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Preface

The Workshop on Automata, Formal and Natural Languages was focused on automata, formal languages, natural language processing, and computational linguistics. It was held for the second time as a part of the Information Technologies – Applications and Theory (ITAT 2021) conference from September 22 to September 23, 2021. The workshop's main aim was to encourage cooperation among researchers in formal languages and natural language processing in Middle Europe. In order to attract young researchers, master and doctoral students of formal languages and computational linguistics were invited to participate.

The workshop consisted of an invited lecture, regular papers track, and an open session. The open session was organized in order to encourage further cooperation and sharing of information among investigators in automata and natural language processing. This offered an opportunity for anyone to present her/his work without writing a paper.

This volume contains (extended) abstracts of three open session contributions presented at WAFNL 2021.

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An Introductory Overview of Evaluating Facts and Attitudes in Diplomatic Discourse

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Abstract: This is a work-in-progress paper on evaluative analysis of different approaches to managing representations of facts and attitudes in linguistics. The aim of this comparative analysis is to find the most suitable approach for developing an annotation scheme in order to build a dictionary of attitudinal expressions during the further stages of the project. Among the approaches analyzed are the Appraisal Theory [5], the scheme developed by Bedranek [9], as well as sentiment analysis and opinion mining techniques [17], and argument mining [20]. The results of the current paper should be considered as the first step in the research of distinguishing facts and attitudes in diplomatic speeches of the United Nations Security Council.

1 Introduction

The task of automatically defining facts and attitudes in natural texts has already been elaborated by various researchers and research groups. Usually, this task consists of either analyzing and identifying facts and argumentation (as in the argument mining approach) or in sentiment identification and evaluation (as it has been elaborated in sentiment analysis and the Appraisal theory).

This paper presents an overview of some of the approaches to the manual and automatic identification of facts and attitudes. The aim of this paper is to analyze the pros and cons of the approaches in order to understand how to apply them to the analyzed data and to find out which of the discussed approaches are more suitable for the task.

Our greater research task consists of analyzing facts and attitudes in the diplomatic discourse of the United Nations Security Council and requires identification and classification of both facts and attitudes in the corpus of speeches [1]. Even though diplomatic speeches tend to be of the highest politeness, diplomats do express not only positive, but also negative emotions and attitudes towards the events, personalities, and countries. The ways they formulate the attitudes and the facts they support their opinions with are of a particular interest not only for linguists but also for natural language processing specialists. When our task is solved, the outcomes could be used for improving such tasks as fact-checking, identification of the speaker's position, and many more.

The specificity of our task, namely the need to identify and distinguish between both facts and attitudes should be considered as an interesting project for both the NLP and the linguistic communities.

2 Defining facts and attitudes

Deciding on choosing the approach for practical analysis first requires us to clarify the terms we are referring to. The theories to be presented are all dealing with analytical or automatic schemes for deciding if a given word or expression could be viewed as a fact or as an attitude. However, most of them do not refer to these terms as facts and attitudes. For instance, the Appraisal theory views expressions of opinions as attitudes, whereas, in sentiment analysis, the focus is put on on the term emotionality. We are going to assume facts to be "a piece of information presented as having objective reality" [3], and attitudes to be a word or phrase of "a feeling or emotion toward a fact or state" [2] expressed explicitly or even implicitly by language means.

In linguistics, the attitude towards some real or potential event is referred to as evaluation [6]. Whereas the entity whose use commits a speaker to the truth of a subordinate proposition is being referred to as factive [7]. Factive and evaluative ways of presenting information have their own linguistic specificities. In the diplomatic discourse, as well as many other discourses the factive information is usually presented in the declarative form. Some of the features of the factual representation of data in the observed dataset include facts being clauses, usually with the help of either past, or present tense, with a rare to no use of modal verbs. Following is an example of a fact in one of the diplomatic texts of the dataset [1]: "This statement *will be issued* as a document of the Security Council under the symbol S/PRST/1995/1". The linguistic markers of attitudes on the syntactic level may be, for example, exclamatory or imperative sentences. On the level of morphology attitudes may postulate themselves as adjectives, adverbs, as well as nouns and verbs as can be seen in an example: "This shipment of fuel has *violated* the territorial *integrity* and *sovereignty* of the Republic of Bosnia and Herzogovina (...)"[1].

