Adjectives and Negation: deriving Contrariety from Contradiction

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Abstract Antonymic pairs of gradable adjectives (e.g. *tall-short*) give rise to contrary opposition. This fact has so far stood in the way of reducing this type of opposition to logical negation, which gives rise to contradictory opposition. We present an analysis of these antonymic pairs in terms of an underlying logical negation, and propose to derive the contrary nature of the opposition from the interaction of interval semantics with the presence of a contextual standard, which is known to be a part of the denotation of gradable adjectives. This analysis opens the way for a decomposition of negative adjectives as containing a logical negation with contradictory meaning.

1 Introduction

Consider the following examples:

(1)   a.   Linus is tall.
        b.   Linus is short.

Suppose (1a) is true; then (1b) cannot be true as well. But both sentences can be false together, namely in a situation where Linus is neither tall nor short, but of average height. This is, in other words, a case of contrary opposition: it holds between two sentences that cannot be true together, but that can be false together. Scalar adjectives like *tall* and *short* refer to a scale of tallness, and (informally) denote areas on that scale. Assume, for argument's sake, that anyone shorter than 175cm counts as short, and anyone above 185cm counts as tall. The area denoted by *short* is then indicated by the blue line on the top line of Figure 1; similarly, the area of *tall* is the red line a the top. The contrary nature of the opposition

between *tall* and *short* now translates into the existence of a neutral area in the middle of scale, namely the area between 175 and 185cm, which counts as neither tall nor short (the dotted line in Figure 1). This neutral area is context-dependent, an issue which we shall return to in section 3 below.[1]

Figure 1: Contrary and contradictory opposition
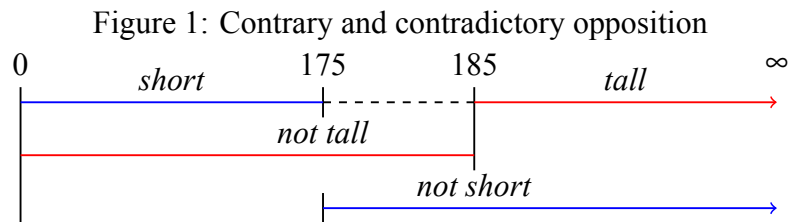
Now consider (2):

(2) a. Linus is tall.
     b. Linus is not tall.

These sentences instantiate contradictory opposition: (2a) and (2b) cannot both be true together, nor can they can be false together. For example, if a person's height were 180cm, we would be justified to say that the person is not tall. This is because an individual is either tall or not tall, and cannot be anything in between. In terms of our diagram in Figure 1, there is no neutral area between the two red lines, which represent the domain of *tall* and *not tall*; nor is there one between the two blue lines of *short* and *not short*.

What we can conclude from that is that the sentential negator *not* gives rise to contradictory opposition, but that antonymic pairs like *tall-*

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[1] For clarity of exposition, we limit ourselves in this paper to a particular type of antonyms, namely those which Kennedy (2001a) calls dimensional adjectives, such as *long–short*, *wide–narrow*, *high–low*, etc. What characterises the scales that these adjectives refer to is the fact that 'the parameter expressed by [the] adjective has a vanishing zero-value, and no upper limit' (Seuren 1978:340). With a vanishing endpoint, he means that at value 0 the parameter ceases to exist. For example, we would not say that an object with zero tallness is short, but rather that it lacks the tallness dimension altogether. In contrast, a person with zero possessions still qualifies as poor. We shall not discuss antonyms like *rich–poor*, *nice–ugly* etc., which behave differently in certain respects (e.g. with respect to the equivalence to be discussed in section 6 below).

short are related by contrary opposition (see also Horn 1989).[2] Now in earlier work (De Clercq and Vanden Wyngaerd 2017) we have argued that negative adjectives like *short* contain a Neg feature, which is also found in the sentence negator *not*. This Neg feature explains a well-known asymmetry between positive and negative adjectives, which is that negative adjectives systematically resist *un*-prefixation (e.g. *un-happy* vs **unsad*; see Zimmer 1964; Horn 1989). The assumption that negative adjectives contain a covert negation presupposes a form of decomposition. Concretely, we assume that the syntax works with features, and the lexicon is postsyntactic. The concrete means by which an adjective like *short* spells out a set of features, including a Neg feature, is by assuming the nanosyntactic mechanism of *phrasal spellout*: every syntactic object created by Merge interfaces with the lexicon, and undergoes spellout if a matching lexical item is found. The organisation of the lexicon is subject to the following restriction (Starke 2014):

(3)   The lexicon contains nothing but well-formed syntactic expressions.

