambda G \lambda w.\ |\lambda x(F(x)(w)) \cap \lambda x(G(x)(w))| = 1.4 \times 10^7$.
b. $[14\text{ million}] = \lambda F \lambda G \lambda R \lambda w \lambda w'.\ w' \in R(w) \wedge R(w) \cap (\lambda w.[\![14\text{ mil.}]\!](F)(G)(w)) \neq \emptyset$.

The static denotation specified in (II.) maps a pair of properties to the proposition true at a world $w$ iff the cardinality of their intersection at $w$ is 14,000,000. The dynamic denotation specified in (II.) maps a pair of properties to a CCP (a function from accessibility relations to accessibility relations).

Assuming the DP to undergo QR out of direct object position, (1) is assigned the simplified LF in (11), generating the static and dynamic denotations in (12)-(13) respectively:[14]

(11) *⟨*14 million books *⟨*$\lambda_1$ *⟨ ⟨* the BL*⟩ ⟨*owns $t_1$*⟩⟩⟩⟩*.

[14] Slanted brackets, *⟨ ⟩*, are used to represent constituent structure in order to avoid confusion with the dynamic interpretation function, $[\cdot]$.

(12) $[\![(11)]\!]=\lambda w.\ |\lambda x.\ (\textsc{Book}(x)(w))\cap \lambda x.(\textsc{Own}(\textsc{The BL})(x)(w))|=14{,}000{,}000.$

(13) $[(11)]=\lambda R\lambda w\lambda w'.\ w'\in R(w) \wedge R(w)\cap[\![(11)]\!]\neq\emptyset.$

The static denotation of (11) is the proposition true at $w$ iff the number of individuals which are both books at $w$ and owned by the British Library at $w$ is 14,000,000.

The dynamic denotation of (11) is a test. Given an accessibility relation R it returns the relation R[(11)] such that, for all $w$, R[(11)]($w$)=R($w$) if there is some R-accessible world from $w$ at which $[\![(11)]\!]$ is true; otherwise R[(11)]($w$)=$\emptyset$. Identifying the felicity of the utterance of φ at a world $w$ and context C with the consistency of φ at $\langle w,R^C\rangle$, this correctly predicts the felicity judgements regarding (1) in §1. Where $R^C$ is the relation of pragmatic equivalence at C, an utterance of (11) will be felicitous at $w$ and C iff there is some world $R^C$-accessible from $w$ at which the British Library owns 14 million books. Alternatively stated, felicitous utterance of (11) requires that the actual world does not differ from one in which the British Library owns 14 million books in any ways which are pragmatically relevant.

For example, let $C^{\pm}$ be a context in which any difference between the number of books owned by the BL and the number of books owned by the BL when rounded to the nearest million is pragmatically irrelevant.[15] That is, $w'\in R^{C^{\pm}}(w)$ iff $\forall n\in\mathbb{N}$: $10^6(n)-|\lambda x.\ (\textsc{Book}(x)(w'))\cap \lambda x.(\textsc{own}(\textsc{The BL})(x)(w'))|\leq\pm500{,}000$ iff $10^6(n)-|\lambda x.\ (\textsc{Book}(x)(w))\cap\lambda x.(\textsc{own}(\textsc{The BL})(x)(w))|\leq\pm500{,}000$. Let $w^*$ be a world at which there are 13,950,000 books owned by the library. Then an utterance of (11) is predicted to be felicitous at $w^*$, since there exists a world $w$ $R^{C^{\pm}}$-accessible from $w$ such that $[\![(11)]\!](w^*)=1$.[16]

By (DEF.7), the communicated content of (11) at $C^{\pm}$ will be strictly weaker than its literal content. For all R, $\mathcal{C}^R((11))(w)=1$ iff there is some world $w'$ R-accessible world from $w$ such that $[\![(11)]\!](w')=1$. Thus, an utterance of (11) at $C^{\pm}$ communicates the proposition true at a world $w$ iff the number of books owned by the British Library in $w$ falls within the interval $[1.35\times10^7,\ 1.45\times10^7]$. Clearly, this proposition is asymmetrically entailed by the literal content of (11).

