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Situation Semantics, Time and Descriptive Indexicals

Abstract: I argue that descriptive uses of indexicals pose a challenge to the situation semantics of Kratzer and Berman. Many of the proposed methods of analysis for descriptive indexicals are based on the situation semantics of Kratzer as supplemented by Berman's notion of a minimal situation. As Kratzer observed, not all domains are countable and especially not those that are, as is the case with some situations, overlapping. Thus the notion of a minimal situation was initially intended to single out those situations which could serve as a counting domain for quantified sentences. Although minimality works well for timeless situations, I argue that descriptive uses of indexicals requires taking time into consideration and that time, combined with static predicates, poses a challenge to minimality. In (2010) Kratzer introduced the notion of a countable situation intended to replace the notion of a minimal situation. I argue that this notion fails for cases that involve some static predicates.

Key words: descriptive indexicals, situation semantics, time, minimal situations, counting situations, adverbial quantification, donkey anaphora

1 Descriptive indexicals

Descriptive uses of indexicals are such uses whereby – instead of singular propositions about particular persons, objects or places which are typical for indexicals – general propositions are expressed by sentences containing those indexicals. General propositions concern those same persons, objects or places only indirectly, if at all. The descriptive uses of indexicals can be exemplified by the following sentence uttered by someone gesturing towards John Paul II, as he delivers a speech with a Polish accent shortly after his election:

- (1) He is usually an Italian, but this time they thought it wise to elect a Pole.
 (Recanati 2005, Nunberg 1992)

The speaker here expresses not a singular proposition about John Paul II, but a general one, concerning all popes:

(1') Usually Popes are Italian.

Recanati in (2005) claims that the pronoun “he” is here semantically equivalent to a definite description and that definite descriptions should be represented as partial functions from situations to individuals. In his treatment of situations, he relies on Kratzer’s situation semantics and, in fact, almost all interpretations of descriptive indexicals, for example those of Elbourne (2005, 2008), Stokke (2010), Bezuidenhout (1997), Galery (2008) and Recanati (2005), are based on this semantics.

The situation semantics of Kratzer is nowadays a basic tool both in philosophy of language and linguistics. I hope to be able to show that the interpretation of descriptive indexicals requires time to be taken into consideration and that this aspect poses a serious challenge to situation semantics. Finally, I will just sketch an interpretation of descriptive indexicals that does not require quantification over situations.

1.1 The binary structure of adverbial quantification

Proposition (1') is a case of adverbial quantification and, as Quine (1941) observed, such propositions have a specific structure. He postulated that the domain of quantification of adverbs of quantification is not necessarily syntactically explicit but must be supplied contextually in the process of interpretation even if the restrictor clause is not present. He exemplifies this with the following sentence:

(2) Tai always eats with chopsticks. (Quine 1941)

The preferred reading is clearly not the one according to which Tai always eats with chopsticks, even when he sleeps, but the one according to which always when Tai eats, he eats with chopsticks. As if the structure of (2) was in fact (2'):

(2') Always when Tai eats, he eats with chopsticks.

Similarly, in the case of (1) we take into consideration only situations, in which there is a pope and (1) is true if in the majority of those situations the pope is Italian. Thus “usually” is a kind of binary majority quantifier.

1.2 Donkey anaphora

Because sentences containing descriptive indexicals usually contain adverbs of quantification, they often have a binary structure, which Andreas Stokke finds similar to sentences with donkey anaphora, such as:

- (3) Every farmer, who owns a donkey, beats it.

According to the E-type analysis proposed by Evans (1977) and developed by Heim (1990), the pronoun “it” as used in (3) is analyzed by a definite description:

“it” = “the donkey he owns”.

By analogy, the structure of (1) would be:

- (1'') Usually, if there is a pope, he [= the pope] is Italian,

where “it” is analyzed as “the pope”. There have been, however, many popes throughout the course of history while for the definiteness of the description we need just one pope. For such reasons, Heim analyzed descriptions as functions from situations to individuals - in a particular situation there would always be one pope.

