

# A Review on Sentiment Analysis and Text-To-Speech

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## ABSTRACT

This paper explains a study on the different sentiment analysis techniques with the process of annotation and tagging. It explains several research methods, newer techniques and concepts in sentiment analysis as well as classification. This also introduces the concept of Text-to-speech conversion expressively. This study is expected to improve the different methodologies in sentiment analysis as well as in generation of synthetic speech.

## Keywords

Sentiment, Classification, Text-to-speech

## 1. INTRODUCTION

The process of annotation of text with emotions is a difficult task as many human annotators provide different tags for the same piece of information depending upon the circumstances and situation. Thus it becomes important to know how the process of annotation was done to provide a proper processing of the text. In such a context, it will be highly useful if both the chosen representation and the material that is annotated are devised in such a way as to provide flexible transitions between different kinds or methods in annotation. Because some research methods try to concentrate on a smaller set of basic emotions, and others may want to consider a wider range, a resource that is expected to allow easy conversion from annotations in terms of the smaller set of emotions to annotations in terms of larger sets of emotions, or conversion between different methods of representing emotion, will be very useful.

In a TTS system is expected to produce synthesized speech that resembles speech produced by a human but in reality, contemporary TTS systems produce synthetic speech in a way that sounds far from natural. This is to some limit due to some deficiencies in the syntactic analysis of the raw input text and to a shortage in identifying or producing semantic information, affective clues, and world knowledge. Several perceptual and objective experiments have been carried out in [3] that show the present TTS systems being weak in the characterization, classification and expression of emotions. Some TTS systems are found to accept XML-like mark-up input text pre-marked with information for intonation.

Classifications of articles based on the different domains present are common. Here domain means the different categories under which the words can be named. Other than domains the recent most widely used technique is the process of classification on the basis of sentiment. In such case the categorization is on what the sentiment is towards that topic. Natural Language Processing methods are used for sentiment annotation in text. Analysis of sentiment in text helps to determine the different opinions and affective intent of writers, their attitudes, evaluations and inclinations with respect to various topics.

Text-to-speech (TTS) convention plays a major role in transforming linguistic information stored as data or text into speech. Nowadays it is found to be widely used in audio reading devices for blind people [1]. In the latest times however, the use of text-to-speech conversion technology has grown far beyond the disabled community to become a major advantage and a feature to the growing use of digital voice storage in cases of voice mail and voice response systems. Also developments in Speech synthesis technology for various languages have already taken place [2] [3].

The next section, section 2 explains the survey on the different mechanisms in the field of sentiment analysis and some basic mechanisms in Text to Speech systems.

## 2. STUDY

A methodology of automatic domain classification is being presented in [4] discussed the process classification of sentiments based on the domain.

A tiering corpus-based approach is mentioned, the MD-TTS philosophy can be adapted to any other corpus type or even synthesis strategy other than corpus-based. Therefore, the architecture allows a flexible and adaptable TTS system implementation and design that can be tuned according to the application needs or domain characteristics. The architecture of the TTS system must be modified by including a domain classification module, which is expected to interact with the rest of the elements of the TTS system. Different domain classification strategies and a description of a specific implementation of a corpus-based MD-TTS system following a tiering approach is used for classification on the basis of domain. The main disadvantages encountered here are the classification being restrictive to domain based and being able to process only raw input.

Sentence based sentiment classification is being proposed in [5] uses decision tree based method for sentiment classification. First, this method preprocesses the corpus and then uses the Stanford Parser to extract dependency relations among the words in the sentences. Secondly, conversion of all dependency relations in a sentence to its respective dependency tree and then add additional information which will then be pruned in a later stage. Thirdly, the pruning strategy is applied to the dependency tree to create numerous new sub trees and then express that dependency sub-tree as brackets string. Finally, adding the category information for meeting the SVM's input format and then use the SVM Classifier for indentifying the polarity. The disadvantage is the addition of new information for pruning and if pruning not done properly then there is a problem of losing relevant data.

A framework is given in [6] for news story sentiment classification. For the purpose of classification, initially, the words that represent sentiment are selected. Then, with the help of selected words as features, news stories are then classified into classes of sentiment based on a method of

graph based semi-supervised learning. For sentiment ranking, the multimodal fusion approach is used in order to build the final ranking list in each class of sentiment. The contributions include: 1) a novel framework for mining sentiments on the basis of text and visual analysis from news video; 2) an approach of semi-supervised learning approach for classification in sentiments of news story; 3) a novel approach for representing sentiment in news story visual by the combination of affinity propagation clustering and PageRank algorithm. The disadvantages are the requirement to separate text from video clippings and then process them separately.