[15] Assume in addition that the books owned by the British Library is the only thing of pragmatic relevance at $C^{\pm}$.

[16] Note that, for all that has been said, an utterance of (i) at $C^{\pm}$ and $w$ is predicted to be equally felicitous:

(i) The British Library owns 14 million and one books.

Furthermore, the conjunction of (1) and (i) is predicted to be felicitous at certain contexts.

In order to accommodate the apparent infelicity of (i) at $C^{\pm}$ and $w^*$ (and the infelicity of its conjunction with (1) at all contexts), we can posit that the choice of numerical determiner in (i) is treated as evidence that the speaker is presupposing a stricter relation of pragmatic equivalence than would be indicated by the utterance of (1). If certain numerical determiners (such as '14 million') are taken to be preferred over others (such as '14 million and one'), then the contrast between (i) and (1) can be explained in terms of optimality maximisation (Krifka, 2002, 2007; Klecha, 2014).

## 4.2. LT-regulators

Let ↓ be a function from (intensions of) properties to CCPs.

(DEF.8) $\downarrow=\lambda F\lambda R\lambda w\lambda w'.\ w'\in R(w) \wedge (\lambda x.F(x)(w))=(\lambda x.F(x)(w'))$.

For any F such that for some $x$, $\lambda w.F(x)(w)$ is a non-constant function,[17] ↓F is an **update**. Given an accessibility relation R, it returns that $R'\subseteq R$ such that $w'$ is R′-accessible from $w$ iff $w'$ is R-accessible from $w$ and for all $x$, $F(x)(w')=1$ iff $F(x)(w)=1$. That is, R(↓F) is the subset of R which relates only worlds which agree regarding the extension of F. For convenience, we adopt postfix notation for ↓F, so that R(↓F) denotes the result of applying ↓F to R.

The LT-regulator 'exactly' is treated as a determiner-modifier. Let Q, Q′… and $\mathcal{Q}$, $\mathcal{Q}'$,… be variables over $D_{\langle\langle e\langle st\rangle\rangle\langle e\langle st\rangle\rangle t\rangle}$ and $D_{\langle\langle e\langle st\rangle\rangle\langle e\langle st\rangle\rangle\langle\sigma,\sigma\rangle\rangle}$ (i.e., the static and dynamic denotations of determiners respectively):

(III.) a. $[\![\text{exactly}]\!] = \lambda Q\lambda F\lambda G\lambda w.\ Q(F)(G)(w)$.
b. $[\text{exactly}] = \lambda\mathcal{Q}\lambda F\lambda G\lambda R\lambda w\lambda w'$: $w'\in R(\downarrow G)\ (w).\ w'\in R(\downarrow G)(\mathcal{Q}(F)(G))(w)$.

The static denotation of 'exactly' is the identity function for functions of type $\langle\langle e\langle st\rangle\rangle\langle e\langle st\rangle\rangle t\rangle$; $[\![\text{exactly } N_{DET}]\!]=[\![N_{DET}]\!]$. The dynamic denotation of 'exactly' is a function mapping functions of type $\langle\langle e\langle st\rangle\rangle\langle\langle e\langle st\rangle\rangle\langle\sigma,\sigma\rangle\rangle\rangle$ (that is, the type of the dynamic denotation of determiners) to functions of the same type.

(2a) can be assigned the LF in (14), generating the static and dynamic denotations in (15) and (16), respectively.

