Remarks for Panel on New MarketForms

Beyond Cundy's Fallacy: Investigations of Computational Mechanisms in Strategic Contexts[a]

by

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Workshop on Multi-Agent Computation in Natural and Artificial Economies

26-28 October 2001, The Brookings Institution

[a] File: brookings-agents-20011025.tex.

Two distinct points

- (1) Cundy's fallacy & (2) agent communication language(s)
- Cundy's fallacy: it's just HyperCard
- Analog of Cundy's fallacy: it's just a computation; just NP; ...
- Recall properties of "the simplex algorithm" for LP
  1. It's not an algorithm (not certain to halt).
  2. It's not polynomial (if it halts, not certain to halt after using only polynomial resources).
  3. There are polynomial algorithms for LP.
  4. In fact, simplex performs remarkably well.
- Briefly, and by analogy: For finite agents in strategic contexts, the actual algorithms and means of computation will matter and merit investigation.

(2) agent communication language(s)

- Concept: a general purpose formal language for business communication (FLBC).
- What would such a general-purpose language look like?
- What is required for agent communications generally in "natural and artificial economies"?
- Note: The PostScript argument.

  Sometimes you do want to build a brick outhouse.

Example of a 'conversation' between two computers.

1. Computer A: `1, 360`
2. Computer B: `6, 350`
3. Computer A: `3, 1, 1, 2`
4. Computer B: `5, 1, 1`
5. Computer A: `3, 1, 1, 3`
6. Computer B: `5, 1, 1`
7. Computer A: `3, 1, 1, 1`
8. Computer B: `4, 1, 1`
9. Computer A: `3, 2, 1, 150`
10. Computer B: `4, 2, 150`
11. Computer A: `6`
12. Computer A: `8`
13. Computer B: `6`

Translation of the conversation

1. Computer A: Please talk to me on lines 360/361.
2. Computer B: OK. You can talk to me on 350/351.
3. Computer A: Can you do CVSD?
4. Computer B: No, but I can do LPC.
5. Computer A: Can you do RELP?
6. Computer B: No, but I can do LPC.
7. Computer A: How about LPC?
8. Computer B: LPC is fine with me.
9. Computer A: Can you use 150 microsecond sampling?
10. Computer B: I can use 150 microsecond sampling.
11. Computer A: I am ready.
12. Computer A: Are you ready?
13. Computer B: I am ready.

EDI exampe: RFQ in X12

```
[1] ST*840*159
[2] BQT*00*Q47391*820430
[3] N1*SE*X, Inc.
[4] N1*BY*Y Co.
[5] P01*1*30000*EA*0.42*PN*747355*PD*Circuit Network
[6] SCH*10000*EA****002*820604
[7] SCH*20000*EA****002*820709
[8] CCT*1*30000
[9] SE*9*159
```

EDI (X.12) Request for Quotation (line numbers added).

EDI exampe: RFQ in X12, translated

```
[1] This is an RFQ Message * Message Number 159
[2] An Original Document * RFQ #Q47391 * Date: April 30, 1982
[3] Seller of item is X, Inc.
[4] Purchaser of item is Y Co.
[5] First Item: 30000 of part 747355 (a Circuit Network)
    at $0.42/item.
[6] Request that 10000 of the first item be delivered
    after June 4, 1982.
[7] Request that 20000 of the first item be delivered after
    July 9,1982.
[8] A total of 30000 items have been requested.
[9] There are 9 lines in this message.
    This is the end of message 159.
```

What's wrong is the whole approach

Consider the structure underlying the EDI message:

```
START***

R1**********

R2****

  ⋮

STOP**
```

Note: Record types of varying length; some optional records; some record types repeatable.

Suppose organizations A and B wish to trade and to say something outside the standards. Options:

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1. Go to the standards committee and request a change/addition.
2. Modify the standard for your purposes. (Add a new type of record, or modify a record definition.)
3. Use a defined record or field for your special purposes.
4. Use a "free text" field.

(Some further) Puzzles, issues & challenges

1. Three kinds of sentences: simple (clauses), coördinate conjunctions (joined by logical operators), and complex (embedded sentences).

   How can FOL handle embedded sentences?

2. Intensionality (opacity; s-ality)? Intentionality?

   More problems for FOL.

3. Speech acts

   Embedded sentences; neither true nor false; big problems for FOL.

4. Spanning domains with a limited vocabulary

   Ontology? How to deal with huge vocabularies?

Outline of solution

1. FOL language with restricted grammar and predicate list (all public)
2. Open-ended lists of referring terms

   SKUs, people, places, organizations, ...
3. FLBC theory: resolves or circumvents the puzzles

   Logical (semantic) theory, plus many test cases
4. Main elements: ESΘ (event semantics with thematic roles) theory, and disquotation theory for propositional content.

Disquotation theory: alternative to the modal theory ($\Box$)

Consider the simple propositional content (and speech act) sentence:

Expression 1 *Mary asserts that Sam arrived yesterday.*

My idea is to represent this (and similar) sentence(s) with two kinds of expression: (a) a fundamental expression and (b) one or more axiom schemas, used to articulate meaning for the fundamental expressions. First, we can represent *Sam arrived yesterday* in what is more or less standard event semantics:

Expression 2 $\exists e'(arrive(e') \wedge Subject(e', Sam) \wedge Cul(e', yesterday))$

Let ϕ represent Expression 2.

The fundamental expression for the sentence (in Expression 1) becomes, in shorthand:

Expression 3 $\exists e(assert(e) \wedge Subject(e,\ Mary) \wedge Obj(e,\ \ulcorner\phi\urcorner))$

or fully written out:

Expression 4 $\exists e(assert(e) \wedge Subject(e,\ Mary) \wedge Obj(e,\ \ulcorner\exists e'(arrive(e') \wedge Subject(e',\ Sam) \wedge Cul(e',\ yesterday))\urcorner))$

Thus, the main idea in the fundamental expressions is to treat a quoted sentence (the propositional content) as an object or individual about which a comment is made. In particular, the quoted sentence is the direct object of an event (or eventuality). Moreover, a special form of quotation is used: $\ulcorner\cdot\urcorner$. By quoting an expression in this way—as in 3 and 4—we treat it as an individual and so capture (I argue) the second aspect noted about it.

Disquotation theory: alternative to the modal theory ($\Box$)

Formally we have the following rule:

Axiom Schema 1 (Assert Rule) $\forall e((assert(e) \wedge Obj(e, \lceil\phi\rceil)) \rightarrow (Veridical(e) \leftrightarrow \phi))$

Axiom Schema 1 should be thought of as a rule into which we may substitute uniformly for ϕ any well-formed formula in the current language.

Note: This generalizes to all the speech acts.