2 Situation semantics

The situation semantics we are concerned with has been presented by Kratzer in (1989) and its major development is Berman’s notion of a minimal situation (Berman 1987). In contrast to Barwise and Perry (1983), who define situations as set-theoretical entities, Kratzer treats situations as parts of a real or a possible world.¹ For Kratzer the notion of a situation is a basic notion. In this semantics,

¹ Not everybody finds the differences between Kratzer’s and Barwise and Perry’s conceptions of situations important. Some, like Elbourne in (2008), build upon both theories and consider them as developments of one theory: “I am most directly influenced by the version of this theory [Barwise and Perry 1983] set out in Kratzer 1989” (Elbourne 2005, p. 48). von Fintel is of a different opinion: “[t]he situation semantics of Barwise & Perry (1983) is very different from the approach taken by Kratzer”, but he does not specify why he thinks so (von Fintel 2004, p. 139).

situations play a role similar to that of possible worlds in the more familiar possible world semantics, i.e. interpretations of symbols and truth of sentences is relativized to situations and the world is the maximal situation in a part-whole ordering. As in the semantics of possible worlds a proposition is usually represented by a set of possible worlds, here a proposition is a set of situations and we say that proposition p is true in situation s if and only if $s \in p$.

Thus situations look like smaller possible worlds. The move from possible worlds to situations might seem just a generalization of the semantics of possible worlds but, in fact, the change from worlds to situations has important consequences for the interpretation of general statements. This is because in natural language we have just two quantifiers ranging over possible worlds – “necessary” and “possible” – which are the counterparts of the universal and existential quantifier respectively, but there are more quantifiers ranging over situations and some of them, like “always” or “usually”, quantify over situations which are parts of one possible world. “Always” is a general quantifier and will cause no more problems than “necessary” but “usually” is a majority quantifier and requires the comparison of the cardinality of sets of situations. This means that the truth-conditions of sentences with “usually” crucially depends on the way we individuate situations.

2.1 Motivations for situation semantics

The problem of the appropriate individuation of situations and their structure was also the initial motivation for Kratzer’s project of situation semantics and the motivations were partially of an ontological nature. The project was fuelled by examples like the following:

Example I

Noah's ark

How many kinds of animals did Noah take into the ark? He took a pair of dogs. That's one kind. He also took a pair of cats. That's another kind. Hence he took at least two kinds of animals. He also took a pair of doves. Now we have three kinds. He also took mammals. That's certainly a kind we haven't had before. That makes four kinds of animals. And he took birds, which gives us five kinds . . .

(Kratzer 1989, p. 609)

Example II

Imagine the following situation: One evening in 1905, Paula painted a still life with apples and bananas. She spent most of the evening painting and left the easel only to make herself a cup of tea, eat a piece of bread, discard a banana or look for an apple displaying a

particular shade of red. Against the background of this situation, consider the following two dialogues that might have taken place the following day:

Dialogue with a pedant

Pedant: What did you do yesterday evening?

Paula: The only thing I did yesterday evening was paint this still life over there.

Pedant: This cannot be true. You must have done something else like eat, drink, look out of the window.

Paula: Yes, strictly speaking, I did other things besides paint this still life. I made myself a cup of tea, ate a piece of bread, discarded a banana, and went to the kitchen to look for an apple.

Dialogue with a lunatic

Lunatic: What did you do yesterday evening?

Paula: The only thing I did yesterday evening was paint this still life over there.

Lunatic: This is not true. You also painted these apples and you also painted these bananas. Hence painting this still life was not the only thing you did yesterday evening.

The point is that in contrast to drinking tea, which is an action different from painting the still life, painting apples was a part of painting the still life and not something she did apart from painting. The structure of situations should respect such dependencies. We would require that the situation representing the drinking of tea is independent in the sense of the part-whole ordering from the situation representing painting the still life - none is a part of the other - but that the situation of painting bananas is a part of the situation of painting the still life.

