Emotion Valence Shifts in Humorous Metaphor Misunderstandings Generation

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Abstract. In our previous work we proposed an idea of a system able to generate humorous metaphor misunderstanding during conversations with users, employing the mechanism of salience imbalance. However, according to existing research in the field of cognitive science, lexical salience imbalance might not be enough to constitute humorous metaphors. Another important factor in this process can be emotive salience imbalance, i.e. emotional shifts, which occur within metaphorical expressions. In this paper we propose how to employ this mechanism in our system, by implementing an emotion from text detector.

1 INTRODUCTION

Despite the fact that Turing Test [1] is often criticized for its inappropriateness, its impact on today science is undeniable. Alan Turing did not invent a golden mean to measure computer systems' human-likeness in terms of linguistic proficiency. He did, however, trigger scientists all over the world to investigate, what can and what should be done to create machines able to talk naturally.

This naturalness can be seen as the key not only to pass the Turing Test, but in general to create computer systems humans would like to interact with. Needless to say, pure grammatical correctness is by all means not enough to constitute natural interaction. Thus, we need to take into consideration also other aspects, which greatly influence this naturalness. In our research so far we focused on two such factors: emotions and humor. A summary of some of our work can be found at [2] i [3]. Currently we are working on a project in which we also plan to incorporate metaphor processing in human-computer interaction. To our best knowledge, no such system has been developed so far.

In this paper we first briefly summarize an idea of a humorous metaphor misunderstanding system HumMeR, which we proposed in our earlier work [4]. Next we mention a work of Shen and Engelmayer [5], which shows that humorous metaphors often include a sort of "emotional shift", which influences their funniness. Then we describe ML-Ask emotiveness analysis system, developed in our previous research [3, 6], which detects users emotions from text, and propose how it can be implemented into the HumMer system.

The research described in this paper is being conducted in Japanese, although the authors believe that most of the components that will be developed should be easily transferable to other languages. The research is text based, i.e. we focus on textual (and not visual or audial) aspects of conversation.

2 HUMMER SYSTEM

Proposed in our previous work [4], HumMer system is currently under development. It is designed to generate humorous metaphor misunderstandings during conversations with users. This algorithm was based on a conception of salience imbalance, commonly used to explain mechanisms working in metaphor understanding. Proposed by Ortony [7], it states that in metaphorical expressions certain highly salient properties of the metaphor source are matched with much less salient properties of metaphor target. In other words, certain properties of the target, which are normally perceived as not very salient, become more salient by comparing the common ground between the target and the source [7].

The salience imbalance theory was also showed by Shen and Engelmayer [5] to be applicable to humorous metaphors. Basing on results of experiments on humans, they showed that the degree of salience imbalance (the difference between salience of target properties and salience of source properties) should be higher in humorous than in non-humorous metaphors. In other words, salience imbalance is higher in these metaphors which include humor and are perceived as funny by humans.

In HumMeR system development we based on these findings. The input of the system is user's utterance, which is first analyzed to check if it includes any known metaphor, and, if not, if it fulfils the conditions allowing to assume that it can be a metaphorical expression. Then the system checks the salience imbalance between the concepts constituting the metaphor. This is done by using database of salience of concepts in existing metaphors as well as by querying the Internet to check co-occurrence of concepts and their descriptions (which can be seen as equivalent of salience). Next, the system recalculates the salience imbalance of the two concepts, i.e. it chooses another pair of concept properties, in which the difference in salience (salience imbalance) is higher than in the inputted expression. To do that, it uses a database of salience imbalance thresholds in humorous and non-humorous metaphors. Finally, the system uses the selected pair of properties to generate humorous metaphor misunderstanding including response to user utterance, using a database of templates commonly seen in such expressions.

The HumMeR system's algorithm outline is presented in Figure 3. The figure shows the flow of the novel metaphor

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processing procedure. If the metaphor in user's utterance is found to be an existing metaphor (i.e. it is found in our metaphor database), the system uses existing resources (like the salience database) to generate humorous misunderstandings.

Figure 3 also shows how emotiveness analysis can be implemented to facilitate HumMeR system's performance.

