Communicative Action as Bargaining: Utility, Relevance, Elementary Social Acts

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Abstract

I outline an approach to communicative action (CA). Its bases are (i) a bargaining game approach to Elementary Social Acts (ESAs) and (ii) a Decision-Theoretic Semantics (DTS) in which utility and, as a special case, evidential relevance play a central role. The act analysis is extended to a variety of act types. Examples of various kinds of 'conventional' and 'conversational' implicature illustrate how act- and relevance-structure feed into one another. More specific issues addressed include: implications of modelling communication as a coordination game, empirical problems of act-imputation by discourse participants, and mining utterance structure for cues to ostensible utterer's intention.

1. Some Problems of Communicative Action Theories

I should like to submit for evaluation an approach to some of the phenomena CA theories habitually deal us. I believe the approach makes inroads on well-known problems in the theory of meaning for natural languages, and I shall illustrate some, giving references to other cases studies.[1] I shall also attempt to engage some points of discussion raised by symposium convenors, some with reference to responses in discussion drafts.

The exposition aims to provide tools for addressing two specific problems raised explicitly or implicitly by participants to the symposium:

- People can be shown to vary widely in assignment of speech act categories to utterances (Di Eugenio et al 1997).
- Many working systems analyzing and synthesizing aspects of CA very consciously opt for a 'template' approach to utterance meaning (e.g. Thomason and Hobbs 1997).

Problems akin to those of the first kind have prompted many to dismiss speech act type as a piece of superfluous baggage (Gazdar 1981). Similarly, the inadequacy of traditional speech act theory to deal with intonation (Cutler 1977) may warrant suspicions that its categorizations were inadequate not only to this purpose (Merin and Bartels 1997; cp. Pierrehumbert and Hirschberg 1990) but also to others.

On the other hand, lives do occasionally hang in the balance of explicit assignment of traditional speech act categories.[2]

This problem is related to the one singled out by the second problem. Explicit performatives are rare birds. Even when they do occur, there is often no guarantee that what they appear to commit the speaker to will not be subverted by tell-tale clues in surrounding parts of his discourse. So we should ask: to what extent can a semantics – not necessarily truthconditional – of parts of the closed-class lexicon help to get a handle on act structure and thus give a better clue to speakers' ostensible intentions. Natural language structure (as distinct from truth-conditional content and context) could perhaps be more deeply mined for clues than in the best known approaches to CA.

Theories of CA are often classified into those of traditional speech act theory (Austin 1962; Searle 1969), call them *taxonomic*, and those which emphasize context-change, call them *state-change* theories (e.g. Lewis 1970; Stalnaker 1972; Kamp 1973). Emphasis of the latter has been on analyses of a very small number of act types.

Essential formal differences between the two approaches are slight. Taxonomic theories specify constraints on utterance contexts and could, in principle, be reformulated in terms of the types of state-changes brought about by performance of various acts.

Actual differences are, however, significant. The two approaches exhibit complementary virtues and deficits. The taxonomic tradition offers no useful analyses of interactions between recursive semantics and act-pragmatics. In return, it does distinguish illocutionary act (e.g. conditions for an assertion having been made) and perlocutionary action (e.g. bringing

[1] Several technical reports are available online at http://www.ims.uni-stuttgart.de/projekte/SFB340.html

[2] See Shuy (1993) on the mapping from wiretap transcripts to life behind bars or beyond.

it about that the addressee adopt the content of assertion as an epistemic commitment).

By contrast, state-change theories that attend to detail of semantic recursion short-circuit the step between interpretation of the utterance and modification of the context of commitments.[3] The reasons for this are more principled than a hypothesis of mere inattention would explain.

2. Coordination vs. Negotiation

Lewis features a Master with authority to modify the context governing a Slave's commitments at the drop of a word. An assertor will – granted Lewis' Gricean convention of truthfulness – change the context of epistemic commitments by analogous means. Indeed, Lewis' Master has authority in virtue of truthfulness. His command 'You must shine my shoes' amounts to stating 'Slave is under an obligation to shine Master's shoes'. The deontic context adjusts automatically.

The further assumption that Slave will comply without fail might be accomodated as a triviality. For one might say: let us compute what is meant, and leave the question whether or not Slave will indeed comply as an afterthought. In ideal circumstances – where no questions of filling in details of the action to be performed intrude – this might be a warranted assumption. (Think of an action repertoire which leaves no slack with regard to time of compliance and mode of delivery.)

