Hermenophore tools, a new perspective on text analysis

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Abstract. This paper has as starting point the idea that we need a hermeneutic perspective on human-computer interaction and, in special, on analysing text discurse. Consequently, it is discussed and argued the need of considering hermenophore tools (that help generating a hermeneutic perspective) for supporting the analysis of texts for unveil their meaning. An example and discussion is provided for the case of metaphors identification.

Keywords: hermeneutics, artificial intelligence, natural language processing, polyphonic model

1. Introduction

A natural question might arise if we consider hermeneutics from a shallow position: What has in common computer science with hermeneutics, a philosophical position opposed to logical positivism, the latter being the basis for it and for artificial intelligence (AI), its peak? I will try to show that it is not only fully justified, but even necessary to consider a hermeneutic perspective on computer science, in general, and on natural language processing (NLP), in particular. Moreover, tools that help humans to have such a perspective are needed. I called them hermenophore tools (Trausan-Matu, 2000a, 2003), which means tools bearing ("phorous", from Greek) hermeneutics. Supporting arguments for a hermeneutic perspective were provided by other philosophers and researchers in artificial

intelligence and computer science (Constandache and Trausan-Matu, 2001; Mallery, Hurwitz, and Duffy, 1986; Stahl, 2006; Trausan-Matu, 2000a, 2000b, 2003; West, 1997; Winograd, 2007).

The necessity of a hermeneutic perspective and of hermenophore tools for text analysis has become very important in recent years due to the ever-increasing number of texts and other communication channels on the web that face users to information overload and disorientation: "Without some way of telling the significant from the insignificant and the relevant from the irrelevant, everything becomes equally interesting and equally boring and one finds oneself back in the indifference of the present age." (Dreyfus, 2001, p. 83).

Moreover, in these conditions one should ask: what and where are meaning and the truth? "The highly significant and the absolutely trivial are laid out together on the information highway" (Dreyfus, 2001, p. 79). How can we approach them starting from texts? These questions are now very important in the context of the reality that: "Web surfers embrace proliferating information as a contribution to a new form of life in which surprise and wonder are more important than meaning and usefulness." (Dreyfus, 2001, p. 12).

A hermeneutical constructivism approach was also emphasized by Terry Winograd in the discussions regarding the limitations of artificial intelligence (Winograd 1987, pp. 20-22). Winograd, one of the most important researchers in AI in the seventies, which has also been involved in the creation of Google (Brin, Page, Modwani, and Winograd, 1999), characterized AI as lacking empathy, "a phenomenon in which one person can experience states, thoughts and actions of another person, by psychological transposition of the self in an objective human behavior model, allowing the understanding of the way the other interprets the world" (Marcus, 1997).

Experiencing phenomena is fundamental for their understanding, involving a kind of emphaty, as was also emphasized by von Wright (1995, p. 29). The lack of empathy is the consequence of the fact that AI applies mechanically some rules, driving to a kind of beaureaucratic attitude. Winograd wrote that AI has these drawbacks because it does not have the experience of "living in the world", a fundamental factor in the phenomenological philosophy. Winograd (1987) concludes that AI will never master language understanding. In fact, the idea which stands at the

basis of Google is that texts (web pages) should be considered not only from the content they have, but their social importance, computed as their pagerank (Brin et al., 1999), is more important. This idea is, in my opinion, also a consequence of the hermeneutic position stated by Winograd.

Hermenophore tools should be able to emphasize in texts features that a hermeneutic approach would disclose. Moreover, they should enable texts annotation and afterwards, suggestive visualizations or sonifications.

The paper continues with a section presenting what is hermeneutics. Hermenophore tools are the subject of the third section. Section 4 presents an example of hermenophore tools for metaphor identification.

2. Hermeneutics

Hermeneutics was defined as the theory of interpretation, initially considering only texts. In the twentieth century, hermeneutics got an extended scope, being the concept used for naming one of the two main philosophical schools of thinking. Philosophical hermeneutics includes names such as Heidegger, Gadamer, Habermas, and Ricoeur. The opposed philosophical position is the analytic philosophy (formalism, neo-positivism, logical positivism, reductionism) represented by Descartes, Leibniz, and Russel.