3 EMOTIONAL SHIFT IN HUMOROUS METAPHORS

In Section 2 we briefly summarized the salience imbalance theory and its applicability to humorous metaphors processing, which was experimentally showed by Shen and Engelmayer [5]. In the same work, however, the authors show also that extended degree of salience imbalance between the concept properties is not the only difference that occurs between humorous and non-humorous metaphors. Another important feature of the former is that they often include what Shen and Engelmayer call "a shift in emotional load of the two concepts" that constitute the metaphorical expression [5]. By this the authors understand that humoristic effect in metaphors (and in humorous contents in general) can be enhanced or even co-produced by a discrepancy between emotional valence (positive or negative) of two concepts that constitute the metaphor. For example, in the humorous metaphor:

"A friend is like an anchor – sometimes you want to throw them out of the boat." [5]

we can see that it joins two emotionally opposite properties, that are common for friends and anchors. An anchor-like friend, being a reliable and steady ally, is emotionally positive, while an idea of throwing a friend out of the boat is commonly associated as negative.

Shen and Engelmayer conducted an experiment, which results back up this claim. They investigated the degree of congruency between the emotional connotations of the two parts of humorous and non-humorous metaphors. The participants evaluated the sentence parts for their valence: positive, negative or neutral. The results showed that in most humorous metaphors a shift between positive and negative emotions occurred, while non-humorous metaphors rather tend to join emotionally similar concepts.

Thus, it can be stated that in order to generate humorous metaphors (or humorous metaphorical misunderstandings, as in our project), we should take into consideration also emotive valence of concepts and their properties. In order to do that, we need a tool that will allow us to assess sentences (or their parts) emotiveness. In HumMeR system, this role will be performed by Ptaszynski et al.'s ML-Ask Emotiveness Analysis System [3, 6].

4 ML-ASK EMOTIVENESS ANALYSIS SYSTEM

ML-Ask Emotiveness Analysis System was developed by Ptaszynski et al. [3, 6]. It which detects emotions from the textual layer of speech. Its algorithm is presented on Figure 1.

The system first analyses the inputted sentence to check its emotiveness. This is done by checking if it contains so-called "emotive elements". For example, the sentence:

"Kono hon saa, sugee kowakatta yo. Maji kowasugi!"

(That book, ya know, 'twas a total killer. It was just too scary.),

is recognized as emotive, as it contains emotive elements: *saa* (emphasis), *sugee* (totally), *yo* (emphasis), *maji* (really), *-sugi* (too much) and an exclamation mark. If the sentence was recognized as emotive, the system next detects emotion types it contains. This is done by checking if the sentence contains any "emotive expressions", i.e. expressions that convey particular emotions. For example, in the sentence above, the system found the emotive expression *kowai* (scary), which belongs to the group called *kyoufu* (fear).

If no such expression is recognized, the system uses Shi et al.'s web-mining technique [8] to extract emotive associations from the Internet. It first extract a phrase to be queried in the Internet, and transforms it to widen the search spec. If the phrase is, for instance, "it is hot today", the system would transform it into phrases like "it is hot today and...", "it is hot today, so..." etc. This procedure is called phrase modification. Next, the phrase and all its modified versions are queried in Yahoo to check its emotive associations by counting which emotive expressions follow it most often. This procedure is showed on Figure 2.

