Optimal Interpretations of Permission Sentences

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Abstract
I aim to show that the long-standing problem of Free Choice Permission can find a natural pragmatic solution in the framework of Bidirectional Optimality Theory. In the absence of a model of competition among alternative forms and meanings, pragmatic approaches, although intuitively appealing, have remained problematic. Once, however, a family of alternative form – meaning pairs are taken into account, there is a means to single out the problematic inference as the intended meaning. Indeed, on reasonable assumptions concerning relevance, the speaker's knowledge, and the semantics of permission, *You may take an apple or a pear* emerges as the optimal form for the content that you may take an apple and you may take a pear, and conversely, that you may take an apple and you may take a pear emerges as the optimal content for that form, in terms of the notion of conditional informativity.

1 Introduction

The problem of Free Choice Permission (or Free Choice Disjunction) ([8], [11]) is that a sentence like (1a) will usually be taken to imply a sentence like (1b), and more generally, in a situation where there are both green and red apples available, a sentence like (2a) will often be taken to imply one like (2b):

(1) a. You may take an apple or a pear.
b. You may take an apple and you may take a pear.

(2) a. You may take an apple.
b. You may take a green apple and you may take a red apple.

Epistemic counterparts (i.e., corresponding utterances where the modal is used in an epistemic sense) show the same or at least a similar inference pattern, indicating a general notion of **Free Choice Possibility**. This inference pattern is not justified, however, on any standard semantics for disjunction and permission.

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1.1 Semantics

Zimmermann [16] (and, in a similar vein but somewhat differently, Geurts [6]) has proposed a semantic treatment involving a novel interpretation of disjunction. Asher and Bonevac [1], on the other hand, have proposed a semantic treatment involving a novel interpretation of permission. These two proposals may be correct. But both have their problems. For one thing, Zimmermann [16] fails to generalise to disjunctionless cases like (2a). Furthermore, Zimmermann and Geurts are committed to assuming a "reduction to wide disjunction", that is, an analysis of (1a) in terms of (3), whereas Asher and Bonevac assume narrow disjunction for the case where the inference is intuitively valid but wide disjunction otherwise, as in (4):

(3) You may take an apple or you may take a pear.

(4) You may take an apple or a pear, but I forget which.

(I will assume a narrow disjunction analysis of (1a) *and* (4), cf. 2.2 and 3.) Besides, as argued by Kamp ([9], 274ff.), a pragmatic account compatible with the standard semantics for permission and disjunction is *prima facie* preferable. [1]

1.2 Pragmatics

But attempts at pragmatic explanations have proven problematic. [2] In particular, it is difficult to derive (1b) as a conversational implicature from (1a). One may want to argue that the choice of (1a) over the stronger (1c) communicates that (1d) is not true, and thus indirectly that (1b) is true.

(1) c. You may take an apple.
d. You may take an apple and you may not take a pear.

(2) c. You may take a green apple.
d. You may take a green apple and you may not take a red apple.

But such an argument is dubious in a classical (Gricean or Neo-Gricean) pragmatic framework. On a classical argument, the choice of (1b) over the stronger (1c) will communicate that this stronger alternative is not true; but on the contrary, the inference is that both (1c) and the corresponding sentence about pears are true.[3] To show that (1a) communicates (1b), one needs both

- a precise notion of **competition** and
- a way to show that (1a) **preferably communicates** (1b) and that the latter is preferably communicated by the former.

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1. A mixed (semantic – pragmatic) approach is represented by van Rooy [13]; *per se*, however, that theory does not give a definitive answer to the question at hand (cf. pp. 126ff.).
2. Cf. Asher and Bonevac [1]: Section 6.
3. Note that regarding obligation, the situation is different: A classical argument can account for the inference from *You must kill a lion or a leopard* to the negation of *You must kill a lion* (this is one aspect of "Ross's Paradox" (Ross [15])).

I will show that this follows on a natural treatment of permission sentences in Bidirectional Optimality Theory, in the original formulation of Blutner [2].

2 Candidate Forms and Candidate Contents

Bidirectional OT assumes that the intended content of a linguistic form can be one among a range of possible specifications of its meaning, and that it is selected through a competition with alternative forms and alternative contents. For a form to be optimal for a certain content, it must be at least as good as any alternative form for that content, and for a content to be optimal for a certain form, it must be at least as good as any alternative content for that form.

