

Textual Emotion Detection Using Emotion Detector Algorithm

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ABSTRACT: Emotion Detection is one of the most emerging issues in human machine interaction. Detecting emotional state of a person from textual data is an active research field along with recognizing emotions from facial and audio information. Several methods were given to recognize emotion from text in previous years. This paper proposed a new architecture (a keyword based approach) to recognize emotions from text. In case of recognizing emotion from a piece of text document or a blog, any human can do this better than a machine only problem is he/she takes time. Proposed emotion detector system takes a text document and the emotion word ontology as inputs and produces one of the six emotion classes (i.e. love, sadness, joy, fear and surprise, anger) as the output. Every input text contains some short stories which are firstly read and assigned an emotion class manually and then that emotion class is compared to the output of the proposed system to check the accuracy of the Proposed Emotion Detector System. It is found that the Proposed Emotion Detector System produces output with the accuracy of more than 75%.

KEYWORDS: Human-Computer Interaction; Textual Emotion Recognition; Emotion Word Ontology

I. INTRODUCTION

Human emotion recognition by analyzing written documents appear challenging but many times essential due to the fact that most of the times textual expressions are not recognition from text is becoming increasingly important from an applicative point of view. only direct using emotion words but also result from the interpretation of the meaning of concepts and interaction of concepts which are described in the text document. Emotion detection from text plays a key role in the human-computer interaction [1]. Human emotions may be expressed in many ways like person's speech, face expression and written text known as speech, facial and text based emotion respectively [14]. In human computer interaction, human emotion

Methods being used for text based emotion detection are classified into keyword spotting technique, lexical affinity method, learning based method and hybrid approach however each method has its own limitations [19]. A proposed architecture which contains the emotion ontology and emotion detector algorithm is explained in Section 3. In section 4, algorithm is implemented and results are shown. Conclusion is given in Section 5.

II. RELATED WORK

1. The role of human computer interaction is proposed by Picard in the concept of affective computing [3]. Many researchers from computer science, biotechnology, psychology, and cognitive science are attracted by this domain. From another point of view, research in the field of emotion detection from textual data emerged to determine human emotions. Emotion detection from text can be formulated as follows: Let A be the set of all authors, T be the set of all possible representations of emotion-expressing texts, and E be the set of all emotions. Let r be a function to reflect emotion e of author a from text t, i.e., $r: A \times T \rightarrow E$, then the function r would be the answer to the problem [4]. The concept of emotion recognition systems lies in fact that, although the definitions of T and E may be straightforward, the definitions of individual element, even subsets in both sets of T and E would be rather confusing. As the languages are constantly emerging new elements may add on one side, for the set T. Due to the complex nature of human minds,

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any emotion classifications can only be seen as “labels” annotated afterwards for different purposes, whereas on the other side, currently there are no standard classifications of “all human emotions”. Methods used for text based emotion recognition system [4], [5] are:

A. Keyword Spotting Technique

The keyword spotting technique can be described as the problem of finding occurrences of keywords (love, anger, joy, Sadness, surprise and fear) from a given text document. Many algorithms to analyze sentiment or emotion have been Suggested in the past. In the context of emotion detection this method is based on certain predefined keywords. These Emotion words are categorized into keywords such as disgusted, sad, happy, angry, fearful, surprised etc. Occurrences of these keywords can be found and based on that an emotion class is assigned to the text document.

B. Lexical Affinity Method

Detecting emotions based on related keywords is an easy to use and straightforward method. Keyword spotting technique is extended into *Lexical affinity approach* which assigns a probabilistic ‘affinity’ for a particular emotion to arbitrary words apart from picking up emotional keywords. These probabilities are part of linguistic corpora but have some disadvantages also; firstly the assigned probabilities are biased toward corpus-specific genre of texts, secondly it misses out emotional content that resides deeper than the word-level on which this technique operates e.g. keyword ‘accident’ having been assigned a high probability of indicating a negative emotion, would not contribute correctly to the emotional assessment of phrases like ‘I met my girlfriend by accident’ or ‘I avoided an accident’.