Formalism and structuralism are at the basis of computer science, of AI and NLP. For example, in NLP is usually considered the reductionist assumption that the meaning of a sentence can be composed from the meanings of the component words (the decomposable semantics), without taking into account exterior influences. The same ideas, used in AI in general, produce several major problems, such as the frame axioms, the impossibility of handling "commonsense", tacit knowledge, and metaphor understanding. They could not be handled satisfactory, even with the newest approaches considering the so-called "embodied intelligence" or the simulation of accumulating experience through artificial neural networks

Hermeneutic philosophers, on the other hand, state that the experiences of the writers and readers, their "living in the world" experience, their believes, the context of writing and reading have major importance for text understanding and, in general for thinking and intelligence. Ricoeur considers hermeneutics as a complementary approach to structuralism for

language, meaning, and cultural symbolism analysis (Mallery et al., 1986).

> "Hermeneutics grounds the meaning of texts in the intentions and
> histories of their authors and/or in their relevance for readers.
> In contrast, analytic philosophy usually identifies meaning with
> the external referents of texts and structuralism finds meaning
> in the arrangement of their words. Hermeneutics regards texts as
> means for transmitting experience, beliefs and judgments from one
> subject or community to another. Hence the determination of
> specific meanings is a matter for practical judgement and common
> sense reasoning - not for a *priori* theory and scientific
> proof." (Mallery et al., 1986)

3. Hermenophore tools

I will start the considerations on the hermenophore tools with an excerpt of the previous quotation: "Hermeneutics regards texts as means for transmitting experience, beliefs and judgments from one subject or community to another" (Mallery et al., 1986). In this idea, hermenophore tools should identify concepts, ideas, connections, and, very important, especially those hidden, reflecting intentions and opinions of the writer in a text or in a corpus. Moreover, they should also try to reveal texts' features related to life experience, such as chronotopes (Trausan-Matu, 2014, 2015), rhythm (Trausan-Matu and Niculescu, 2016), narratives, and musicality, a human only specific attribute (Trausan-Matu, 2017). In addition, they should provide a basis for texts annotation with the unveiled facts and, subsequently their suggestive visualization or sonification. Therefore, in a very comprehensive classification, candidates for being hermenophore tools for text analysis, annotation and illustration could include:

1. Text analysis
   a. identification of concordances in context (Trausan-Matu, 2000b)
   b. concepts extraction
   c. events extraction
   d. text summarization
   e. annotation support
   f. discourse structure extraction (Jurafsky and Martin, 2009; Mann, 1988)

     g.   intertextuality detection

     h.   opinion mining

     i.   chronotopes identification

     j.   narratives identification

     k.   metaphors and idioms identification

     l.   illocutionary force identification (Reboul and Moeschler, 2001)

     m.   identification of conversational implicatures (Grice, 1975)

     n.   intentions identification

     o.   polyphonic structure identification (Trausan-Matu, 2010)

2. Hermeneutic markup (Piez, 2010)

3. Illustration

     a.   Visualization (Trausan-Matu and Dascalu, 2015)

     b.   Sonification (Trausan-Matu and Calinescu, 2015)

However, even if they can help a hermeneutic analysis, not all the above-mentioned tools could be characterized as hermenophore. Most of the text analysis tools are included in the category of well-known text mining tools. A hermenophor tool should be able to identify and reveal in texts unnoticed things, that, to be understood, we should consider intentions of the writer, social and cultural practices, hidden historical or of other persons' influences, etc. All these tasks are extremely difficult, if not even impossible to be handled by natural language processing technology.

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"It is easy to count the number of words of a document and
describe the amount of information based on bits (positivist
view), but it is hard to say who will need this document and what
are the important questions that can be answered by this document
(hermeneutic view). Information is essentially a hermeneutic
category" (Rashidi, 2012).
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Deep neural networks and the statistical machine learning, in general, the most advanced approaches today, even if they provide very useful results, they miss individual facts, they uniformise, as Constantin Noica mentioned when he wrote that the syllogism "All men die, Socrates is a man, therefore Socrate dies" is true, but the fact that it refers to Socrates, a name which is

full of history and meanings, changes how we can understand it (Noica, 1988). He writes that the logic, as it is usually now considered, is a "logic of Ares", which is like a mechanism, like a game, in which an individual is only a statistical fact. Instead of this kind of logic, which has as a basic principle to clearly delimitate parts into a whole, Noica affirm the need for a logic of Hermes, a holistic logic, in which the whole is present into its parts, as opposite to the logic of Ares (Noica, 1988).

