Scalar (Non-)Identity and Similarity

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1 Introduction

Perhaps the simplest view of the meanings of English *different* and *the same* takes these adjectives to express the relations of non-identity and identity between individuals.

(1) a. My new car is different from my last one.
b. Water is the same as H_20.

In this paper, I will argue that at least some uses of *different* and *the same* are best taken as expressing relations of similarity, rather than identity. I will do this by identifying two ways in which an identity predicate analysis of *different* and *the same* is inadequate, and then showing that a similarity predicate analysis straightforwardly solves these problems. I will also consider the question of whether both similarity and identity meanings exist for *different* and *the same*, and if so, what the relation between the two meanings should be.

2 *Different* and *the same* as identity predicates

2.1 A simple view of different *and* the same

The simple view alluded to above can be found in work on such uses of *different* and *same* as the ones illustrated in (2) (see, e.g., Dowty 1985, Heim 1985, Carlson 1987, Moltmann 1992, Beck 2000, Barker to appear).

(2) a. Every student read a different book.
b. The same salesman sold me these two magazine subscriptions.

Here, *different* and *same* occur NP-internally, and their interpretation depends upon a plural or distributive NP occurring elsewhere in the sentence, e.g., (2a) can be paraphrased as "Every student read a book that is different from the book that every other student read". The primary focus of this work has been on exactly how *different* and *same* relate to the plural/distributive NP. In much of it, it is simply assumed that *different* expresses non-identity, while *same* expresses identity, and that these are relations that hold amongst individuals.

A question that arises is whether all occurrences of *different* and *same* express (non-)identity between individuals. In particular, we could ask whether the simple predicative uses in (3) also express these relations.[1]

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[1] While the appearance of the definite article with NP-internal *same* in (2b) is not surprising, its appearance in (3b) is, given the lack of an overt nominal head. Throughout this paper, I will treat the definite article when occurring with such predicative uses of *same* as if it were contentless, though this seems unlikely to be correct. Exactly what licenses its appearance here is something that I do not presently understand (though see also section 4.4).

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(3) a. My new car is different from my last one.
b. Water is the same as H_20.

Under such a view, *different* and (*the*) *same* could be given the denotations in (4) and (5) (see Beck 2000 for a version of (4)).

(4) [[**different**]] = $\lambda x.\lambda y.x \neq y$ (non-identity relation b/w individuals)

(5) [[(**the**) **same**]] = $\lambda x.\lambda y.x = y$ (identity relation b/w individuals)

The logical complementarity of *different* and *the same*, which is illustrated in (6), would follow straightforwardly from these denotations.

(6) Contentment isn't the same as happiness. ⇔
Contentment is different from happiness.

2.2 Two problems for the simple view

Perhaps not too surprisingly, this simple view of *different* and *the same* appears to be too simple. There are two sets of facts in particular that cause problems for it.

2.2.1 Scalar uses of different *and* the same

The first problem is that the relations of (non-)identity between individuals cannot hold to varying degrees, but those expressed by *different* and *the same* can (Huddleston & Pullum 2002; see also Laca and Tasmowski 2003 on French *différent*). (7a) and (8) show that both *different* and *the same* readily occur with degree modifiers; (7b) shows that *different* also appears in comparative constructions.

(7) a. My new car is {a bit, quite, very, really} different from my previous one.
b. Jack and Diane turned out to be more different than I had expected.

(8) Frozen fish is {almost, nearly, just about, not quite, roughly} the same as fresh fish.

Such examples require that *different* and *the same* be given scalar denotations. The ones given in (4) and (5) are inherently non-scalar, and so are unable to account for these uses.

2.2.2 Logical relations with similarity predicates

The second problem is that from (4) and (5), there is no reason to expect *different* and *the same* to be logically related to similarity predicates, such as (*a*)*like*. It turns out, though, that there are indeed logical relations amongst the three predicates.

Consider first *different* and *like*. It is generally true that a sentence of the form *a and b are more different than c and d* is logically equivalent to the sentence *c and d are more alike than a and b*.

(9) a. English and Spanish are more alike than English and American Sign Language. ⇔
English and American Sign Language are more different than English and Spanish.
b. Oranges and apples are more different than oranges and tangerines. ⇔
Oranges and tangerines are more alike than oranges and apples.

This kind of equivalence is a characteristic property of scalar antonyms, e.g., *tall* and *short*.

(10) Shaquille is taller than Kobe. ⇔
Kobe is shorter than Shaquille.