However, much if not most of current speech act kinematics makes a rather stronger assumption. It assumes that this first interpretation step – or rather the formal reconstruction of it – should remain the same when *com*mand is replaced by *de*mand. This is not at all obvious. Commands constitute a rather degenerate special case of demands: namely that case where the commander exercises, within a certain range of authorization, unlimited power over the commandee. Commands rest on *authority* that brooks no tradeoff; demands rest on *incentives* to be weighed and capable of being balanced. An alternative way of putting the authoritarian case is that any individual interests Commandee might have and which do not conform to those of Commander, have no possibility of influencing the situation, for want of countervailing incentives Commandee might bring to bear on Commander.

Hence, Slave's preferences can, vacuously, be identified with those of Master's: and all that is needed is that Slave be kept informed of what Master's (and hence his own) preferences are. We have a game of *pure coordination*.

Note now that precisely the same structural conflation attends current kinematic analyses of assertion. Here, too, the Grice/Lewis convention of truthfulness warrants the irrelevance of scepticism and hence immediate uptake. The analysis of *assertion* is, in fact, the analysis of a flat, disinterested and undeniable *statement*.[4]

The coordination game – embodied in Grice's Cooperative Principle – presupposes a social relationship that cannot simply be assumed to govern dialogue on issues of vital interest.[5] A serious alternative contender here is the bargaining game (Nash 1953) where both common interests (e.g. getting a cake it takes two to reach) and opposed interests (deciding on the distribution) enter the picture.

One should, in regard to these alternatives, distinguish two questions: (a) the politico-juridical question — which, if any, of these pictures better characterizes the median of social interaction types, or a given social situation; (b) the linguistic question — whether a convention of interpretation predicated on unilateral authority relations or one predicated on bilateral influence, i.e. explicit or tacit (Harsanyi 1977) bargaining underlies interpretive strategies in the uptake of meaning. Theories of CA will have to attend to both questions and explore what, if any, degree of dependence there is between their answers in a given situation.

The approach I advocate is taxonomic with regard to acts, but then cuts across the the narrow divide (if any there is, cf. Traum 1993) that separates it from rhetorical relations as presently understood. Within the context of speech act studies it has two distinctive features:

1. Its basic and initial theoretical outlook is quite narrowly that of political economy. Accordingly, prominence is given to a mode of interaction widely held to provide foundations for basic microeconomic theory, and the structure of pure cooperation characteristic of systems exemplified by Winograd's SHRDLU and by airline reservation interfaces, does not play a fundamental role.[6]

2. Its original empirical motivation was to account for some difficulties in the formal semantics of what appear to be the least context-dependent elements of natural language vocabularies: the 'logical' connectives *or* and *and* (Merin 1991, 1992).

[3] State-change approaches that do not short-circuit, also do not consider semantic detail.

[4] Imagine your bank sending you something headed 'Our Assertion/Admission of Your Current Balance of Acct.'

[5] Better Salesmanship Manuals will, of course, counsel representing the situation as such to prospects: the better to turn them into things that don't look out for the even break. Note that I do not contest that coordination games are good ways of describing the stability of convention pure and simple. The rules of chess are a convention.

[6] If anything, it emerges as a prominent degenerate case, in which there is not two but just one preference schedule to consider. Another usefully contrasting approach is the system of Traum and Allen (1994) in which the juridical notion of obligation (imposed by social convention) is introduced as a primitive to supplement lacunae in plan- and intention-based approaches (e.g. Cohen and Levesque 1990) to CA. Cp. Merin (1994b).

Accordingly, the evidence for the choice of framework is primarily its performance in explaining non-peripheral linguistic data, i.e. robust, spontaneous native speaker intuitions on acceptability and paraphrase. To the extent that the semantics of such items and others with a prima facie non-truthconditional component (*but, even, only, also*) is an element of a theory of rhetorical relations, to that extent the present approach may have something to say about those.

The narrow assumptions guiding (1) would at first sight appear to be at odds with the eminently cooperative spirit that governs well-bred dialogue on the plan-recognition-based approach to discourse. Moreover, while it is predicated, ultimately, on assuming social conventions that are not put into question[7] it does not, at the level of act-specification, take such conventions for granted as defaults, as suggested by Traum and Allen (1994). On the other hand, the task specification of Di Eugenio et al. (1997) already comes much closer to a negotiation-centered view.

