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Abstract Semantics of Numeratives: Towards a Model for the Synthesis of Hindi and English Numeratives (Deep and Surface-Semantic Representation)

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ABSTRACT

The present study develops a multi-layered semantic model for analyzing numeratives in Hindi and English, focusing on the relationship between deep conceptual structures and their surface linguistic realizations. Moving beyond traditional treatments of numerals as purely quantificational expressions, the study incorporates classifiers, measure phrases, and related constructions as central components of numerical meaning. Drawing on formal semantic theory and typological evidence, the analysis investigates how languages encode quantification through different strategies of individuation and countability.

The findings indicate that although Hindi and English share universal cognitive principles of quantification, they diverge significantly in their linguistic implementation. Hindi employs classifier-like and measure-based structures to explicitly encode individuation, while English relies predominantly on the lexical mass/count distinction within its nominal system. These differences are captured through a three-layer model consisting of a conceptual layer (universal quantification), a classification layer (atomicity and countability), and a surface realization layer (morphosyntactic expression). The study further demonstrates that numeratives function as semantically active operators contributing to truth-conditional interpretation rather than serving as purely structural elements. The proposed framework offers a unified

account of numerical meaning across languages and contributes to the broader understanding of cross-linguistic variation in quantification systems.

Keywords: Numeratives; classifiers; quantification; formal semantics; Hindi; English; mass/count distinction; typology; measurement expressions; cross-linguistic semantics; individuation; numeral systems.

INTRODUCTION

This study develops a formal model for analyzing how numeratives function in Hindi and English, with a particular focus on the relationship between "deep semantic structure" and "surface-level linguistic expression." Building on earlier work (Tripathi & Rathod 2024; Rubehn et al. 2025), the paper adapts existing approaches – especially those proposed for Russian numeratives – to account for the typological and semantic differences between these two languages.

Rather than treating numerals as simple expressions of quantity, the study focuses on numeratives more broadly, including classifiers, measure expressions, and other elements that connect numbers with nouns. These elements play an important role in how numerical meaning is constructed across determiner, degree, and predicative uses (Spector 2013).

The main goal is to develop a model that links:

- **abstract representations of quantity** (e.g., cardinality and quantification),
- with their **actual realization in language**.

To do this, the paper examines how quantitative expressions are modified in context (Mikulová 2023) and how they interact with nominal classification systems. Insights from classifier languages such as Mandarin are particularly useful here, as they highlight how counting and measurement often depend on additional structural elements rather than numerals alone (Gebhardt 2009; Scontras 2015).

A key issue addressed in this study is the ambiguity of expressions like "two glasses of wine," which can refer either to two physical containers or to a measured quantity. Such cases illustrate that numerative constructions operate on more than one semantic level at once (Rothstein 2016).

LITERATURE REVIEW

Research on numeratives shows that they cannot be fully understood if we look only at numerals themselves. Instead, we need to consider how numerical expressions interact with "nominal structure and classification." Studies of languages such as Yakut demonstrate that numerical systems often distinguish between "abstract counting" and "counting of individuated objects" (Arsenijević & Borik 2020).

Classifier systems provide particularly important evidence. In many languages, numerals cannot combine directly with nouns without an additional element that helps structure the reference. These elements – commonly called classifiers – can indicate how entities are grouped, counted, or measured.

One important insight in the literature is that classifiers are not simply properties of nouns. Instead, they are often selected by numerals themselves, serving to resolve mismatches between different semantic types (Bale & Coon 2014). This is especially clear in languages where nouns do not inherently mark number, making classifiers essential for determining whether something can be counted (Fieder et al. 2014).

A related distinction is found between "classifier constructions" and "measure constructions." As argued by Krifka (1989), classifiers are more tightly linked to the semantics of the noun, while measure expressions tend to have more stable meanings across contexts.

At the same time, classifiers are not uniform in their function. Some contribute very little semantic content, while others impose clear restrictions on how numerals can be interpreted (Sağ 2018; Little et al. 2022). This variability suggests that numeratives should be analyzed as "semantically active elements," rather than as purely formal markers.

METHODOLOGY

This study uses a "comparative semantic approach" to examine how numeratives function in Hindi and English. The analysis combines insights from formal semantics, typology, and morphosyntax.

The data include both constructed and naturally occurring examples of:

- count expressions (*two books*),
- mass expressions (*two cups of tea*),
- and classifier-like constructions in Hindi (*दोगिलासपानी*).

These examples were selected to highlight differences in how the two languages handle "countability," "measurement," and "individuation."

The analysis is based on a three-level model:

1. **Conceptual layer** – represents general principles of quantification
2. **Classification layer** – captures how languages encode countability and individuation
3. **Surface layer** – describes how these meanings are expressed grammatically

The study proceeds in four steps:

1. Breaking down the semantic structure of each construction
2. Comparing Hindi and English patterns
3. Examining how mismatches between numerals and nouns are resolved
4. Integrating the findings into a unified model

The analysis also distinguishes between "inherent meaning" and "contextual interpretation" (Nouwen 2010), and considers how classifier systems mediate between numerals and nouns (Chen 2022).