Turning to *like* and *the same*, these participate in a logical strength relation, with *like* subordinate to *the same*. This can be seen from their behavior in *if not* and *or at least* appositives, where the relevant generalization is that the material in an *if not* appositive must be logically stronger than what the appositive attaches to, while what occurs in an *or at least* appositive must be logically weaker (Carlson 1981). Then, (11) and (12) show *like* to be logically weaker than *the same*.

(11) Humanism is rather like, if not the same as, atheism.
(cf. *Most, if not* {*all*, **some*}, *of us enjoy our beer served warm.*)

(12) Humanism is the same as, or at least rather like, atheism.
(cf. *Most, or at least* {**all*, *some*}*, of us enjoy our beer served warm.*)

3 *Different* and *the same* as similarity predicates

I claim that *different* and *the same* show logical relations with similarity predicates such as *like* simply because on some of their uses, they are similarity predicates. A question that immediately arises is how similarity between two individuals is computed. The answer that I'll adopt here is that similarity is measured in terms of shared or distinguishing properties. That is, a property counts as a "similarity" between two individuals if it fails to distinguish between them, by either applying to both individuals or else to neither. As McCawley (1970) has observed, such a view of what constitutes a similarity is supported by restrictions on clauses of the form *in that S* when they occur with similarity predicates. Informally, these clauses serve to specify the exact nature of the asserted similarity; the examples in (13) show that an *in that S* clause occurring with *like* must entail the existence of a property that fails to distinguish between the relevant individuals. In other words, the *in that S* clause must entail the existence of a similarity, as defined above.

(13) Jack is like Diane in that . . .
a. . . .they both have red hair.
b. #. . .he has red hair.
c. . . .he has red hair too.
d. . . .neither of them finds people with red hair attractive.

Correspondingly, a "difference" between two individuals can be taken to be a property that does distinguish between them, by applying to the one but not the other. Evidence from *in that S* clauses again provides some support for this view; the examples in (14) show that an *in that S* clause occurring with *different* must entail the existence of such a property.

(14) Jack is different from Diane in that . . .
a. . . .he has red hair, while hers is blonde.
b. #. . .he has red hair.
c. . . .only he has red hair.

While this view of what constitutes a similarity or a difference between two individuals may ultimately turn out to be too simple, I think that it is a reasonable first approximation of these notions.[2] For the purposes of what follows, it should suffice.

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[2] In particular, I think that there are good reasons to construe a similarity not as a simple property, e.g., '*x* has red hair', but rather as a family of properties that together partition the set of individuals according to some dimension, e.g., the family of properties '*x* has red hair', '*x* has brown hair', '*x* has blonde hair', etc., which partitions the set of individuals according to hair color (see Deutsch 1998 for a version of this idea). This refinement resolves certain questions that arise concerning the role of "negative" properties in the view outlined above, e.g., should the property '*x* is a citrus fruit' always count as a similarity between apples and bananas, in virtue of its failure to apply to either fruit? Unfortunately, space limitations preclude any thorough discussion of this issue and its resolution under the partition view.

Given this, I propose that similarity predicate uses of *different*, *the same*, and *like* be analyzed as follows. A sentence of the form *a is like b* will assert that some amount of similarity exists between *a* and *b*, i.e., that there is some property that counts as a similarity between the two.

(15) *My new car is like my previous one* is true in *w* iff $\exists P[P_w(n) \leftrightarrow P_w(p)]$.

A sentence of the form *a is different from b* will assert that some amount of difference exists between *a* and *b*, i.e., that there is some property that counts as a difference between the two.

(16) *My new car is different from my previous one* is true in *w* iff $\exists P[\neg (P_w(n) \leftrightarrow P_w(p))]$.

Finally, a sentence of the form *a is the same as b* will assert that maximal similarity obtains between *a* and *b*, i.e., that every property counts as a similarity between the two.

(17) *My new car is the same as my previous one* is true in *w* iff $\forall P[P_w(n) \leftrightarrow P_w(p)]$.

Before moving on to consider how this proposal accounts for the facts in section 2.2, let me first address a possible objection to the analysis of *the same* given in (17). It concerns the fact that a sentence like (18) can be taken as true, given an appropriate context or adjunct.

(18) (In all relevant respects,) Beijing is the same as Shanghai.

If *the same* requires that every property fail to distinguish between its arguments, then it seems that (18) could never be true. After all, there must always be some property that distinguishes Beijing from Shanghai, e.g., the property of being located south of Shanghai. (Note that (18) is also a problem for the identity predicate analysis.) The solution to this problem is in fact a rather familiar one: we need only assume that the quantification over properties performed by *the same* is restricted by some set of contextually relevant properties *C*, so that what (18) actually asserts is that every contextually relevant property fails to distinguish between Beijing and Shanghai. (See Nunberg 1984 for a related view of *the same*.) The result of incorporating the set of contextually relevant properties *C* into the logical form for (18) is shown below.