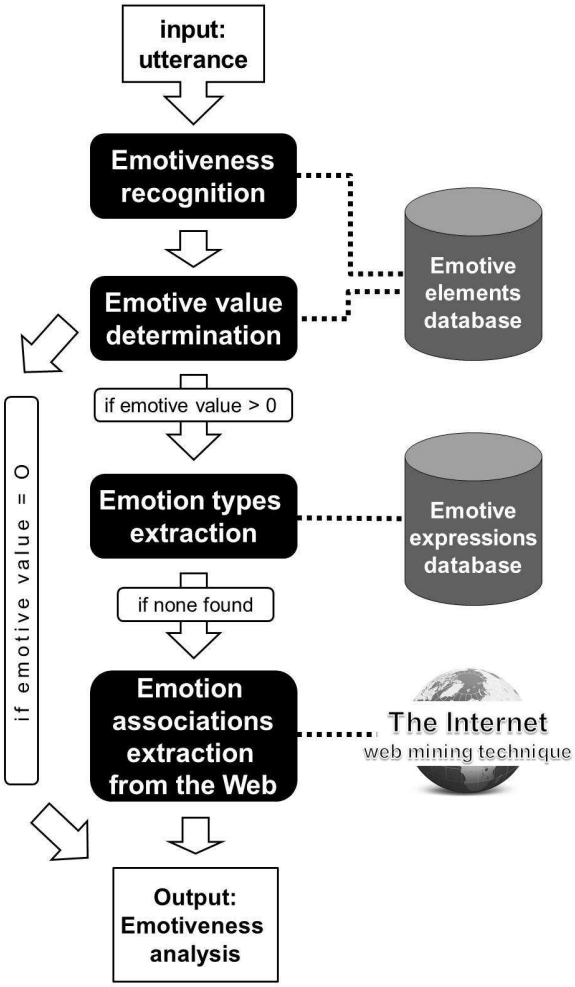

Figure 1: ML-Ask system algorithm outline

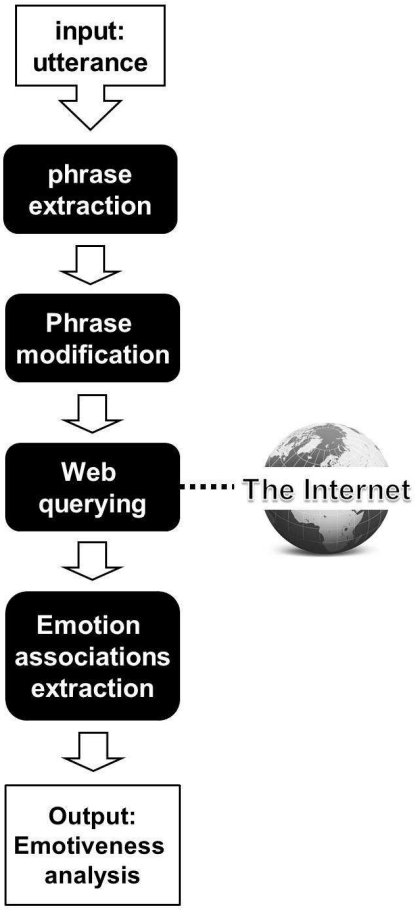

Figure 2: ML-Ask system – web mining procedure algorithm outline

As the result, we obtain an emotiveness analysis summary, such as below:

Sentence: *Kono hon saa, sugee kowakatta yo. Maji kowasugi!"* (That book, ya know, 'twas a total killer. It was just too scary.)

Emotive elements: *saa* (emphasis), *sugee* (totally), *yo* (emphasis), *maji* (really), *-sugi* (too much), exclamation mark
Emotive value: 6 (above zero -> specify types of emotions)
Emotive expressions: *kowai* (frightening)
Emotions found: fear
Valence: negative

Sentence: *Kyou wa atatakai desu ne.* (It's warm today, isn't it?)

Emotive elements: *-ne* (-isn't it)
Emotive value: 1 (above zero -> specify types of emotions)
Emotive expressions: none (-> use web mining procedure)
Emotions found on the Web: joy
Valence: positive

Performance of the ML-Ask system was tested in numerous evaluation experiments, which showed that it can successfully detect emotions from users utterances [3]. We also used it in our previous research on humor-equipped conversational systems [2], in which it also proved useful and usable. Thus, the ML-Ask system should be a proper tool to incorporate emotional shift in the HumMeR system's metaphor misunderstanding generation.

5 EMOTIONAL SHIFT IN HUMOROUS METAPHOR MISUNDERSTANDING GENERATOR

The role of ML-Ask system in the process of humorous metaphor misunderstanding generation will be to detect emotions present and associated with the candidates generated to create the misunderstandings. Next the system will assess each phrase's valence, which will allow to choose the pair in which emotional shift occurs. The outline of the system is shown on Figure 3.

The system's algorithm was explained in section 2. If, for example, user's utterance would be "a good friend is like an anchor", the system would presumably detect it as an existing metaphor and then it would extract salience of its components (descriptions of anchor and friend) from the database. Then, the system will query the Internet and offline corpora to extract common descriptions of these two concepts (anchor and friend) for which salience imbalance degree would be higher than in the inputted metaphor. These descriptions along with the concepts they belong to will then be analyzed by the ML-Ask system to check their emotional valence. In the above example, the system would check the valence of "good friend" and, if such description is generated, "throwing someone out of the boat". This will be done by querying the Internet for emotive associations, as described in section 4. Next, the system will check the valence of extracted emotive associations in order to choose the description with the opposite valence than the concept ("a good friend" is commonly associated with positive valence, while "throwing someone out of the boat" should be seen as rather negative). In the next step, the system would use metaphor misunderstanding templates database in order to generate a humorous response to user's utterance. In the above example, the response could be "Like an anchor? You mean, sometimes you want to throw him out of the boat?".

In the final stage of the HumMeR system development, we are planning to implement it into a chatterbot (see [4] for details). This will allow the system to place metaphor misunderstanding generation in daily conversations with users.