2.2 Situations

Kratzer does not want to treat situations as simply parts of a spatio-temporal matter. She relies on Armstrong's notion of a thin particular (1978), i.e. a real or possible particular from which we abstract away all its properties, and a situation for Kratzer is such a thin particular together with one or more of its properties, but so is the whole world. Each such thin particular is a part of just one world. Thick particulars, i.e. particulars with all their properties, are situations as well, but neither thin particulars alone nor properties alone are situations. Kratzer specifies the following formal characterization of situations:

- S a set, the set of possible situations (including the set of thick particulars)
- A a set, the set of possible thin particulars

\leq a partial ordering on $S \cup A$ such that at least the following conditions are satisfied:

- (i) For no $s \in S$ is there an $a \in A$ such that $s \leq a$
- (ii) For all $s \in S \cup A$ there is a unique $s' \in S$ such that $s \leq s'$ and for all $s'' \in S$: if $s' \leq s''$, then $s'' = s'$

$P(S)$ the power set of S , the set of propositions

W a subset of S , the set of maximal elements with respect to \leq . W is the set of possible worlds. For all $s \in S$, let w_s be the maximal element s is related to by \leq .

Dekker in (2004) gives a formalisation of the theory of situations as understood above and, by his account, the part-whole relation order satisfies the axioms of Leśniewski's mereology (1927-1931).

2.3 Minimal situations

How many situations we have depends, however, on our way of individuating them. For Barwise and Perry, situations are set-theoretical objects, sets, and sets are identical when they have identical elements yet for Kratzer the ontology is quite different. We are supposed to think of situations as chunks of reality, both actual and possible reality. If, contrary to Kratzer's explicit declarations,² situations were constructed as parts of spatio-temporal matter together with the properties of those parts, situations with different time specifications would simply be different situations. Yet situations are not supposed to be construed as parts of spatio-temporal matter, so it is not clear whether two situations that differ only with respect to time should be counted as one or as two situations. Say we want to consider Czesław Miłosz and his property of walking in Krakow. How many such situations do we have? One, or one for each time instant we can differentiate during those walks, or so many, as the number of times he took a walk in Krakow. Obviously we want as many situations as there were walks. It is, however, unclear how to obtain this result in formal semantics.

Almost everybody who works in situation semantics stressed the problem of individuating situations and Berman introduced the notion of a minimal situation with the hope that this notion would solve most of the problems. Berman proposed that in the truth-conditions of quantified sentences we count only situations which are minimal in the part-whole sense:

² "Situations cannot be identified with space-time chunks" (Kratzer 1989, p. 612).

A situation $s \in S$ is minimal with respect to the conditions expressed by α if, for some g , $[[\alpha]]^{sg}$ is true and for all $s' \in S$ such that $s' \leq s$, if $[[\alpha]]^{s'g}$ is true, then $s' = s$.
(Berman 1987, p. 65)

Here S is a set of situations, $[[.]]^{sg}$ is the interpretation of the enclosed formula in situation s , under valuation g .

Minimal situations are relativized to particular propositions, i.e. a situation which is minimal with respect to one proposition may not be minimal with respect to another. For example, situation s containing Simon Ammann, Martin Schmitt and their two concrete ski jumps is minimal with respect to the proposition p : “Ammann and Schmitt ski jumped”, because p is true in s and neither a situation containing both of them and one jump, nor the one containing two of the jumps but only one of the jumpers (both proper parts of situation s) is a situation in which p is true. On the other hand, situation s' containing only Aammann and his jump is minimal with respect to the proposition q : “Aammann ski jumped”, but situation s is not minimal with respect to q , because s' is a proper part of s and q is true in s' .