Noica's ideas that the whole should be present in the parts implies that you cannot compose the meaning of a text starting from the meaning of its parts, as in the principle of decompositional semantics, which stays at the foundation of NLP, because you cannot understand the parts without understanding the whole. This idea is, in fact, a manifestation of the hermeneutic circle or "the notion that understanding or definition of something employs attributes which already presuppose an understanding or a definition of that thing" (Mallery et al., 1986).

In fact, several difficult artificial intelligence problems are related to each other in a sort of a hermeneutic circle: understanding needs intelligence, which requires involvement. Involvement requires ethical knowledge, conscience, emphaty, and understanding. All these capacities need life experience.

The approach proposed and exemplified below, in the case of idioms and metaphors, is an example of a hermenophore tool that tries to make a bridge between the hermeneutic and structuralist positions. It starts from theories in humanistic domains (about metaphors, in our case), formalize them as ontologies and develop NLP programs for text analysis.

4. Metaphors identification

The identification of metaphors and idioms in texts is one of the most difficult problems of NLP. Even state of the art translation tools fail on the completion of this task. For example, "a dat ortu popii" (a Romanian idiom equivalent with "he kicked the bucket", which may be translated word by word as "he gave the coin to the priest") was translated by Google Translate, at different periods of time in: "the old priest gave ortu", "bucket gave ortu", "He gave ortu bucket", and the modified "a dat ortul popii" ("ortu"and "ortul" are two equally accepted forms) in "He gave croak"!. To understand what means "a dat ortu popii", one should know that in

Romania, during the eigthteen century, "ort" was a word used for a coin or a tax, and that it was a pagan popular belief that when somebody dies, the relatives should give a coin to the priest in order that he will put it in the hand of the deceased for paying the "tax" for passing the border to the world of deads. Moreover, "ort" was adapted in Romanian from the German "ortstaler" ("thaler"), through Polish (http://adevarul.ro/locale/ploiesti/de-provine-expresia-a-ortul-popii-legatura-obicei-pagan-practicat-inmormantari-1_560e7f82f5eaafab2c3db007/index.html, accessed at 6 April 2017).

It is obvious that the understanding of the deep meaning of "a dat ortu popii" needs knowledge of historical facts and of popular beliefs and practices. State of the art technology (in this case Google Translate) is based on statistical methods that do not capture meaning, they only identify and take advantage of regularities, or patterns identified in large corpora. Also, the deep neural networks, the technology that is now considered as giving the best results in NLP, is based on learning regularities from large collection of texts.

The above discussed example might be extreme, but it is a very good illustration of the fact that words and groups of words are filled with echoes of their previous usage as Voloshinov/Bakhtin wrote:

