

Semantics and Syntax of Gradable Adjectives in English and Mandarin

1 Introduction

Gradability is an essential concept in the studies of adjectives, which classifies adjectives into two major classes, non-gradable adjectives, like *British*, etc. and gradable adjectives, like *tall*, *long*, etc. To grasp this distinction and particularly to account for the core characteristic of gradable adjectives, linguists conduct a great many investigations around DEGREE. Among various aspects for looking into the problem, this paper adopts the major approaches in the field of formal semantics as well as in generative grammar. The paper attempts to integrate formal semantics and generative syntax to reveal the core meaning of gradable adjectives and the syntactic constructions where they appear. The explanation for the noticeable differences between Mandarin comparisons and English comparisons will also be given.

1.1 Starting point: Cresswell

Compositionality is the most important principle in formal semantics. Under the guidance of the Compositionality Principle, formal semantics focuses on determining the semantic type of constituents and figuring out the means of how they combine with each other, which is referred to as the type-driven computation (Jiang Y, 1998). In formal semantics, questions concerning generalised quantifiers and λ -conversion are of prominent importance and they are also largely encountered in discussions of gradable adjectives. As to degree semantics, degree is encoded in the meaning of gradable adjectives an account commonly admitted by scholars, which is initially proposed by (Cresswell, 1976), giving rise to a third primitive semantic type d besides the two primitive semantic types e and t in classical semantics Degree semanticists also identify three major parts of gradable adjectives: (a) a measure function G , mapping the target x onto the abstract dimension for measurement characteristic of the gradable adjective (Bartsch & Vennemann, 1974); (b) the total ordering relation \geq , which makes the set of scales corresponding to the abstract dimension ordered in pairs of a same direction; (c) the degree variable, indicating the value of $G(x)$. A gradable adjective of predicative use is analysed as a two-place predicate with the individual and the degree as its arguments.

The purpose of generative grammar is using definite and concise rules to generate indefinite and complex structures via formal expressions. Among a great many technical details of generative grammar, the development of the functional phrase (FP) can be taken as reference to account for the structure of degree constructions in particular. Besides the derivation of Logical Form (LF) is a cross-cutting question between syntax and semantics, which is crucial for discussions of the scope ambiguity of generalised quantifiers, almost unavoidable in debates around degree constructions.

Since Cresswell, the semantic type of gradable adjectives is largely debated, among which three major perspectives are listed here: (a) $\langle d, \langle e, t \rangle \rangle$ (A. Von Stechow, 1984), which is the so-called standard analysis; (b) $\langle e, t \rangle$ (Kennedy, 1997), which is referred to as the simplified analysis; (c) $\langle e, \langle e, t \rangle \rangle$ (Rett, 2008), which is referred to as the order-changed analysis.

Another doubtful topic in the field of degree constructions is the status of “more/er” degree morpheme. The major discrepancy exists in whether to regard the degree morpheme as a generalised quantifier (Bhatt & Pancheva, 2004; Heim, 1985; A. Von Stechow, 1984) or to regard the degree morpheme as a functional morpheme (Bierwisch, 1989; Corver, 1990, 1993, 1997a; Kennedy, 1997). The former including the so-called standard analysis of von Stechow, advocates that the degree morpheme lands at an adjunct position within the adjective phrase (AP), undergoing quantifier raising (QR), while the latter assumes that the degree morpheme occupies the head of the degree phrase (DegP) located above the gradable adjective.

1.2 Standard analysis: von Stechow

von Stechow proposes a comprehensive constructive analysis of comparisons (A. Von Stechow, 1984), which becomes the so-called standard analysis later (Bale, 2011). A brief account of major contents given in his analysis will be given in the following paragraphs, organized in an order to unfold semantic components of comparative constructions, where readers will see that the framework of generative grammar is compatible with this semantic analysis.

