

GAMES OF PARTIAL INFORMATION AND PREDICATES OF PERSONAL TASTE

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ABSTRACT: A predicate of personal taste occurring in a sentence in which the perspectival information is not linguistically articulated by an experiencer phrase may have two different readings. In case the speaker of a bare sentence formed with a predicate of personal taste uses the subjective predicate encoding perspectival information in one way and the hearer interprets it in another way, the agents' acts are not coordinated. In this paper I offer an answer to the question of how a hearer can strategically interact with a speaker on the intended perspectival information so that both agents can optimally solve their coordination problem. In this sense, I offer a game-theoretical account of the strategic communication with expressions referring to agents' perspectives, communication which involves the interaction between a speaker who intends to convey some perspectival information and who chooses to utter a bare sentence formed with a predicate of personal taste, instead of a sentence in which the perspectival information is linguistically articulated by an experiencer phrase, and a hearer who has to choose between interpreting the uttered sentence in conformity with the speaker's autocentric use of the predicate of personal taste or in conformity with the speaker's exocentric use.

KEYWORDS: predicates of personal taste, autocentric, exocentric, communication, games of partial information, Nash equilibrium, Pareto dominance

1. Introduction

The ability of using language to communicate is an important part of human agency which involves, without any doubts, elements of cooperation. In order to successfully communicate by means of language, agents must coordinate on the intended meaning of the uttered sentences. In everyday life, it is not uncommon for people to talk to each other about their likes and dislikes, about their tastes and preferences, or about their perspectives from which they conceive the reality. In order to do that, they exploit in communication the fragment of natural language which consists of subjective predicates. One subclass of these predicates which the agents often use to express perspectival information is the class of predicates of personal taste.

Depending on which particular perspective the speaker refers to when he intends to communicate to the hearer perspectival information, a predicate of

personal taste occurring in a sentence in which the perspectival information is not linguistically articulated by an experiencer phrase may have two different readings. In the case in which the speaker of a bare sentence formed with a predicate of personal taste uses the subjective predicate encoding perspectival information in one way and the hearer interprets it in another way, things go wrong. Cases of this kind, in which the agents do not coordinate on the intended perspectival information, constitute instances of a more general case in which the agents' acts are not coordinated.

In this paper I will offer an answer to the question of how a hearer can coordinate with a speaker on the intended perspectival information conveyed by an utterance of a bare sentence formed with a predicate of personal taste, and I will show that there is a systematic way in which both agents can optimally solve their coordination problem and rationally avoid problems due to miscommunication. In this sense, in order to isolate some of the semantic properties exemplified by the utterances of bare sentences formed with predicates of personal taste, I will compare them, in the next section of the paper, with utterances of sentences in which an indexical like "I" occurs. Both types of sentences have a context-sensitive profile which explains the variation, in different contexts, of their semantic contents and of their truth-values. In contrast with the speaker-oriented semantics of sentences in which the first person singular pronoun occurs, the semantics of bare sentences with predicates of personal taste is not necessarily speaker-oriented. In this sense, I will introduce the distinction between the autocentric and exocentric interpretations of predicates of personal taste, interpretations which correspond to the different values the context of utterance provides to the variable for perspective occurring in the logical forms of bare sentences formed with predicates of this kind. In the third section of the present paper, I will offer a game-theoretical account of the strategic interaction between a speaker who intends to convey some perspectival information and who chooses, in this sense, to utter a bare sentence formed with a predicate of personal taste, instead of a sentence in which the perspectival information is linguistically articulated by an experiencer phrase, and a hearer who has to choose between interpreting the uttered sentence in conformity with the speaker's autocentric use of the predicate of personal taste or in conformity with the speaker's exocentric use of the predicate. The present game-theoretical account of strategic communication with expressions referring to agents' perspectives predicts that if the situation in which the speaker intends to convey to the hearer perspectival information about himself is factual, then the unique Pareto-Nash equilibrium of the game modeling the situation will correspond to

the balance between the speaker's choice to utter a bare sentence formed with a predicate of personal taste and the hearer's choice to interpret the utterance as expressing the perspective-specific proposition which corresponds to the speaker's autocentric use of the predicate of personal taste.

2. Predicates of Personal Taste

Predicates of personal taste are linguistic devices used to convey perspectival information. In order to explain how these linguistic tools can be used in real-world communication to express perspectival information, the truth-conditional semantics had to make room for the subjective meanings encoded by the predicates of personal taste. One such semantic theory, in which the truth-conditions of sentences formed with predicates of personal taste are accommodated with the subjective meanings lexicalised by these predicates, is *meaning perspectivalism*.¹ There is, however, a second variety of perspectivalist semantics, more precisely, *truth perspectivalism*, according to which the predicates of personal taste are monadic predicates whose extensions vary depending on the values of a parameter which represents the perspective and which is placed in the circumstances with respect to which the truth-values of the utterances of bare sentences formed with predicates like these are evaluated.² The game-theoretical account which I will offer in the following section frames the problem of coordination of the speaker and the hearer on the intended perspectival information conveyed by utterances of bare sentences formed with predicates of personal taste in the terms and spirit of meaning perspectivalism.

According to meaning perspectivalism, at the level of the logical forms of sentences formed with predicates of personal taste, there are variables whose role is to represent the agents' perspectives.³ In this perspectivalist semantics, utterances of bare sentences formed with predicates of personal taste express perspectival information by means of the values which the contexts of utterances assign to the variables representing the perspectives of the contextually salient agents. Therefore, even though the perspectival information is not represented by

¹ Jonathan Schaffer, "Perspective in Taste Predicates and Epistemic Modals," in *Epistemic Modality*, eds. Andy Egan and Brian Weatherson (Oxford: Oxford University Press, 2011), 179-226.

² Schaffer, "Perspective in Taste Predicates," 188; Herman Cappelen and John Hawthorne, *Relativism and Monadic Truth* (Oxford: Oxford University Press, 2009); Claudia Bianchi, "Contextualism," in *Philosophical Perspectives for Pragmatics*, eds. Marina Sbisa, Jan-Ola Östman, and Jef Verschueren (Amsterdam: John Benjamins, 2011), 64-66; Emma Borg, *Pursuing Meaning* (Oxford: Oxford University Press, 2012), 23-27.