From the work in [7] verbs are found to be used more than adjectives, adverbs, and nouns in expression of opinions regarding social issues. Moreover, from the perspective of linguistics, verbs are found to play an important role in the semantics of a sentence. Consider the case, in the sentences I believe its the woman's choice, and I agree abortion must end, the verbs believe, agree, and end determines the orientation of the sentiment regarding abortion. If the verb's role is not being considered in the sentiment of sentence recognition of the sentiment may become difficult or may not produce an accurate result. For example, in the sentence "I completely agree that abortion is a terrible idea", the total sentiment of opinion terms (agree and terrible) is actually neutral while the sentence is found to be negative (or against abortion).

The paper given in [8] explained that the differences between products and social issues inspired to carry out a research the process of classification of sentiment on the basis of social issues. In domains that are social, the polarity of the sentiment in a document regarding a specific issue is dependent on the contents of semantic components of sentences present in the document. Verbs do play an important role in the semantic aspects of a sentence. In the sentences "I agree to punish them", and "I dislike to fight kids" are having objects of negative nature. The sentiments mentioned of these two sentences regarding the phrase "punishment of kids" are positive in nature.

The next work in this list is [9] which have mentioned segmentation of text on the basis of sentiment. The problems of sentiment based text segmentation are considered in one context, in product reviews. And the problems in the context can be given as, the identification of product features; the extraction of opinions associated with these features; sentiment polarity classification.

Another method that is being proposed is [10]. An AFINN word list is used and is then checked for sentiment analysis. The wordlist is expected to contain 2477 English words, labeling each word with a valence, which is set as an integer between -5 and +5 (-5 denoting the most negative words and +5 the most positive).

Another proposal is given in [11] in which a part of speech model that uses a document is represented as a vector, the entries of which are corresponding to individual terms of a vocabulary.

Part-of-speech tagging and the resultant information is supposed to indicate a sentiment expression and hence is the most significant in this respect. The process of subjectivity detection is used to reveal between the presence of adjectives and sentence subjectivity a relatively high correlation.

A recent work on classifying information in Twitter has been explained in [12]. The system used Twitter data and performs parsing, domain specific classification, and sentiment analysis. It has also found overlapping information in smaller

texts with the help of filtering tweets for required data. For the process of extraction of tweets, an Archive is used, which is a service that uses Twitter Search API to find and archive relevant tweets. A list of statistical algorithms is combined in a series with a larger data-set that describes the words objects, individuals, and locations. It also works to combining the different subtypes of the entity thus providing a detailed mapping for an entity, for instance identifying a Person as a Politician or Actor. The process of component wise processing and analysis of tweet data are discussed here.

Moreover, the conventional SA solutions extracted from the NLP scenario is required to be adapted to the TTS environment as they are required to work with compilations of long texts that are generally considered as a complete text rather than separate sentences at sentence-level [13]. Some work has been done with heuristic approaches by weighting the lexicon in shorter texts and then spotting keywords in the sentences, [14]. Other works started proposing solutions to issues by Machine Learning (ML) methods to facilitate learning from previous sentences. Some previous works are found to observe that the latter methods performed more effectively for the problem at hand [15]. Therefore, the method proposed in the following paragraph focuses on direct ML methods. Given the reduced information provided by a sentence, some approaches that are generated on the basis of the latter ML methods also proposed using additional texts to infer further sentences with affect [15]. Other works focused into the characteristics that are considered to be relevant of the available text of analysis without the necessity for the data being enlarged.

The most recent work focuses on a sentence based sentiment analysis and then classification. This is given in [16] in which after the sentiment analysis there is a requirement for the process of giving the analyzed text as an input to the text to speech system which will then produce expressive speech. This method uses an EmoLib framework for this process with a pipelined structure. Then the output is fed into the TTS system. This system is represented by fig 1. This method uses a set of machine learning methods to compare the most effective method possible for this scenario. The main disadvantage in the system is that it is restrictive to the data in the domains in which the dataset used for training depends.

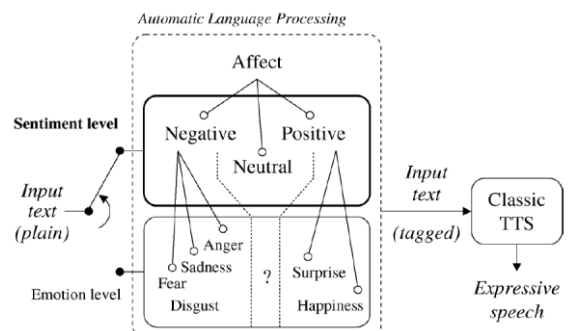


Fig 1: A sentiment sensitive TTS

### 3. CONCLUSION

This paper has discussed a study of the different mechanisms and methodologies in sentiment analysis. Other topics in this study include doing sentiment analysis on verbs, nouns and adjectives. Different methodologies have also been analyzed in this study. One another aspect is the use of sentiment classification as the input of a Text-to-speech system. This study has also covered the difference that the sentiment

classification makes to the synthetic speech making it more expressive. Future works are being done to improve the classification to multiple domains.

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