The consequence of this is that lexical items contain well-formed syntactic trees. We return to the precise decomposition of *short* and similar adjectives below.

   This analysis, however, raises the following puzzle: why does negation sometimes give rise to contrary opposition, as in the case of antonymic adjectives, and sometimes to contradictory opposition, as in the case of the sentence negator *not*? The question is particularly pregnant for our decomposition analysis, which assumes the same Neg feature to be present in both. It is this question that we aim to answer in this paper. We shall argue that an analysis of negative gradable adjectives is possible in terms of the presence of a contradictory negation in their

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[2] We abstract away here from the fact that a sentence like (2b) may have a reading where *not tall* gets a stronger meaning, equivalent with *short*. Horn (1989) calls this the pragmatic strengthening of a contradictory negation to a contrary one. Such pragmatic strengthening is not found with the negative pole of the scale (*not short*), nor with nonscalar predications (e.g. *John laughed-John didn't laugh*). Also see Krifka (2007); Ruytenbeek et al. (2017).

internal structure, which at the same time allows for the existence of a contrary relationship with their positive antonyms.

The paper is structured as follows. In section 2, we introduce the notion of an interval or extent, and show how positive and negative extents are related by a relation of contradictoriness. Section 3 discusses the context-dependence of gradable adjectives. In section 4 we show how the contrary opposition can arise from the presence of an underlying contradictory negation. Section 5 discusses the syntax of antonymic gradable adjectives. Finally, in section 6 we show how our analysis straightforwardly derives an equivalence that exists between antonymic adjectives in the comparative.

2   Extents

The analysis that we propose of gradable adjectives draws heavily on Seuren (1978), whose analysis is based on interval semantics, in which gradable adjectives are taken to denote intervals or extents (see also Seuren 1984; von Stechow 1984; Löbner 1990; Kennedy 2001a; von Stechow 2008; Roelandt 2016).

An extent is a part of a scale. A scale S_{DIM} is a set of linearly ordered set of points along a dimension DIM. An extent E is a nonempty subset of S with the following property (Landman 1991:110):

(4) $\forall p_1, p_2 \in E, \forall p_3 \in S, [(p_1 < p_3 < p_2) \rightarrow (p_3 \in E)]$

Assume further a degree function d_{DIM}, which maps any entity x which can be ordered along some dimension DIM onto a unique point on the scale S_{DIM}. This unique point divides the scale into two intervals or extents, a positive and negative one, as defined in (5):

(5)   a. $POS_{DIM}(x) = \{p \in S_{DIM} \mid p \leq d(x)\}$
         b. $NEG_{DIM}(x) = \{p \in S_{DIM} \mid \neg[p \leq d(x)]\}$

Suppose, for example, that $d(Kurt) = 167$; then the corresponding positive and negative extents can be represented as in (6) (the orientation of the square bracket indicates whether or not the point next to it is included in the extent).

(6) a. $POS_{HEIGHT}(\text{Kurt}) = [0, 167]$
     b. $NEG_{HEIGHT}(\text{Kurt}) =]167, \infty[$

A graphical representation is given in Figure 2, with the red line the positive extent of x, and the blue line x's negative extent.

Figure 2: Positive and negative extent
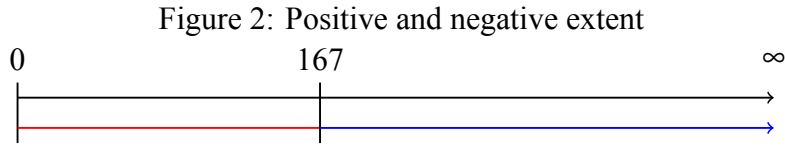
In our definition of a negative extent given in (5b), we differ from Kennedy (2001a:211), who defines the negative extent not in terms of negation but by reversing the ordering relation:

(7) a. $POS_{DIM}(x) = \{p \in S_{DIM} \mid p \leq d(x)\}$
     b. $NEG_{DIM}(x) = \{p \in S_{DIM} \mid p \geq d(x)\}$

As a result, a positive extent and its negative companion are join complementary, i.e. they share a single point, namely $d(x)$. In our definition, these extents are fully complementary as a result of the presence of negation in the definition of the negative extent in (6b). This will allow us to consider the relationship between a positive and a negative extent as a case of contradictoriness, as we shall show now.