Berman’s motivation for the introduction of minimal situations was the analysis of sentences such as (3):³

(3) John sneezed twice.

We want this sentence to be true in a situation s , if John sneezed twice in that situation and false if, for example, he sneezed just once. Remember that situation are parts of possible worlds - we don’t want to know if John sneezed twice in his whole life, we are concerned with a particular situation and ask how many times he sneezed in that situation. Those two sneezings must be parts of the situation with respect to which we evaluate the sentence. Intuitively, we expect something like the following condition:

(3) is true in a situation s iff there are 2 situations, which are parts of s and in which John sneezed.

³ Berman (1987, p. 54) uses a slightly different example: “A man sneezed (exactly) twice”. For simplicity’s sake, I have replaced the indefinite description with a proper name. Berman traces the notion of a minimal situation to Bäuerle and Egli (1985).

But imagine that yesterday afternoon, in his house (situation s), John sneezed exactly once. Is (3) false in such a situation? Imagine he sneezed in the kitchen. The situation s' , containing John, his sneezing and the kitchen, is one situation in which the sentence “John sneezed” is true, but so is situation s'' , containing John, his sneezing, the kitchen and his bedroom. Thus we have found two situations, which are parts of the relevant situation s , in which John sneezed. It looks like (3) is true after all, contrary to what was expected. We can easily save the sentence from unintuitive truth by reading the quantifier “twice” as “exactly twice”, because apart from s' and s'' there are other situations (for example s''' containing John, his sneezing, the kitchen and the bathroom), in which “John sneezed” is true, making (3) false. Still, there remain sentences such as (4):

(4) John sneezed only once,

which should be true in the described situation s , but turn out to be false, because we are able to find more than one situation - s'' and s''' are suitable - in which the sentence “John sneezed” is true. Such considerations motivated Berman’s notion of a minimal situation, which was to prevent counting situations many times in the truth-conditions of sentences. Intuitively, we want to count only situations containing John and his sneezing and not those of which those counted are proper parts. The situations we count should contain neither the kitchen nor the bedroom as those are not important for the truth or falsity of “John sneezed”.

2.4 Minimal situations and adverbial quantification

The notion of a minimal situation is used by Berman in the definition of sentences with adverbs of quantification:

For all g , for all $s \in S$ $[[Q\alpha\beta]]^{sg}$ is true iff for Q minimal $s' \in S$ such that $s' \leq s$ and there is a $g' \sim g$ such that $[[\alpha]]^{s'g'}$ is true, [...] there is an $s'' \in S$ such that $s' \leq s'' \leq s$ and $[[\beta]]^{s''g'}$ is true. (Berman 1987, p. 56)

Q is a determiner and specifies in how many minimal situations a given condition must be satisfied. Thus for “always” a condition must be satisfied in all minimal situations contained in s , for “usually” in most of them, and for “seldom” – say – in less than a half. $g' \sim g$ means that the only assignments on which g' and g might differ are those to the free variables in the sentence being evaluated relative to g' . Berman thus requires that in the situation s to which we

relativize the true value of the quantified sentence, there are sufficiently many minimal situations in which the matrix condition α is satisfied and which are expandable inside s into situations in which both α and β is true.

I will use Berman's example to illustrate how the definition works:

- (5) If a letter arrives for me, I am usually at home. (Berman 1987)

(5) has the following truth-conditions:

For all g , for all $s \in S$, $[(5)]^{sg}$ is true iff for most minimal $s' \in S$ such that $s' \leq s$ and there is a $g' \sim g$ such that $[[x \text{ is a letter and } x \text{ arrives for me}]]^{s'g'}$ is true, there is an $s'' \in S$ such that $s' \leq s'' \leq s$ and $[[\text{I'm at home}]]^{s''g'}$ is true.