The Meaning of gradable adjectives are interpreted as a measure function plus an ordering relation. The measure function maps the individual to the dimension denoted by gradable adjectives and the ordering relation ensures that the scale of the individual exceeds the degree to compare. In generative grammar, a gradable adjective is the head of AP. It functions as a two-place predicate, with an individual typed e and a degree typed d as its two arguments. What deserves a note is it is von Stechow who in first seriously regards degrees denoted by symbol d as one of the primitive semantic types and it is degree d that captures the difference between gradable adjectives and non-gradable adjectives. Here the semantic type of gradable adjectives is manifested as $\langle d, \langle e, t \rangle \rangle$. Giving tall as an instance, the lexical entry of a gradable adjective is shown in (1), in which height denotes the measure function encoded by *tall* and \geq denotes the ordering relation between the individual and the degree:

$$(1) \llbracket tall \rrbracket = \lambda d \lambda x. [height(x) \geq d]$$

The analysis of DegP headed by a degree morpheme is much more complicated. The semantic type of DegP is $\langle d, \langle e, t \rangle \rangle$. Based on the approach in generative grammar, DegP lands at an adjunct position of AP in the deep structure and then undergoes quantifier raising (QR) in the logical form (LF) to a node above the original IP inside which DegP is initially located, with the trace left denoting a d type argument. The motivation for this movement is that, according to von Stechow’s analysis DegP can be regarded as isomorphic to a generalised quantifier phrase (QNP), an account under large debate afterwards.

The head of DegP, giving the comparative morpheme *er* as the typical one, takes a “than phrase” (thanP) as its complement and a differential phrase (DiffP) as its specifier. Depending on various categories of complement in thanP as well as the overt appearance, such as *6 feet*, or covert appearance of DiffP, *er* has kinds of semantic variants:

1. *thanP* can take three types of complement:

- i. A direct degree expression, such as *than 6 feet*, which denotes a degree argument typed d .
- ii. A comparative clause, such as *than Mary is tall*, which denotes a property of degree argument, typed $\langle d, t \rangle$ because according to the view of Chomsky, the comparative clause *than Mary is tall* owns a deep structure looking like *than how_i Mary is t_i tall* which undergoes *wh*-movement, leaving the trace t_i denoting a degree variable bound by λ -operator (Chomsky et al., 1977).
- iii. A bare NP, such as *than Mary*, regarded as a deletion from the full comparative clause *than Mary is tall*, also denotes a property of degree argument typed $\langle d, t \rangle$.

2. *DiffP* with overt appearance denotes a degree argument, typed d .

Here some examples of possible semantic variants of *er* are illustrated:

- (2) (a) John is taller than 6 feet.
 (b) John is taller than Mary.
 (c) John is taller than Mary is.
 (d) John is 6 inches taller than Mary is.

thanP takes a direct degree expression as complement in (2a), a bare NP in (2b), a comparative clause in (2c—2d). Optional *DiffP* only owns overt appearance in (2d). Based on the analysis above, semantic type of *er* in (2a) is $\langle d, \langle \langle d, t \rangle, t \rangle \rangle$, in (2b) as well as (2c) is $\langle \langle d, t \rangle, \langle \langle d, t \rangle, t \rangle \rangle$, in (2d) is $\langle \langle d, t \rangle, \langle d, \langle \langle d, t \rangle, t \rangle \rangle \rangle$.

According to type-driven computation in formal semantics, the gradable adjective typed $\langle d, \langle e, t \rangle \rangle$ first combines the trace of the semantic type d which is left by *DegP* in the process of QR, then combines the subject in the matrix clause of the semantic type e , outputting a t type proposition with a free degree variable. λ -abstraction turns this t type open proposition into a property of degree typed $\langle d, t \rangle$ which saturates *DegP* typed $\langle \langle d, t \rangle, t \rangle$. Finally, a t type proposition is made out. Here we have successfully recapitulated the procedure in von Stechow's analysis of how to derive a comparative construction.

1.3 Simplified version: Kennedy

The research of Kennedy investigates what the so-called gradable adjectives refer to as well as in what kind of constructions they appear, which is referred to as degree constructions in his paper (Kennedy, 1997). In this research, Kennedy combines semantics and syntax to reveal the essence of this largely discussed topic.

As to the semantic interpretation of gradable adjectives, there are two major schools: (a) scalar analyses, in which the set of scales corresponding to a gradable adjective is compatible with the partial ordering relation (Bierwisch, 1989; Cresswell, 1976); (b) vague predicate analyses, in which the extensions of gradable adjectives need to be determined according to the context (Ginet, 1973; Kamp, 2013; Klein, 1980). Kennedy's analysis falls into the general family of scalar analyses.

However, Kennedy also makes some revolution to the classical scalar analysis, particularly as to the semantic type of gradable adjectives, as well as the interpretation of degrees.

adjectival polarity can be divided into positive adjectives, such as *tall*, and negative ones, such as *short*. According to this distinction, the anomaly of comparisons made between antonymous adjectives as shown in (5) can be explained by the undefined ordering relation for extents of opposite polarity:

- (5) *Carmen is taller than Mike is short.