3. Decision-Theoretic Semantics and the Bargaining Situation

Dynamic or kinematic interpretation in current semantics turns semantics, at least technically, into a branch of speech act theory. After all, an act changes the course of the world in some respect. Current epistemic re-construals of truth-conditional meaning specify it in terms of changes of context brought about by an utterance. The meaning of an indicative sentence Φ is seen as a partial function on epistemic states. (It will be undefined e.g. for any context at which a presupposition of Φ is unsatisfied.)

In its most basic versions this view abstracts away from difference of speech act type such as between *assertion* and *admission* or, more generally (covering the imperative mood, too) *claim* and *concession*. With this simple generalization we are already in the domain of political economy and, indeed, of bargains.

A default assumption of opposed participant preferences—inverse on the Pareto boundary of a mixed-motive bargaining situation, rather than in the empirically rare sense of a game of strict competition—is no less a candidate for a default than the received assumption that preferences are consonant enough to be either ignored altogether or to play, as being consonant, an explanatory role.[8] Neither of the two competing assumptions will always hold in they eye of human or divine observers. Which default delivers structure is entirely an empirical question.

[7]Even the *argumentum ad baculum* lives by conventions that govern its initiation and, in view of the relatively low death rate it carries in some parts of the world, execution.

[8]Strict competition is the ideology of a game-models for semantics of classical and other logics; cf. Hintikka (1968).

The ideology of communication I shall try to milk for empirical structure is basically interested and partisan. Its paradigmatic context of use is constituted by two persons that have to negotiate a *joint strategy*, i.e. a mutually binding constraint. The constraint will be one on their conduct in the typical imperative case. The constraint will apply to their disposition to conduct in the typical indicative case, given a dispositional construal of belief. If they were of one mind—in precisely the sense of the idiom that designates consonance of preferences—there would be no issue between them.

Issues live on locally inverse preferences, and on the provision of incentives for one or more of the participants to accomodate to the other's preferences. Incentives might range from wielding a heavy stick (the original *argumentum ad baculum*), over offers of money, offers of charitable status, and (in the typical indicative case) tacit or explicit offers of whatever is common evidential currency.

Put crudely, the gross value of an imperative to the utterer is the utility increment to be derived from the addressee's compliance. If values are deemed intersubjective[9], we shall, on disregarding incentives offered, have a simple transfer of standardized utility before us.

'Give me your wallet!' is a useful example sentence. 'Give me your wallet and your mobile phone', 'Give me you wallet or your mobile phone' are others. Utterances of these are, presumably, of the speech act type 'demand' or 'claim' (demanding with menaces being a special case). Whereas a response chosen from among 'OK, take my wallet ({and/or}) my mobile phone)' would presumably instantiate a concession.

Already here we are ready for an immediate explanatory payoff whose value will be an increasing function of the time one has spent pondering the underlying problem. Note that a demand (Nash 1953) is bounded from below.[10] If I ask for \$5, I should not rationally mind if you give me \$6, \$1000, or your Mercedes into the bargain. But I shall get very edgy, indeed angry, starting with \$4.99 and going down. Dually, if I concede \$5 to you, I don't mind if you take less (or nothing, or give me your Mercedes instead).[11]

[9]This is a naive assumption underlying Aristotle's account of economic exchange, discredited by 19th century marginal utility theory, and beset by all the philosophical and mathematical difficulties attaching to the very idea of interpersonal utility.

[10]And from above only by the feasible set, whose extent may be imperfectly known to players under incomplete information. This openness to windfall gains is a robust feature of all real-world bargaining games (they can be very brittle in other respects) and hence a safe import for explanatory purposes.

[11]We take for granted naive independence and monotonicity assumptions that reflect in surprise at the aesthetic fact that milk and lemon jointly don't improve your tea, and in literary figures such as the Sorcerer's Apprentice.

Consider now disjunction and conjunction. For demands (homogeneous in sign of utility) an inclusive reading is predicted for disjunction; likewise, conjunction has its ordinary reading. For concessions we should predict that disjunction will have an exclusive bias: the least concession compatible with one disjunct being conceded is the natural reading. Similarly, if I concede the conjunction you are free to take just one or even neither. Suppose commands are being *represented* as a non-degenerate species of demand, and permissions as a species of concession. Then the above informally stated predictions will presage a difference between readings for these two act-modes which correspond neatly to those not predicted by current context-change descriptions of the phenomena.

