Natural Language Understanding: Problems of Figurative Language Processing

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Abstract: *This work is devoted to the problem of the criterion of metaphorical statements. In order to categorise the statements as particular type (literal, metaphorical, idiom, ...) we need a definite criterion. As one possible solution to this problem it is suggested to take logical criterion based on the obvious contradiction to the third axiom of logic (the law of excluded middle). In the article the experiment conducted to check the proposed criterion is described and the results of the experiment are presented.*

Key words: linguistic behaviour, figurative language models, metaphor.

1. INTRODUCTION

One of the main directions of AI research is natural language understanding. Usually the specialists in the field consider only non-figurative language leaving figurative language aside. At the same time non-figurative speech and, in particular, metaphors have received special attention in psycholinguistic studies recently.

If we accept the idea that speech could be divided into literal and figurative we divide linguistic behaviour into two types. Therefore, we will face the problem what makes us to choose this or that type of behaviour and what serves us as the criterion that helps to choose this or that interpretation of utterance. Second problem is closely connected with the criterion of metaphoricity.

Such a criterion should help a person to decide whether s/he deals with a metaphorical or literal proposition. In other words, we have to explain how a human being in her/his psychological reality could differentiate different linguistic expressions. The answer to this problem is crucial for any theory of language or theory of metaphor as well as for AI applications.

Different answers are based on different models. The first model sees metaphor as a comparison (e.g., Tomashevsky, 1998; Vinogradov, 1976).

Second models try to explain metaphor from the pragmatic point of view. Within this theory we could explain metaphor as certain violation of rules that guide use of language (e.g., Searle; 1979, Grice, 1975). In this case we use words to convey sense that is different from the words' sense, i.e. metaphorical meaning is different from the words' meaning, contrary to the literal proposition. If we find the set of rules that guide our language practice (Grice, 1975) then metaphor could be explained as violation of certain rule(s).

The third model sees in metaphor semantic phenomenon, i.e. explains it as a proposition that violates semantic structures of language. Such solution allows to ignore non-linguistic (e.g., pragmatic) factors and to explain metaphor only within semantic structure of a word. Usually theories of that type explain metaphor as the transfer of a certain features (but not defining) of a concept a word stands for (Ortony, 1979; Arutunova, 1979; Lakoff&Johnson, 1980).

Notwithstanding the fact that we break the majority of theories of metaphor in a three big groups on the basis of underlying model the criterion which breaks linguistic construction on metaphorical and literal sentences is in the most cases logical:

We take as metaphor an expression
that is obviously false or meaningless. (1)

When taking literally metaphor in most cases is really a false statement and this fact serves us as the

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only evidence for such a criterion. Slightly different version of this criterion we could find in different works (Arutunova, 1979; Vinogradov, 1976; Searle, 1979, etc.). However, there are several difficulties with such a criterion. We could easily see that propositions such as "*John is a jackal*"' are obviously false. That is why we could treat such propositions as metaphors. However, equally easy we could see that propositions such as "*The Earth is flat*", "*The Sun is a small object*" are also obviously false. At the same time they are not metaphors. The main problem with this criterion is that it requires considering as a metaphor any false expression. Otherwise we have to add extra rule(s) that would filter out "good" false expressions (potential metaphors) from "bad" false expressions (simply false expressions). From the one prospect the rule (1) gives us rather necessary condition than a criterion (necessary and sufficient condition), i.e. a metaphor is false when taken literally but this very fact is not sufficient for consideration an expression as metaphor. We think that such a criterion should be extended.

Let us consider the following construction:

All living beings are mortal.
All birds are living beings.
Dove is a bird. (2)
∴Dove is mortal.

If we agree with all the premises and with the process of reasoning we should except the conclusion.

Now let us change the initial construction in the following way:

All living beings are mortal.
All birds are living beings. (3)
My soul is a bird flying in the sky.
∴My soul is mortal.

Now the conclusion seems to be wrong, even if we would except the premises. What has happened with the example? We changed one of the propositions for a metaphor. If we would follow comparison or semantic theories of metaphor we will face real difficulties to explain why the conclusion in (3) is wrong, since we have to accept that the comparison is true or at least that it is meaningful.

If we accept one of the pragmatic theories of metaphor then we have to change metaphorical premises in (3) for another proposition that conveys [true] metaphorical meaning.

