

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

Secondly, Kennedy makes refinement to the interpretation of degrees. He argues that degrees should be formalized as extents (Bierwisch, 1989; Löbner, 2010; Seuren, 1978; A. v. Von Stechow, 1984) rather than as points on a scale, which is different from classical scalar analyses. Based on this extent-scalar view, Kennedy assumes that gradable adjectives characteristic of 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 Temp

In order to take a deep investigation about phenomenon mentioned in last section, we shall go back to the really beginning: the lexical entry of gradable adjectives. For our knowledge, there are two typical hypotheses of what should this lexical entry looks like, which are shown in (6). The lexical entry definition of gradable adjectives is literally important, because different definitions of adjective's lexical entry always lead totally different results in semantics and syntax just like Butterfly Effect.

- (6) (a) $\llbracket tall \rrbracket = \lambda d \lambda x. Height(x) \geq d$
 (b) $\llbracket tall \rrbracket = Height(x) = d$

(a) is a traditional lexical entry of gradable adjectives, and many researchers believe in it (refhere). Under this definition, gradable adjective *tall* is considered as a relation of "greater equal", which is true when an individual x as input and x 's height is at least as great as d .

Since there are several kinds of way to build a degree construction, such as positive form, comparative form and superlative form, a lexical meaning should have ability to give a interpretation of all these distribution. The lexical expression in (6)(a) works fine with comparative form and superlative form on account of its "greater equal" relation. But when building a positive form, this "greater equal" relation may cause some unintended problem. For example in (7). And lexical entry analysis of (7) is shown in (8).

- (7) Jhon gao 2 mi.
Jhon tall 2 meters.
 Jhon is 2 meters tall.

- (8) (a) $\llbracket tall \rrbracket = \lambda d \lambda x. Height(x) \geq d$
 (b) $\llbracket tall \ 2m \rrbracket = \llbracket tall \rrbracket(2m)$
 $= \lambda x. Height(x) \geq 2m$
 (c) $\llbracket John \ tall \ 2m \rrbracket = \llbracket tall \ 2m \rrbracket(John)$
 $= Height(John) \geq 2m$

To resolve λ abstraction, the lexical entry of *tall* need a measure phrase with lexical entry d and an individual x , which are respectively $2m$ and *John*. $2m$ change the semantic type of *tall* from $\langle d, \langle e, t \rangle \rangle$ to $\langle e, t \rangle$, and *John* are input as type e which makes final result to

type t . The result of lexical entry calculation tells a truth that John's height is not only equal to 2 meters precisely, but also has a possibility to greater than 2 meters. But actually we do know that sentence in (7) means John's height is 2 meters accurately, which is mismatch with the result of lexical entry calculation. The reason makes this mistake is that the partial ordering relation of degree is encoded in gradable adjective, and there is no way to resolve this "greater equal".

Base on the mistake mentioned above, there is another group of researchers propose that the gradable adjectives' lexical entry should not encode the partial ordering relation, instead, the gradable adjective should reveal the original property of individual, which means *tall* should simply illustrate the height of an individual. Thus the lexical entry of gradable adjectives should looks like (6)(b), in which there is just a single equal sign.

Under this assumption, the partial ordering relation still needs a place to be introduced, Svenonius claims that there is a null operator whose semantic and syntactic function is to introduce a degree argument and bear the mission of introducing the "greater equal" meaning. The denotation of this null operator is spelled out in (9), and the (9)(c) shows the composition of null operator and gradable adjective, which is same with (6)(a).

- (9) (a) $\llbracket nop \rrbracket = \lambda G \lambda d \lambda x. G(x) \geq d$
 (b) $\llbracket tall \rrbracket = Height(x)$
 (c) $\llbracket nop tall \rrbracket = \llbracket nop \rrbracket(\llbracket tall \rrbracket)$
 $= \lambda d \lambda x. Height(x) \geq d$

Next questions are, does this null operator have a specific phonetic expression in any language and where is it.

For the first question, Svenonius does a deep investigation about Icelandic and Norwegian, which shows that Norwegian does not exist a phonetic word of this null operator but Icelandic does. In Icelandic, (10) give three different ways to express same meaning. In (10)(a), the word *Hversu* is mapping to two English words *how.much*, but actually *Hversu* only used as a degree operator, and it does not bear the function of manner adverbial. In (10)(b), speaker can omit word *Hversu* and front predicate to express the same meaning. Also, in (10)(c), a word *Hvað* can be placed at the beginning of the sentence, and keep all other morphemes in their original position. What should be noticed is that the Icelandic word *Hvað* do not have real meaning, it is just a phonologically placeholder, which exactly be a evidence of the existence of null operator. For the latter question, Svenonius gives syntax structures of (10) respectively as shown in (11). From Svenonius' perspective, null operator and the word *Hvað* show the same locality conditions which is same with famous *wh*-movement.

- (10) (a) *Hversu gammall ertu?*
how.much old are.you
 how old are you?
 (b) *er du gammel?*
are you old
 how old are you?
 (c) *Hvað ertu gammall?*
null are you old
 how old are you?

- (11) (a) $[_{CP}Nop_1\ er_2[_{IP}du_3\ t_2[_{VP}t_2[_{AP}t_3\ t_1\ gammel]]]]$
 (b) $[_{CP}Hva\delta_1\ er_2[_{IP}\ -tu_3\ t_2[_{VP}t_2[_{AP}t_3\ t_1\ gammel]]]]$

Applying this assumption to Mandarin, I give a example in (12). Following Grano (Grano & Kennedy, 2012b), I also rename null operator to μ for the sake of convenience.

- (12) Jhon (μ) gao 2 mi.
Jhon μ tall 2 meters.
 Jhon is 2 meters tall.

But, this solution still causes some mistakes, such as following example in.

3 My Theory

References

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