(14) *[[[*Exactly 14 million*]* books*] [*$\lambda_1$ *[ [* the BL*] [*owns $t_1$*]]]]*.
(15) $[\![(14)]\!]=[\![(11)]\!]$.
(16) $[(14)] = \lambda R\lambda w\lambda w'$:
$w'\in R(\downarrow(\ \lambda x.\lambda w\ \textsc{Own}(\textsc{The BL})(x)(w)))\ (w).\ R(\downarrow(\lambda x\lambda w.\ \textsc{Own}(\textsc{The BL})(x)(w)))\ [(11)]$.

(11) and (14) statically denote the same proposition. However, the CCPs dynamically denoted by (11) and (14) differ. Unlike (11), the dynamic denotation of (14) is divisible into two components: an 'at-issue' update on the input relation R and a 'not-at-issue' domain restriction on the output of this update.

The 'not-at-issue' effect of [(14)] is to make the relation returned by the CCP only partially defined in its second argument place. Given an input R, [(14)] returns a relation R[(14)] such that, for all $w$, R[(14)]($w$) is defined on $w'$ iff the set of entities owned by the British Library in $w$ and $w'$ are the same (and $w'\in R(w)$). That is, for all $w$, the domain of R[(14)]($w$) is $\{w'\in R(w)$: $(\lambda x.\textsc{Own}(\textsc{The BL})(x)(w'))=(\lambda x.\textsc{Own}(\textsc{The BL})(x)(w'))\}$.

Unlike its counterpart (11) (which constitutes only a test on contexts), update with [(14)] restricts the output relation so that it is only defined on worlds which agree with respect to the

[17] That is, any F such that F does not correspond to an essential property.

extension of the property denoted by the scope of its determiner. By treating the effect of LT-regulators as partially consisting in a domain restriction, this effect is made accessible to higher operators such as negation.

The 'at-issue' update associated with [(14)] can be further sub-divided into two component operations. First, it restricts its input R to that subset which relates $w$ and $w'$ iff the set of entities owned by the BL is the same in $w$ and $w'$. Intuitively, this can be thought of as a modification of the input context which makes any difference with respect to what the BL owns pragmatically relevant. Second, it applies the test denoted by [(11)] to this relation. Thus, $R[(14)](w)=\emptyset$ if there is no world $w'$ R-accessible from $w$ at which the things owned by the British Library are the same at $w$ and $w'$ and number of books that it owns at $w'$ is 14 million. Otherwise, $R[(14)](w)$ is that subset of $R(w)$ which agrees with $w$ regarding the things owned by the British Library. Clearly, it follows that (14) will be consistent at $\langle w,R\rangle$ iff the number of books owned by the BL at $w$ is 14 million.[18]

For example, consider the evaluation of an utterance of (14) at $C^{\pm}$ and $w^*$. $R^{C^{\pm}}[(14)](w^*)$ is only defined on that subset of $R^{C^{\pm}}(w^*)$ which agrees with $w^*$ on the things owned by the British Library. $R[(14)](w^*)=\emptyset$ unless that subset contains a world at which the British Library owns 14 million books. Otherwise, R[(14)] relates $w^*$ to the members of the subset of $R^{C^{\pm}}(w^*)$ which agrees with $w^*$ on the things owned by the library, and is elsewhere undefined. Yet, since the British Library owns 13,950,000 books at $w^*$, there is no world which agrees with $w^*$ regarding the things owned by the library at which it owns 14 million books. Hence, (14) is predicted to be infelicitous at $C^{\pm}$.

By (DEF.7), for any context C, the communicated content of (14) at C will be identical to the literal content of (11), since, for any C, (14) is consistent at $\langle w,R^C\rangle$ iff $[\![(14)]\!]$ is true at $w$. Thus, we correctly predict that (14) can be felicitously uttered only if its literal content is true, and that it communicates the same proposition as it literally expresses.