³ Schaffer, "Perspective in Taste Predicates," 191.

a lexical unit from the surface syntax of a sentence formed with a predicate of personal taste, this information enters into the semantic content expressed by uttering the sentence in a context. In order to facilitate comprehension, consider, as an example, the following sentence:

[1] Philosophy is fun.

Consider also that the function μ is a semantics, that u is a situation in which an arbitrary expression s is uttered, and that the pair $\langle w, t \rangle$, which consists of a possible world w and of a time t , represents the index with respect to which the extension of s is determined. According to meaning perspectivalism, the semantic value of the predicate of personal taste which occurs in the above displayed sentence is functionally represented in the following way:⁴

$$\mu(\textit{fun})^{u, \langle w, t \rangle} = \lambda x_e. \lambda y_e. x \textit{ is fun to } y \textit{ in } w \textit{ at } t.$$

Depending on the values contextually assigned to the variable y , a sentence like [1] above will express, in different contexts, different propositions. Insofar as the perspectival information is a syntactically unprofiled constituent of the proposition expressed by uttering the sentence [1] in a particular context, this proposition is considered to be, in meaning perspectivalism, a *perspective-specific proposition*.⁵

Meaning perspectivalism conceives the semantics of the natural language fragment containing predicates of personal taste in the same way in which the semantics of the natural language fragment containing indexicals is conceived. In this regard, the conceptual framework by means of which the semantic values of predicates of personal taste are construed is that of Kaplanian semantics. What justifies, in meaning perspectivalism, the methodological import which amounts to semantically treating predicates of personal taste as indexicals, is the context-sensitivity exhibited by these predicates. In order to capture the context-dependence of the semantic values of indexicals and demonstratives, Kaplan has distinguished between the *character* of an expression and its *content*.⁶ While the former is represented as a function from the set of contexts of utterance to the set of semantic contents, the latter is understood as a function whose domain is the set of circumstances in which simple or complex expressions are evaluated and whose range is the set of their extensions. In order to better grasp the difference between these levels of meaning, consider that one and the same sentence

⁴ Eric Snyder, "Binding, Genericity, and Predicates of Personal Taste," *Inquiry* 56 (2013): 282.

⁵ Schaffer, "Perspective in Taste Predicates," 184.

⁶ David Kaplan, "Demonstratives," in *Themes from Kaplan*, eds. Joseph Almog, John Perry, and Howard Wettstein (Oxford: Oxford University Press, 1989), 481-563.

containing an indexical, like [2] below, is uttered by Mihai in a context c_1 and by Irina in a context c_2 :

[2] I love philosophy.

With regard to this particular example, the semantic explanation offered to the intuition according to which Mihai and Irina said the same thing appeals to the fact that the character of the sentence uttered by Mihai in the context c_1 does not differ from the character of the sentence uttered by Irina in the context c_2 . Likewise, what explains the intuition according to which the agents of c_1 and c_2 said different things when they utter the sentence [2], is the fact that [2] expresses different semantic contents, one corresponding to the proposition [Mihai loves philosophy], the other to the proposition [Irina loves philosophy].

At this point, the similarities between the semantic behavior of indexicals and that of predicates of personal taste become more transparent. One feature that both classes of expressions have in common is their *alethic variability*. In this sense, one and the same sentence in whose surface syntax occurs an indexical item or a predicate of personal taste can have, in different contexts, different truth-values. Consider that only Mihai finds philosophy fun and loves reading philosophy papers. In the case in which Mihai utters the sentences [1] and [2] in a context c_3 and Irina utters them in a context c_4 , Mihai's utterances are both true, while Irina's utterances of the same sentences are false. What explains the variation in truth-values of the different utterances of the sentence [2] is the occurrence, at the level of the logical form of [2], of a variable, representing the speaker, whose values are provided by the contexts in which [2] is uttered. In the same vein, the truth-conditional effects of the contexts c_3 and c_4 in which the sentence [1] is uttered are traced to the presence, at the level of the logical form of [1], of a variable representing the perspective of the contextually salient agent. Insofar as the values that the context c_3 provides to the variables present in the logical forms of [1] and [2] are different from the values assigned by the context c_4 to the same variables, c_3 and c_4 have different contextual contributions to the semantic contents of the utterances of the sentences [1] and [2]. In this case, what the agent of the context c_3 says, when he utters the sentence [1], can be equated with the perspective-specific proposition [Philosophy is fun for Mihai], while the semantic content of the utterance of the same sentence by the agent of the context c_4 will correspond to the perspective-specific proposition [Philosophy is fun for Irina]. Likewise, the semantic contents of the utterances of the sentence [2] in c_3 and c_4 are, as I already said, the perspective-neutral proposition [Mihai loves philosophy] and, respectively, the perspective-neutral proposition [Irina loves philosophy]. Hence, the variation of the values contextually assigned to the

variables which occur at the level of the logical forms of sentences formed with predicates of personal taste or with indexicals, like [1] and [2] above, explains the variation of the semantic contents of their different utterances which, in its turn, explains the variation of the truth-values of the propositions which these utterances contextually express.⁷ The alethic variability of utterances of sentences like [1] and [2] above is warranted by the fact that predicates of personal taste and indexicals are context-sensitive expressions whose characters, according to the Kaplanian semantics, are not constant functions.⁸ Since the character of a context-sensitive expression is not a constant function, the sentences syntactically constructed with expressions of this kind, will express, depending on the contexts in which they are uttered, variable semantic contents.

Another feature that predicates of personal taste and indexicals have in common is the way in which pragmatic factors intervene in the process by means of which the semantic values of these expressions are determined. Even though an interpreter of a sentence in which a predicate of personal taste or an indexical occurs knows the semantic roles associated with these expressions, he is forced to consult the context in which the sentence was uttered and to extract from there the needed information in order to determine the semantic content of the utterance and the semantic values of its parts. Insofar as the interpreter who exploits contextual information to resolve the references of indexicals and of predicates of personal taste is guided in his task by their semantics, both types of expressions involve a *semantic use* of context.⁹ In order to understand how a context can be used in a semantic way, it is better to bear in mind the distinction that Recanati drew between saturation and modulation. Even though both saturation and modulation belong to the class of primary pragmatic processes, there is a sharp contrast between them. While modulation is, from a linguistic viewpoint, an *optional* pragmatic process whose function is to informationally enrich the semantic contents of utterances, saturation is a linguistically *mandatory* pragmatic process by means of which the references of indexicals and demonstratives are contextually resolved and of which the values of the variables from the logical forms of sentences are assigned.¹⁰ Even though in both cases the interpreter exploits contextual information, only in the case of saturation the appeal to context is induced by the presence, in the surface or deep syntax, of

⁷ Bianchi, "Contextualism," 65.