Intuitively, positive and negative extents entertain a relation of contradictoriness: together, they exhaust the universe (i.e. the entire scale), and there is no neutral area in between them. We formalise this idea by adopting the following definitions of contradiction and contrariety:[3]

(8) a. Contradiction
         $A \cup B = \mathscr{U}$
         $A \cap B = \varnothing$
     b. Contrariety
         $A \cup B \neq \mathscr{U}$
         $A \cap B = \varnothing$

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[3] That the logical relations between propositions are analogous to relations between sets was noted by Keynes (1906:119;174) (L. Demey, p.c.).

Contradictory opposition involves a relation between two items where their set-theoretic union amounts to the Universe $\mathscr{U}$. In the case of contrariety, set-theoretic union yields less than the universe. In either case, the intersection of both sets is empty. Let us first show that this set-theoretic definition can be applied to propositions. This is done by taking the denotation of a proposition to be the set of situations in which it is true (Van Fraassen 1971). Two propositions are then contradictory if their union equals the Universe of all possible situations, and contrary if their union does not denote the Universe. In either case, their intersection will yield the empty set: the set of situations where both propositions are true is empty, i.e. they cannot be true together.

But the definitions in (8) also work to directly establish a relation of contradictoriness between extents, since extents are sets. By (8a), the relation between the positive and negative extent in (6) (and in the corresponding Figure 2) is a contradictory one: their union is the entire scale, and their intersection is empty. In the case of contrary opposition, the union of the two sets does is less than the Universe: this can be seen in the top line of Figure 1, where the blue line of *short* and the red one of *tall* together do not amount to the entire scale. Here too, the intersection of the two sets is empty.

The contradictory nature of the opposition between positive and negative extents follows directly from the presence of logical negation ($\neg$) in the definition of a negative extent in (5b) above. We may therefore define a negative extent more concisely as follows (see also von Stechow 1984):

(9) $NEG_{DIM}(x) = \neg POS_{DIM}(x)$

This will be important when we look at the relationship between antonymic adjectives.

A crucial assumption is that positive gradable adjective denote a positive extent, and negative gradable adjectives a negative extent, as shown in (10) for the pair *tall-short* (see also Kennedy 2001a;b; Heim 2006; Büring 2007; Heim 2008):

(10)   a. $[\![\text{tall}(x)]\!] = POS_{HEIGHT}(x)$
          b. $[\![\text{short}(x)]\!] = NEG_{HEIGHT}(x)$

That is, $[\![\text{tall}(x)]\!]$ is the set of degrees to which x is tall, whereas $[\![\text{short}(x)]\!]$ is the set of degrees to which x is not tall. The antonymic pair in (10) therefore stands in a relationship of contradictoriness, mediated by logical negation.

Given the equation in (9) above, we can now assume that negative scalar adjectives contain a logical negation in their internal structure, as proposed in De Clercq and Vanden Wyngaerd (2017).

(11) $[\![\text{short}(x)]\!] = [\![\neg\text{tall}(x)]\!] = \neg POS_{HEIGHT}(x) = NEG_{HEIGHT}(x)$

The arboreal representation of this is given in (12). We assume that gradable adjectives involve a Q feature, which semantically contributes an ordering (De Clercq and Vanden Wyngaerd 2017). Negative gradable adjectives add a Neg feature.

(12) $\text{NegP} = [\![\text{short}(x)]\!] =]r,\infty[_{HEIGHT}$

   Neg $\text{QP} = [\![\text{tall}(x)]\!] = [0,r]_{HEIGHT}$

      Q $\sqrt{}$

Now this analysis obviously raises the question where the contrariness comes from in this (and similar) pairs of antonyms. In order to answer that question, we first need to consider the issue of the context-dependence of scalar adjectives.

