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Lexical Analysis of Emotiveness in Utterances For Automatic Joke Generation

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Abstract In this paper we describe a method for calculating plausible conditions within user's natural language input in order to discover a possibility of generating puns automatically. The method is based on analysis of emotive features at the lexical level of user's utterances. The system based on this method acquired 88% of accuracy in determining emotiveness comparing to providers of test material and 76% of accuracy comparing to human evaluators of the material.

Keyword emotiveness, emotive analysis, pun.

1. Introduction

Emotions have been fascinating scientists for centuries. There are remarkable works trying to describe emotions, such as the ones by Darwin [1], or many others [2, 3, 4]. However, for a long time emotions were treated rather as an idol to worship, worthy attention of thinkers, but not material or tangible enough to be accurately described in detail, or processed by machines. Recent years brought research on emotions into the focus of Computer Sciences, and Artificial Intelligence, and its sub-fields like Natural Language Processing [5, 6]. Subjectivity of feelings though, driving researchers into a corner of ambiguity, often becomes a blockade for research in this field. However, we assume, analysis of emotions, narrowed to specified borders, should give results comparable to those of humans.

2. Narrowed approach to emotive analysis

The approach to the matter was based on the assumption that it might be difficult to concentrate on analyzing emotions without a primary goal stating what the analysis will be used for. There are different dimensions on which emotions can be analyzed, such as vocal, linguistic, visual, social, neurobiological, etc. Unfortunately the research in each of these fields is still in the primal phase and combining them all, which would be desirable, is still impossible. We decided to narrow the approach towards emotions to text analysis.

The following assumptions have been made to narrow the emotive analysis. Firstly, emotiveness will be analyzed on the basis of textual utterances. This releases us from analyzing relevant, but ambiguous and difficult to process mechanically – features such as vocal, visual and other dimensions of expressing emotions, giving a green light for concentrating on emotiveness in the textual surface of an utterance. Secondly, the emotiveness will be analyzed on dialogue-like utterances appearing usually in speech. This limits appearance of descriptive utterances, literature and poetry. Finally, as the recognition of emotions during conversation gives humans information about what to say and when [7, 8], we set one specific goal for our system, namely to determine whether the present context in a dialogue allows for producing a joke. This relates to the future goal, which is to propose an algorithm generating jokes automatically for a conversation system, as the one of presented by Higuchi, et. al [9]. In this paper the first step of this algorithm will be described, namely an algorithm for recognizing emotiveness and proposing candidates for puns from among the words in the analyzed sentence. Applying emotive analysis for joke generating, although not covering every nuance of the subject of emotiveness, is logically reasoned by pragmatics. To perform a joke, a situation off-record is desirable [7, 8, 10, 11, 25], and there is no better way to determine whether a context of an utterance belongs to an off-record situation, than determining its emotiveness [21, 22, 23, 24].

3. Emotive analysis - linguistic approach

The emotive function of language, which refers to expressing emotions [26, 27], is realized verbally through exclamations, hypocoristics (endearments), vulgar language, mimetic expressions (*gitaigo* [1]), and so on [28]. A key role in expressing emotions is also played by the lexicon of words describing states of emotions [19]. On the borderline between verbality and nonverbality we can talk about elements of language such as intonation, voice modulation or tone of voice. In the written text these are usually represented symbolically by exclamation marks, or multiple usage of question marks. Nonverbal elements realizing emotive language are body language, with all its components, like gestures, face expressions, eye contact, or pose [1, 10]. However in conversation systems like chat-bots the communication channel is limited to transmission of signals encoded in lines of letters, punctuation marks and symbols, etc. Therefore for emotive analysis in conversation systems we need to agree to a compromise of restrictions in the communication channel and base the emotive analysis on its linguistic part.

The emotive analysis in the proposed program is based on Ptaszynski's idea of finding emotive elements in the text [12, 13, 20]. In an utterance made by the user emotive elements will be examined using the top-down determined databases

[1] in this paper we use italic for Japanese expressions.

of emotive elements in speech. We gathered these databases of each emotive elements appearing in conversation in Japanese, basing on different researches. The databases are divided into interjections [19, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38], emotive mimetics (*gitaigo*) [1, 30], endearments [28], vulgar vocabulary [17, 18], and symbols representing emotiveness [28]. As for this database, only symbols ending sentence like exclamation marks have been taken into account during this step of the research, however it is considerable to add an algorithm recognizing emotiveness of emoticons, as symbols already widespread in the Internet, in the future research.

A few simple examples of sentences without emotive value (A, B), and those colored with emotions (A', B') are given below. The parts of each sentence that constitute its emotiveness were shaded gray.

A: 今日はいい天気です。
Kyō wa ii tenki desu.
It is a good weather today.

A': ああ、今日はええ天気だな！
Aa, kyō wa ee tenki dana !
Wow, now today is a fine weather!

B: 彼女は、大きいかさをもってきて、信之介を強く殴った。
Kanojo wa, ookii kasa wo mottekite, Shinnosuke wo tsuyoku nagutta.
She brought a large umbrella and strongly hit Shinnnosuke.

B': あいつぁ でっけーかさをもってきやがって、シンちゃんをひでー ボコボコに しちまった！
Aitsaa dekkē kasa wo mottekiyagatte, Shin-chan wo hidē bokoboko ni shichimatta!
That slut lugged a huge umbrella with her and beat the crap out of Shin-chan.

