Emotions Translated: Enhancing a Subjectivity Lexicon Using a Parallel Valency Lexicon

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**Abstract:** This paper documents the behavior of verb valency complementations regarding the position of the target of evaluation within the valency frame. We classify the types of evaluative meaning expressed by the verbs and identify shared characteristic features considering the valency patterns of the verbs. In the analysis, we comment on three major issues of interest: the semantic classification of evaluative verbs and its relation to the propagation of sentiment value to the participants, the possible non-matching structural positions of the target of evaluation in the valency frame of a verb and its translation, i.e., the possible shift in evaluative focus and scope, and the possible loss of evaluative stance in the process of translation.

**Keywords:** sentiment; subjectivity lexicon; valency; parallel corpora

Introduction

In this paper, we present our efforts to enhance a Czech subjectivity lexicon with additional evaluative verb lemmas using a parallel valency lexicon as a relevant source of verb meanings. Also, we offer an analysis of the acquired verbs with respect to what happens to the evaluative state, the ordering of participants, the positions of the Source and Target of evaluation, and the evaluative strength of the verb in the process of sentence translation from one language to another (in this case, English to Czech).

Building subjectivity lexicons, or expanding them with additional meanings, can be done using various methods and resources. A favourite resource for many languages is WordNet (Arora, Bakliwal and Varma 2012). Another option is employing unsupervised learning methods (Kanayama and Nasukawa 2006). Our approach is similar to the use of cross-lingual projections (Milhacea, Banea and Wiebe 2007), but applied via a parallel lexicon and syntactically annotated corpus.

Subjectivity lexicons are valuable resources for identification of emotional, subjective and evaluative stances in the text. As verbs usually represent the core of the sentence, they often represent also the core of the so-called evaluative state,[[1]](#footnote-1) in the case that the sentence expresses evaluative meaning. Their valency complementations, then, acquire the roles of the Source and Target of evaluation. By identifying evaluative verbs and their valency patterns in the text, we gain the ability to interpret the evaluative meaning of the sentence.

We believe that verbal valency may tell us much about the way evaluation is treated in a language, and moreover, a cross-lingual point of view may reveal some interesting facts about both the universal and language specific features of evaluative language as a linguistic construct.

Used Data and Theoretical Background

Czech Sublex 1.0

Czech Sublex 1.0 (Šindlerová, Veselovská and Hajič, Jr. 2014) is a Czech subjectivity lexicon, i.e., a list of subjectivity clues for sentiment analysis in Czech. It has been gained by automatic translation of a freely available English MPQA Subjectivity Lexicon (Wilson, Wiebe and Hoffmann 2005) using a Czech-English parallel corpus CzEng 1.0 (Bojar and Žabokrtský 2006). Additionally, some manual refinement of the lexicon followed in order to exclude controversial items. Finally, it contains 4626 domain-independent evaluative items (1672 positive and 2954 negative) together with their part of speech tags, polarity orientation and source English lemmas. Of these, 1549 are verbs.

Czengvallex 1.0

Czengvallex 1.0 (Urešová, Fučíková and Šindlerová 2016) is a parallel verb valency lexicon based on the Prague Czech English Dependency Treebank (PCEDT) (Hajič et al. 2012). It stores alignments between Czech and English valency frames and their arguments in about 22 000 English-Czech frame pairs. Aligned pairs of verb frames are grouped by the English verb frame, and for each English verb sense, their Czech counterparts are listed. For each such pair, all the aligned valency slots are listed and referred to by the functor assigned to the slot. So far, Czengvallex contains only the alignment of verb pairs, though an extension covering other parts of speech is planned.

Functional Generative Description Valency Theory

The Czengvallex has been built using the valency theory developed within the Functional Generative Description approach – the Functional Generative Description Valency Theory (FGDVT). The basics of the approach describe e.g., Lopatková and Panevová (2004). The FGDVT sees valency as a special relation between a governing word and its dependents, combining a syntactic and semantic approach for distinguishing valency participants. Verbs are considered to be the core of the sentence, governing both the morphological properties of their dependents and their semantic interpretation. The number and realization of the participants constituting the valency structure of the phrase is represented by valency frames. In the frame, each participant is represented by a functor, which is a label stating the value of a corresponding deep syntactic dependency relation, as well as expressing the function of the participant in the clause. Participant labels consist of two groups, the so called *inner participants* (Actor, Patient, Addressee, Origin and Effect) and *free modifications* (Cause, Location, Direction, etc.). Inner participants are considered as constituting the valency frame in any case, whether they are obligatory or optional. Free modifications belong to the valency elements only if they are obligatory. The first two positions in the valency frame, the Actor (ACT) and the Patient (PAT), are connected with no specific globally defined semantics. As a result, the FGDVT adopts the concept of shifting of “cognitive roles”. According to this rule, the roles of Addressee (ADDR), Effect (EFF) and Origin (ORIG) are being shifted to the PAT position in case the verb has only two arguments, or any of the inner participant roles to the ACT position in case there is only one position in the frame.

Enhancing the Lexicon

In the process of lexicon enhancement, we utilized English lemmas from Czech Sublex, i.e., the original source English lemmas used in the task of Czech Sublex creation that correspond to the final lemmas included in Czech Sublex after manual cleanup. We used the lemmas as an input for the search of corresponding Czengvallex frame pairs. After sorting out translations already present in Czech Sublex, we gained 1166 new verb translations corresponding to 578 unique lemmas. These 578 lemmas we subjected to manual cleanup, after which we ended up with 222 new true subjective lemmas to be included in Czech Sublex.