⁸ Kaplan, "Demonstratives," 481-563.

⁹ John Perry, *Reference and Reflexivity* (Stanford: CSLI Publications, 2001), 39-42.

¹⁰ François Recanati, *Literal Meaning* (Cambridge: Cambridge University Press, 2004); François Recanati, *Truth-Conditional Pragmatics* (Oxford: Oxford University Press, 2010).

elements which demand to be contextually filled. The contextual provision of values to the variables which represent, at the level of the logical form of sentences like [1] and [2] above, the perspective of the salient agent, and, respectively, the speaker, is linguistically controlled, which means that the same pragmatic mechanism (i.e., saturation) operates both in the case of indexicals and in the case of predicates of personal taste.

In spite of all the features which sentences containing an indexical like “I” and bare sentences formed with predicates of personal taste have in common, there is one aspect which highlights a pragmatic contrast between them. Consider again the sentences [1] and [2] displayed above. If Mihai utters the sentence [2] in the context c_3 and Irina utters it in the context c_4 , the referent of the indexical occurring in [2] is, in both cases, a constituent of the semantic content expressed by uttering [2]. But insofar as the contexts c_3 and c_4 are different, because the agents of c_3 and c_4 are not the same, the referents of the indexical occurring in [2] will be different, and therefore the propositions which contain these referents will be different. The constituent of the proposition expressed by uttering the sentence [2] in the context c_3 is the agent of c_3 , that is, the speaker of [2] in c_3 , while the constituent of the proposition expressed by uttering [2] in the context c_4 is the agent who utters [2] in c_4 . This has to do with the semantics of the indexical occurring in [2] which requires that the value contextually assigned, by means of the pragmatic process of saturation, to the variable present in the logical form of [2], has to be the agent of the context in which [2] is uttered, that is, the speaker of [2]. In this sense, it can be said that the semantics of sentences in which the first person singular pronoun occurs is a *speaker-oriented semantics*. But the generalization licensed by the semantics of the indexical occurring in [2], according to which the utterances of sentences like [2] refer to their speakers, is not supported by the semantics of predicates of personal taste. Consider that Mihai utters the sentence [1] in the context c_3 and Irina utters it in the context c_4 . Among the constituents of the proposition expressed by uttering [1] in the context c_3 we find the perspective of the agent of c_3 . Similarly, one of the constituents of the proposition expressed by uttering [1] in the context c_4 is the perspective of the agent who utters [1] in c_4 . In both these cases, the perspective of the agent who utters the sentence [1] is a constituent of the semantic content expressed by uttering [1]. But it cannot be inferred from these data that the utterances of bare sentences formed with predicates of personal taste always refer to the perspectives of their speakers. The semantics of bare sentences in which predicates of personal taste occur does not impose the restriction that the value contextually assigned to the variable present in the logical form of [1], has to be the perspective of the

agent who utters [1]. The latter semantic requirement is relaxed in the case of the predicates of personal taste and this can easily be seen if we take into consideration a scenario in which, even though Irina does not find philosophy fun, she intends to utter the sentence [1] in order to communicate to her interlocutor information about Mihai's perspective, not about her. Even though the variable which occurs at the level of the logical form of [1] contextually receives a value which corresponds to a specific perspective of an agent, this does not imply that the value assigned to the variable must correspond to the perspective of the agent who utters [1], that is, to Irina's perspective. Instead, in the latter considered scenario, it corresponds to Mihai's perspective. Therefore, in contrast with the speaker-oriented semantics of a sentence in which the first person singular pronoun occurs, the semantics of a bare sentence formed with a predicate of personal taste is not necessarily speaker-oriented: the value contextually assigned to the variable present at the level of the logical form of a sentence of this kind can correspond to the perspective of the agent who utters the sentence, but, as well, to the perspective of another agent.

Consider that e is a bare sentence formed with a predicate of personal taste, like [1] above. In the case in which the value contextually provided to the variable for perspective present in the logical form of e corresponds to the perspective of an agent different from the speaker who utters e , or even to the perspective of an entire group, the predicate of personal taste occurring in e is used by the speaker of e in an *exocentric* way.¹¹ In this case, the utterance of e will not convey perspectival information about the agent of the utterance and the speaker's perspective will not be a constituent of the perspective-specific proposition contextually expressed by uttering e . In contrast, when the value contextually provided to the variable for perspective present in the logical form of e corresponds to the perspective of the speaker who utters e , the predicate of personal taste occurring in e is used by the speaker of e in an *autocentric* way.¹² In this case, the utterance of e will express perspectival information about the agent of the utterance and the speaker's perspective will be a constituent of the perspective-specific proposition contextually expressed by uttering e .

¹¹ Peter Lasersohn, "Context Dependence, Disagreement and Predicates of Personal Taste," *Linguistics and Philosophy* 28 (2005): 643-686; Cappelen and Hawthorne, *Relativism and Monadic Truth*, 104; John MacFarlane, *Assessment Sensitivity. Relative Truth and Its Applications* (Oxford: Oxford University Press, 2014).

¹² Lasersohn, "Context Dependence, Disagreement and Predicates of Personal Taste," 643-686; Cappelen and Hawthorne, *Relativism and Monadic Truth*, 104; MacFarlane, *Assessment Sensitivity*.

The fact that speakers who utter bare sentences formed with predicates of personal taste use these predicates in more than one way can put the utterances' interpreters in difficult situations. Situations like these constitute instances of the more general and classical problem of coordination. If a speaker who utters in a context a sentence e , in whose surface syntax the perspectival information is not explicitly mentioned by an experiencer phrase, autocentrically uses the predicate of personal taste occurring in e , while the hearer assigns to the utterance of e an interpretation which would correspond to the speaker's exocentric use of the predicate, the two agents' acts are not coordinated. Similarly, if the speaker of e has the intention to communicate to the hearer perspectival information about an agent different from the speaker, while the hearer understands that the perspective of the speaker is a constituent of the perspective-specific proposition expressed by the utterance of e , the possibility of successful communication is compromised. In order to restore it, the agents' acts of utterance and of interpretation must be aligned. This would ensure that the speaker's choice of an utterance of a sentence like e , in which the perspectival information is not linguistically articulated, and the hearer's choice of its interpretation are balanced. But how can the speaker and the hearer arrive at this optimal solution of their coordination problem? Is there a systematic way which specifies how the speakers of bare sentences formed with predicates of personal taste and the interpreters have to act in order to be rational and to solve and avoid problems due to miscommunication?