RESULTS

The analysis shows that Hindi and English differ in how they encode numerical meaning, even though both use numerals to express quantity.

Hindi makes use of "classifier-like elements" and "measure words," especially when dealing with mass nouns. These elements help to individuate referents and make them countable. English, in contrast, relies more heavily on the "mass/count distinction built into its noun system" (Li et al. 2009).

This difference can be seen clearly in constructions like:

Hindi	English
दोगिलासपानी	Two glasses of water

In both cases, a measure element is used, but its grammatical status and distribution differ.

The findings suggest that any adequate model must account for:

- shared semantic principles of quantification
- as well as language-specific ways of expressing them

The analysis also highlights the importance of how "numerical ranges and interpretations" are encoded in meaning (Stateva et al. 2019), and how they interact with the mass/count distinction (Rothstein 2017).

Table 1. *Cross-linguistic comparison of numeratives in this article*

Feature	**Hindi**	**English**
Basic structure	Numeral + (Classifier) + Noun	Numeral + Noun
Classifier presence	Optional / semi-obligatory	Absent (replaced by measure phrases)
Mass noun strategy	Requires measure/ classifier	Requires measure phrase (*of*)
Countability marking	Flexible, context-driven	Lexically encoded

Example (count)	*दोकिताबें*	*two books*
Example (mass)	*दोगिलासपानी*	*two glasses of water*
Individuation	Via classifiers	Via lexical distinction
Typological type	Semi-classifier system	Non-classifier system

DISCUSSION

The findings of this study confirm that numeratives in Hindi and English cannot be adequately explained by surface morpho syntactic descriptions alone. Instead, they require a multi-layered semantic model that distinguishes between deep conceptual structures and language-specific realizations. The contrast between the two languages demonstrates that while quantification is a universal cognitive operation, its linguistic encoding varies depending on how languages structure the relationship between numerals and nominal predicates.

A key insight from the analysis is the role of classification mechanisms in mediating between numerals and nouns. In Hindi, numeratives frequently involve overt or implicit classifier-like elements, particularly in measure or container constructions (e.g., *दोगिलासपानी* "two glasses of water"). These elements serve to individuate mass referents by introducing counting units, effectively enabling the interpretation of non-countable nouns as countable entities. This supports the view that numeratives function as type-shifting operators that resolve mismatches between numerals and nominal predicates.

In English, similar distinctions are primarily handled through the lexical mass/count system. As a result, classifiers are not grammatically required but appear in measure phrase constructions such as "two cups of coffee." This suggests that English encodes much of the classificatory work in the lexical semantics of nouns, whereas Hindi distributes this function across lexical and structural components.

Within the proposed three-layer model, these differences can be interpreted as follows:

1. At the **conceptual layer**, both languages share a common cognitive representation of quantity as a relation between a numerical value and a set of entities. This layer reflects universal principles of quantification.
2. At the **classification layer**, divergence becomes apparent. Hindi employs more explicit strategies for encoding individuation, often through classifier-like elements, whereas English relies on inherent lexical distinctions between mass and count nouns.
3. At the **surface realization layer**, these differences appear in distinct syntactic patterns:

    - Hindi: Numeral + Classifier + Noun
    - English: Numeral + Noun or Numeral + Measure Phrase + of + Noun

These patterns show how similar semantic operations are mapped onto different grammatical structures.

Another important issue is the ambiguity of numerative constructions. Expressions such as “two glasses of wine” may refer either to two physical containers or to a specific quantity of liquid. This demonstrates that numeratives encode multiple layers of meaning, which are resolved through contextual and pragmatic factors.

Furthermore, numeratives are not merely structural elements; they contribute directly to truth-conditional interpretation. Whether a referent is construed as a discrete object or as a measurable substance depends on how numeratives structure the domain of reference. This supports the claim that numeratives should be treated as semantically active operators rather than syntactic auxiliaries.

From a typological perspective, Hindi occupies an intermediate position between fully grammaticalized classifier languages and non-classifier languages such as English. This reinforces the need for a flexible model capable of capturing gradient variation rather than rigid categorical distinctions.

Finally, the proposed synthesis model shows that deep and surface semantic representations are linked through systematic

compositional mapping. By integrating formal semantics, typology, and cognitive perspectives, the model provides a unified account of numerical meaning across languages. It also opens avenues for further research, particularly regarding the cognitive processing of numeratives, their diachronic development, and their interaction with definiteness, plurality, and specificity.

Model of numerative synthesis

CONCEPTUAL LAYER
(Abstract Quantification)
↓
CLASSIFICATION LAYER
(Atomicity / Countability / Individuation)
↓
SURFACE REALIZATION
Hindi: Num + Cl + N
English: Num + N
Num + Measure + of + N

CONCLUSION

This study proposes a model that connects abstract representations of quantity with their linguistic realization in Hindi and English. By distinguishing between conceptual, classificatory, and surface levels, the model accounts for both shared and language-specific aspects of numerative systems.

The findings show that numeratives are not just structural elements but play an essential role in shaping meaning. They determine how entities are counted, measured, and interpreted.

Future research could further explore:

- how numeratives are processed cognitively,
- how they develop historically,
- and how they interact with other grammatical categories such as definiteness and plurality.

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