C. Learning-Based Methods

Learning-based methods are being used to analyze the problem in a different manner. Initially problem was to determine sentiment from input text data but now the problem is to classify the input texts into different emotion classes. Unlike keyword-based detection methods, learning-based methods try to recognize emotions based on previously trained classifier, which apply theories of machine learning such as support vector machines [8] and conditional random fields [9], to determine that input text belongs to which emotion class.

D. Hybrid Methods

Since keyword-based technique with thesaurus and naïve learning-based method could not acquire satisfactory both the methods are combined to improve accuracy.

E. Limitations

From above discussion there are few limitations [7]:

1) Ambiguity in Keyword Definitions

Keyword based emotion detection is a simple way to detect associated emotions but the meanings of keywords could be multiple and vague, as several keywords could change their meanings according to different usages and contexts. Moreover, even the minimum set of emotion labels (without all their synonyms) could have different emotions in some extreme cases such as ironic or cynical sentences.

2) Incapability of Recognizing Sentences without Keywords

Keyword-based approaches always search for some specific set of keywords. Therefore, sentences which does not contain any keyword would imply that they do not belong to any emotion at all, which is obviously wrong e.g. “I passed my qualify exam today” and “Hooray! I passed my qualify exam today” imply the same emotion (joy), but the sentiment in former sentence without “hooray” could not get detected if “hooray” is the only keyword to find the emotion.

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3) *Lack of Linguistic Information*

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4) *Difficulties in Determining Emotion Indicators [10]*

Learning-based approaches can determine the probabilities between features and emotions but these approaches still need keywords in the form of features. Emoticons are the most intuitive features which can be seen as author’s emotion annotations in the texts. The cascading problems would be the same as those in keyword-based methods.

III. PROPOSED WORK

The proposed architecture is based on keyword based approach along with the concept of emotion word ontology. Ontology is an explicit specification of conceptualization. Emotion ontology is developed by an open source ontology editor called Protégé. Ontology contains almost all the words that contribute to a specific emotion. It is stored in a tree like structure. Here we use Emotion Word Ontology which consists of both words and emoticons. The emotion word ontology consists as follows:

- **Keywords:** Keywords include intensity modifiers and negations. Intensity modifiers are the words which specifies the intensity of an emotion such as very, too, exclamatory marks etc., Negations are the words which negate an emotion such as not, isn’t etc.
- **Emoticons:** Emoticons are pictorial representation of a facial expression using numbers, letters, symbols and punctuation marks usually written to express a person’s feelings. Even they are included in the emotion word ontology.
- **Data:** It consists of the dictionary words which expresses the emotion of a person.

Since here we use the negations and intensity modifiers the disadvantages of the previous traditional methods are overcome in this system.

