Modified Numerals and Plurality in Bangla

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ABSTRACT

The issue of how quantification is encoded in various languages has been widely debated in formal semantics as well as in syntax. This paper presents an overview of the various modified numeral phrases in Bangla in relation to the theories of Plurality and Distributivity. Moreover, this paper examines the structural distribution of the modified numeral phrases in Bangla along with a brief semantic analysis of the different kinds of plurality (i.e. collective, distributive, cumulative) that are encoded by these. Additionally, this paper argues that distributivity can also be signalled by the modified numeral phrases in Bangla.

Keywords: plurality; distributivity; numeral phrase; quantification; syntactic derivation

1. Introduction

Modified numerals in natural languages are defined as a composite phrase denoting cardinal numbers that are modified by a quantifier or degree modifiers (+ adposition) and yield plurality. Modified numerals denote plurality with or without specifying the exact cardinality of the numerals. The examples of a few of these modified numerals are given below:

(1) There are at most 10 students in the class.
(2) I have fewer than 10 pens.

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The structure of modified numerals can also be observed on postpositional languages, where the quantifiers or degree modifiers follow the numeral. (e.g. Bangla, Hindi etc.) In several languages, there is a comparative adposition that occurs in between the numeral and degree modifiers, such as, than, /sel/ (in Hindi), /que/ or /de/ (in French) etc. However, in Bangla, a null comparative postposition is present that implicitly denote the comparative quantity which is signalled by the numeral and adjectival degree modifiers in a modified numeral phrase. The following sections will present an overview of the various modified numerals in Bangla. In addition to that, the syntactic structure of these modified numerals will be provided along with an in-depth semantic analysis to show the different kinds of plurality that is expressed by the modified numerals in Bangla.

2. Research Objectives

In this paper, the question of how plurality is encoded by various modified numeral phrases in Bangla is examined. In addition to that, this paper addresses the issue of distributivity that is explicitly or implicitly signalled by the modified numeral phrases. This paper is a semantic inquiry into adjectival quantification (specifically, comparative and proportional adjectival quantity words in a NumP) in Bangla and analyses whether modified numerals map into universal grammar, and if so, how these notions can be located at the semantics-syntact interface.

3. Theoretical Background

The formal study of quantification and its logical dimensions has been a debated issue in formal semantics for decades. Barwise and Cooper (1981), Keenan and Stavi (1986) have established the significance of quantification in the theory of LF, and later semanticists have proposed multiple applications of Generalized quantifier Theory in relation to many of the quantificational categories in natural languages.

In contemporary semantics, Ionin and Matushansky (2006) claim that numbers are nouns. Whereas Kayne (2005) offers a detailed analysis proposing that few and many are adjectives and that instead of modifying the Head Nouns directly, they in turn modify an “unpronounced noun” containing the number (Num). Geurts and Nouwen (2007) argue that inferences can be drawn from comparative numbers, such as more than two, less than two, however, more than n-1 is not equivalent to at least 1. However, Heim (2001) interprets the modified numerals as ‘degree-determiners’ that functions as a relation between two sets of degrees.

Interestingly, the modified numeral phrases, such as, most three boys, more than three boys and fewer than three boys, do not denote the exact cardinality of the plural predicates. In view of such examples, the issue whether the modifier modifies the whole nNP phrase or combine with the numeral to compositionally build the meaning, is debatable. (Kriifka 1999, Winter 2001).

Furthermore, Nouwen (2010) puts forward the claim that there are two classes of modified numerals (Class A and Class B) and also provides the semantic analysis of modified numerals in English. Moreover, he argues, Class A modified numerals readily express relations to definite amounts (e.g. A hexagon has fewer than 11 sides.). Class B modified numerals, on the other hand, are incapable of expressing relations to definite amounts (e.g. A hexagon has at most maximally up to 10 sides.).

4. Research Methodology

The Bangla data-set to illustrate the modified numerals in Bangla in this paper, is produced by my linguistic judgements as a native speaker of Bangla (Spoken in Kolkata). The research methodology is largely deductive with some induction based on the data, which has been collected and examined based on my acceptability judgements as a native speaker with ample additional examples which have
been compiled in consultation with other native Bangla speakers. The data is verified against the introspective judgments of the Bangla speakers located in both Delhi and Kolkata, including both monolingual and multilingual speakers.