3   Context-dependence

It has long been known that the interpretation of gradable adjectives is sensitive to a contextual standard (Wheeler 1972; Seuren 1978; Klein 1980, and much subsequent work). For example, a sentence like *Kurt is tall* does not mean that Kurt has a degree on the scale of height, but rather that Kurt's degree on the scale of height exceeds a contextually given standard. This standard may be made explicit, as in the following examples:

(13)   a.   Kurt is tall for a Bolivian.
         b.   Kurt is not tall for a Swede.

Varying the standard may lead to the sentence changing its truth value; as a result, both sentences of (13) may be true together. If we take out the standard again, but interpret the implicit standard as in (13), this may lead to an apparent violation of the Law of Contradiction (LC): $\neg(p \wedge \neg p)$.

(14)   a.   Kurt is tall.
        b.   Kurt is not tall.

These two sentences can be true together if we interpret (14a) as (13a) and (14b) as (13b). The LC can be upheld, however, by stipulating that in sentences with gradable adjectives, the (implicit) standard of comparison of a sentence and its negation needs to be held constant.

Following Seuren (1978), we take this contextual standard or average itself to be an extent, i.e. the context-sensitive interval A_C of average height, or the set of degrees that counts as neither neither tall nor short (see also von Stechow 2008). For the above example, let the relevant extents be as in (15):[4]

(15)   a. $A_C = [175, 185]$ (Swedish men)
        b. $A_B = [145, 155]$ (Bolivian men)

With this much in place, we are ready to explain how the contradictory negation in the internal makeup of negative adjectives gives rise to contrary opposition.

4   Deriving contrariety from extent inclusion

Contrariety in pairs of antonymic adjectives is a direct consequence of the truth conditions on sentences with gradable adjectives, to which we turn now. Following Seuren (1978), we formulate these truth conditions in terms of extent inclusion. We define inclusion as in (16):

(16)   For two extents X and Y,
 $X \subseteq Y \iff ((X \cap Y = X) \wedge (X \cup Y = Y))$.

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[4] https://en.wikipedia.org/wiki/List_of_average_human_height_worldwide

A sentence like *Linus is tall* is true if the positive extent of Linus's height includes the contextual average A_C. Similarly for negative adjectives, except that they involve a negative extent: *Kurt is short* is true in case the negative extent of Kurt's height includes A_C.

(17)   a. $[\![\text{Linus is tall}]\!] = 1 \iff POS_{HEIGHT}(Linus) \supseteq A_C$
       b. $[\![\text{Kurt is short}]\!] = 1 \iff NEG_{HEIGHT}(Kurt) \supseteq A_C$

Figure 3 illustrates these inclusion relationships (where $d(Linus) = 193$ and $d(Kurt) = 167$). The bold red line is the positive extent of Linus' height, and it includes the interval of the average height of Swedish men A_C. The bold blue line is the negative extent of Kurt's height, and it likewise includes the interval of the average height of Swedish men A_C.

Figure 3: Extent inclusion in positive adjectives
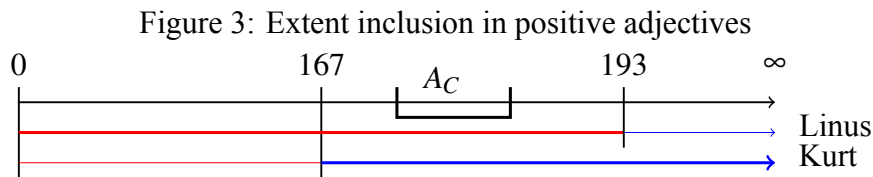
In this model, then, both sentences of (17) will come out as true.

Now suppose Eva is of average height, e.g. $d(Eva) = 182$. Since this value is included in the contextual average A_C, neither the positive nor the negative extent of Eva's height will include A_C. This is shown in Figure 4. As a result, both the sentence *Eva is tall* and *Eva is short* will come out as false. This derives the contrary opposition of the latter two sentences, since they are both false at the same time (though not both true at the same time, as the reader may verify).