In what follows, I will show how a hearer can coordinate with a speaker on the intended perspectival information conveyed by uttering a sentence like e . In this regard, I will offer, in the next section of the present paper, a game-theoretical account of the strategic interaction between a speaker who intends to convey some perspectival information and who chooses, in this sense, to utter a bare sentence formed with a predicate of personal taste, instead of a sentence in which the perspectival information is linguistically articulated by an experiencer phrase, and a hearer who has to choose between interpreting the uttered sentence in conformity with the speaker's autocentric use of the predicate of personal taste or in conformity with the speaker's exocentric use of the predicate.

3. Games of Partial Information

In order to model the strategic communication between a hearer and a speaker of a sentence formed with a predicate of personal taste in which the perspectival information is not linguistically articulated by an experiencer phrase, and to show how the hearer can coordinate with the speaker on the intended perspectival

information conveyed by an utterance of a bare sentence formed with a predicate of personal taste, I will use the conceptual framework of games of partial information elaborated by Parikh and the format in which van Rooy has framed the games designed by Parikh.¹³

Given that the autocentric uses of the predicates of personal taste which occur in sentences in which the perspectival information is not linguistically articulated are more frequent¹⁴ than their exocentric uses, I choose to model, in this paper, only the situations in which the hearers have to interpret the bare sentences formed with predicates of personal taste which the speakers choose to utter in order to convey information about their own perspectives. The present model can be extended and accordingly adapted also for the cases in which a hearer has to strategically interact with a speaker who intends to convey perspectival information about another agent and who utters, in this sense, a sentence formed with a predicate of personal taste in which this information is not linguistically articulated by an experienter phrase.

Consider a scenario in which A has recently met B , they moved together and they want to invite an old friend C of A 's to dinner at their home. A and B begin to talk about the food they will serve to C and about their likes and dislikes. In this context, A , who has the intention to talk about his tastes and to convey to B information about his own perspective, utters the following sentence:

[3] Lasagna is delicious.

Let e_1 abbreviate the above bare sentence formed with a predicate of personal taste which the speaker A uses, in the utterance situation u , to convey perspectival information to the hearer B . Insofar as the agent's perspective is not profiled in the surface syntax of sentences like e_1 , and as sentences of this kind are used in contexts to express perspectival information, it is common knowledge to both A and B that A can use the predicate of the sentence e_1 in two ways. The speaker can use the predicate of personal taste occurring in e_1 in an autocentric way, intending to convey information about his own perspective, or in an exocentric way, having in mind the intention to convey to the hearer B information about the perspective of another agent, namely C . If A uses in u the predicate of personal taste occurring

¹³ Prashant Parikh, *The Use of Language* (Stanford: CSLI Publications, 2001); Prashant Parikh, *Language and Equilibrium* (Cambridge: MIT Press, 2010); Robert van Rooy, "Signalling Games select Horn Strategies," *Linguistics and Philosophy* 27 (2004): 493-527.

¹⁴ Lasersohn, "Context Dependence, Disagreement and Predicates of Personal Taste," 673-674; Tamina Stephenson, "Judge Dependence, Epistemic Modals, and Predicates of Personal Taste," *Linguistics and Philosophy* 30 (2007): 520-521; Hazel Pearson, "A Judge-Free Semantics for Predicates of Personal Taste," *Journal of Semantics* 30 (2013): 115.

in e_1 in an autocentric way, as it happens in the present scenario, the sentence e_1 expresses the perspective-specific proposition [Lasagna is delicious to A]. Likewise, if the predicate of e_1 is used by A in an exocentric way, the sentence e_1 will express in u the perspective-specific proposition [Lasagna is delicious to C]. Let p_1 abbreviate the perspective-specific proposition expressed in u by the autocentric reading of the predicate of e_1 , and p_2 abbreviate the perspective-specific proposition expressed in u by the exocentric reading of the very same predicate. Regarding what B considers possible in this scenario and the information he has, the meaning of the above mentioned sentence [3] can be functionally represented as follows:

$$\mu(e_1)^{u, \langle w, t \rangle} = \{p_1, p_2\}.$$

This means that, in this scenario, the hearer B is confronted with the following two choices: either he interprets the sentence e_1 as meaning p_1 , or he interprets it as meaning p_2 . Even though B does not know which of p_1 and p_2 is the particular perspective-specific proposition A intends to communicate by uttering e_1 , it is plausible to reckon that, in this scenario, based on the information provided by the utterance situation u and on the fact that bare sentences with predicates of personal taste are usually used in autocentric ways, B will correctly choose to interpret e_1 as meaning p_1 .

The scenario described above constitutes an example of situation in which the agents strategically interplay with one another. In order to game-theoretically model the strategic interaction between A and B , I will adopt the general assumptions¹⁵ on which relies the conceptual framework of games with partial information elaborated by Parikh and I will adapt them to the present case. Hence, I will assume that:

- (1) Both the speaker A and the hearer B are rational agents.
- (2) E is the fragment of language containing sentences with predicates of personal taste.
- (3) A and B competently use E .
- (4) The function μ is the semantics of E .
- (5) The target set of μ is the power set of the set of perspective-specific propositions.
- (6) A intends to linguistically express the perspective-specific proposition p_1 .
- (7) A uses in the utterance situation u an element e_1 of E .
- (8) The perspectival information is not profiled in the surface syntax of e_1 .
- (9) B intends to interpret the bare sentence e_1 uttered by A in u .

¹⁵ Parikh, *The Use of Language*, 21-23; Parikh, "Communication, Meaning, and Interpretation," *Linguistics and Philosophy* 23 (2000): 193-194.