## 4.3. Negation

Let the static and dynamic denotations of negation be introduced syncategorematically:

(IV.) a. $[\![\neg\varphi]\!] = \lambda w.\ [\![\varphi]\!](w)=0.$
b. $[\neg\varphi] = \lambda R\lambda w\lambda w'.\ w'\in R(w) \wedge R[\varphi](w)=\emptyset \wedge w'\in \textsc{Dom}(R[\varphi](w)).$

The static denotation of $\neg\varphi$ is simply $\mathcal{D}_s - [\![\varphi]\!]$. The dynamic denotation of $\neg\varphi$ , given an input R, returns that relation $R[\neg\varphi]$ such that, for all $w$, $w'\in R[\neg\varphi](w)$ iff conditions (i.)-(iii.) are satisfied:

(i.) $R[\varphi](w)=\emptyset$;
(ii.) $w'\in R(w)$;
(iii.) $w'\in \textsc{Dom}(R[\varphi](w))$.

[18] Assuming, at least, that if $x$ is something owned by the BL, then it is pragmatically relevant whether $x$ is a book.

Condition (i.) requires that φ be inconsistent at ⟨*w*,R⟩. If this condition fails, then R[¬φ](*w*)=∅. Condition (ii.) requires that *w′* be R-accessible from *w*. Accordingly, R[¬φ](*w*)⊆R(*w*). Finally, the failures of commutativity observed in §2.3 suggest that the effects of LT-regulators project out of negation. Thus, condition (iii.) requires that R[φ](*w*) be defined on *w′*. Accordingly, R[¬φ](*w*) includes only those members of R(*w*) which satisfy the domain restrictions (if any) introduced by [φ]. Combining (i.)-(iii.), if R[φ](*w*)=∅, then R[¬φ](*w*) is that subset of R(*w*) in the domain of R[φ](*w*); otherwise R[¬φ](*w*)=∅.

Since ⟦(11)⟧=⟦(14)⟧, the static denotations of their negations of are identical. However, the dynamic denotations of ¬(11) and ¬(14) differ substantially. To see why, consider the difference in the effect of their utterance at $C^{\pm}$ and *w*.

Suppose, first, that ¬(11) is uttered. By condition (i.), $R^{C^{\pm}}$[¬(11)](*w**)=∅ if $R^{C^{\pm}}$ [(11)](*w**)≠∅. Yet, as noted in §4.1, if the BL owns 13,950,000 books in *w**, then there is a world *w′* $R^{C^{\pm}}$-accessible from *w** at which it owns 14 million. Hence, ∅⊂$R^{C^{\pm}}$[(11)](*w**)=$R^{C^{\pm}}$(*w**), and, accordingly, $R^{C^{\pm}}$[¬(11)](*w**)=∅.

In contrast, suppose ¬(14) is uttered. Since, as noted in §4.2, $R^{C^{\pm}}$[(14)](*w**)=∅, condition (i.) is satisfied. Thus, $R^{C^{\pm}}$[¬(14)](*w**) is that subset of $R^{C^{\pm}}$(*w**) on which $R^{C^{\pm}}$[(14)](*w**) is defined. $R^{C^{\pm}}$[(14)](*w**) is defined on *w′* iff *w′*∈R(*w**) and agrees with *w** regarding the things owned by the BL. Thus, $R^{C^{\pm}}$[¬(14)](*w**) is that subset of R(*w**) which agrees with *w** regarding the things owned by the BL. Thus, for all *w′*∈ $R^{C^{\pm}}$[¬(14)](*w**), the BL owns 13,950,000 books in *w′*.

By (DEF.7), the communicated content of ¬(11) will be strictly stronger than its literal content. For all *w*, there is some world $R^{C^{\pm}}$-accessible from *w* at which the BL owns 14 million books iff the number of books the library owns at *w* is within the interval $[13.5\times10^6,14.5\times10^6]$. Thus, an utterance of ¬(11) at $C^{\pm}$ communicates the proposition that the number of books the library owns falls outside this interval. Clearly, this proposition asymmetrically entails the literal content of ¬(11).