Figure 4: No inclusion with average height
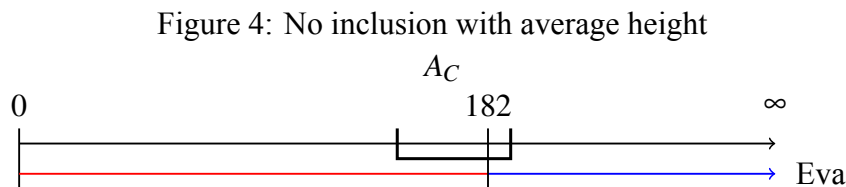
Now recall from above the contradictory pair in (2), repeated here:

(2)   a.   Linus is tall.
         b.   Linus is not tall.

The truth condition of (2a) is as before (see (18a)). In line with our earlier analysis in terms of extent inclusion, (2b) is true if the (positive) extent of Linus' height does not include the contextual average.

(18)   a. $[\![\text{Linus is tall}]\!] = 1 \iff POS_{HEIGHT}(Linus) \supseteq A_C$
         b. $[\![\text{Linus is not tall}]\!] = 1 \iff POS_{HEIGHT}(Linus) \not\supseteq A_C$

In our example of Swedish men (i.e. given that $A_C = [175, 185]$; see (15a) above), (18a) will come out as true for all values of $d(x)$ equal to or higher than 185, since this will give rise to positive extents that include A_C, whose upper bound is 185. By the same reasoning, (18b) will be true for any $d(x)$ that is lower than 185, since such extents do not include A_C. It is easy to see that these two cases are exactly complementary: any value of x that makes (2a) true makes (2b) false, and vice versa. The net result is contradictory opposition. We leave it to the reader to verify that the same works for the contradictory pair *short-not short*.

In sum, the analysis we propose takes antonymic pairs of adjectives to be related by a Neg feature, which gives rise to contradictory opposition between a positive extent and its negative complement. Contrariety follows from the truth conditions of gradable adjectives, which are formulated in terms of an inclusion relation between two extents: one the one hand, a context-dependent average A_C; on the other, a positive extent for positive adjectives, and a negative extent for negative adjective ones.

5   Syntax

The syntax of gradable adjectives that we proposed above still leaves some issues to be addressed. Recall (from (12) above) that we have assumed a Neg feature in the makeup of negative gradable adjectives, which contributes contradictory opposition:

(19) $\text{NegP} =]r, \infty[_{DIM}$

    Neg $\text{QP} = [0, r]_{DIM}$

        Q $\sqrt{}$
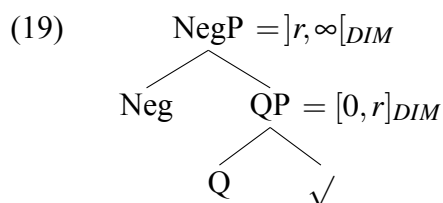
There are three issues with this structure that need to be addressed. The first is that it does not give us contrariety; the second that it lacks the aspect of context-dependence of gradable adjectives. Lastly, what (19) does not give us is a compositional way of getting from (19) to the truth condition for a sentence like *Linus is tall*, which involves an inclusion relationship between a positive or negative extent and the contextual average. It is from this inclusion relationship that contrariety is the consequence.

Before we go on to modify the syntactic structure in (19) to address these issues, we first discuss a number of cases where the contextual average is absent from the interpretation of the adjective.

(20)   a.   How tall is Kurt?
        b.   Kurt is (more/less than) 1.5m tall.
        c.   Kurt is that tall.

(21)   a.   Kurt is (half/twice) as tall as Lisa.
        b.   Kurt is (not) as tall as Lisa.
        c.   Kurt is taller than Lisa.

(22)   a.   Kurt is too tall for this suit.
        b.   Kurt is tall enough to be a pilot.

What all these examples have in common is that the adjective *tall* itself does not make reference to a contextual standard. This is quite clearly seen in (20a), which is a question for a degree (any degree) on the scale of height. The other examples are all interpreted in terms of some standard or other, but one that is explicitly present in the sentences (e.g. *1.5m, that* (pointing), *Lisa's tallness, for this suit, to be a pilot*, suggesting that the in these cases adjective *tall* itself does not refer to such a standard. Following Seuren (1978), we call this the neutral use of *tall* (or *neutral*

tall for short). The use of *tall* that involves reference to a contextual standard (e.g. (2a) above) we shall call *relative tall*.