4. Elementary Social Acts

In (Merin 1994a) a paradigmatic, structure-generating convention (Discourse Institution) is proposed in an algebraic framework simple enough to yield denotata for natural language expressions having a directly context-changing component or, indeed, nature. Modelled on the situation explicated by two-person bargaining games (Nash 1953) it features two dialogue participants, Ego (E) and Alter (A). They have to decide whether a certain proposition Φ, put forward by one of them, is to become a joint commitment (JC) constraining their beliefs ('epistemic') or conduct ('deontic'). I.e. a decision is to be made about adoption of a 'jointly randomized strategy' (Harsanyi 1977), where randomization for present purposes only admits of the 'pure' cases.

Suppose E proposes, i.e. *claims* Φ ($\mathrm{CLA_E}\Phi$). Then A has two options: (i) admit, i.e. *concede* Φ ($\mathrm{CON_A}\Phi$), whereupon Φ becomes a JC; (ii) *deny* Φ ($\mathrm{DEN_A}\Phi$). If (ii), then E has two options: (iii) *retract* the claim ($\mathrm{RET_E}\Phi$); or (iv) *insist* ($\mathrm{INS_E}\Phi$) i.e., to simplify matters, repeat the *claim* ($\mathrm{CLA_E}\Phi$); and so on. Thus I consider, initially, Elementary Social Acts of claim, concession, denial and retraction.

The sequential structure of elementary transactions is represented by two feedback-linked automata accepting a formal act-description language.[12] The division of automata corresponds to one between Joint Commitment States regarding a proposition, and Negotiation States.

Paradigmatic structure of negotiation acts is represented by interpreting the target states of constant partial functions on the negotiation state set which represent act-types. The interpretants are binary decision-theoretic parameters P_X. They represent actor-role assignment (P_S), propositional complement polarity with respect to classical negation (P_O), who ostensibly prefers the conventionally non-negative cell of the proposition-pair at issue (P_P), who is ostensibly allocated dominant incentives deciding the issue (P_D) and who is imputed with initiating the transaction process (P_I). In the case of retraction two options for consequences for JC are readily conceivable: either that no JC regarding Φ is undertaken, or else that $\neg\Phi$ becomes JC. The latter option is motivated as a constraint against frivolous claims, supposing that personal interests attach to adoption. (See Figure 1.)

	P_S	P_O	P_P	P_D	P_I		P_S	P_O	P_P	P_D	P_I
$\mathrm{CLA}_E\Phi$	E	Φ	E	E	E	$\mathrm{CLA}_A\Phi$	A	Φ	A	A	A
$\mathrm{CON}_E\Phi$	E	Φ	A	A	A	$\mathrm{CON}_A\Phi$	A	Φ	E	E	E
$\mathrm{DEN}_E\Phi$	E	Φ	A	E	A	$\mathrm{DEN}_A\Phi$	A	Φ	E	A	E
$\mathrm{RET}_E\Phi$	E	Φ	E	A	E	$\mathrm{RET}_A\Phi$	A	Φ	A	E	A
$\mathrm{CLA}_E\neg\Phi$	E	$\neg\Phi$	A	E	E	$\mathrm{CLA}_A\neg\Phi$	A	$\neg\Phi$	E	A	A
$\mathrm{CON}_E\neg\Phi$	E	$\neg\Phi$	E	A	A	$\mathrm{CON}_A\neg\Phi$	A	$\neg\Phi$	A	E	E
$\mathrm{DEN}_E\neg\Phi$	E	$\neg\Phi$	E	E	A	$\mathrm{DEN}_A\neg\Phi$	A	$\neg\Phi$	A	A	E
$\mathrm{RET}_E\neg\Phi$	E	$\neg\Phi$	A	A	E	$\mathrm{RET}_A\neg\Phi$	A	$\neg\Phi$	E	E	A

Fig. 1: Elementary Social Acts and associated Contexts

Example: if Ego retracts Φ ($\mathrm{RET}_E\Phi$) the ostension (from Ego's point of view) is among other things that Ego *ceteris paribus* prefers Φ, that Ego took the initiative along those lines, and that Alter dominates (hence that Alter's preference for $\bar{\Phi}$ will turn into a JC.)