(19) *Beijing is the same as Shanghai* is true in *w* relative to a set of contextually relevant properties *C* iff $\forall P \in C[P_w(b) \leftrightarrow P_w(s)]$.

In general, I will assume that the meanings of *different*, *the same*, and *like* are all subject to such contextual restriction. (Its presence in the semantics of *different* can be seen from the fact that the sentence (*In these respects,*) *humans are no different from computers* need not be false.)

4 Similarity and scales

4.1 Logical relations with similarity predicates, Part I

At this point, two of the logical relations identified in section 2 follow straightforwardly. The similarity predicate analysis predicts the logical complementarity of *different* and *the same*, just as the identity predicate analysis did.

(20) Contentment isn't the same as happiness. $\Leftrightarrow$
Contentment is different from happiness.

Under the similarity predicate analysis, their complementarity follows from the equivalence of the external negation of a universal statement and the internal negation of the corresponding existential statement ($\neg\forall$ and $\exists\neg$). This can be seen in the logical forms in (21) and (22), which differ only in the strength of the quantifier, and the placement of negation with respect to the quantifier.

(21) *Contentment isn't the same as happiness* is true in *w* relative to a set of contextually relevant properties *C* iff $\neg \forall P \in C[P_w(c) \leftrightarrow P_w(h)]$.

(22) *Contentment is different from happiness* is true in *w* relative to a set of contextually relevant properties *C* iff $\exists P \in C[\neg (P_w(c) \leftrightarrow P_w(h))]$.

The logical subordination of *like* to *the same* is also predicted by the similarity predicate analysis.

(23) Humanism is rather like, if not the same as, atheism.

(24) Humanism is the same as, or at least rather like, atheism.

Here, logical relatededness follow from the fact that a universal statement over a non-empty domain always entails its corresponding existential statement. This can be seen in the logical forms in (25) and (26), which differ only in the strength of the quantifier.

(25) *Humanism is like atheism* is true in *w* relative to a set of contextually relevant properties *C* iff $\exists P \in C[P_w(h) \leftrightarrow P_w(a)]$.

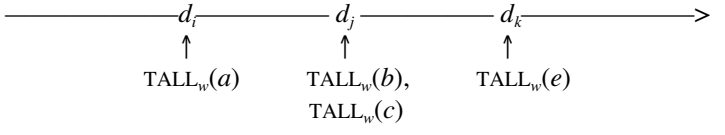
(26) *Humanism is the same as atheism* is true in *w* relative to a set of contextually relevant properties *C* iff $\forall P \in C[P_w(h) \leftrightarrow P_w(a)]$.

Accounting for the final logical relation, the antonymy between *different* and *like*, requires that we first account for their scalarity.

4.2 Scalar uses of different *and* like

According to the approach to the semantics of scalarity taken in von Stechow 1984, Rullmann 1995, Kennedy 1999, and many other works, a scalar adjective like *tall* is associated with a scale, which is a linearly ordered set of points, or "degrees". Part of the meaning of a scalar adjective is a measure function that maps members of the adjective's domain onto its scale, e.g., the meaning of *tall* includes a measure function TALL that locates individuals along some scale according to their height.

(27)



The denotation of *tall* is in turn a relation between degrees and individuals, specifically the one given in (28). This is the relation that holds between a degree *d* and an individual *x* just in case the degree returned by applying the measure function TALL to *x* is ordered ahead of *d*; informally, what is required for the relation to hold is that *x*'s height exceed *d*.

(28) $[\![\textbf{tall}]\!]^w = \lambda d.\lambda x.\text{TALL}_w(x) \geq d$

So-called "absolute" constructions as in (29) are interpreted relative to a contextually supplied degree argument (the "standard" value in the context).

(29) *Kobe is tall* is true in *w* iff $\text{TALL}_w(k) \geq d_s$

(30)

The truth conditions in (29) state that *Kobe is tall* will be true just in case Kobe's height exceeds some contextually determined standard of height.

Given this general approach to scalarity, scalar uses of *different* and *like* can then be accounted for by taking these adjectives to denote relations between degrees and pairs of individuals, as shown in (31) and (32).