It is obvious that relative *tall* has a richer intension than neutral *tall*, since it contains both the degree function of neutral *tall,* as well as a reference to a standard. The question is how the relation between both types of *tall* can be modelled. We suggest that it is a case of syncretism, i.e. one piece of phonology that is shared by different grammatical categories. In particular, we shall be assuming two things: (i) given that relative *tall* has a richer intensions than neutral *tall*, it is syntactically bigger than neutral *tall*, and (ii) the structure of relative *tall* contains that of neutral *tall*. We depict this analysis in the tree in (23).

(23) A_CP $\Rightarrow$ relative *tall*

  A_C QP $\Rightarrow$ neutral *tall*

         Q $\sqrt{}$
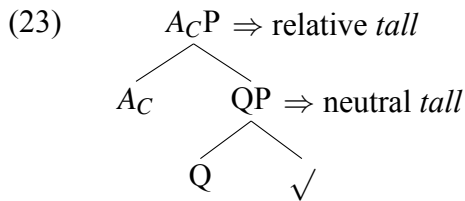
In comparison with our earlier tree, this tree adds the feature A_C for the contextual average at the top. The syncretism now arises in virtue of the fact that *tall* can spell out both QP (neutral *tall*) and A_CP (relative *tall*). The principle by which this happens is the Superset Principle (Starke 2009):

(24)   *Superset Principle*
         A lexical entry may spell out a syntactic node iff the lexical tree is identical to the syntactic tree, or if it contains the syntactic tree as a constituent.

Concretely, the lexicon entry for *tall* would contain the entire tree in (23); this lexical entry could spell out the syntactic object QP, since QP is contained in the lexical tree, as well as A_CP, since in that case the syntactic tree is identical to the lexical tree.

Semantically, we saw earlier that QP denotes an extent. We now formulate this a bit more accurately (though not essentially differently) and say that QP denotes a function from an individual to an extent: to get an extent we necessarily need a degree, and to get a degree, we need

an individual who is the input to the degree function $d(x)$ that maps the individual onto a degree. Using λ-notation, the functions for positive and negative gradable adjectives are given in (25):

(25)　　a.　$\lambda x.POS_{DIM}(x)$
　　　　b.　$\lambda x.NEG_{DIM}(x)$

The head A_C then adds the contextual average, as well as the inclusion relation, as follows:

(26)　　a.　$\lambda x.POS_{DIM}(x) \supset A_C$
　　　　b.　$\lambda x.NEG_{DIM}(x) \supset A_C$

Now the semantic relationship between neutral *tall* and relative *tall* can be represented as in (27):

(27)　　　　　$A_CP = \lambda x.POS_{DIM}(x) \supset A_C$

　　　　A_C　　$QP = \lambda x.POS_{DIM}(x)$

　　　　　　Q　　$\sqrt{}$

Negative adjectives differ from positive ones in the presence of a Neg feature, which transforms the positive extent into a negative one. The A_C head subsequently adds the contextual average and the inclusion relation.

(28)　　　　　$A_CP = \lambda x.NEG_{DIM}(x) \supset A_C$

　　　　A_C　　$NegP = \lambda x.NEG_{DIM}(x)$

　　　　　　Neg　　$QP = \lambda x.POS_{DIM}(x)$

　　　　　　　　Q　　$\sqrt{}$

This completes the account of the syntax of positive and negative gradable adjectives, and how the syntax is semantically interpreted.

6   Comparatives and contraposition

Our analysis also allows a straightforward account of the following equivalence that holds between the pairs of antonymic adjectives discussed in this paper:

(29)   Edie is taller than Paul $\iff$ Paul is shorter than Edie

Such equivalences arise with all and only adjectives that form antonymic pairs (as the reader may verify by replacing *shorter* on the right hand side of the equation with *slimmer*, in which case the equivalence breaks down). This suggests that pairs of antonyms are semantically related; the obvious way in which they are related is through negation. Informally put, equivalences like (29) hold because *short* is somehow equivalent to (or has to be decomposed as) *not tall*. A traditional obstacle for such an analysis, however, has always been that *short* is not, in fact, equivalent to *not tall*, since *tall* and *short* are contrary opposites, whereas *short* and *not tall* are contradictory ones (as explained above).