Both component sentences, so-called restrictor and scope, contain verbs in the present tense and require specification of time for truth-conditional evaluation. They thus contain hidden time variables or some equivalent formal representation. Because they are evaluated under the same valuation g' , situations in which we evaluate them must contain the same time. Thus it looks like we must take time into consideration in situation semantics so as to account for the relation of simultaneity between the events related in the restrictor and in the scope - I need to be at home during the time the letter arrives. Because events must be fully contained in them in order to be parts of situations, the times moments marking the beginning and the end of an event gives the minimal time interval necessary for a letter to be delivered. Thus, even though time is divisible *ad infinitum*, a situation that contains a time interval smaller than those required for the delivery will not count as situation in which the restrictor clause is true. On the other hand, situations containing times longer than required for the delivery, or those containing elements other than the time required, the letter and me at home, will not be minimal. This gives an intuitive correspondence between minimal situations and events.

Time is required as well in the analysis of an example by Lewis, concerning the adverb "seldom":

- (6) Caesar seldom awoke before dawn, (Lewis 1975, Berman 1987)

with the following truth-conditions.⁴

⁴ I ignore the past tense here.

For all g , for all $s \in S$ $[(6)]^{sg}$ is true iff for less than half of the minimal $s' \in S$ such that $s' \leq s$ and there is a $g' \sim g$ such that $[\text{ Caesar awakes }]^{s'g'}$ is true, there is an $s'' \in S$ such that $s' \leq s'' \leq s$ and $[\text{ Caesar awakes before dawn }]^{s''g'}$ is true.

Intuitively, the minimal situations will contain Caesar, his awakening, and the minimal time that contains that event. We then count those minimal situations that occur before dawn, those that occur after and compare the numbers. But do the situations need to contain time? Without time, there would be just one situation containing Caesar and his awakening, so there would be nothing to count. Without minimality, on the other hand, we would count some events several times, because, for example a situation containing the exact time of the awaking, and that containing the whole day of the same particular event are two different situations. Yet, to be able to nontrivially apply the notion of minimality, we need to think of time in such a way that a situation that contains, say, the first minute of an hour is a part of a situation that contains that hour and is otherwise the same. Such a treatment would work for a case like (6), because again it makes sense to talk about a minimal stretch of time in which an event such as an awaking takes place.

3 Situations and time

Could we thus just assume that the founders of situation semantics had such a treatment in mind? Can we assume that minimal situations may contain time? The matter is not that simple. Kratzer and Heim explicitly distance themselves from considering time:

I am restricting myself to atemporal readings. (Heim 1990, p. 152)

[W]e are neglecting matters of time. [...] The situations we are considering all have the same temporal location. (Kratzer 1989, p. 616)

But if we really took those declarations seriously and considered only “slices of worlds”, as Kratzer put it (1989, p. 611), most of the examples would make no sense. How would we evaluate the frequency of Caesar’s awakenings before dawn, if we consider just one time? We must ignore those declarations and add time to minimal situations.

Since Elbourne claims that his situation semantics is a development of Barwise and Perry (1983) and that Kratzer’s semantics is such a development as well, we should probably begin by considering the former theory, as Barwise and Perry explicitly include spatio-temporal location in situations. For Barwise

and Perry states of affairs – which are their counterparts of Kratzer's situations – consist of situation types and locations. Such objects are ordered by a part-whole relation which is, however, limited to the same location:

A state of affairs [= <location, situation-type>] s is part of a state of affairs s' if s and s' have the same location and the type of s is contained in a type of s' .
 (Barwise i Perry 1983, p. 55)

Assuming such a definition (without even going into the details of what containment between types of situations consists in) we are not able to compare situations containing Caesar, his awakening and the minimal time this waking takes (assuming there is such a time) with a situation containing Caesar, his awakening and a whole hour containing his waking. As a result, both situations are trivially minimal and we are not able to avoid counting some situations twice, contrary to what was expected from the concept of a minimal situation. Reliance on Barwise and Perry's locations of situations would thus not help us here.