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"the speech act or, more accurately, its product - the utterance,
cannot under any circumstances be considered an individual
phenomenon in the precise meaning of the word and cannot be
explained in terms of the individual psychological or
psychophysiological conditions of the speaker. The utterance is a
social phenomenon […] In point of fact, word is a two-sided act.
It is determined equally by whose word it is and for whom it is
meant. As word, it is precisely the product of the reciprocal
relationship between speaker and listener, addresser and
addressee," (Voloshinov, 1973, p.83-86)
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"The word in language is half someone else's. It becomes 'one's
own' only when the speaker populates it with his own intentions,
his own accent, when he appropriates the word, adapting it to his
own semantic and expressive intention. Prior to this moment of
appropriation, the word does not exist in a neutral and
impersonal language … but rather it exists in other people's
mouths, in other people's contexts, serving other people's
intentions; it is from there that one must take the word, and
make it one's own." (Bakhtin, 1981, p. 294)
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The large number of metaphors used in daily language is reflecting a fundamental feature of human beings. Lucian Blaga wrote that humans are metaphorical beings (Blaga, 1985). Lakoff and Johnson also considered them as fundamental, saying that metaphors "... form coherent systems in terms of which we conceptualize our experience" (Lakoff and Johnson, 1980).
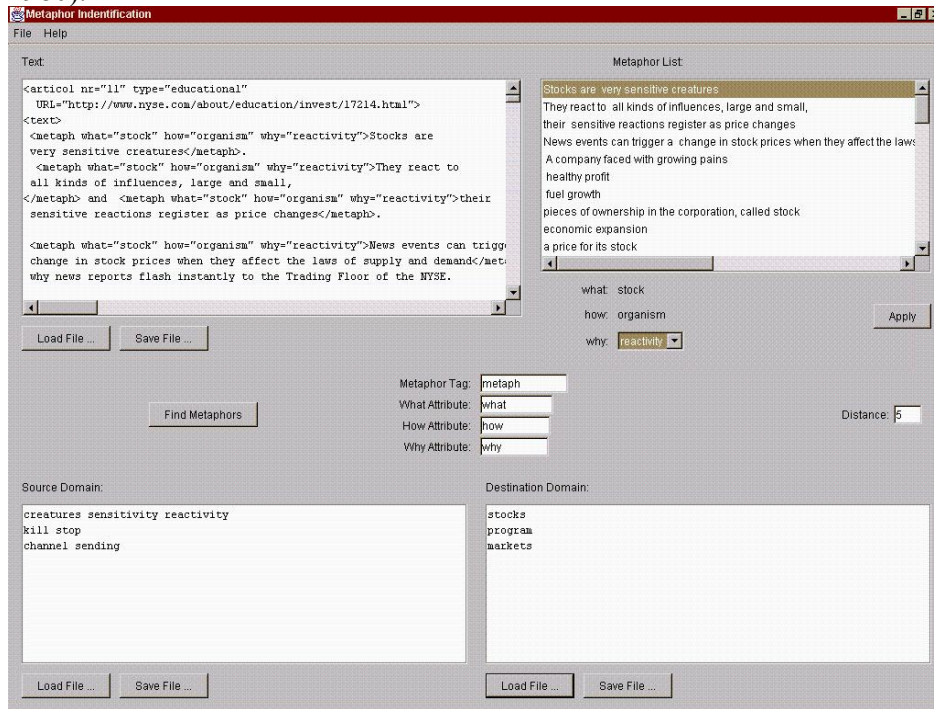

Figure 4. Example of the interface of the program for identification of a candidate metaphor (Trausan-Matu, Maraschi and Cerri, 2002)

Conceptualization of our experience is, on the other hand, also a goal in AI, the most well known way of doing this being ontologies: "An ontology is a specification of a conceptualization....That is, an ontology is a description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents" (Gruber, 1992) However, ontologies, as is also mentioned in the above quote, are a kind of formalization, they are, in fact, declarative knowledge bases, taxonomically organized. One of their main problems is the difficulty of

their development and alignment (join). Other essential problem is that fundamental categories like time and space proved extremely difficult to tackle. This latter problem is, however, fundamental in metaphors. They are used by people for describing experience of living events. An example is the understanding of the metaphor "Time flies like an arrow", a chronotope (Trausan-Matu, 2014, 2015) in which one needs to have the experience of time passing with a high speed, like the speed of an arrow. Another example is "Stocks are very sentitive creatures", which describe the experience with stocks, emphasizing features that are very difficult, if not impossible to describe in a taxonomy, in an ontology (Trausan-Matu, 2000b) or, as Noica said, using a logic of Ares, which only uses decomposition, subcategorization. Lakoff and Johnson also mention this idea: "subcategorization and metaphors are two endpoints of a continuum", metaphors "... form coherent systems in terms of which we conceptualize our experience" (Lakoff and Johnson, 1980). A clear consequence is that metaphors offer other expressive means than traditional ontology-based systems that use subcategorization. Metaphors imply an emphatic process: "The essence of metaphor is understanding and experiencing one kind of thing in terms of another" (Lakoff and Johnson, 1980).

A system for metaphor identification was developed based on the above ideas (Trausan-Matu, 2000b). An ontology of the concepts used as source of metaphors was developed starting from the ideas of Lakoff and Johnson. They include: resources, instruments, physical objects, humans, actions and processes (Lakoff and Johnson, 1980). These concepts may be further grouped according to Lakoff and Johnson as Orientational, Structural and Ontological. They were taxonomically organized, as in the following fragment:

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Physical_object
     Organism
          Human
     Instrument
     Building
Pillar
     . . .
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A computer program identifies pairs in which there are words untypical to the considered domain, that means a word belonging to the metaphor

ontology and another from the ontology of the domain. Such an "irregularity" signals an intension of the speaker or writer. An example is "stocks are very sensitive creatures", in which "creatures" is not expected in the financial context.

