Sentence meaning as argumentative dialogues

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Introduction

In formal semantics the meaning of a sentence A is defined using the truth condition of the sentence and formalized using possible worlds semantics. We twist the classical view by stating that: the meaning of a sentence A asserted by speaker P is defined as the set of all possible justifications of A, which are argumentative dialogues starting with A won by speaker P. The idea of explaining the meaning of sentences in terms of how they can be justified in an argumentative dialogue goes back to [3]. We propose to apply this idea to sentences of natural language.

Definitions

Argumentative dialogue for S: sequences of utterances

$$\mathfrak{D} = U_0, U_1, \dots U_N \quad \text{where:}$$

- the U_i are **utterances** i.e. sentence prefixed by ! (assertion) or ? (question)
- $\mathfrak{D}$ **starts** with $!S$ that is U_0 is $!S$
- $\mathfrak{D}$ is an **alternate** sequence:
  even utterances U_{2p} are said by P
  odd utterances U_{2p+1} are said by O
- the sequence respects **answering rules** i.e.
  what U_{i+1} might be
  according to the previous utterances $U_0, \dots, U_i$
- P **wins** the dialogue when the last utterance is by P and O cannot answer — otherwise O wins the dialogue.
- For each U_i i is the position in the dialogue.

Rules

There are two kinds of answering rules when constructing a formal dialogue.

Logical rules : stipulating how an utterance can be questioned or answered according to its main logical operator.

Structural rules : imposing global conditions on the shape of the dialogue

	Conditional rule
X	$!(S_1 \to S_2)$
Y	$!S_1,\ ?S_2$
X	S_1

$X, Y \in \{P, O\} \quad X \neq Y$

Atomic structural rule: P may assert an atomic sentence q only if O has previously asserted q

Structural rule 1: a question may be answered at most once

Structural rule 2: if i is a position and if at $i-1$ there are several questions that are waiting for an answer only the last of them can be answered

Advantages of this approach

1. The class of models of a sentence S can be badly infinite. On the contrary the set of Argumentative dialogues won by P can be recursively enumerated.
2. This kind of semantics is more fine-grained then traditional truth theoretic semantic. In the traditional approach two sentences having the same class of models are identified in terms of meaning e.g. $[S_1 \wedge S_2] \equiv [S_2 \wedge S_1]$ whereas they are distinct in terms of argumentative dialogues.

Example

S_1: John kills Mary
S_2: John will go to jail
S_3: John will pay for his crime

0	P	$!S_1 \to S_2 \to (S_2 \to S_3 \to (S_1 \to S_3))$	
1	O	$!S_1 \to S_2,\ ?(S_2 \to S_3 \to (S_1 \to S_3))$	[0,Q]
2	P	$!S_2 \to S_3 \to (S_1 \to S_2)$	[1,A]
3	O	$!S_2 \to S_3\ ,?(S_1 \to S_3)$	[2,Q]
4	P	$!S_1 \to S_3$	[3,A]
5	O	$!S_1,\ ?S_3$	[4,Q]
6	P	$!S_1,\ ?S_2$	[1,Q]
7	O	$!S_2$	[5,A]
8	P	$!S_2,\ ?S_3$	[3,Q]
9	O	$!S_3$	[8,A]
10	P	$!S_3$	[5,A]

Forthcoming Research

Our approach is related to the inferentialist view of meaning [2, 1]. The central tenet of inferentialism is

Manifestability: The knowledge of the meaning of a sentence or expression must be in principle completely observable and publicly testable

Disagreement about word-meaning frequently emerge in real life dialogues:

0 John is not a murderer
1 John is a murderer since he killed Mary
2 I grant that he killed Mary, but it was by accident.

- We plan to characterize manifestability, that is to find the conditions that would guarantee the emergence — in formal dialogues — of any possible disagreement about word meaning.
- Computing a dialogue exhibiting a disagreement can be viewed as a machine-learning procedure for axioms.
- In order for this procedure to be effective we are developing our line of research into two parallel directions:

1. We are developing rules for argumentative dialogue expressed in decidable fragment of first order logic involving sentence with generalized quantifiers like in [4]
2. the practical development of natural language processing tools using such ideas can only be achieved if a very precise topic has been circumscribed. Indeed, a prototype would require sophisticated linguistic resources (lexicons e.g. $\lambda x^e (snores^{e \to t} x)$, knowledge representation e.g. $snores \to sleep$). We are currently studying how such resources can be integrated in formal argumentative dialogues.

References

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