The third possibility is to suggest that metaphorical expressions are not subjected to formal logic (i.e., contradict to one or several axioms of formal logic). We think that this property of metaphor rather than its obvious falsehood could be taken as the criterion for metaphoricity. In the simplest form we could think about criterion for metaphor as about the rule that could show that an expression in question does not belong to the set of expressions subjected to formal logic. As such a rule we could formulate a criterion based on obvious violation of the third axiom of formal logic (the law of excluded middle):

> *If the proposition conveyed by linguistic expression is obviously false, but it is said (or it is evident from the context) that it is true, we have a sign that we deal with metaphor.* (4)

The criterion (4) could be considered as necessary and sufficient criterion for metaphor. In other words, when we say, "John is a jackal," we mean just what we say, i.e., that John is a jackal and we will insist that John is a jackal notwithstanding the fact that the proposition is wrong. It means that we will not agree that we are wrong that John is a jackal. Such a criterion tells us that if we give some cue that plainly wrong or meaningless expression is true it could be taken as a metaphor. Similarly metaphor could be considered as ordinary false propositions if it would be said that they have to be considered within formal logic.

In order to check the criterion we have done an experiment.

2. EXPERIMENT

The idea of the experiment is check how the perception of metaphors changes under different conditions. According to our line of reasoning the explicit order to use the rules of formal logic should prevent to perceive metaphors as true statements. However, if the circumstances change (e.g., there is no necessity to use logical rules) metaphors could be considered as the statements telling the truth being actually false. It is assumed that in most situations people should not judge metaphors as false statements, i.e., they should differentiate between false statements and metaphors.

We expect also that explicit instruction to use, for example, mental imagery or logic rules should change the perception of metaphors. The instruction to use logical rules would result in the increased perception of metaphors as false statements, whereas the instruction to use mental imagery would result in the increased perception of metaphors as true statements.

To check these predictions the following experiment was done.

Method

Participants

The participants were 90 students from Belarusan State Pedagogical University, Polytechnic Academy

and Belarusan State University of Informatics and Padioelectronics: 45 males and 45 females. The age of participants vary from 17 to 31. They took part in the experiment as volunteers.

Materials

A list of 60 sentences was prepared for the experiment. The sentences in the list were of 3 types. Twenty sentences were obviously false (e.g., "*The Earth is flat*", "*A triangle has four angles*"), twenty sentences were true (e.g., "*A triangle has three angles*"), and the last twenty were metaphors taken from poetic and scientific literature. Several random sequences of chosen sentences were prepared

Three types of instruction were also prepared. One instruction was neutral and told the subjects that their task is to determine whether each of the sentences in the list is true or false. The second instruction stated explicitly that to solve the task it is necessary to use formal logic. The third instruction contained the order to use mental imagery when evaluating sentences as true or false.

Procedure

The subjects were divided into three groups (15 males and 15 females). Each group received a booklet of 4 pages with one of the instructions on the first page. The last three pages contained the list of sentences. Near each sentence the words "YES" and "NO" were printed, and the subjects were to circle the answer they choose.

The participants were tested individually or in small groups. They were given unlimited time to complete the task. It took approximately 10 minutes to do it.

Results and discussion

For the statistical analysis the number of positive answers (the answer "YES") was taken. Positive answers for three different types of instruction and three different kinds of statements were counted.

The data of two subjects were excluded from the analysis because of possible unreliability too many positive answers to the obviously false statements.

Two-way ANOVA was performed with the obtained data where one factor was the instruction's type and the other factor was the kind of sentence. For the data analysis STATISTICA 5.5 for Windows was used.

The main effect of the variable *kind of sentence* (see Fig. 1) appeared to be statistically significant ($F_{2,225}=1140,25$; $p<0,0001$).