> **Strong Optimality**
>
> A pair $< f, c >$ is strongly optimal iff it satisfies the S (or Q) Principle concerning alternative forms f' and the H (or I or R) Principle concerning alternative contents (interpretations) c'.

The ordering relation over form – content pairs has been understood in a number of ways (cf. Jäger [7], van Rooy [14]); I will follow Blutner [2] in assuming it to be defined in terms of complexity and **conditional informativity**.

2.1 Candidate Forms

To solve the problem of Free Choice Permission in this setting, one must show that the pair consisting of (1a) and the meaning of (1b) is optimal: There must be no better form for the meaning of (1b), and no better content for (1a).

> **Hypothesis**
>
> the pair consisting of (1a) and the meaning of (1b) is optimal:
> There is no better form for the meaning of (1b),
> and there is no better content for (1a).

Now what is the range of alternative forms in this case? First, it is reasonable to include (1c) and (1e).

(1) a. You may take an apple or a pear.
c. You may take an apple.
e. You may take a pear.

In addition, it may be reasonable to include (1b), the direct expression of what is to emerge as the intended meaning of (1a). Now this sentence is considerably more complex than (1a). If it is included among the candidates, this can be assumed to seriously affect its optimality. Note that (1b) has to be this complex to compete; (5) will express a permission to take both an apple and a pear.

(5) You may take an apple and a pear.

At any rate, this would seem to be so; on the face of it, (5) does not share a reading with (1a). But note that Merin [12] contends that (5) intuitively implies (1b) ("Conjunctive Permission"). This view is not uncontroversial, however; the intuition about Conjunctive Permission seems to be more labile than that about Disjunctive Permission. Therefore, I will omit (1b) and (5) from consideration.

2.2 Candidate Contents

Concerning the range of alternative contents, formulations of the problem usually make two relevant assumptions: For the inference to go through,

- the question whether the hearer may take an apple and the question whether (s)he may take a pear must both be **relevant**, and,
- the speaker must be assumed to **know** the answers.[4] (In (4) she doesn't.)

Now both conditions will be met when the sentence is used performatively, as a second person *may* sentence will normally be. If both conditions are met – relevance and knowledge on the part of the speaker regarding each disjunct – the alternative specifications of the meaning of (1a) will be (1b), (1d), and (1f).

(1) b. You may take an apple and you may take a pear.
d. You may take an apple and you may not take a pear.
f. You may take a pear and you may not take an apple.

3 Possibilities and Conditional Probabilities

What is to be shown is that

- (1a) ("P(a or p)") is a better form than (1c) or (1e) ("P(a)" or "P(p)") for the content (1b) (P(a) ∧ P(p)), and that
- this is a better content than (1d) or (1f) (P(a) ∧¬ P(p) or P(p) ∧¬ P(a)) for the form "P(a or p)"

in terms of complexity of forms and conditional informativity of f – c pairs.

Concerning complexity of form, I will assume that the difference between "P(a)" or "P(p)" on the one hand and "P(a or p)" on the other is negligible.[5] Concerning conditional informativity, however, considerable differences emerge. Note that there is an intuition that the symmetric form "P(a or p)" should agree with the symmetric content P(a) ∧ P(p) rather than the asymmetric content P(a) ∧¬ P(p). This intuition is reflected in the conditional informativity. The conditional informativity of a form-content pair $< f, c >$ is defined in terms of the probability of c given the semantics of f – the surprise c holds if f is true:

4. This assumption underlies what Zimmermann ([16], 286) calls the **Authority Principle**; Asher and Bonevac [1] speak about the speaker knowing the rules relevant to the issue.
5. This is different in the (2) case, where "P(a)" compares favourably with "P(g-a)" and "P(r-a)". If "P(a or p)" does compare unfavourably with "P(a)" or "P(p)" concerning complexity of form, this difference does not outbalance the difference in conditional informativity.