5. Modified Numerals in Bangla

The issue of modified numerals in natural language has been a topic of inquiry in the contemporary semantics. According to Szabolcsi (2010), modified numerals include counting words (e.g. exactly \( n \) \( NP \)), comparative quantifiers (e.g. more than \( n \) \( NP \)) and non-comparative/superlative quantifiers (e.g. at most \( n \) \( NP \)). [p.175].


The cardinal numbers in natural language can be modified by adjectives and degree quantifiers. Numeral modifiers modify the exact cardinality of the natural numbers and encode a set of scalar range for the number. The modified numerals differ from the proportional quantifiers. Although, the proportional quantifiers denote a set of numeral variables, however, they encode the relation between two cardinal numbers or one cardinal number and a measurement value, for example, more than half of 10, 8 out of 10 and one thirds etc.

In Bangla, the numerals can be modified by adjective quantity words, comparative quantifiers and degree quantifiers. Additionally, these modified numerals can also be modified further by adjective quantity words, quantifiers, partitives and negation. Some of the examples of modified numeral phrases in Bangla include:

- (3) /došer kɔm/(less than 10)
- (4) /doš er ɔnek kɔm/ (fewer than 10)
- (5) /doš er beši/ (more than 10)
- (6) /doš er ɔnek beši/ (a lot more than 10)
- (7) /doš er beši ɔe/ (not more than 10)
- (8) /ɔntɔto doš/ (at least 10)
- (9) /hik došta/ (exactly 10),
- (10) /doš er beši ɔe/ (not more than 10)
- (11) /doš er kɔm ɔe/ (not less than 10)
- (12) /sudhɔ došta/ (only 10)

The modified numeral construction in Bangla include cardinal numbers that are modified by degree modifiers (/kɔm/, /beši/), quantifiers (/kichu/, /ektu/, /ɔlpol), adjective quantity words (/ɔnek/) etc.

These modified numerals occur in different sentence structures and encode comparative quantificational sets of entities/objects. The cardinality of the numeral is denoted by comparative quantification and definite NPs. However, the plural readings of these modified numerals needs to be defined in relation to the complex cardinality that is implicitly encoded by these composite phrases.

6. Modified Numerals and Plurality

Plurality in natural language semantics is typically encoded by plural noun phrases that quantifies over atomic individuals or collections of individuals and entities (Winter & Scha 2014). Scha (2003) has described a unified treatment of plurality in natural language that accounts for the variety of plural
readings. According to Scha, “A quantification which ranges over the extensions of a noun is called distributive.” [ibid] Balusu (2005) has put forward semantic account of the distributive readings of the reduplicated numerals in Telugu.

Winter and Scha (2015) examine the problem concerns in the interpretations of plurality in natural languages by mainly concentrating on English plurals. According to them, referential plural NPs are uniformly analysed as denoting plural individuals that act as predicate arguments. Similarly, they also occur in sentences that have distributive interpretation, and moreover, quantificational distributivity is identified with only referential plurals. [ibid] To further extend, they put forward two central approaches of semantic analysis of plurals, i.e. as modifiers of predicates and as plural determiners. They argue that in many instances the plural NP quantifies over single entities or collections of entities. They claim that the sentence John shuffled the decks encode both the collective and distributive readings. Along similar lines, the modified numerals also encode various range of plurality in Bangla, such as:

(13) ei boi -te dɔ́sh -ta -r kɔ́m paṭa aε̃b e [Collective]
    this book -LOC. ten -CLS. -GEN. less page be.PRES.
    “This book has less than 10 pages.”

(14) ami bajar ʃeke ʃiʃik kuri -ta lebu kinec hi [Collective]
    I market -ABL exactly twenty -CLS. lemon buy.PERF.1st
    “I bought exactly 20 lemons from market.”