Elbourne, on his part, defined the parthood relation in the following way:

A situation s is part of a situation s' if and only if s' contains all the particulars s does, instantiating all the properties and relations that they instantiate in s .
 (Elbourne 2005, p. 49)

But treating spatio-temporal locations as particulars would result in two situations that contain different locations being not related and the situation of Caesar awakening on the minimal space Caesar and his waking take will again not be a part of the situation containing Caesar, his awakening and the bedroom, because the bedroom is not identical to the smaller minimal space the waking occupies. To save minimality, we must thus think of locations in such a way that the minimal space in which Caesar is awakening is a part of his bedroom and that the situation containing Caesar awakening in this minimal space is a part of a situation containing Caesar waking in his bedroom. The same is true for time: a situation containing a particular day should be a part of a situation containing the year which contains that day but which is otherwise the same. We would then be able to obtain minimal situations which contain the minimal space and time for Caesar's awakening.

3.1 Time and descriptive indexicals

Yet even if such a treatment worked for events, it would fail for sentences containing static predicates because if somebody is pope in May 2012, he is pope in each day of that month and each moment of that day. In such cases, a minimal stretch of time makes little sense, as there is none and many examples of descriptive indexicals contain static predicates. For them, the notion of a minimal situation containing time is not well defined.

Yet perhaps we should ignore time when considering static predicates and treat situations containing just particulars and their static predicates as minimal? Let us forget popes for a moment, as the fact that one can be a pope only once makes this example non-representative. Let us consider the property of “being a Prime Minister” and the sentence

(7) Gordon Brown was Prime Minister twice.

In fact he was Prime Minister once, from 2007–2010. The sentence (7) should thus be false. But if we abstract Brown from the 1st January 2008 together with his property of being Prime Minister, and then again from 28 January 2008, we obtain two situations containing just Brown and his property of being the Prime Minister and in both situations the sentence “Gordon Brown is Prime Minister” is true. Yet maybe there is just one such situation, not two. After all they contain the same particular and the same property, because we have abstracted from the time that differentiates them. Such a move would, however, be fatal for the theory as it is, after all, possible that Brown was elected Prime Minister twice. In such a possible world we would want to differentiate between the situation abstracted from his first term and the situation abstracted from his second term, so as to obtain two situations that would make (7) true in such a possible world. But if again we obtain just a thin particular Brown and his property of being Prime Minister, these two situations will be impossible to differentiate between.

To conclude this argument, we should consider situations that contain individual moments of time, as such would be minimal and would suffice for the differentiation of the two situations taken from Gordon’s possible two terms. This move would, however, lead to excess since in a possible world in which Gordon is Prime Minister twice, there are not two, but infinitely many moments of time in which he is Prime Minister.

It thus transpires that we need to take time into consideration even if we analyze sentences containing static predicates and for those, the notion of a minimal situation is not well defined. We thus cannot use the notion of a

minimal situation in the general definition of the truth-conditions of a quantified sentence but we cannot count all of the situations, as there are too many of those, even if we consider issues as simple as how many popes were Italian.

Berman, Heim and Kratzer in their earlier works paid most attention to quantifiers such as “always”, whose truth-conditions do not depend on ways of individuating situations, because in the end all of the situations are taken into account. In the case of “usually” and other majority quantifiers, however, we must count situations and compare the number of those that satisfy a particular condition to the number of those that do not satisfy it and here the results differ depending on our way of individuating situations. Additionally, most of the examples discussed by them concerned events, and events, as we have seen, are not problematic even in the context of quantifiers such as “seldom”. This allowed Kratzer and others to believe for some time that the concept of a minimal situation is well defined.

3.2 Counting situations

But over the years many people, for example Dekker (2004) or von Fintel (2004), have pointed out the difficulties with properly defining the notion of a minimal situations and even Kratzer admitted the need for revision. In (2010) she considered the following example:

- (8) When snow falls around here, it takes ten volunteers to remove it.