The focus of our attention is put on finding the smallest representations of facts and attitudes in the texts, so we consider boundaries from word-level up to clause level. In this level attitudes are usually found to be adjectives (e.g. 'fruitful'), nouns (e.g. 'congratulations'), or verbs (e.g. 'we welcome'). These are some of the many features of facts and attitudes in diplomatic discourse, which are to be further analyzed and categorized.

3 The Appraisal Theory

The Appraisal theory is a framework, developed by Martin and While for analyzing "those meanings by which texts convey positive or negative assessments, by which the intensity or directness of such attitudinal utterances is strengthened or weakened and by which speakers/writers engage dialogistically with prior speakers or with potential respondents to the current proposition" [4]. The scheme for evaluating the appraisal is presented in the Figure 1.

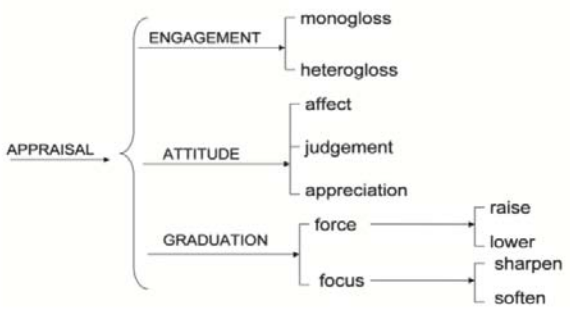

Figure 1: An overview of appraisal resources, [8]

The evaluation framework presented on the Figure 1 consists of the three main semantic systems: *engagement*, *attitude*, and *graduation* where "attitude is concerned with our feelings, including emotional reactions, judgments of behavior and evaluation of things. Engagement deals with sourcing attitudes and the play of voices around opinions in discourse. Graduation attends to grading phenomena whereby feelings are amplified and categories blurred." [5]. Each system is then subdivided. For our analysis, the most important system is the 'attitude'. According to Martin and White [5] attitude could be identified either as 'affect' understood as an expression of positive or negative feelings, 'judgment' - is described as an attitude toward behaviour, or as 'appreciation' - evaluation of phenomena of various kinds according to their value for the speaker. The more detailed scheme of the system of attitude is displayed in the Figure 2. Here we can see that the system of attitude consists of such parameters as the $attitude-type$ (authors specify 3 main types: affect, judgement, and appreciation), $attitude-polarity$ (this parameter can vary between positive-attitude, negative-attitude, and an ambiguous attitude), *explicitness* (which can be inscribed or invoked depending on how direct and explicit was the expression of an attitude), *appraiser* (which defines who expresses an opinion), and *appraised* (referring to the speaker's ability of expressing an attitude towards themselves or towards other people or entities).

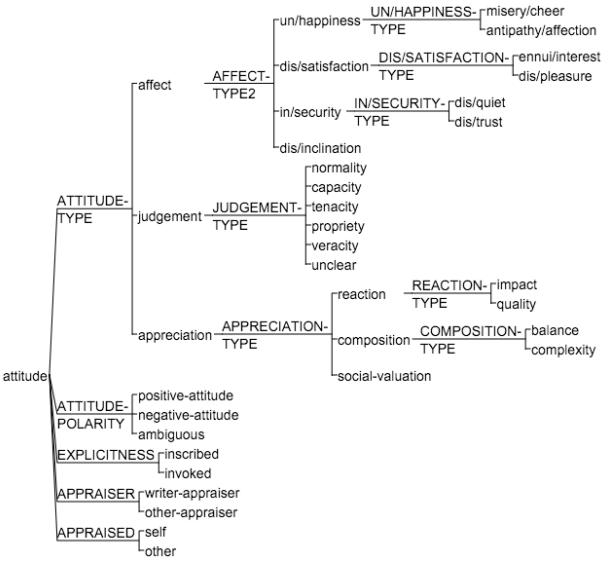

Figure 2: The scheme of the subfield of Attitude, Appraisal theory, [15]

The Appraisal theory is expected to be very applicable to diplomatic speeches. The attitude scheme could then be elaborated according to the specificities of the diplomatic texts.