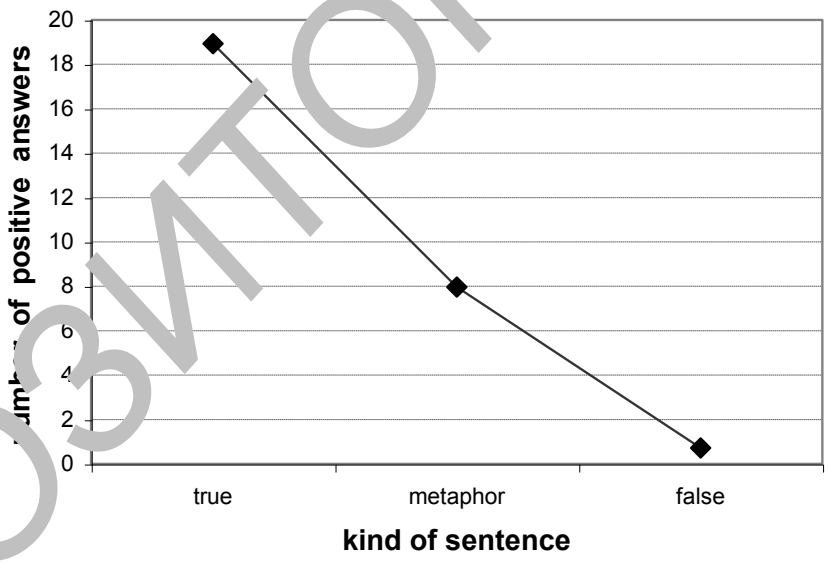

Fig. 1. Main effect of kind of sentence on the number of positive answers.

Tukey HSD Post Hoc test showed that there is also statistically significant difference between the perception of metaphors and true sentences as correct ones ($p<0,0001$) as well as between the perception of metaphors and false sentences ($p<0,0001$). It is evident from the data that unlike the other statements metaphors could be seen as true or false depending on the subject's attitude or experience. The qualitative analysis of the data showed that one and the same metaphor was considered as true by one participant but appeared to be false for another participant.

The interaction between the type of instruction (formal logic vs. mental imagery) and kind of sentences (true sentences or metaphors) appeared to be statistically significant ($F(1,112)=4,82$; $p<0,03$). The result of interaction could be found on the Fig.2.

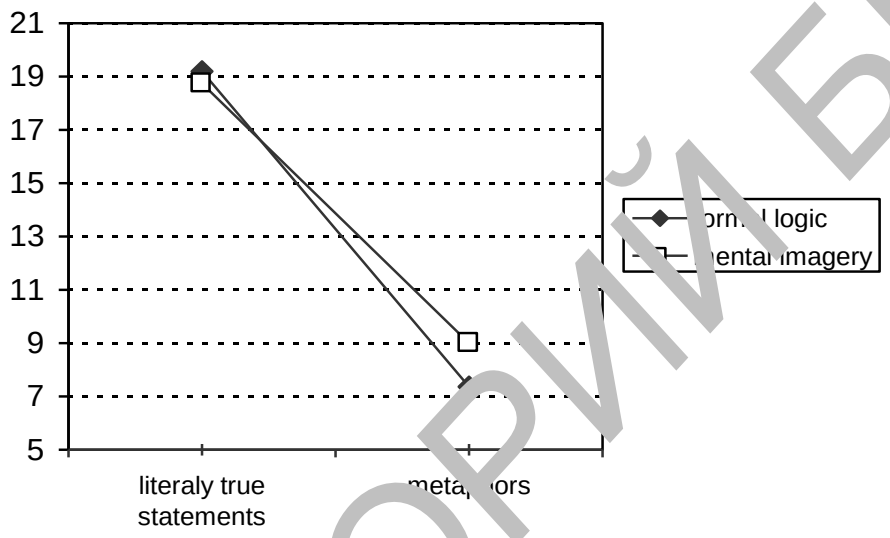

Fig.2. Interaction between the type of instruction and kind of statements: mean number of positive answers for metaphors and literally true statements in two different conditions (to use formal logic and to use mental imagery)

It could be noted that the changes in the instruction did not influence the number of literally true statements perceived as true (Duncan Post Hoc test, $p=0,51$), but significantly changed the number of metaphorical statements perceived as true (Duncan Post Hoc test, $p<0,02$). The requirement to use formal logic reduced the number of metaphors that could be counted as correct statements.

3. CONCLUSION

From the results of the experiment it is evident that in normal situation people do not judge metaphors as false statements. Explicit instruction to use formal logic or mental imagery changes the perception of metaphors. They are perceived as truths more often under the condition to use mental imagery then under the condition to use formal logic rules, i.e., we obtained the predicted results. This shows us that the suggested criterion could be considered as possible solution to the problem of differentiation between figurative and non-figurative speech.

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