## 4.4. Conjunction and failures of commutativity

Let the dynamic denotation of conjunction be introduced syncategorematically:

(V.) a. ⟦φ∧ψ⟧=λ*w*. ⟦φ⟧(*w*)=⟦ψ⟧(*w*)=1.
b. [φ∧ψ]=λR. R[φ][ψ].

The static denotation of φ∧ψ is the intersection of ⟦φ⟧ and ⟦ψ⟧. The dynamic denotation of φ∧ψ, given a relation R, returns the result of sequentially updating R with [φ] and [ψ]. Say that conjunction is statically commutative iff φ∧ψ⊨$_T$ψ∧φ; say that conjunction is dynamically commutative iff φ∧ψ⊨$_C$ψ∧φ. Under (V.), ∧ is statically but not dynamically commutative. In particular, (11)∧¬(14)⊭$_C$¬(14)∧(11). To see why, consider the difference in the effect of the utterance of (11)∧¬(14) and ¬(14)∧(11) at $C^{\pm}$ and *w**.

Suppose, first, that (11)∧¬(14) is uttered. As noted in §4.1, there is a world $R^{C\pm}$-accessible from *w** at which the BL owns 14 million books. Thus, $R^{C\pm}[(11)](w^*)=R^{C\pm}(w^*)$. As such, $R^{C\pm}[(11)\wedge\neg(14)](w^*)=R^{C\pm}[\neg(14)](w^*)$. Yet as noted in §4.3, since (14) is inconsistent at $\langle w^*, R^{C\pm}\rangle$, $R^{C\pm}[\neg(14)](w^*)$ is that subset of $R^{C\pm}(w^*)$ which agrees with *w** on the things owned by the BL. Thus, since *w** is itself one such world, $R^{C\pm}[\neg(14)](w^*)\neq\emptyset$. Utterances of (11)∧¬(14) are correctly predicted to be felicitous at $C^{\pm}$ and *w**.

In contrast, suppose that ¬(14)∧(11) is uttered. As noted, $R^{C\pm}[\neg(14)](w^*)$ is that subset of $R^{C\pm}(w^*)$ which agrees with *w** on the things owned by the BL. Thus, for any *w*′ which is $R^{C\pm}[\neg(14)]$-accessible from *w**, the BL owns 13,950,000 books in *w*′. Yet, from §4.1, for any R, $R[(11)](w^*)=\emptyset$ unless there is some world R-accessible from *w** at which the library owns 14 million books. Thus, $R^{C\pm}[\neg(14)][(11)](w^*)=\emptyset$. Utterances of ¬(14)∧(11) are correctly predicted to be infelicitous at $C^{\pm}$ and *w**.

More generally, (11)∧¬(14) is predicted to be consistent at any $\langle w,R\rangle$ such that $w,R\models_C(11)$ but $w,R\not\models_T(11)$; that is, at which (11) is false but felicitously assertable. In contrast, ¬(14)∧(11) is predicted to be inconsistent at all $\langle w,R\rangle$. As such, we correctly predict the contrast observed between (9a) and (9b).

## 5. Conclusion

Loose utterances display two central features which have gone widely unobserved: First, the communicated content of certain loose utterances of negated sentences is strictly stronger than the utterance's literal content. Second, the felicity of the loose utterance of certain conjunctions fails to commute. Under the present proposal, these features have been proposed to be related, and to arise from the interaction of negation, conjunction and LT-regulators in cases of loose talk.

More generally, it has been argued that in order to account for these phenomena it is important to recognize that loose utterances are not merely *dependent* upon contexts for their felicity, but also serve to *change* the context in systematic ways. Due to the effect of LT-regulators two sentences, such as (1) and (2b), which agree in their truth conditions may have different effects on context. To accommodate the role of LT-regulators, the effect of an utterance on a context must be taken to be determined by components of its meaning which outstrip its truth conditions. The fragment presented in §4 offers one way of implementing this observation.

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