Five binary parameters distinguish 32 contexts. Halving the set is a link between preference and initiative: short-sighted *homini oeconomici* do not launch ostensibly counterpreferential initiatives. Transformations of contexts represented by transformations of the parameter space yield a language of transaction effectors, transduced into one of transaction descriptors by the automaton. Elements of the effector language and, in turn, transformations of context transformations are proposed as denotata for directly context-changing expressions of natural languages. (This was the main objective of the exercise.)

Systematic changes of equational constraints on the parameter space and homomorphic projections on subspaces then supply formal explicata of act types such as request (e.g. $\mathrm{REQ}_E\Phi = [E, \Phi, E, A, E]$, suggestion (e.g. $\mathrm{SUG_E}\Phi = [E, \Phi, Æ, Æ, E]$ where Æ represents underspecification or probabilistic mixture of binary parameters), etc .

The analysis in terms of such dialogical Discourse Institutions explains a number of non-peripheral linguistic phenomena ranging from aspects of negation, polarity phenomena, modality, modal and degree particles, and coordinating connectives, to 'yes'/'no' systems and honorifics.

The initial repertoire of acts is, of course, limited enough to be reminiscent of handshake protocols used in TELNET for many years. However, the interest structure attaching to the bargaining situation—in

[12] If you read this paper, correct some misprints that appeared between proof-stage and printing. I.e., insert a missing arc in Figure 11.1 (from leftmost to rightmost node) and in some places restore type-compatibility by replacing italic f symbols with bold roman $\mathbf{f}$ symbols.

the two-person case strictly inverse along the Pareto-optimal negotiation boundary—imports structure that does not enter the usual paradigm of epistemic or even deontic state change.[13]

There is, then, a significant difference of emphasis between the ESA analysis and current trends embodied in the Discourse Resource Initiative (DRI) coding manual (cf. Di Eugenio et al. 1997). ESAs include DRI 'forward' acts such as proposals (claims, suggestions) and DRI 'backward' acts such as acceptances, rejections (concessions, denials). The anaphoric nature of the latter is coded by the parameter equation $P_S(c) \neq P_I(c)$): i.e. transaction initiative is imputed to the party not currently acting.[14]

If, for certain purposes, it should turn out to be fruitful to see here a fundamental distinction (e.g. in the light of conventions in which silence means assent, or of others in which it means dissent) then one should be clear about analytic costs, weigh tradeoffs, and perhaps broach the issue of intertheoretical relations among theories shaped by specific analytic tasks.

The parameter algebra affords enough combinatorial structure to investigate systematically under what conditions projections on subspaces may be enriched and how probabilistic parameter linkages might be in evidence. This could, perhaps, yield inputs for the problem broached by Di Eugenio et al., viz. of overly specific interpretation by hearers of fairly underspecified speech act types. To be sure: such inputs are no substitute for specific contextual and world knowledge. But they might supplement it, or suggest ways of feeding contextual knowledge into a convenient format.

5. Acts, Relevance and Rhetorical Relations

I shall in what follows concentrate on the indicative case. To this end I will treat evidential *relevance*, explicated within the probability calculus, as a utility.[15] Personal (and negotiably interpersonal) probability is taken to measure degree of belief. Hence, as standard in decision theory, belief states are represented by probability functions on an algebra of propositions. The basic idea then is that propositions and their algebraic compounds are evaluated by (positive or negative) relevance with respect to one or the other leg of a dichotomous issue. Relevance is, intuitively speaking, a measure of epistemic force and, given actors' goals, a measure of preference with respect to attainment of the individual actors' preferred resolution of the contextually given issue.

The partisan ideology of bargaining is that of classical rhetoric. Its overriding objective is not cooperation but the optimization of what Quintilian calls *utilitas causae*: things furthering one's partisan interest. In contexts of use typically associated with simple, modal-free sentences in the indicative mood the working hypothesis is that people speak[16] to further their chosen ends. An assertion is made to some point. I say: 'Snow is white'. And the point of that might be, for instance, to argue against putting on white clothing (or, in a different situation, for putting on white camouflage). You say: 'He can spell', and I understand that this is an argument for 'We'll have him proofread the manuscript'.