(31) $[\![\textbf{different}]\!]^{C,w} = \lambda y.\lambda d.\lambda x.\text{DIFF}_{C,w}(x)(y) \geq d$

(32) $[\![\textbf{like}]\!]^{C,w} = \lambda y.\lambda d.\lambda x.\text{LIKE}_{C,w}(x)(y) \geq d$

The denotations in (31) and (32) contain the measure functions DIFF and LIKE. These are functions that map pairs of individuals to degrees and satisfy the following conditions:

(33) For any individuals a, b, c, e, world w, and set of contextually relevant properties C,
$\text{DIFF}_{C,w}(a)(b) > \text{DIFF}_{C,w}(c)(e)$ iff $|\{P \in C : \neg(P_w(a) \leftrightarrow P_w(b))\}| > |\{P \in C : \neg(P_w(c) \leftrightarrow P_w(e))\}|$
(i.e., $\text{DIFF}_{C,w}(a)(b)$ is ordered above $\text{DIFF}_{C,w}(c)(e)$ iff there are more differences between a and b in C than there are between c and e.)

(34) For any individuals a, b, c, e, world w, and set of contextually relevant properties C,
$\text{LIKE}_{C,w}(a)(b) > \text{LIKE}_{C,w}(c)(e)$ iff $|\{P \in C : P_w(a) \leftrightarrow P_w(b)\}| > |\{P \in C : P_w(c) \leftrightarrow P_w(e)\}|$
(i.e., $\text{LIKE}_{C,w}(a)(b)$ is ordered above $\text{LIKE}_{C,w}(c)(e)$ iff there are more similarities between a and b in C than there are between c and e.)

The conditions in (33) and (34) state that DIFF and LIKE map pairs of individuals onto their associated scales according to the number of differences or similarities that exist between the pairs' members (relative to a given set of properties). Those pairs that possess more differences are ordered more highly by DIFF, while those that possess more similarities are ordered more highly by LIKE.

The resulting logical forms for absolute constructions involving *different* and *like* are given in (35) and (36).

(35) *My new car is different from my previous one* is true in w relative to a set of contextually relevant properties C iff $\text{DIFF}_{C,w}(n)(p) \geq d_s$.

(36) *My new car is like my previous one* is true in w relative to a set of contextually relevant properties C iff $\text{LIKE}_{C,w}(n)(p) \geq d_s$.

Observe that what was previously accomplished with direct existential quantification in (15) and (16) now follows from the ordering requirements present in (35) and (36): the condition in (e.g.) (35) will be satisfied just in case there exist a sufficient number of differences between my new car and my previous one.

4.3 Logical relations with similarity predicates, Part II

An important feature of the measure functions DIFF and LIKE is that they determine inverse orderings over pairs of individuals: if DIFF orders $\langle a,b \rangle$ above $\langle c,e \rangle$, then LIKE will order $\langle c,e \rangle$ over $\langle a,b \rangle$, and vice versa.

(37) For any individuals a, b, c, e, world w, and set of contextually relevant properties C,
$\text{DIFF}_{C,w}(a)(b) > \text{DIFF}_{C,w}(c)(e)$ iff $\text{LIKE}_{C,w}(c)(e) > \text{LIKE}_{C,w}(a)(b)$.

This fact is all that is needed to capture the logical equivalence in (38).

(38) Oranges and apples are more different than oranges and tangerines. ⇔
Oranges and tangerines are more alike than oranges and apples.

I assume the simplified logical form for comparative constructions given in (39), which states that *a is more Adj than b* will be true just in case the measure function associated with *Adj* orders *a* over *b*.

(39) *a is more Adj than b* is true in *w* iff $\text{MEAS}_w(a) > \text{MEAS}_w(b)$.
(MEAS is the measure function associated with *Adj*.)

The resulting truth conditions for the sentences in (38) are shown in (40) and (41); given that DIFF and LIKE determine inverse orderings, these are equivalent.

(40) *Oranges and apples are more different than oranges and tangerines* is true in *w* relative to a set of contextually relevant properties *C* iff $\text{DIFF}_{C,w}(o)(a) > \text{DIFF}_{C,w}(o)(t)$.

(41) *Oranges and tangerines are more alike than oranges and apples* is true in *w* relative to a set of contextually relevant properties *C* iff $\text{LIKE}_{C,w}(o)(t) > \text{LIKE}_{C,w}(o)(a)$.

Thus, the similarity predicate analysis also predicts the logical relatedness of *different* and *like*.[3]

4.4 Scalar uses of the same

Let me now return to the modification properties of *the same*. (43) demonstrates that the modifiers that occur with *the same* also occur with expressions involving overt universal quantification.

(42) Frozen fish is {almost, nearly, just about, not quite, roughly} the same as fresh fish.

(43) a. {Almost, nearly, just about, roughly} everyone you meet in Santa Cruz has a tattoo.
b. I'm sure that not quite everyone would agree with that statement.