To be able to interpret the pronoun “it” as a definite description (“the snow”), we would need to choose situations which we quantify over and the snow from which counts. It is, however, doubtful if there are minimal situations in which snow falls, and even if there were, the snow from those situations would be not that much, making (8) trivially false. What we aim at, are rather situations containing complete snowfalls. Kratzer in (2010) put forward a definition of an exemplification of a proposition by a situation, which is a generalization of a notion of a minimal situation and was an attempt at replacing the condition of minimality in the truth-conditions of quantified statements:

Exemplification (Kratzer 2010)

A situation s exemplifies a proposition p iff whenever there is a part of s in which p is not true, then s is a minimal situation in which p is true.

This definition affords two ways of exemplification: by minimal situations in which a proposition is true and by situations in which a proposition is true in all their parts. The latter are so-called homogeneous situations.

Exemplifying situations are, however, not suitable as a replacement of minimal situations in the truth-conditions of quantified statements for the same reason that situations simpliciter are not suitable – there are too many of them. That is because exemplifying situations can overlap: each situation which is a proper part of a situation containing just falling snow is a situation exemplifying the proposition “Snow falls” and there are infinitely many of those if we assume a continuous nature for time. Such a set of homogenous situations would be useless for the truth-conditions of “The snow fell twice last week”, because to obtain appropriate truth-conditions for such a sentence we need a notion that would give not uncountably many but exactly two situations of a certain type, in which snow falls.

Following Casati and Varzi (1999) Kratzer proposed a criterion which a domain must meet in order to be suitable as a basis for defining the truth-conditions of quantified sentences:

Counting Principle (Kratzer 2010)

A counting domain cannot contain non-identical overlapping individuals.

Based on this counting principle, Kratzer introduced the notion of a maximal self-connected situation exemplifying a proposition, which was called “counting situation” by Portner in (2009). Counting situations were to replace minimal situations in truth-conditions of quantified sentences when the counting principle is violated. Kratzer does not give a formal definition of counting situations but the differences between minimal, exemplifying and counting situations are nicely illustrated by Portner, who has used Kratzer’s own example (the numbering of the formula has been adjusted):

(9) Josephine flew an airplane.

Suppose Josephine flew an airplane twice, each time for two hours. The minimal situations are the smallest ones about which one could say that they contain her flying the plane. Maybe these last one second, or one millisecond. The exemplifying situations are all of the situations which you get by combining those minimal situations: the first five minutes of the first flight, the last ten minutes of the second, and so forth. Some exemplifying situation will be strange, because they combine the parts of the two flights, for example the first five minutes of the first flight and the last five minutes of the second. [. . .] There are only two counting situations: the two complete two-hour flights. The counting situations are

important because they are often the natural units for semantics. For example, it is because there are two counting situations that Josephine flew an airplane twice is true.

(Portner 2009, p. 216)

Both situations containing the complete flight and Josephine are here characterized as situations exemplifying (9). Because they are not minimal, they must be homogenous situations in which Josephine is flying the plane, i.e. situations whose all parts are situations in which Josephine is flying the plane. To obtain this result, we must assume that time is contained in situations, as a part of a complete flight is a proper part of the flight only if we take the time of the flight into consideration. To get homogenous situations, we must additionally assume that each situation which is a part of the situation containing a complete flight and Josephine, contains her and a temporal part of the flight – Josephine is here treated as a thin individual and neither such an individual alone, nor its properties alone are situations.

Counting situations were to replace minimal situations in the definition of the truth-conditions of quantified sentences and Portner gives such conditions for “always” in the following way:

$$[[\text{always}]](\alpha, \beta) = \{s: \forall s' ((s' \leq s \wedge s' \in \text{COUNTING}(\alpha)) \rightarrow \exists s'' (s'' \leq s' \wedge s'' \in \beta))\}, \quad (\text{Portner 2009, p. 215})$$

where COUNTING is a function, selecting counting situations from all situations in which the restrictor clause α is true.