- (10) B interprets e_1 .
- (11) According to B , $\mu(e_1)^{u, <w, t>} = \{p_1, p_2\}$.
- (12) $\mu(e_1)^{u, <w, t>} = \{p_1\}$, if A autocentrically uses the predicate of e_1 .
- (13) $\mu(e_1)^{u, <w, t>} = \{p_2\}$, if A exocentrically uses the predicate of e_1 .
- (14) p_1 is more likely than p_2 .
- (15) The effort of producing linguistic forms which explicitly express p_1 and p_2 is greater than the effort of producing e_1 .
- (16) The effort of processing linguistic forms which explicitly express p_1 and p_2 is greater than the effort of processing e_1 .
- (17) All of the above, except (6) and (9), are common knowledge to A and B .

The above assumptions ensure that, in the scenario previously described, the speaker A will successfully communicate, by using the sentence e_1 in the utterance situation u , the perspectival information p_1 to the hearer B .

The strategic interaction between a speaker A who utters in a context a bare sentence formed with a predicate of personal taste and a hearer B who tries to figure out whether A is using autocentrically or exocentrically the predicate of personal taste occurring in the received sentence, can be modeled as a two-agent game of partial information which A and B play, more precisely, a game whose unique solution is a Pareto-efficient Nash Equilibrium.¹⁶ In what follows, I will show that in the game which models the above described scenario, the optimal choice of A is to utter, in u , the sentence e_1 and the optimal choice of B is to assign to e_1 the interpretation p_1 , that is, that perspective-specific proposition which corresponds to the speaker's autocentric use of the predicate of personal taste occurring in e_1 and to his intention to convey information about his own perspective.

According to the contextual assumption (6), the agent A intends to linguistically communicate the perspective-specific proposition p_1 to the agent B . In order to accomplish this task, A has the following two possibilities: either he chooses to utter the sentence e_1 , that is, a linguistic expression belonging to E in whose surface syntax the perspectival information is not profiled, or he chooses to utter another sentence e_2 in which the perspectival information is syntactically represented by an experiencer phrase which refers to his own perspective. In this sense, one such sentence in which A 's perspective is explicitly mentioned by some linguistic material can be the following:

[4] Lasagna is delicious to me.

Let e_2 abbreviate the above sentence which A could utter in order to explicitly convey perspectival information to the hearer B . A sentence like e_2

¹⁶ Parikh, "Communication, Meaning," 207.

would make transparent to B the fact that the speaker uses the predicate of personal taste which occurs in e_2 in an autocentric way and that the perspective-specific proposition which A intends to express by uttering e_2 in the situation u is p_1 . According to the contextual assumption (15), the effort of A to produce the sentence e_2 in which the perspectival information is linguistically articulated is greater than the effort of producing the sentence e_1 which does not linguistically articulate the perspectival information, even though it expresses, in the above described scenario, the same perspective-specific proposition as e_2 , that is p_1 . Insofar as the speaker A is, according to the assumption (1), a rational agent, A has to take into consideration¹⁷ the consequences of his choice to utter the sentence e_1 along with the consequences of his choice to utter the sentence e_2 , and to compare the former consequences with the latter ones in order to decide which of e_1 and e_2 is the optimal linguistic form to express the semantic content p_1 .

In the above scenario, the speaker A has decided that in order to communicate to B information about his own perspective, his optimal action is to utter the sentence e_1 and to autocentrically use the predicate of personal taste occurring in e_1 . According to the contextual assumption (9), B intends to interpret A 's utterance, in the situation u , of the bare sentence formed with a predicate of personal taste. Insofar as the utterance of the sentence e_1 in u can express, according to the contextual assumption (11), either the perspective-specific proposition p_1 or the perspective-specific proposition p_2 , the hearer B cannot decide whether A uses the predicate of personal taste occurring in e_1 in an autocentric or in an exocentric way. B knows only that if, in the above scenario, the speaker A autocentrically uses the predicate of personal taste which occurs in the sentence e_1 , then, according to the contextual assumption (12), the utterance of e_1 in the situation u expresses the perspective-specific proposition p_1 . Likewise, he knows that in the case in which A exocentrically uses the predicate of personal taste occurring in e_1 , then, according to the contextual assumption (13), the utterance of the sentence e_1 in the situation u will express the perspective-specific proposition p_2 . Let s_1 denote the situation in which the speaker A intends to communicate to the hearer B , by uttering e_1 , the perspectival information corresponding to his autocentric use of the predicate of personal taste occurring in e_1 , and let s_2 denote the situation in which A intends to convey to B , by uttering e_1 , the perspectival information corresponding to the exocentric use of the very same predicate. If A is in the situation s_1 , he intends to use the sentence e_1 to linguistically communicate to the hearer the perspective-specific proposition p_1 ,

¹⁷ Parikh, "Communication, Meaning," 196.

and to transmit information about his location¹⁸ in s_1 . Similarly, if the speaker is in the situation s_2 , he intends to use the bare sentence containing a predicate of personal taste to convey to B the perspective-specific proposition p_2 , and to transmit information about his location in s_2 . According to the above described scenario, s_1 is a factual situation, s_2 is a counterfactual one and only A can discriminate between them. While A knows which of s_1 and s_2 is the factual situation, B does not know and this is common knowledge to both agents.¹⁹ Insofar as B does not have enough information to decide which of s_1 and s_2 is the factual situation, he does not know A 's intention yet and both epistemic possibilities form B 's information set. What the hearer B knows instead, according to the contextual assumptions (14) and (17), is that the perspective-specific proposition p_1 is more likely than the perspective-specific proposition p_2 , which means that B knows that the situation in which A autocentrically uses the predicate of personal taste which occurs in the sentence e_1 is more probable than the situation in which he uses the very same predicate in an exocentric way. In fact, this is known to both A and B and this fact is common knowledge to both agents involved in the strategic interaction described by the above scenario.²⁰ Let $\rho(s_1)$ represent the probability that the speaker A is located in the situation s_1 , that is, the probability that A intends to linguistically communicate to B , by uttering in u the sentence e_1 , the perspective-specific proposition p_1 , and consider also that $\rho(s_1) = 0.9$. Hence, the probability that A is located in the situation s_2 and that he intends to express, by uttering e_1 , the perspective-specific proposition p_2 , will be $\rho(s_2) = 1 - \rho(s_1)$, that is 0.1.²¹

At this point, the hearer's choice problem becomes more transparent. In our scenario, B has two choices: either he chooses to assign to the sentence e_1 uttered by the speaker A in u the semantic content which corresponds to the perspective-specific proposition p_1 , or he chooses to assign to the utterance of e_1 the semantic content corresponding to the perspective-specific proposition p_2 . But the optimal choice of B depends on which of s_1 and s_2 is the factual situation. B knows that if s_1 is the factual situation, then his optimal choice would be to interpret the utterance of the sentence e_1 as meaning p_1 rather than p_2 . Similarly, B knows that if s_2 is the factual situation, then his optimal choice would not be to assign to the utterance of e_1 the semantic content p_1 , but instead, it would be to interpret the utterance of the bare sentence formed with the predicate of personal taste which A uses in an

¹⁸ Parikh, "Communication, Meaning," 196; van Rooy, "Signalling Games," 499.