After analyzing every utterance this way, the program returns a verdict whether the utterance is emotive and what emotive elements were found in the utterance. On this basis the program proposes its emotive value of the sentence. The value is placed on a scale of 0 to 5 (with 0 for no emotive element in the utterance and 1 point for every kind of it). The second step determines whether the emotiveness of the utterance is positive or negative and what feeling exactly is communicated. Emotiveness derived this way becomes then a designatum determining whether there are felicitous conditions for telling a joke, which leads us to the second part of the program, namely generating a list of candidates for jokes.

4. A candidate for a pun

As stated above, one of the future goals of this research is to propose an algorithm generating jokes automatically for a conversation system. This research is a straight continuation of Dybala's research on recognizing puns in Japanese systematically [14], and his ideas of conveying sense of humor to machines in the research on PUNDA Project [15, 16].

The algorithm created in this research extracts words from sentences determined as emotive and proposes a list of words-candidates for pun jokes. The list is created on a set of linguistic rules described by Dybala [14]. The list is then compared with Internet to extract only the most accurate candidates.

Although this research is restricted to simple puns, we plan to enrich the joke-generating algorithm with other kinds of jokes and senses of humor based on lexical level [21, 24].

5. Emotive Analysis Evaluation Experiment.

To verify how accurate the emotive analysis of our program is, we performed an experiment.

5.1. Survey

In the experiment we asked ten people (8 males and 2 females in the age of 19-35) to write three non-emotive sentences and three with similar meaning, but colored with emotions. This survey gave us a bank of sixty sentences - thirty non-emotive and thirty emotive.

5.2. Experiment

The sentences gathered in the survey mentioned above were next analyzed by the program. For each sentence the program was supposed to determine whether the sentence was emotive and, if so, what were the emotive elements found and what is the proposed emotive value of the utterance. Next, the program was to determine if the emotiveness is of positive or negative character and what feeling exactly is conducted in the utterance by what element. We used Nakamura's [19] classification of emotions as the most appropriate known today classification of emotions in Japanese.

At the very end of the procedure, for each utterance determined as allowing or not prohibiting telling a joke, a list of pun candidates was created. These lists will be used in future research on sense of humor in Japanese.

5.3. Evaluation

As it was mentioned above, the sense of emotiveness might differ for different people. Therefore we also performed an evaluation of the gathered sentences. In the evaluation we asked seven people (5 males and 2 females in the age of 20-30) to determine whether the sixty sentences are emotive or not and how much (we decided to use the same scale as the program, that is 0-5). The results given by the program and the results of evaluation were compared to the authors of the sentences classification of emotiveness and to each other.

5.4. Results

5.4.1. Emotiveness - program and evaluators vs. authors

According to the classification of the authors of the sentences, the program was able to determine emotiveness in an accuracy rate of 88%.

On the other hand, evaluation showed differences between

authors of the sentences and evaluators. The unity of determining emotiveness by authors and evaluators was established at the level from 55% to 83%.

1	Program	88%
2	evaluator01	83%
3	evaluator02	67%
4	evaluator05	67%
5	evaluator08	67%
6	evaluator04	60%
7	evaluator03	58%
8	evaluator07	55%

Table 1 Results of determining emotiveness by program and evaluators - comparing to the classification of authors of the sentences.

5.4.2. Emotiveness. Program vs. evaluators and authors

For sentences with a perfect unanimity between evaluators, but without taking into account authors' classification, (25 of 60 sentences) the system reached the accuracy of 76% (19 of 25).

However, for sentences with a perfect match, where authors and all evaluators were unanimous about the emotiveness (18 of 60 sentences), the system acquired 100% of accurancy.

5.4.3. Emotive value. Program vs. evaluators

The approximate of unanimity among the evaluators themselves about emotive value of the sentences was set at a level of 39% for the perfect match and 69% for the almost perfect match (one evaluator's results different). This showed that determining emotiveness vary much among people.

Comparing to the results above, system's unanimity with all of the evaluators was lower, but comparable, and reached 22% for perfect match and 46% for almost perfect match.

5.4.4. Identification of emotions

The system could not identify exactly any of emotions due to lacks in appropriate databases. However, as long as the research will continue, this problem is thought to be solvable.

5.5. Description of errors

There were several errors found during the experiments. Although the evaluation given by the program about emotiveness was higher than we expected, there were a few mis-evaluations. A few times program described a sentence as emotive although neither author nor any of evaluators determined it this way. However, such bugs were caused by lacks in the databases, which could be easily adjusted.

6. Conclusions

The experiment proved that emotiveness is not incomputable. Moreover, computer program designed in a specified any can determine emotiveness of a sentence with higher accuracy than other people, in specified borders. This is enough to determine whether the conditions in the dialogue allow producing a joke.

Although there were still problems not solvable for the machine, it is predictable that, along with continuing of this research, the day of solving the mystery of emotions will get closer.

7. Future work

We set ourselves a number of works to be done for the future research.

We will continue working on this project to eliminate the lacks in the databases mentioned above. The code of the program will be upgraded to eliminate appearance of bugs.

The lists of candidates for puns will be used in our future research about sense of humor and jokes in Japanese.

Since we proved that it is possible to determine whether a sentence introduces a situation off-record into the dialogue, we can now go a step forward and challenge with specified identification of feelings conveyed.

Implementing the algorithm to a conversation system will help to gather a large database of sentences. This will be helpful in finding emotiveness of specified words by their appearance in either emotive or non-emotive sentences.

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