4. Counting situations and descriptive indexicals

The important question is now if the notion of a counting situation can replace the notion of a minimal situation in the interpretation of descriptive indexicals. Sentences containing descriptive indexicals were interpreted as adverbial quantifications in whose scope a pronoun is interpreted as a definite description. In the case of (1), the pronoun “he” in the scope has been interpreted as a definite description “the pope”:

(1’’) Usually, if there is a pope, he [= the pope] is Italian.

Since the quantifier quantifies over situations and among those in which there is a pope there are such in which there are many popes, the minimality was

required to guarantee the uniqueness for the description. And minimality turned out to be problematic once we have taken time into consideration.

The notion of a countable situation would work in example (1) as a replacement for the notion of a minimal situation, but it is just a byproduct of the fact that there is always a break between one pope and the next, neatly cutting self-connected situations in the right places. But, apart from the case when a president dies during his term, there is no break between presidents and a maximal spatio-temporally self-connected situation would typically contain more than one president. Let us consider an American watching Barack Obama's inauguration as president in 2009, who, prompted by the surprised gaze of a foreigner utters (10):

(10) He is usually white,

expressing a general proposition

(10') US Presidents are usually white.

On Stokke's account (10) would have the following truth-conditions:⁵

(10) is true in s iff for most minimal situations s' such that $s' \leq s$ and there is a US president in s' , there is a minimal situation s'' such that $s' \leq s''$ and the president in s' is white in s'' .

For simplicity's sake, let us concentrate on the postwar history of the US. Because a president remains in the office until the inauguration of his successor, only the premature death of a president breaks the continuity of a state, in which there is a president. In the postwar history of the US, say post-Truman, we have only had two counting situations: from the inauguration of Truman until the death of Kennedy and from the inauguration of Johnson until the utterance of (10). The first situation contains three presidents, while the second contains nine of them and in both the definite description in the scope of (10), "the president (of the US)", is undefined, as in both there is more than one president.

Thus, while the notion of a minimal situation is not well defined for situations containing both time and static properties, the notion of a countable situation cannot replace it there. In fact, in the case of (1) and (10), the truth-

⁵ Compare Stokke (2010, p. 71).

conditionally relevant difference between situations is only when the Pope or the President is a different person. If we knew that much, we would know all that is really needed to ascertain the truth-value of those sentences and Kratzer's theory of situations does not give a general solution here.

5 Descriptive indexicals without situations

In Kijania-Placek (2012a, 2012b) I proposed an interpretation of descriptive indexicals that does not rely on the need to count situations at all. On this proposal, the pronoun in (1) is not interpreted via a definite description but its semantic value is a property of being a pope (obtain by a pragmatic process I call descriptive anaphora). Additionally, we do not quantify over situations but over individuals or, in other cases, over events. The logical form of (1) is:

(1'') **usually**_x (**pope**(x), **Italian**(x)),

and that of (10) is:

(10'') **usually**_x (**US-president**(x), **white**(x)),

where **usually** is a binary generalized majority quantifier (see Barwise and Cooper 1981, Peters and Westerståhl 2006). Both situations and minimality were required for the definiteness of the definite description. But what we in fact need is just the property of being a pope or of being a president of the US – properties that give the set of popes and the set of US presidents respectively. The truth-value of (1), for example, depends only on how many of those popes were Italian and how many were non-Italian.

6 Conclusion

In this paper I have pointed out the difficulties with properly defining the notion of a minimal situation in contexts that require time to be taken into consideration. Since minimal situations are essentially deployed in most of the influential analysis of descriptive indexicals that rely on situation semantics, my arguments possibly undermine such analyses. But the main conclusion is more general: as the case of descriptive indexicals shows, in situation semantics there is no definition of the truth-conditions of quantified sentences appropriate to account for sentences containing static predicates.

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