Even though this scheme is very suitable for half of the task, namely for analyzing attitudes, it does not cover the other half, which means that it could only be combined with another approach of linguistic analysis, such as argument mining. Nevertheless, annotation of the diplomatic speeches according to the Appraisal theory is a good source for obtaining the data for an appraisal dictionary. Such a dictionary could then be used to train a model to find and distinguish between attitudes in any diplomatic speech of the UNSC.

4 Sentiment analysis and opinion mining

Sentiment analysis and opinion mining is the field of study that analyzes people's opinions, sentiments, evaluations, attitudes, and emotions from written language [16]. The process of the sentiment analysis application consists of text preparation (consisting of cleaning the extracted data before analysis), sentiment detection (here, sentences containing the sentiment information are annotated, and the sentences expressing facts are either discarded or ignored), and sentiment classification. There are three approaches to the latter step. The first one is the machine learning approach used for identifying the polarity of sentiments

based on trained as well as test data sets. The second approach is the lexicon-based one. It does not require any training for mining the data, however, it uses a pre-defined dictionary of 'sentimental' words. The third approach is the combined one, which uses both machine learning and lexicon to identify and classify sentiment in a given text. The third approach is nowadays considered to be the most promising one. "The main advantages of the hybrid approach are the lexicon/learning symbiosis, the detection and measurement of sentiment at the concept level, and the lesser sensitivity to changes in the topic domain. While the main limitation is that reviews are with a lot of noise (irrelevant words for the subject of the review) are often assigned a neutral score because the method fails to detect any sentiment." [17]

Another important issue to address is the size of the fragments annotated. Sentiment classification has three main classification levels [18], namely the document-level, the sentence-level, and the aspect-level. As our task focuses on the identification of tokens and phrases up to a clause, the document level should not be considered suitable for the given task. The sentence-level analysis classifies sentiment expressed in each sentence. If the sentence is subjective it classifies it in positive or negative opinions [17]. Assigning polarity labels to each sentence of the speeches will also not help with the task. We consider the aspect-level to be the most suitable. The aspect level means classifying the sentiment with respect to the specific aspects of entities. Users can give different opinions for different aspects of the same entity. [17].

Sentiment analysis is also expected to be well-applied on the data, however, this method is also not ideal. Sometimes polarity categories are not enough to describe the attitudes, so just assigning positivity/negativity labels would scarcely help. Therefore sentiment analysis alone is not enough. From the point of identifying and classifying emotions, the Appraisal theory seems to be more informative. This, however, needs to be proved by an introductory annotation analysis which is expected to be conducted.

The sentiment analysis and opinion mining approaches are very well developed and this is a very important point why the approaches could be applied to solve our task. However, as it could only solve half of it, namely identifying and classifying attitudes, the second part of the task remains uncovered. Perhaps, combining the sentiment analysis with another approach should be considered. Such a combination could include, for instance, argument mining for identifying and possibly classifying facts within the analyzed data.

5 Argument mining

Another considered approach is the argument mining, recently created and being developed by Natural Language Processing and the Knowledge Representation and Reasoning specialists. Argument mining is a rather new interdisciplinary approach in automatic speech analysis. It has been defined as "the general task of analyzing discourse on the pragmatics level and applying a certain argumentation theory to model and automatically analyze the data at hand" [21] and is based on applying the Argumentation Theory by means of Natural Language Processing. NLP serves as a mean of identification arguments and their components (i.e., premises and claims), while KRR contributes to the analysis of reasoning in the retrieved components so that fallacies and inconsistences could be automatically detected [20].