Conditional informativity

$\mathbf{inf}(c/[\![f]\!]) = -\log_2 P(c/[\![f]\!])$

It should be as low as possible. – The crucial points are now that

1. On a standard analysis of permission as possibility,[6] if P(a or p) is true, there is a nonempty intersection between the proposition (a or p) and a relevant (ordering source and / or modal base) set of possible worlds.
2. Since this intersection contains an indefinite number of possible worlds, the probability that it contains worlds where a is true *and* worlds where p is true will be high; the probability that it contains only a (or only p) worlds will be low.
3. Since it contains both p worlds and a worlds iff $\mathrm{P(a)} \wedge \mathrm{P(p)}$,
   $P(\,\mathrm{P(a)} \wedge \mathrm{P(p)} \,/\, [\![\text{“P(a or p)”}]\!]\,)$ will be high and
   $\mathbf{inf}(\,\mathrm{P(a)} \wedge \mathrm{P(p)} \,/\, [\![\text{“P(a or p)”}]\!]\,)$ will be low.

Let the “worlds witnessing the truth” of a possibility statement refer to the worlds in the intersection between the proposition and the relevant set of worlds. The more worlds witnessing the truth of “$\mathrm{P(a} \vee \mathrm{p)}$”, the higher the probability of $\mathrm{P(a)} \wedge \mathrm{P(p)}$. I assume that there are in principle many worlds:

Assumption

Mentally, or realistically, or both, the “at least one” world witnessing the truth of a possibility statement is a *plurality* of worlds.

Generally – assuming an even distribution of worlds and of apples and pears –

- $\mathbf{inf}(\mathrm{P(a)} \wedge \neg\, \mathrm{P(p)} \,/\, [\![\text{“P(a or p)”}]\!])$ will equal the number of worlds witnessing the truth of $[\![\text{“P(a or p)”}]\!]$;
- $\mathbf{inf}(\mathrm{P(a)} \wedge \mathrm{P(p)} \,/\, [\![\text{“P(a or p)”}]\!])$ will approach 0 with a growing number of such worlds.

The difference will be significant even if – to take an artificial example – only 3 worlds witness the truth of $\mathrm{P(a} \vee \mathrm{p)}$. We then arrive at these values:

$\mathbf{inf}(\cdot/[\![\cdot]\!])$	$\mathrm{P(a)} \wedge \neg\, \mathrm{P(p)}$	$\mathrm{P(a)} \wedge \mathrm{P(p)}$	$\mathrm{P(p)} \wedge \neg\, \mathrm{P(a)}$
“P(a)”	$\Rightarrow 1$	1	$*$
“P(a or p)”	3	$\Rightarrow \log_2 \frac{4}{3}$	3
“P(p)”	$*$	1	$\Rightarrow 1$

Table 1: Conditional informativity of permissions; no. of relevant worlds = 3

6. such as Kratzer [10]

The middle cell represents the conditional informativity of the interpretation that you may take an apple and you may take a pear ($[\![(1b)]\!]$) given that you may take an apple or take a pear ($[\![(1a)]\!]$), assuming a set of just 3 relevant worlds. This value is computed on the basis of $P(\,\mathrm{P(p)} \wedge \mathrm{P(a)} \,/\, [\![\text{“P(p or a)”}]\!]\,)$, which is $\frac{3}{4}$. It is a number between 0 and 1, and the more relevant worlds, the closer it gets to 0. We see that it compares favourably both horizontally, regarding alternative contents, and vertically, regarding alternative forms. The pair <“P(a or p)” , $\mathrm{P(a)} \wedge \mathrm{P(p)}$> is thus **strongly optimal**, and this explains the free choice effect.

4 Discussion

The account of Free Choice Permission developed above compares favourably with other proposals in a number of respects. It does not presuppose a revised semantics for permission or disjunction but renders standard analyses of *may* and *or* “intact”. (Of course, whether this should be considered an advantage depends on the success of revised analyses (like Zimmermann [16], Geurts [6], Asher and Bonevac [1]) in a broader picture.) And, as permission is analysed as just one type of possibility, the treatment immediately generalises to other types of conversational background. Moreover, it does not just account for Free Choice Disjunction but more generally for Free Choice Possibility: Cases like (2) and counterparts in other modal settings are accounted for along the same lines of reasoning as cases like (1).[7]

4.1 Local Problems

There are problems, though. For one thing, the proposed account only makes sense for **narrow disjunction**, that is, may(you take an apple or you take a pear), not for **wide disjunction**, that is, [(you may take a pear) or (you may take an apple)]. But (3) also seems to license the inference (1b).