¹⁹ Parikh, *The Use of Language*, 27-29; Parikh, "Communication, Meaning," 196-198.

²⁰ Parikh, *The Use of Language*, 28; Parikh, "Communication, Meaning," 197.

²¹ In what follows, I will use ρ_1 instead of $\rho(s_1)$ and ρ_2 instead of $\rho(s_2)$.

exocentric way as meaning p_2 rather than p_1 . Insofar as the hearer B does not know which of s_1 and s_2 is factual, he does not know which interpretation of the utterance of e_1 is correct and, in consequence, he does not know what to choose between p_1 and p_2 , even though he knows that p_1 is, in the above described scenario, the most likely interpretation of the utterance of e_1 .

To solve this problem, the hearer B has to take into consideration the speaker's possible choices²² and to relate them to his actual choice of uttering e_1 . In this sense, B knows that A might have chosen from the fragment of natural language E containing sentences formed with predicates of personal taste alternative sentences in which the perspectival information is syntactically represented by experiencer phrases whose semantic role is to make salient the relevant perspective. Hence B knows that if s_1 is the factual situation, then A might have chosen to utter a sentence like e_2 mentioned above in order to make transparent to B the fact that he uses the predicate of personal taste in an autocentric way and that he intends to communicate the perspective-specific proposition p_1 . Similarly, B knows that if s_2 would be the factual situation, then A would make transparent to B the fact that he uses the predicate of personal taste in an exocentric way and that he intends to convey the perspective-specific proposition p_2 , only if A would choose to utter a sentence like the following:

[5] Lasagna is delicious to C .

Let e_3 abbreviate the above sentence which A might have uttered in order to explicitly signal to B that s_2 is the factual situation. In consequence, both agents A and B have to take into consideration the alternative sentence e_2 , which explicitly expresses only the perspective-specific proposition p_1 , and the alternative sentence e_3 , which explicitly expresses only the perspective-specific proposition p_2 , and to contrast these two linguistic variants with the sentence e_1 which can be used to express both p_1 and p_2 .

In order to show how to solve the two-agent cooperation game which models the strategic interaction between A and B in the above described scenario, I will use the format in which van Rooy has framed the games of partial information designed by Parikh. I will also adopt from van Rooy the assumption that the players of the game simultaneously choose strategies.²³ A strategy specifies what an agent chooses in different situations when he is involved in a strategic interaction with other agents. In van Rooy's framework, the speaker's strategy is

²² Parikh, *The Use of Language*, 30; Parikh, "Communication, Meaning," 199; van Rooy, "Signalling Games," 499.

²³ van Rooy, "Signalling Games," 500.

modeled as a function from the set of situations to the set of sentences, while the hearer's strategy is modeled as a function from the set of sentences to the set of situations.²⁴ More precisely, a speaker's strategy A_i ,²⁵ where $i = 1, 2, 3, 4$, is an element of

$$[\{s_1, s_2\} \rightarrow \{e_1, e_2, e_3\}]$$

and a hearer's strategy B_j , where $j = 1, 2$, is an element of

$$[\{e_1, e_2, e_3\} \rightarrow \{s_1, s_2\}].$$

The following two tables depict the strategies of both agents involved in the present strategic communication. The first table displays the strategies of the speaker A , while the second those of the hearer B .

	s_1	s_2
A_1	e_1	e_1
A_2	e_2	e_1
A_3	e_1	e_3
A_4	e_2	e_3

	e_1	e_2	e_3
B_1	s_1	s_1	s_2
B_2	s_2	s_1	s_2

What both agents A and B choose when they play the game which corresponds to the above described scenario, depends on what they prefer in this scenario. Insofar as successful communication is preferred to miscommunication,²⁶ the speaker and the hearer have, in this regard, the same preference. In general, one decision maker's preferences are modeled by a utility function U which assigns numerical values to his choices in conformity with the order of his

²⁴ van Rooy, "Signalling Games," 500.

²⁵ I will use, in what follows, the same letters A and B because I believe that the context makes clear when the letters have, in the economy of the text, the function to refer to agents or to their strategies.

²⁶ Parikh, *Language and Equilibrium*, 94.

preferences.²⁷ In the present two-agent game, the function U is defined over the profiles of strategies, where a profile of strategies is a pair whose first member is one of the speaker's strategies and the second member is one of the hearer's strategies. Hence, the domain of the utility function contains the elements from the Cartesian product of the set of the speaker's strategies and the set of the hearer's strategies. Assuming that the speaker and the hearer involved in the strategic interaction described by the above mentioned scenario have the same utility function, and that s is a situation from the set $\{s_1, s_2\}$, the successful communication between agents can be represented by letting U to output 1, while the miscommunication which occurs between them can be represented by letting U to output 0, as below:²⁸

$$U(s, A(s), B(A(s))) = 1, \text{ if } B(A(s)) = s \\ = 0 \text{ otherwise.}$$

In order to solve the game which models the situation in which the speaker utters a bare sentence formed with a predicate of personal taste and the hearer has to infer the perspectival information which the speaker intends to communicate, we have to determine the expected utilities for each profile of strategies. Taking into consideration the probability distribution ρ over the situations, the expected utility of each joint strategy can be computed according to the following formula:²⁹

$$EU(A, B) = \sum_s \rho(s) \times U(s, A(s), B(A(s))).$$

The following two tables display the utilities assigned by the function U to the profiles of strategies in the situations s_1 and s_2 :

s_1	B_1	B_2
A_1	1	0
A_2	1	1
A_3	1	0
A_4	1	1

s_2	B_1	B_2
A_1	0	1
A_2	0	1
A_3	1	1
A_4	1	1

Using the above mentioned probabilities (i.e., $\rho_1 = 0.9$, $\rho_2 = 1 - \rho_1 = 0.1$) and the utilities assigned by U to all the profiles in the situations s_1 and s_2 , the expected

²⁷ Robin Clark, *Meaningful Games. Exploring Language with Game Theory* (Cambridge, Massachusetts: MIT Press, 2012), 71.