This argumentative view of language is due in large measure to Oswald Ducrot (1973) who used it to describe a wide range of phenomena in non-truthconditional semantics and pragmatics. The present approach embeds it into a more general framework which also offers scope for formal explication. The key notion for the indicative case, explicating Ducrot's intuitive *valeur argumentative* is *relevance* as defined in probability theory and the philosophy of science (Jeffrey 1983).[17] Explicate, using a relevance-function championed by C.S. Peirce, A.M. Turing, and I.J. Good:

> DEFINITION: The *relevance* $\mathrm{r}_H(E)$ of proposition E to proposition H in an epistemic context represented by conditional probability function $P(\cdot|\cdot)$ is given by $\mathrm{r}_H(E) =_{df} \log[P(E|H)/P(E|\bar{H})]$.

The relevance of E to H thus defined yields: the log of the posterior odds on H (i.e. granted E) is the sum of the log of the prior odds (i.e. without taking E fpr granted) and the relevance.

A substantial range of results are provable (Merin 1994c, 1995, 1996a,b), concerning scalar implicature (now induced with respect to relevance-orderings), the semantics of such items as *but* and *even* and the classical instances of presupposition phenomena (definite descriptions, *also* and *too*).

5.1 'Scalar Implicature'

Bargaining structure explains immediately the *defeasibility differential* between the 'upperbounding' (Horn 1972) implicature/default and speaker's ('Pro's) 'lowerbounded' claim/assertion: virtual or actual opponent's ('Con's) 'at most' is *not Pro's responsibility*

[13] Merin (1994b) characterizes relations between ESA types and modal operators functorially. Preference relations (that determine linguistic monotonicity intuitions) turn out *not* to map covariantly on entailment relations.

[14] The curiosity in the basic paradigm is Retraction, which is doubly anaphoric and a species of sequential self-contradiction. Note that it maps functorially to that corner of the deontic square that L.R. Horn showed to be habitually unlexicalized in natural languages.

[15] A well-known such relevance function is a cardinal utility in the technical sense of Jeffrey (1983). Proof in Merin (1997a).

[16] Read as: language is designed as if made for people who speak. . . .

[17] This is not the notion favoured by Sperber and Wilson (1986) which, if anything, comes closer to (Neo-)Gricean informativeness, in being non-partisan. See Merin (1996a) for a formal discussion.

to back. And rationality of Con makes the Scalar implicature a computational *default*.

Net meaning is the rationally expected-to-be conceded claim; the intersection of 'assertion' and 'implicature'. Here is an intuitable example (cf. Merin 1997b):

Q: *Do you speak Portuguese*?
A: *My husband does* $[= F]$.
Scalar Implicature:
Speaker A (= Wife) doesn't. $[= \bar{E}]$

This is due to Hirschberg (1985), who explains: The context of potential Portuguese-speakers is the $\subseteq$-poset of alternatives $Pow\{husband, wife, child\} - \phi$. A generalization of Gricean 'Quantity' implicates $\bar{E}'$ for all such E' with subject denotata $s \not\leq_{Poset} \{husband\}$.

But, as the following examples suggest, the subset-structure is not pertinent. Nor is the poset-rule independently motivated. For neither will explain (where $\surd$ means: 'O.K.')

A: $\surd$\{*My brother/mother/servant//Kim/Kim Bloggs*\} *does*
A: *\{*Kim Basinger/The president of Brazil/Bill Clinton*\} *does.* $[= G]$

Let Q = Boss Inc., $A = W$ (Wife) at her job interview. Ask: a. Why should Q ask? and b. W answer as above? Because: (a) Q wants utility-relevant information ('Should we hire W?' $[= \{H, \bar{H}\}?]$) and (b) W wants to be hired $[H]$. H is the *discourse topic*. Suppose W doesn't speak Portuguese, but can call upon someone who does, virtually gratis. Typically such a person will be kin or agnate; else a friend (Kim); or an acquaintance (Kim Bloggs). But presumably *not* Kim Basinger. Hence the *.

Moreover, $\mathrm{r}_H(E) > \mathrm{r}_H(F) > 0$, surely. Treat E and F as potential claims. Recall that claims (demands) in bargaining are always 'at least'. And that the strongest compatible response (meanest concession) amounts to 'at most' that. So $\bar{E}$ is the counterclaim of sceptical[18] Boss, made and conceded *by default*.[19] Indeed,

FACT: $\mathrm{r}_{\bar{H}}(\bar{E}) > 0$ iff $\mathrm{r}_H(\bar{E}) < 0$ iff $\mathrm{r}_H(E) > 0$.