The argument mining process consists of two stages. The first stage is called 'argument extraction' and consists of the identification and extraction of arguments in the natural text provided. This stage is further split into the detection of argument components, and further identification of their textual boundaries (and then boundaries between different components) [20]. The second stage of the process is predicting relations between arguments identified. This step requires high-level knowledge of representation and reasoning techniques as relations between arguments may be of heterogeneous nature [20] (i.e., discreditation and support). During this stage, the relations between arguments and internal relations between their components are being predicted [22].

Applying the argument mining to the diplomatic texts should be fruitful as this approach has already been used in the data-driven analysis of political debates and speeches by different researchers. Lippi and Torroni [23] have conducted corpus-based research on detecting claims in the 2015 UK political election debates. As the diplomatic discourse of the UNSC is monologic, another useful referential research example is the analysis of the corpus of speeches from the Canadian Parliament by Naderi and Hirst [24] as well as an example by Menini [25], where the source data used for prediction were monologic political speeches. The argument mining technique is preliminary seen as a good solution for identifying and classifying language entities with a function of facts in the diplomatic speeches.

6 Conclusions

The presented paper includes an overview of the approaches for solving the task of automatically distinguishing and classifying facts and attitudes in diplomatic speeches of the United Nations Security Council.

There is no single theory or approach to solve this task, however, if it could be divided into two, some of the existing approaches fit well to solve it. The first two approaches, namely the Appraisal theory and sentiment analysis and opinion mining, could be selected to be applied in order to solve the attitude detection and classification part of the task, while the argument mining could be applied to identify and classify facts in diplomatic speeches. It is yet unclear how to combine these theories and methods, as well as which of them to choose as they all have their

pro et contra. The argument mining is for now the only considered approach for identifying facts, and even though the method theoretically should be applicable, this should be further proven. The next step of this work in progress will be continuing the comparison of the presented methods and theories through application on a small subset of data in order to see on practice if each of them is equally applicable and useful for the task.

7 Acknowledgments

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Why NLP Cannot Benefit from Linguistic Universals in Pragmatics Yet

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Abstract: NLP has come a long way in recent years. Furthermore, the knowledge of linguistic universals in areas such as syntax or morphology has made it possible to extend these advances to languages with fewer sources (O'Horan et al. 2016; Ponti et al. 2019). However, we do not yet have NLP or universal corpus tools that work with universals in pragmatics (Aijmer 2020; Rühlemann and Clancy 2018). In this presentation-poster we will, first of all, review all the steps that must be taken to reach this goal. Second, we want to raise some aspects that would help to improve this situation. Thus, in the future, we could have some universal corpus (Nivre et al. 2016) that allows us to have pragmatic information that would help languages with fewer resources and studies to benefit from the advances of the NLP in this area.

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Fuzzy Universal Grammar: A Multimodal Approach with Linguistic Constraints

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Abstract: Advances in NLP are trendy nowadays. However, this mainly concerns the English language. Generally, those languages that do not pose "infinite data" postulate a problem when applying NLP methods to computational applications and analysis. Most spoken languages will probably die soon, or they will never reach the necessary amount of data to perform NLP approaches satisfactorily. A formal theory for linguistic universals might help solve the first step of providing a formal "toy" grammar to make the NLP approaches more accessible for these languages. Therefore, making the NLP task more adaptable and less data demanding. Consequently, we present a formal framework that combines several traits from different theories to characterize linguistic universals to provide this first "toy grammar" of a targeted language. The Fuzzy Universal Grammar can do such a thing since it considers a significant amount of formal resources in solely one theory. Some of these formal resources are the use of linguistic constraints in linguistic constructions, the formula of a fuzzy grammar for gradient grammaticality, the notion of universality from evaluative expressions from Fuzzy Natural Logic, and the theoretical framework of womb grammars. Because of all these traits, the Fuzzy Universal Grammar will automatically extract formal (toy) grammars from those languages with low resources.