The program displays the "irregular" pairs that are potential metaphors and, if the user accepts it, he/she should also indicate a reason for using the metaphor, which is an indication of the intentionality of the speaker/writer (see Figure 1). The system was subsequently generating a personalized collection of web pages, which included the metaphors and the associated reasons for using them (Trausan-Matu, Marasci and Cerri, 2002 - see Figure 2).
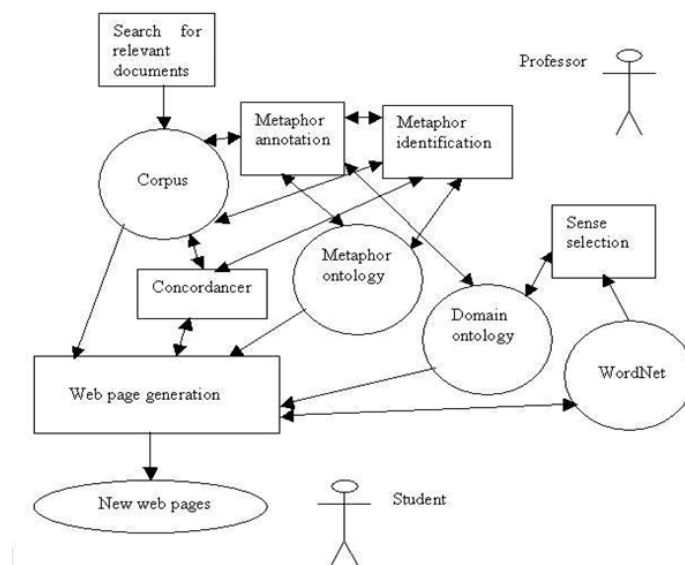
Figure 5. A system for using metaphors for generation of personalized web pages for learning
(Trausan-Matu, 2000b)

Nr	Ref	Time	User	Text
17		10.26.25	tim	You discussed about a topic separation
18	15	10.26.37	adrian	First of all, the reply method is cumbersome
19	17	10.26.50	john	yes.. because we did not like the way the topics were presented in concert chat
20	18	10.26.56	john	yes !!
21	20	10.27.04	john	i hate double-clicking!
22	20	10.27.18	tim	and how can we find topics ?
23	18	10.27.26	adrian	What bothers me is the linear presentation of the discussin
24	23	10.27.43	john	Yep
25	18	10.27.46	adrian	and double-clicking too
26		10.27.54	tim	You mean u want something like a chat forum ? :D
27	24	10.27.58	john	and the reply-to facility is supposed to help you
28	18	10.28.15	adrian	i'd like a tree presentation more
29	18	10.28.38	adrian	or maybe multiple chat columns, for each chat sub-thread
30	27	10.28.58	john	but it is really difficult to use in real time, because there are so many topics discussed which intertwine each other
31	28	10.29.18	john	i subscribe to a tree-like presentation form
32	P 30	10.29.20	adrian	yes, that's why a clear separation of topics is needed
33	31	10.29.47	adrian	this is easy to implement, no problem here :)
34	30	10.29.49	tim	You need also a clever visual representation
35	30	10.30.05	tim	you'll need also a clever visual interface
36		10.30.22	tim	Who decides the topics ?
37	33	10.30.33	john	i suppose you are refering to the visual representation, right ?
38	37	10.30.45	john	What i would like is a clever way to separate the topics
39	38	10.30.59	john	not just doing ot myself, manually
40	37	10.31.00	adrian	Yeah
41	39	10.31.44	adrian	When you start a new thread (a new message, non-related to other message), the app can assume a new topic
42	39	10.31.46	john	i would like the application to be able to detect w topic change all by itself
43	42	10.32.01	tim	That right

Figure 6. The polyphonic structure of a conversation (Trausan-Matu, Stahl, and Sarmiento, 2007)

5. Conclusions

Computers may be seen as extensions of human mind. In fact, hypertexts and the WWW started from the idea of enhancing human intelect (Engelbart, 1995; Nelson, 1995). However, even if now the Web is a materialization of the ideas of Engelbard, we still need tools for understanding, not only for getting information (Dreyfus, 2001). We called these tools hermenophoric, we gave example of a system for the case of metaphors, one of the trickiest phenomenon in computational linguistics. linguistics. The tools for polyphonic analysis (Trausan-Matu, 2010) are another example of hermenophoric tools. They evidentiate hidden

polyphonic structures in texts (see Figure 3). However, these are only a start, further work in this direction should be done.

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