That's why smart W gives an indirect, (call it) *'second-best'* answer. Surely also $\mathrm{r}_H(F) > \mathrm{r}_H(G) = 0$. Thus, W will never implicate that the President of Brazil can't speak Portuguese. And note again: presumably E, F, G are logically independent.

'Generalized conversational implicature' is handled by the same principles. To make relevance predict here, we need a further definition.

DEFINITION: A and B are *independent conditionally* on H and $\bar{H}$ with respect to $P(\cdot)$
$[(A \perp B| \pm H)]_p] \Leftrightarrow P(AB|H) = P(A|H)P(B|H) \wedge P(AB|\bar{H}) = P(A|\bar{H})P(B|\bar{H})$.

[18]'Persuade us!'

[19]Here W must know whether or not E. This is what ensures that Boss' counter cannot be fobbed off as wholly unfounded.

Intuitively, $(A \perp B| \pm H)$ when knowing whether H or $\bar{H}$ accounts fully for any interactions between A and B. It yields additivity, i.e. compositionality of relevance:

FACT: If $[(A \perp B| \pm H)]_p]$, then $\mathrm{r}_H(AB) = \mathrm{r}_H(A) + \mathrm{r}_H(B)$.[20]

Intuitions on relevance often rest on warrant for

[CIP] Conditional Independence Presumption: $(X \perp Y| \pm H)$ where X, Y are denotata of sister nodes in coordinate constructions X' CONJ Y'.

The idea of CIP is familiar from expert systems, where it reduces computational load and the need for appeal to world knowledge. Let now $\nabla =_{df} XOR$. Then we have as a

THEOREM: If $(A \perp B| \pm H)$ and $\infty > \mathrm{r}_H(A)$, $\mathrm{r}_H(B) > 0$ then
(a) $\mathrm{r}_H(AB) > \max[\mathrm{r}_H(A), \mathrm{r}_H(B)] > \mathrm{r}_H(A \vee B) > 0$, $\mathrm{r}_H(A \nabla B)$, whereas
(b) $\not\forall\ \mathrm{r}_H(A \nabla B) \geq 0$; $\not\forall\ \mathrm{r}_H(A \nabla B) < 0$;
$\not\forall\ \mathrm{r}_H(A \vee B) < \mathrm{r}_H(A), \mathrm{r}_H(B))$.

By (a), CIP rules out 'paradoxes of relevance': counterintuitive negative relevance of conjunctions or even disjunctions of positively relevant atoms. Moreover, if relevance-maximization is a Pro's conventional goal, then assertion of a disjunction will indicate an inability to assert the more relevant disjunct. (If equi-relevance is the default, we get the familiar 'implicature' of ignorance.)

Conjoined with the bargaining assumption it explains 'strong' Scalar implicature for $\vee$. A reasonable candidate for a default context set *ceteris paribus* should be the Lindenbaum algebra over $\{A, B\}$. Its atoms represented by $AB, \bar{A}B, A\bar{B}, \bar{A}\bar{B}$ finest-partition the space of possibilities. Suppose A and B positively relevant to H, preferred by Pro. Under incomplete information (nothing e.g. is presumed known about the comparative relevance of $A\bar{B}, \bar{A}B$) Con's natural default counterclaim to Pro's $A \vee B$ is $\bar{A} \vee \bar{B}$; their meet is $A \nabla B$. Thus, *reduced* expected (positive, evidential, partisan) *relevance* of a claim has *increased* (non-partisan) semantic *informativeness* as a byproduct since $A \nabla B \models A \vee B$ while $A \vee B \not\models A \nabla B$.

5.2 'Conventional implicature': "but"

Traditionally, the conjunction *but* is said to signal some sort of opposition or contrast between what comes before and what comes after it. Since "contrast" is a widely used label for rhetorical relations and *but* a frequent expressive means associated with analyst's identification of this relation, a semantics for *but* would

[20]Without any independence assumptions we have as a FACT: $\mathrm{r}_H(AB) = \mathrm{r}_H(A) + \mathrm{r}_{H|A}(B)$.
The epistemic dynamics here parallels analyses context-change familiar from the literature on dynamic approaches to discourse.

surely contribute to our understanding of such relations.