(3) You may take an apple or you may take a pear.

For this case, another story must be told, unless one can argue that (3) is really “longhand” for (1a). To be sure, one would need some independent evidence.

Secondly, the account presupposes that if the number of relevant worlds is low, the probabilities of the two disjuncts – a and p – are more or less evenly distributed. Thus, if the apples outnumber the pears by a ratio of 4 : 1, there must be 5 or more worlds to witness the truth of (1a) for the symmetric interpretation to be optimal. This tradeoff between fruits and worlds may be considered problematic, because no matter how few pears there are in relation to apples, (1a) persistently sanctions the inference (1b) (assuming, as always,

7. Admittedly, the inference from (2a) to (2b) is a more context dependent matter than the one from (1a) to (1b); in (2a), the noun *apple* might be contextually restricted to green apples.

that the speaker knows whether P(a) / P(b)). The answer can only be that the number of possible worlds witnessing the truth of a possibility statement is indefinitely high – so that conceptually, it will outweigh any numerical imbalance between the options.

4.2 A Global Problem

Thirdly, cases like (6) argue against a purely pragmatic (conversational) theory.

(6) Usually you may only take an apple. So, if you may take an apple or take a pear, you should bloody well be pleased. (Kamp [9], 279)

Kamp observed that conversational implicatures – and optimal interpretations like strong interpretations of disjunctive permissions are conversational implicatures (cf. Blutner [4], 54) – are established on the basis of the truth conditions of assertions. Cases like (6) are problematic in this perspective because the strong interpretation belongs to a proper part of the assertion, in fact, to a part that is not itself asserted. Indeed, because the disjunctive permission is the antecedent of a conditional, the strong interpretation rather serves to weaken the assertion than to strengthen it. The argument is restated by van Rooy ([13], 128): "The problem is that these strong readings should also be predicted in case disjunctive permissions are embedded in larger sentences such that the proposition expressed by this larger sentence does not entail the proposition expressed by the embedded disjunctive permission sentence."

There are, as far as I can see, two possible strategies for dealing with this problem. Blutner [5] has sketched a reinterpretation of OT pragmatics: Conversational implicatures can "freeze" to conventional implicatures – we do not actually compute the optimal interpretation each time we process a Disjunctive Permission (a DP); rather, this interpretation has become conventionalised:

> Global [that is, competition-based] approaches may be useful and necessary for diachronic explanations and for modelling language acquisition. For synchronic descriptions we should avoid them.

On this reinterpretation, the strong interpretation is invariant and cases like (4), where the speaker does not know whether P(a), must be accounted for through another logical form, wide disjunction, as assumed by Asher and Bonevac [1].

But there may be no need to draw such a drastic conclusion from the material at hand. The other strategy consists in elucidating the conditions under which the strong interpretation is available in embedded positions. These conditions seem to be rather restricted, in fact, to contexts that are or can be understood as utterance reports, where a speaker can be inferred who can be assumed to know whether P(a). (In (6) this is the actual speaker, inasmuch as she seems to be presupposing the DP.) In (7), such an interpretation is not readily available, but in (8), if a paraphrase like (9) is reasonable, it is:

(7) I hope you may take an apple or a pear; then, you won't feel so hungry.

(8) If you may take an apple or a pear, you must take a pear.

(9) If they tell you that you may take an apple or a pear, take a pear.

If this hypothesis can be substantiated (something which, needless to say, calls for thorough empirical investigations), strong interpretations of embedded DPs can be explained by essentially the same pragmatic reasoning as that used for deriving strong interpretations of autonomous DPs: If (8) is paraphrased as (9), the same inference will be licensed in this indirect utterance context as when the DP is uttered directly: From *x says that P(a or p)* we may, if there is reason to believe that *x* knows whether *P(a)* and whether *P(p)*, infer *x communicates that P(a) and P(p)*, because that is the optimal interpretation of her utterance.

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