²⁸ van Rooy, "Signalling Games," 502.

²⁹ van Rooy, "Signalling Games," 501.

utilities, calculated for each profile of strategies, are displayed in the following table.

<i>EU</i>	<i>B₁</i>	<i>B₂</i>
<i>A₁</i>	0.9	0.1
<i>A₂</i>	0.9	1
<i>A₃</i>	1	0.1
<i>A₄</i>	1	1

The data from the table in which are depicted the expected utilities of all the profiles of the players' strategies can now be used to see whether there is an optimal combination of a strategy from the speaker's set of strategies and a strategy belonging to the hearer's set of strategies. If there is an optimal profile of strategies, this would constitute the solution to the game of partial information which models the strategic interaction between *A* and *B* in the above described scenario. Such a combination of a speaker strategy and a hearer strategy would be a Nash equilibrium of the present two-agent game, and this would basically mean that neither *A*, nor *B*, will benefit by changing his strategy while the other agent keeps his strategy fixed.³⁰ But a quick look at the table of expected utilities shows that the game depicted there in strategic form has multiple equilibria, or, more precisely, that the set of Nash equilibria contains the following four elements (*A₃*, *B₁*), (*A₄*, *B₁*), (*A₂*, *B₂*), (*A₄*, *B₂*). Since the utility function measures how successful the communication between *A* and *B* is, the multiple equilibria of the game show that the strategic interaction between *A*, who utters a bare sentence formed with a predicate of personal taste, and *B*, who has to decide whether *A* uses the predicate of personal taste in an autocentric or in an exocentric way, involves four cases of successful communication between them. Insofar as the structure of the game is common knowledge to both *A* and *B*, *B* knows which profiles of strategies form Nash equilibria. Since *B* knows that the game involves four optimal combinations of strategies which warrant that the agents successfully communicate one with the other, *B* does not know what is the best strategy for him to play, and, in consequence, *B* cannot decide which of the perspective-specific propositions *p₁* and *p₂* is the intended meaning of *A*'s utterance of the sentence *e₁*.

In order to solve this problem, Parikh's proposal is to fine-grain the agents' preferences. This means that the agents, beside preferring successful communication to miscommunication, will prefer, this time, not just to

³⁰ Parikh, *The Use of Language*, 38.

successfully communicate with a simple expression rather than to successfully communicate with a more complex expression, but also to successfully communicate with a complex expression rather than to miscommunicate.³¹ The previously mentioned contextual assumptions (15) and (16) encapsulate these preferences. According to the contextual assumption (15), the effort of the speaker A to produce the sentence e_2 , which makes transparent to the hearer B the fact that A autocentrically uses the predicate of personal taste, or his effort to produce the sentence e_3 , which makes transparent to B the fact that A uses in an exocentric way the predicate of personal taste, is greater than the effort of producing the sentence e_1 in which the perspectival information is not linguistically articulated. Similarly, according to the contextual assumption (16), the effort of B to process the sentence e_2 , which expresses only the perspective-specific proposition p_1 , or his effort to process the sentence e_3 , which expresses only the perspective-specific proposition p_2 , is greater than his effort to process the simpler sentence e_1 . What both contextual assumptions (15) and (16) signal is that the utility function U has to be sensitive to the fact that the costs involved in producing and processing a bare sentence formed with a predicate of personal taste, like the sentence e_1 which A uses in u to convey perspectival information to B , are inferior to the costs involved in producing and processing alternative sentences from E , like e_2 and e_3 , in which the presence of an experiencer phrase in the surface syntax makes transparent to the hearer what the speaker intends to communicate. In order to capture the agents' preferences for shorter and more economical expressions, I will follow van Rooy's proposal to define a complexity measure and to let the value of the utility function to incorporate this measure. Considering that the complexity of sentences containing predicates of personal taste can be measured by a function $\delta: E \rightarrow N$ from the set of sentences forming the fragment of language E to the set of natural numbers, the utility function will have now the following format:³²

$$U(s, A(s), B(A(s))) = 1/\delta(A(s)), \text{ if } B(A(s)) = s \\ = 0 \text{ otherwise.}$$

Assuming the following values of the function which measures the complexity of e_1 , that is, of the bare sentence with a predicate of personal taste used by A , in the above mentioned scenario, to communicate to B the perspective-specific proposition p_1 , and of its more complex alternatives e_2 and e_3 ,

$$\delta(e_1) = 1$$

³¹ Parikh, *Language and Equilibrium*, 94; Clark, *Meaningful Games*, 252; van Rooy, "Signalling Games," 502.

³² van Rooy, "Signalling Games," 502.

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$$\delta(e_2) = 2$$

$$\delta(e_3) = 2,$$

the function U will assign to the profiles of strategies in the situations s_1 and s_2 the utilities displayed in the following tables:

s_1	B_1	B_2
A_1	1	0
A_2	0.5	0.5
A_3	1	0
A_4	0.5	0.5

s_2	B_1	B_2
A_1	0	1
A_2	0	1
A_3	0.5	0.5
A_4	0.5	0.5

The table below displays, for each profile of strategies, the expected utilities which I have calculated with the help of the above established probabilities, that is, $\rho_1 = 0.9$ and $\rho_2 = 0.1$, and of the utilities assigned by U to all the profiles of strategies in the situations s_1 and s_2 :

EU	B_1	B_2
A_1	0.9	0.1
A_2	0.45	0.55
A_3	0.95	0.05
A_4	0.5	0.5

The data from the table in which the expected utilities are depicted, show that there are now two solutions to the game of partial information that models the strategic interaction between A , who utters a bare sentence formed with a predicate of personal taste, and B , who has to decide whether A uses the predicate of personal taste in an autocentric or in an exocentric way. Now, the optimal combinations of strategies which warrant that A and B will successfully communicate one with the other are the two elements (A_3, B_1) and (A_2, B_2) of the set of Nash equilibria. What the first Nash equilibrium (A_3, B_1) basically means is that the speaker A reserves the more complex and costlier sentence e_3 for the situation s_2 , and that, given that s_1 is the factual situation, A chooses to utter the bare sentence formed with a predicate of personal taste and the hearer B chooses to interpret A 's utterance as expressing the perspective-specific proposition p_1 . According to the second Nash equilibrium (A_2, B_2) of the game, A chooses to utter, in the situation s_2 , the simplest and economical sentence e_1 , he reserves the more

complex sentence e_2 for the more probable situation s_1 , and the hearer B chooses to interpret A 's utterance as expressing the perspective-specific proposition p_2 .