(15) Ram kauke dɔ́sh -er opor -e nɔ́mbor ʃayɔ ni [Distributive]
    Ram anyone ten -GEN over -LOC. marks give.PERF. NEG.3rd
    “Ram has not given anyone more than 10.”

(16) dɔ́sh -ta c̣ele mile ʃadʒar -er beʃi ɔ̃ḍa ʃulec̣ e [Cumulative]
    ten -CLS. boy together thousand -GEN. more donation collect.PAST.perf.
    “Ten boys have collected more than thousand rupees donation.”

The above examples express the various plural readings that are encoded by the various modified numerals in Bangla. The following section (6.1) provides a detailed semantic analysis of the distributivity feature that is encoded by these modified numerals in Bangla (in some sentences). Moreover, an account of the syntactic structure of the modified numeral in Bangla is also provided in the section (7).

6.1 Distributivity and Modified Numerals

The modified numerals in Bangla yield the distributivity feature in some of the sentences where the extension set(s) quantified by the modified numerals distributes over a range of sets of variables in all possible world (w). These sets of variables include adjectival quantity words, quantifiers and indefinites. In some of the examples, the modified numerals encode both collective and distributive readings, for example:

(17) ek -ta boi -te dɔ́sh -ta -r kɔ́m paṭa ʃake [Distributive]
    one -CLS. book -LOC. ten -CLS. -GEN. less page be.PRES.hab.
    “One book has less than 10 pages (usually).”

(18) ek -ta boi -te dɔ́sh -ta -r kɔ́m paṭa ʃake [Collective]
However, there are sentences that yield only distributive readings are such as:

(19) ąnek baři -te oントo ɖu -to boi tʰake
   many house -LOC. at least two -CLS. book be.PRES.hab.3rd
   “At many houses, there are at least two books.”

(20) kiĉʰu lok -er ɖu -to -r beši gaɾi aĉʰe
    some people –GEN. two -CLS. –GEN. more car be.PRES.hab.
    “Some people have more than two cars.”

Therefore, the modified numerals in Bangla encode the feature of distributivity that is observed in many quantificational constituents in Bangla. This paper demonstrates the comparative quantification in Bangla in relation to plurality and distributivity.

7. An Account of Structure and Semantics of Modified Numerals

The syntactic structure of these modified numerals in Bangla includes a composite phrase that has a null comparative postposition. The structure of the modified numerals in Bangla can be analysed as follows (Kayne, 2005 & Bittner and Hale, 1996):

(21)/dɔʃ er beši/ (more than 10)

(22) a. The repeated (21.) phrase structure after Merge:

(22) b. The syntactic derivation after Move:

The semantic analysis of the distributivity feature of some of the Bangla modified numerals can be formalized as follows (example 20. is repeated as example 23.):
This interpretation of distributive reading is modelled by letting the predicate \( \text{Have}(aky) \) ‘distribute over’ the denotations of the DP \( \langle \langle c,t \rangle , t \rangle \).

(24) Let \( P = \{a_1, a_2, a_3 \ldots \} \) be the total set of people in the given context.

Let \( x \{a_1, a_2, a_3, \ldots, a_n\} \) be the subset of people picked out by /kiĉhu lok/ ‘some people’.

\[ \exists x (x \subseteq P) \land \forall a_k \{ \exists y ((\text{Car}(y) \land (|y| = i)) \land (ak \ x) \rightarrow \text{Have}(aky)) \} \] where \( i > 2 \), such as \( i = 3, 4, \ldots \) and \( k \in \{1, 2, 3, \ldots, n\} \)

\( k \) can denote any type or token of car.

Therefore, the modified numerals in Bangla encode the semantic feature of distributivity that is observed in various modified numeral phrases in Bangla. This paper highlights the comparative quantification in Bangla in relation to plurality and distributivity.

8. Conclusions

This paper presents a brief analysis of the semantics of modified numerals and plurality in Bangla. These modified numerals in Bangla are capable of encoding different kinds of plurality, most importantly distributive plurality. Syntactically these modified numerals include a nullP denoting a comparative adposition. Therefore, this paper highlights the issue of modified quantification in Bangla in relation to the theories of plurality and Distributivity in natural language semantics.

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