6 CONCLUSION AND FUTURE WORK

The HumMeR system project is currently under development. That said, we realize that achieving our goal may not be sufficient to create a system able to generate humorous metaphor misunderstanding in perfectly natural and human-like manner. There are numerous factors that will have to be taken into consideration in the future, such as proper timing of misunderstandings (i.e. deciding whether a metaphor should be answered by misunderstanding or not) or individual approach to every user. Some ideas on these aspects are given in [3] and [9].

Another important issue we will need to deal with in our research project is the evaluation of our system. To do that, we will use methodology proposed and tested in our earlier works (see [10] for summary).

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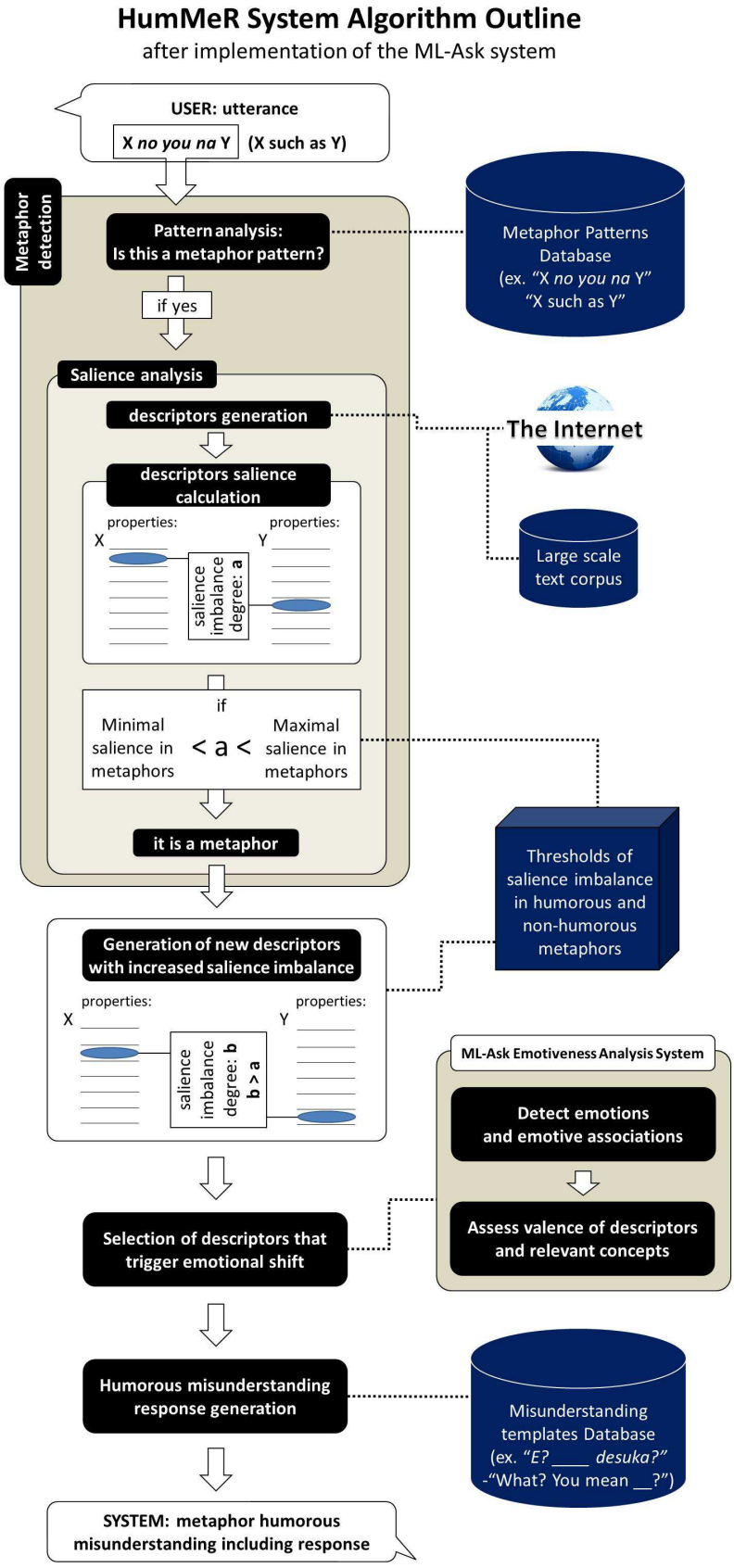

Figure 3: HumMeR humorous metaphor misunderstanding generator algorithm outline after implementation of the ML-Ask emotiveness analysis system