In order to find a unique solution to the game of partial information which models the strategic interaction between A and B in the above described scenario, I will use Parikh's proposal to appeal to the idea of Pareto dominance as a second-order criterion.³³ The idea of Pareto dominance allows us to reduce the cardinality of the already determined set of Nash equilibria and to transform this set into a singleton. A Nash equilibrium of a two-agent game satisfies the condition of being Pareto dominant only if the expected utility it yields is at least as high as the expected utility yielded by any other Nash equilibrium of the game.³⁴ Applying the idea of Pareto dominance to the set determined above of Nash equilibria, it can be seen that the profile (A_3, B_1) has a higher expected utility than the profile (A_2, B_2) . Insofar as the first contextual assumption guarantees that both A and B are rational agents, and the last assumption (17) ensures that the structure of the game of partial information which models the strategic interaction between A and B is common knowledge, both agents will choose the profile of strategies which maximizes their expected utilities. This implies that, in the present game, both agents choose to play the strategies which form the profile (A_3, B_1) because the Nash equilibrium which corresponds to this profile Pareto dominates the Nash equilibrium corresponding to the profile of strategies (A_2, B_2) . Therefore, the unique solution of the present game of partial information which models the process of interpretation of an utterance of a bare sentence formed with a predicate of personal taste is the Pareto-Nash equilibrium (A_3, B_1) , according to which the speaker A reserves the complex sentence e_3 for the counterfactual situation s_2 , and, given that s_1 is the factual situation, he chooses to utter the simple sentence e_1 in which the perspectival information is not linguistically articulated by an experiencer phrase, while the hearer B chooses to interpret A 's utterance as expressing the perspective-specific proposition p_1 which corresponds to A 's autocentric use of the predicate of personal taste occurring in e_1 .

In more general terms, the present game-theoretical account of strategic communication with expressions referring to agents' perspectives predicts that if the situation in which the speaker intends to convey to the hearer perspectival information about himself is factual, then the unique Pareto-Nash equilibrium of the game modeling the situation will correspond to the balance between the speaker's choice to utter a bare sentence formed with a predicate of personal taste and the hearer's choice to interpret the utterance as expressing the perspective-

³³ Parikh, *The Use of Language*, 39; Parikh, *Language and Equilibrium*, 114.

³⁴ Parikh, "Communication, Meaning," 205; Clark, *Meaningful Games*, 92.

specific proposition which corresponds to the speaker's autocentric use of the predicate of personal taste. Similarly, the model predicts that if the situation in which the speaker intends to convey to the hearer perspectival information about another agent is factual, then the unique Pareto-Nash equilibrium of the game modeling this situation will correspond to the balance between the speaker's choice to utter a bare sentence formed with a predicate of personal taste and the hearer's choice to interpret the utterance as expressing the perspective-specific proposition which corresponds to the speaker's exocentric use of the predicate of personal taste.

4. Conclusion

I have focused, in this paper, on bare sentences formed with predicates of personal taste. These sentences are used in communication to express perspectival information even though this information is not linguistically articulated by the occurrences of experiencer phrases at the level of sentences' surface syntax. In order to list some of the semantic properties exemplified by the utterances of bare sentences formed with predicates of personal taste, I have compared them with utterances of sentences in which an indexical like "I" occurs. In this sense, I have shown that both a sentence formed with an indexical corresponding to the first person singular pronoun and a bare sentence formed with a predicate of personal taste, express, in different contexts, different propositions, and have, in consequence, different truth-values. Their context-sensitive profile, which explains the variation of the semantic content expressed, and also the variation in truth-value of both types of sentences, is due to the occurrence, at the level of their logical forms, of a variable which represents the agent who utters the first person singular pronoun and, in the case of sentences with predicates of personal taste, the perspective of an agent. Insofar as it is semantically required that the value contextually assigned to the variable present in the logical form of a sentence in which the indexical "I" occurs, has to be the agent who utters the indexical, the semantics of sentences of this kind is speaker-oriented. In contrast, the semantics of a bare sentence with a predicate of personal taste is not necessarily speaker-oriented: the value contextually assigned to the variable present in its logical form can correspond to the perspective of the agent who utters the sentence, but also to the perspective of another agent. In this sense, I introduced the distinction between the autocentric and exocentric interpretations of predicates of personal taste, interpretations which correspond to the different values the context of utterance provides to the variable for perspective occurring in the logical forms of bare sentences formed with predicates of this kind. The

situations in which an agent, who intends to communicate perspectival information to another agent by uttering a sentence in which this information is not linguistically articulated by an experiencer phrase, uses in one way the predicate of personal taste occurring in the sentence, while the other agent interprets it in another way, constitute instances of a more general case in which the agents' acts are not coordinated. In this sense, I have tried to answer the question of how a hearer can coordinate with a speaker on the intended perspectival information conveyed by the utterance of a bare sentence formed with a predicate of personal taste, and I have showed that there is a systematic way in which both agents can optimally solve their coordination problem and rationally avoid problems due to miscommunication. In this regard, I have proposed, in the present paper, a game-theoretical account of the strategic interaction between a speaker who intends to convey some perspectival information and who chooses, in this sense, to utter a bare sentence formed with a predicate of personal taste, instead of a sentence in which the perspectival information is linguistically articulated by an experiencer phrase, and a hearer who has to choose between interpreting the uttered sentence in conformity with the speaker's autocentric use of the predicate of personal taste or in conformity with the speaker's exocentric use of the predicate. The present game-theoretical account predicts that, in the situations in which the speaker intends to talk about his perspective and utters, in this sense, a bare sentence formed with a predicate of personal taste, the solution to the game which models situations of this kind is a unique Pareto-Nash equilibrium according to which the speaker does not linguistically articulate the perspectival information by an experiencer phrase and the hearer interprets the utterance as expressing the perspective-specific proposition which corresponds to the speaker's autocentric use of the predicate of personal taste.³⁵

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