Automatic Emotion Recognition and Classification

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Abstract

Emotions are an important part of human communication. In this paper emotion is automatically detected from text. Understanding the meaning of language is the goal of Natural Language Processing and also understanding emotion is one of goals of affective computing. Those two areas of artificial intelligence have recently come together for understanding emotion in text. This paper describes an English emotion ontology based on WordNet and its construction. The ontology is used to understand, classify and recognize emotion in English sentence. Using the ontology the emotion will be predicted by Natural Language Processing.

Keywords: ontology, Natural Language Processing, affective computing, WordNet

1. Introduction

Emotions are a key semantic component for human communication. Effective communication between humans is only accomplished when both the meaning and the emotion of the communication are understood by all parties involved. Understanding the meaning of language has widely been studied in natural language processing in the form of semantic analysis. In natural language processing the text can be processed properly for classification. Emotions are not only important for human communications but also critical for human computer interactions.

Ontology is an explicit specification of a conceptualization. Ontology is developed for sharing common understanding of the structure of information among people or software agents and also to enable reuse of

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domain knowledge. It is also used to separate domain knowledge from the operational knowledge and to analyze domain knowledge.

Affective computing is a relatively new area of artificial intelligence that was created to deal with the understanding and expression of emotion. The emotional ontology is created to determine the exact emotional class. In order to determine efficient ontology search here used the parser for analyzing. Natural Language Processing (NLP) is the computerized approach to analyzing text that is based on both a set of theories and a set of technologies. NLP is more efficient processor for processing English sentence and it is also easy to learn. The domain knowledge will used for constructing the emotion ontology.

This paper will continue as follows. First, in section 2 background information on emotion and related work will be discussed. Then, in section 3 the creation process is examined in detail. Next, in section 4 the results of manually evaluating the created ontology are given. Finally, in section 5 future works is discussed and concluding remarks made.

2. Related Work

2.1 Corpus

Corpus is a large collection of writings of a specific kind or on a specific subject. There is no standard emotion mark-up language which can be used to develop a corpus with emotion tags. For the purposes of this study, we selected the UIUC children’s stories corpus [1], [2]. This is a new corpus designed specifically for emotion classification which was developed as part of a dissertation project [1], [2] by Alm atUIUC.

2.2 Emotions

Emotion is a mental state or a feeling that arises subjective. The mental states and feelings are often expressed using nouns and adjectives in language. In ancient Greek time’s philosophers, psychologists, etc. have debated what the basic human emotions are. But these debates are no prevailing theory. Because of this, researchers often find themselves choosing basic emotions that fit their current objectives. Recognition, understanding and simulation of emotion close to humans’ real feelings are needed to improve human computer interaction.

In this paper ontology is created based on WordNet. And also the basic emotions are also drawn from WordNet. In total there are 113 basic emotions. Leaving the ontology with this large number of basic emotions may be useful for the future as it is easier to combine emotions into one category than it is to split categories into smaller ones. The ontology allows for simple applications that do not need the full expressiveness of human emotion and for the more complicated. Emotion ontology is used to classify all kind of emotions.

2.3 Emotional Classes

Emotion analysis has been done on the applications of machine learning to emotion classification. Much of the research done has used varying theories of emotions and as such different basic emotions. In [7], six basic emotions of anger, disgust, fear, joy, sorrow and surprise were used to classify facial expressions with Support Vector Machines. Above paper used SVM classifier to classify the emotions.
In [5], three emotion components, Valence (positive, neutral, negative), Activation (excited, neutral, calm) and Dominance (weak, neutral, strong) of spontaneous emotional speech utterances were used for emotion classifier estimation. In this paper the emotion are classified for more number of emotion classes by using emotion ontology.

2.4 Ontology Creation

Affective computing is used for understanding the emotions and also for creating the emotions. But still there is difficulty in classifying complex emotional feelings so going for emotional ontology. In order to have a deeper understanding of emotion, especially in text, emotion ontology is needed. Emotion ontology will help in recognizing, classifying, and understanding emotion.

In this paper, emotion ontology for English is semi automatically created using WordNet. WordNet is English lexical dictionary that describes the inter-conceptual relations and inter-attribute relations among words and concepts as a network [4]. WordNet is as widely used in English natural language processing applications as HowNet is in Chinese. Because of its importance and wide spread use, it makes a good basis for creating emotion ontology.

3. Proposed Architecture

In the proposed system, the input text will be given as input to the NLP and processed the text. The First step is to create emotion ontology for classification. In order to create emotion ontology have to collect emotions from domain knowledge for identify concept and relationship. Domain Knowledge can be collected from the websites, literature survey etc. Using the emotion words decided from domain knowledge is given to WordNet to check proper meaning. Then Collect the synset from WordNet. Using the synset create ontology for all emotions. This emotion ontology is used to classify complex sentences.
In NLP the text will be processed for classification. The exact term for the cause of emotional feeling of the sentence will be identified. Term Extractions helps us to classify the sentence based on the emotional class already defined. The emotion ontology will be created as owl file. Using the NLP has access the ontology and finds the exact class. In the emotion classification the emotion will be classified by searching the ontology.

### 3.1 Text Processing

In Text processing, the text is input given to the NLP for processing the sentence and for classification. The Term Extraction will be taking place in order to extract the terms for identifying the emotional class. The emotion causing word in the sentence is defined as term. The NLP is easy to implement and also to segment the paragraph. After processing only the text can be easily classified.

![Figure 2: Text Processing](image)

The Natural Language Processing is for analysing the English sentences. The Terms is used to identify the exact class for the sentence. Directly can classify sentence using classifiers but it is less efficient so going for emotional ontology for classifying complex sentence.

### 3.2 Emotion Ontology Creation

Ontology is nothing but formal, explicit specification of a shared conceptualization. Emotion ontology is created by means of domain knowledge for correct identification of emotional words. To check for proper Emotional word, we are going for WordNet to check all emotional words which are going to define under emotional classes. The Ontology Creation is important part in this paper to improve the classification more accurate for complex sentences. After emotional class hierarchy is created, have to set relationship for entire emotional words in the emotional ontology. Using the relationship can able to parse the ontology and identify the class name for the given input text to the natural language processor.

### 3.3 Emotion Classification

The end user uses the natural language query and the query analyser will analyse the query. Then the system will access the emotional ontology which have been already created using WordNet. The Natural language processing will classify the sentence based on emotional ontology and finally gives the emotional class as output.
Figure 3: Emotional Class Hierarchy

Figure 4: Emotion classification
4. Experimental Results

In this paper, a manual evaluation of the ontology was performed. All 5,498 verb concepts were examined to determine if they were indeed affective verbs and were in the correct place in the ontology. The manual evaluation found that all verbs were indeed affective and in the correct place. This was to be expected as the creation process used a controlled knowledge source, WordNet, which allowed an errorless extraction of the emotion ontology. Then classified the emotion according to the emotional class the sentence belongs.

5. Conclusions and Future Work

In this paper, an approach for creating an emotion ontology using WordNet was presented. The process started by identifying the affective class hierarchy in WordNet and extracting it. The next step was to assign emotions to the semantic roles of the extracted predicates creating an emotion predicate hierarchy. Then transform the emotion predicate hierarchy to emotion ontology by filling the hierarchy with the verbs from WordNet’s knowledge dictionary. In the end an ontology containing just fewer than 5,500 verb concepts was created. We would also like to examine the use of the ontology in classifying the emotion of the actors in sentences and the overall sentence. In future we can extend the hierarchy by adding other parts-of-Speech like nouns, adjectives and adverbs. Extend to add more emotional classes.

References