A unitary semantics for English *but* (Merin 1996a,b) calls upon the resources of act-typology and decision-theoretic semantics. It turns out that A *but* B, where B is or may be expanded to a full, unreduced clause, is readily mapped onto a sequence of acts in which the first constitutes a speaker's concession of a claim A made by another, actual or virtual, person (an actual or virtual opponent in argument), while B is a counterclaim on the speaker's part.[21] This analysis takes off from Ducrot's (1973) observation that, in general, A here argumentatively supports some contextually given proposition H while B supports its Boolean complement, $\bar{H}$,[22] and, in addition, ostensibly 'outweighs' A.

In terms of evidential relevance the requirement on the semantics of *but* can now be explicated as

$$-\mathrm{sgn}(\mathrm{r}_H(A)) = \mathrm{sgn}(\mathrm{r}_H(B)) = \mathrm{sgn}(\mathrm{r}_H(AB)) \neq 0$$
$$\text{and } |\mathrm{r}_H(AB)| > |\mathrm{r}_H(A)|.$$

This covers cases such as [A] *Wilkins is a man of principle, but* [B] *he is now Chancellor of Crowford*, where no aspersions need be cast on Crowford, nor on Wilkins. Simply imagine yourself discussing the moral decline of Batbridge and let H be e.g. 'Wilkins can stop the rot at Batbridge'.

Setting $H = \bar{B}$ we have the special case, noted by Locke and Frege, where B is indeed unexpected in view of A.[23] An example of this might be [A] *Kim is rich but* [B] *stupid*.

The probabilistic formulation thus unites intuitions of a vaguely epistemic and psychological nature ("surprise") and those of an argumentative, sociological kind (evidential support). If we now look at the preference structure in the simple nominal terms we picked for the act-parametrization, i.e. represented here by *sign* of relevance, we see that indeed the A-conjunct and the B-conjunct respectively fit the preference parametrization for concession and claim. We might say, $A = C$ where C is another's claim.

Consider now the occurence of *but* that is frequently labelled by another bona fide rhetorical act label, 'correction'. This is characterized by obligatory explicit negation of the A-clause and obligatory ellipsis in the B-clause of material that is not the negation focus in the A-clause (i.e. the 'scope', in some writers' terminology). *Kim didn't hit Sandy, but Lee* makes the first clause a *denial* of an assertion (by a real or virtual other) of *Kim hit Sandy*. Call that latter proposition again C. Here the B-clause content typically entails the A-clause and hence the negation $\bar{C}$ of C. This explicates what might perhaps be seen as a rhetorical relation of 'parallel' or even 'elaboration' between first and second clause. The formal framework might allow us to assess more clearly what purchase intuitive rhetorical notions do give us on the data, and where to see common structure or diversity.

Now, provably, if in the first occurence of *but* $H = \bar{B}$, then $\mathrm{r}_A(B) < 0$, i.e. B must be negatively relevant to A, i.e. to C. In the second case, let $A = \bar{C}$, the denial of the other's assertion. C. Then again, B is negatively relevant to C. If moreover, we set the same default, i.e. $H = \bar{B}$, then in *both* occurrences we satisfy the double constraint $\mathrm{r}_H(C) > 0$ and $\mathrm{r}_H(B) < 0$. This gives some formal substance to the intuition that *but* has a unitary semantics.

[21] Cp. traditional terminology that classes *but* as expressing a 'concessive' relation (Quirk 1954).

[22] I propose to call the unnegated element of the pair $\{H, \bar{H}\}$ the *Discourse Topic* (DT). What matters here is that the DT be one leg of an *issue*: a bi-partition of the space of deontic or epistemic constraints such that Alter and Ego prefer different cells.

[23] This case offers a number of desirable mathematical properties which predestines it as a default, over and above the fact that no propositional atom H need be introduced by extra-sentential context.

6. Outlook

Further types of phenomena where DTS has proved useful include those of presupposition. Issue-based construal leads to a formal handle on such notions as 'salience' and 'active context' (Kripke n.d.) and to an explication of a passing observation that accomodables should be 'uncontroversial' (ibid.). The explication (Merin 1997c) yields a purely decision-theoretic explanation why the narrow-scope-negation reading of *The duke of Paris is not bald* should be favoured (and the wide-scope one invariably sarcastic). Here again, the relevance structure feeds into act-categorization and affords an decision-theoretic handle on the most occult type – is it indeed inhabited? – of communicative acts: referring to something.

The proposed framework of DTS should thus be useful in articulating semantic structure and some of the notions central to communicative action—be it among people or among machines with ambitions to human-like conduct.

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