So, taking *the same* to somehow universally quantify over properties, either directly as in (17), or else indirectly via association with a scalar endpoint, should account for its modification properties. Another relevant observation is that *the same* tolerates exceptive phrases, as shown in (44); this too is a property that it shares with universal quantifiers (cf. (45)).

(44) Except for its expensive leather interior, my new car is the same as my last one.

(45) Except for John, everyone in this room can dunk a basketball.

A question worth considering is whether *the same* should be assimilated to the class of "total" adjectives, e.g., *dry* and *complete (*see Rotstein & Winter 2004 and Kennedy & McNally 2005), to superlative expressions, or else to neither. (46) and (47) show that total adjectives and superlatives occur with the modifiers of *the same*, and that both tolerate exceptive phrases.

(46) a. The towel is nearly dry.
b. The poem is complete except for the last stanza.

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[3] Interestingly, although the equivalence in (38) is characteristic of scalar antonyms (cf. (10)), *different* and *like* are not logical contraries:

(i) Friar and Mercutio are both alike and different. They are both pawns serving fate, but Mercutio pays a greater price to his fate in the event of death. (non-contradictory)

Typical scalar antonyms, on the other hand, are logical contraries:

(ii) Mercutio is both tall and short. (contradictory)

(47) a. Mount Rainer isn't quite the tallest mountain in the United States, but it's close.
b. Except for maybe *Pulp Fiction*, Tarantino's new movie is the best that he's ever made.

Taking *the same* to be somehow akin to superlatives may also provide an explanation for why the definite article occurs with *same* even in the absence of any overt nominal head, a fact which I currently have no account for, but which also holds for superlatives (cf. (47b)).

5 Concluding observations

Given that similarity predicate meanings exist for *different* and *the same*, is there evidence that identity predicate meanings exist for these adjectives as well? I believe that there is indeed such evidence; it comes from certain interpretive differences amongst modified, NP-internal occurrences of *different* and *the same* of the sort illustrated in (2).

Consider first the examples in (48) and (49).

(48) a. I will not be directly comparing the two products, as they aim to solve very different problems.
b. "Product A aims to solve a problem, and product B aims to solve a problem, and the problem that A aims to solve is qualitatively very different from the problem that B aims to solve."

(49) a. The '56 DeSoto Diplomat and the '56 Plymouth are almost the same car.
b. "The '56 DeSoto Diplomat and the '56 Plymouth are both cars, and they share almost all relevant properties."

As their associated paraphrases make clear, these examples are concerned with the amount of similarity or difference that exists between the relevant individuals, and thus involve the similarity predicate uses of *different* and *the same* studied here. But consider now (50) and (51).

(50) a. The two micro-organisms cause slightly different symptoms (though each results in diarrhea).
b. "The set of symptoms that micro-organism A causes differs slightly in its membership from the set of symptoms that micro-organism B causes."

(51) a. Interestingly, both too little iron and too much iron can cause almost the same symptoms.
b. "The set of symptoms caused by insufficient iron is almost identical in its membership to the set of symptoms caused by excess iron."

In these examples, *different* and *the same* occur in plural NPs. The most salient interpretation for both examples does not involve similarity, but rather concerns the amount of overlap between plural individuals. In (50a), for instance, what is asserted is that the plurality of symptoms caused by micro-organism A is not identical to the plurality of symptoms caused by micro-organism B, though the two pluralities share most of their subparts. This suggests that *different* and *the same* here express (non-)identity between (plural) individuals, and thus possess identity predicate meanings as well. (See Matushansky and Ruys 2005 for further reasons to distinguish the two sorts of meanings for *the same*.)

As a first step towards determining what relation exists between the similarity and identity meanings of *different* and *the same*, I suggest the logical forms in (52) and (53) for sentences involving their identity predicate uses.

(52) *a and b cause different symptoms* is true in *w* iff
$\exists x[\neg(x \in \{y\text{: } y \text{ is a symptom caused by } a \text{ in } w\} \leftrightarrow x \in \{z\text{: } z \text{ is a symptom caused by } b \text{ in } w\})]$

(53) *a and b cause the same symptoms* is true in *w* iff
$\forall x[x \in \{y\text{: } y \text{ is a symptom caused by } a \text{ in } w\} \leftrightarrow x \in \{z\text{: } z \text{ is a symptom caused by } b \text{ in } w\}]$

These logical forms bear a striking resemblance to the ones given in (16) and (17) for sentences involving similarity predicate uses of *different* and *the same*. Assuming that they can be derived in a reasonable fashion, they provide some understanding of the similarities and the differences that exist across the two uses.

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