2 DegP hypothesis and Deg-Shell

2.1 DegP hypothesis

To study the linguistic features of gradable adjectives, Abney established the DegreeP Hypothesis in his research (Abney, 1987). Before his work, degree words are always treated as occupying the specifier position of AP (Bowers, 1975; Jackendoff et al., 1977). In DegreeP Hypothesis, the comparative and superlative forms of adjectives are analyzed as a functional category called Degree Phrase (DegP), taking the lexical projection AP as its complement.

2.2 DegP-Shell

2.3 DegP Analysis in Specific Western Language

There is lots of work about DegP analysis on specific languages. In most cases, language-specific analyses always apply language-specific rules, which makes their conclusions hard to be extended to different languages such as Mandarin, but the approaches they apply to problems are still valuable. So here I give two examples to show how previous researchers conduct language-specific analyses based on the specific languages which they are familiar with.

In Corver's research in 1997, he investigates the phrase structure of the adjective projection in Dutch language (Corver, 1997a) based on DegP hypothesis. He found empirical evidence about distinctions between DegP and QP (means quantifier-like degree phrase), (6)(a) shows examples of DegP and (6)(b) gives examples of QP. This distinction also leads different phrasal structure, which is shown in (7).

- (6) (a) zo, te, hoe, even
zo, too, how, as

- (b) meer, minder, genoeg
more, less, enough

- (7) (a) [_{DegP} *te* [_{QP} *e* [_{AP} [_{A'} *lang*]]]]
[_{DegP} *too* [_{QP} *e* [_{AP} [_{A'} *tall*]]]]
(b) [_{QP} *minder* [_{AP} [_{A'} *lang*]]]
[_{QP} *less* [_{AP} [_{A'} *tall*]]]

Form Corver's

(7)(a) shows the structure in which
in which DegP selects QP and Q selects AP.

If there is no difference between all degree words, they would be expected to show a symmetric behaviour but actually not. In Dutch, when a sentence uses the quantifier-like

degree expression, the entire adjective phrase can be replaced by a pro-form. Based on this, Corver gives the structures of these two forms which are shown in (7).

In (7)(a), syntactic structure shows that the DegP head selects a QP and QP's head in turn selects AP. (7)(b) shows that adjective phrases are introduced by quantifier-like elements and the DegP is missing. The author tried to merge two structures into a single elegant structure. To make this happen, some evidence must be discovered to support the so-called "A to G raising" which is language specific. In Dutch, there are several phenomena suggesting the existence of this movement. Take one example as *genoeg*-inversion, which is illustrated in (8)(b), and the structure of *genoeg*-inversion is shown in (8)(c).

- (8) (a) *Jan is [genoeg bang daarvoor]
 Jan is enough afraid there-of
 Jan is afraid enough of it
 (b) Jan is [bang genoeg daarvoor]
 (c) [_{QP} *bang_i* + *genoeg* [_{AP} *t_i* *daarvoor*]]

Besides, Corver discussed the way to build a more complete syntactic structure. By summarizing several language-specific rules, he found that there has to be a AgrP in the extended adjectival projection. For one side, if the external argument is assumed to originate in the specifier of AP, there should be a syntactic position so that the subject can be moved in; and for other side, AgrP gives a better solution to explain some Dutch-specific movement operations. After all his work, Corver's final articulated structure with AgrP as below:

- (9) [_{AgrP} [_{Agr'} [_{DegP} [_{Deg'} *Deg* [_{QP} [_{Q'} *Q* [_{AP} *DP* [_{X'} *A* *XP*]]]]]]] *Agr*]]

Svenonius and Kennedy studied Null Degree Questions in Scandinavian (Svenonius & Kennedy, 2006). The so-called Null Degree Question is such a phenomenon that, in some dialects in Scandinavian, a degree sentence can only have degree operator but no wh-word. For example, in (10), the first sentence is Icelandic, and second sentence shows the mapping from Icelandic word to English word. What should be noticed is that the Icelandic word *hversu* turns to two English words *how much*, but actually *hversu* only used as a degree operator, but not a manner adverbial, which makes question '*how old are you?*' sounds like '*old are you?*'.

- (10) Hversu gammall ertu?
 how.much old are.you
 'How old are you?'

To explain this problem, authors made a postulation of null operator in Null Degree Question.

2.4 DegP Analysis in Mandarin

3 My Theory

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