This nonequivalence, however, only holds for relative *tall* and *short*. As we saw in section 2 above, neutral *tall* and *short* are related by (contradictory) negation. As a first point in deriving the equivalence in (29) therefore, we observe that the comparative involves neutral *tall* and not relative *tall*. This appears from the fact that one cannot infer from (30a) to (30b), for example if both Edie and Paul are short, in which case (30a) may be true but (30b) is certainly false:

(30)   a.   Edie is taller than Paul.
          b.   Edie is tall.

Next we formulate the equivalence in (29) in a more general format. Assume a relation of antonymy in terms of the operation of negation, as follows:

(31)   *Antonymy*
          $ANT(A, B) \iff B = \neg A$

This relation holds between the neutral versions of adjectives of antonymic pairs, like neutral *tall* and neutral *short*. We can now formulate the equivalence in (29) more generally as in (32):

(32) b is more A than a $\iff$ a is more $\neg A$ than b

In line with our analysis in terms of extents developed above, we assume that the meaning of the comparative involves extent inclusion. For example, the truth of (33a) requires that the positive extent of Edie's height includes the positive extent of Paul's height, as shown in (33b) (Kennedy 2001a).[5]

(33)   a.   Edie is taller than Paul.
         b. $POS_{HEIGHT}(p) \subset POS_{HEIGHT}(e)$

Similarly, since (34a) involves the negative adjective *short*, its truth requires that the negative extent of Paul's height includes the negative extent of Edie's height:

(34)   a.   Paul is shorter than Edie.
         b. $NEG_{HEIGHT}(e) \subset NEG_{HEIGHT}(p)$

Therefore, what we need to show in order to prove the validity of (32) is that the following equivalence holds:

(35) $POS_{DIM}(a) \subset POS_{DIM}(b) \iff NEG_{DIM}(b) \subset NEG_{DIM}(a)$

This equivalence is in fact the set-theoretic counterpart of the Law of Contraposition:

(36)   *Law of Contraposition*
         $p \rightarrow q \iff \neg q \rightarrow \neg p$

The derivation of (35) is straightforward. Abbreviating the positive and negative extents of a to A and $\neg A$, respectively (and similarly B and $\neg B$ for b), (35) amounts to the following:

(37) $A \subset B \iff \neg B \subset \neg A$

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[5] Kennedy's analysis of the comparative is slightly different, in that it involves existential quantification over extents, but this is immaterial to the matter discussed here. Kennedy derives the same result as we do, but since in his analysis positive and negative extents are join complementary, his derivation is less straightforward.

Starting from the first subset relation, we have the following sequence of steps:

(38) $(A \subset B)$
        $\Longleftrightarrow (x \in A \rightarrow x \in B)$
        $\Longleftrightarrow (x \notin B \rightarrow x \notin A)$ (Law of Contraposition)
        $\Longleftrightarrow (\neg B \subset \neg A)$

This proves the general validity of (32). The proof rests on the assumption that a logical relation of negation is defined between pairs of antonymic adjectives.

A similar equivalence holds between the sentence pair in (39a), the general format of which is given in (39b):

(39)   a.   Edie is too tall $\Longleftrightarrow$ Edie is not short enough
        b. a is too A $\Longleftrightarrow$ a is not $\neg$A enough

For reasons of space, we shall not undertake a demonstration of the latter equivalence. We refer the reader to Meier (2003); Hacquard (2005) for discussion.

7 Conclusion

We have shown how the relative readings of antonymic pairs of gradable adjectives (e.g. *tall-short*) entertain a relation of contrary opposition. We have decomposed such adjectives in two respects: first, they contain a contextual average, and a neutral version of the adjective, which denotes an extent. Second, (neutral) negative adjectives are related to their positive counterparts by means of logical (i.e. contradictory) negation. This double decomposition allows an account of the logical relations that exist between pairs of antonymic adjectives, both the contrary relation between relative readings of antonyms, and the contradictory one that is at the heart of contrapositional relationship between their comparatives.

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