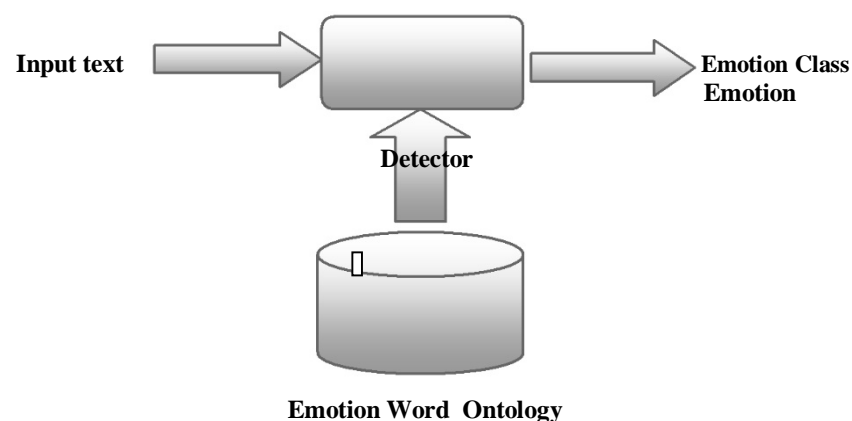


Fig 1. Proposed Architecture

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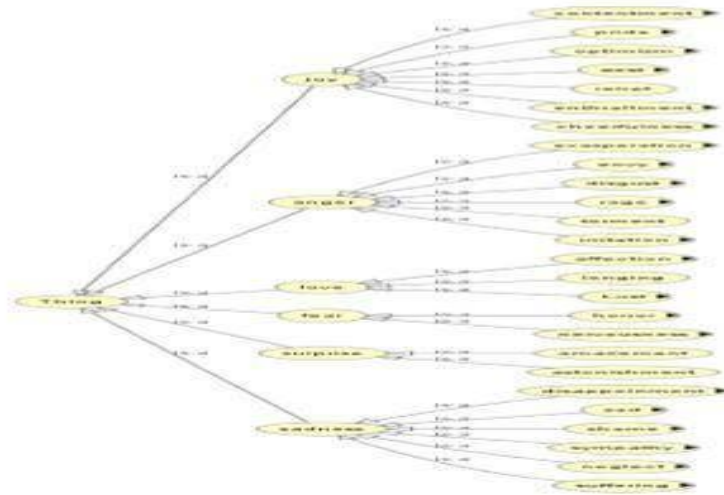


Fig-2 : Emotion Ontology

Algorithm:

- Step 1: Read input text
- Step 2: Split the input text into sentences
- Step 3: For each sentence,
 - 3.1: Search for Punctuations at the end of sentence. If found add it to result.
- Step 4: Split the sentence into words
- Step 5: For each word
 - 5.1: If it is emoticon add it to results
 - 5.2: If it is an emoword.
 - 5.2.1: check the previous word for intensity modifiers and negations. And assign the emotion appropriately.
- Step 6: Output will be emotion class.

Here we take text document as input and split it into sentences and then we check for punctuations such as "!", "?!" which denotes some emotions if found we add those emotions to the result and then we further divide the sentences to words and check for emoword (words that express some emotions) and add those to the result.

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The algorithm makes use of three utilities:

- **Heuristic Utility:** It contains methods to find the coefficients of exclamatory mark, question mark, smileys etc.
- **Parsing Utility:** It breaks the paragraph into sentences and sentences into words.
- **Lexical Utility:** It checks whether the word is a word or not.

Using the algorithm and the emotion word ontology we process three types of input data:

- **Text:** The text data is directly given as an input. The input for text can be taken from newspaper articles, documents, files etc.
- **Tweets:** The tweets are extracted from the twitter using a twitter handler and the tweets are given as input. We use the Alchemy API which is used to provide the web services by communicating with twitter to retrieve tweets.
- **Audio:** The audio input is converted to text using speech processing tool and then given as input which is then used for recognizing emotions.

III. CONCLUSION

It has been seen that the Text-based emotion recognition plays an important role for humans to interact with computers while analysing the email for emotions, writing letters, emotion-based search engine that ranks documents according to the emotion requested by the user or giving feedback to any product in the era of new versions of web. Thus emotion detection from text acts as an important research field in affective computing. In this paper, existing system research of emotion recognition based on textual data is analyzed and drawbacks of existing methods are reviewed.

The emotion class (happy, sad, anger, fear, disgust, surprise) is recognized from the textual document apart from that recognizing the polarity of sentiment (positive/ negative/ neutral) from blogs takes place. Emotion recognition system architecture is proposed to improve detection of emotions in an efficient manner. Proposed system is based on keyword spotting technique that contains rich features of ontology. The advantage of our system is that it does not only detect the emotions from textual documents, but it also takes twitter blogs and audio as input. The audio input is first converted into the text using speech processing tool and then core algorithm is applied to find the emotions.

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