Analysis

Semantic Classes Reflecting the Type of Evaluative Meaning

We have analyzed the outcoming 222 verbs focusing on the question of which of the participants inherits the role of the Target of evaluation. Our first idea was to gather verbs into groups according to the functor label of the participant, to which the sentiment value is propagated by the verb. Nevertheless, due to the formal feature of cognitive role shifting (described briefly in Sec. 2.3) which in some cases re-labels the participants according to their syntactic closeness to the verb, this did not prove advantageous. Therefore, we decided to split the verbs into two categories only – the first propagating the sentiment to the ACT position (making it the Target of sentiment), the second to a non-Actor position (mainly PAT, ADDR, but also any other semantic modification, like, e.g., Cause (CAUS), appearing syntactically in the position of the second argument, labeled PAT in the FGDVT).

Within these two groups, we identified semantically close verb candidates that formed tight semantic classes considering the type of evaluative meaning carried by the verb. These classes did not match any previously created semantic classification, therefore, we used our own labels for their descriptions.

*Verbs of success/failure[[2]](#footnote-2)* propagate sentiment to the ACT position (1a,b). In case they have two participants in the frame (1c,d), the PAT position is usually occupied by expressions of inherent “objective” sentiment value, also known as “Good/Bad news” (Veselovská, Hajič, Jr. and Šindlerová 2012, 300). This group of verbs includes e.g., lemmas “polepšit si, prospět, těžit, užít/užívat si, vychutnat si, vydařit se, zasloužit si”.

1. (a) VečírekACT-TARGET se vydařilEVAL.

(b) Andrej BabišACT-TARGET pochybilEVAL, když nepřiznal střet zájmů

(c) WilliamsováACT-TARGET si vychutnalaEVAL vítězstvíPAT-GOODNEWS nad soupeřkou.

(d) KvitováACTARGET doplatilaEVAL na svou nepřipravenostPAT-BADNEWS.

*Verbs of Improvement/Deterioration*, e.g. “zdokonalovat, zkvalitnit, rozšířit, znásobit”, represent a class of verbs that balance on the verge between true evaluation and the category of Good/Bad News. It can be said that their evaluative strength is strongly dependent on the context. In evaluative contexts, they usually propagate sentiment value to the ACT position.

*Verbs of Helping/Harming* (e.g. “nahrát, napomáhat, deptat, znehodnotit”) and *Verbs of Praising/Disdain* (e.g. “cenit si, přimlouvat se, bagatelizovat, poplivat, ztrapnit”) are (at least) ditransitive. Both classes share an interesting feature. They are subject to dual interpretation depending on the level of sentiment analysis desired. Either the Source of evaluation is sought within the sentence, then the ACT of the verb is considered the Source. Or, the Source of evaluation is looked for outside the sentence, then it is the Author of the text which is considered the Source of evaluation and center of sentiment perspective. In the first case (lower level), the ACT as the Source of evaluation expresses his/her opinion verbally or in an action towards the non-Actor position (usually PAT) as the evaluated Target. In the second case (higher level), the Author of the text evaluates the ACT of the sentence for his involvement in a positive or negative action towards the other entity. The ACT then may be considered the Target of evaluation, while the other participant is perceived as carrying either no specific sentiment value, or a slight value of different orientation than the evaluative state expressed. Thus in (2a), the media is presented as expressing its negative evaluation of the president through the act of verbal attack, whereas in (2b), from the perspective of the Author/Reader, the media may be perceived negatively due to their involvement in a negative act (attack), whereas the president may be pitied as the victim of the act.

1. (a) MédiaACT-SOURCE opět napadají EVAL prezidentaPAT-TARGET.

(b) MédiaACT-TARGET opět napadajíEVAL prezidentaPAT.

Nevertheless, we must bear in mind that the use of Author perspective is strongly influenced by individual subjective attitudes of the Author (or Reader) and is therefore quite difficult to interpret. Therefore, it is usually avoided in the tasks for which Czech Sublex was designed originally.

*Verbs of (Dis)Liking* include verbs describing the feeling of liking either from the perspective of the experiencer, “liker”, or from the perspective of the liked thing. The first group includes lemmas such as “zamilovat se, oblíbit si”. Here the verbs propagate sentiment value to the PAT (or, more generally, non-Actor) position, whereas the ACT position is occupied by the Source of evaluation. The second group includes lemmas such as “pobláznit, uspokojovat, zalíbit se, odstrašit”. In this instance, the ACT position is occupied by the “liked” thing, thus being the Target of evaluation, whereas the non-Actor position is usually reserved for the Source.[[3]](#footnote-3)

*Verbs of Wanting* express a desire (not) to own something or (not) to perform an action of some kind, including the implicit positive (or negative) attitude to the thing or action. This class includes lemmas such as “chtít, dožadovat se, přát si, toužit, žádat”. As for the Target of sentiment, this class behaves in an uncomplicated way, propagating the sentiment value to the non-Actor position (making it the Target of evaluation) and filling the ACT position with the Source of evaluation.

*Verbs of Struggle*, including lemmas “potýkat se, přečkat, protrpět, strpět, vydržet” propagate negative polarity value to the PAT as the Target, while the ACT position is occupied by the Source.

*Verbs of Judgment* include two types of verbs. First, there are verbs with clear positive or negative value, such as “zazlívat, obhájit, vyčíst”. These verbs propagate sentiment to the non-Actor position (PAT or ADDR, usually) and the Source occupies the ACT position. Second, there are verbs in this group which express opinion, but without a clear positive or negative orientation, such as “posoudit, přehodnotit, etc.” In our approach, such verbs are marked as “Elusive Elements,” i.e., elements which are evaluative, but it is not possible to decide their polarity value. These verbs appeared in the final collection of lemmas due to the fact that their English counterparts carried context polarity, i.e., their meaning was to be interpreted as evaluative or elusive, or even neutral, depending on the specific context in the sentence.

Sometimes, the polarity value was reduced in intensity, or even disappeared in the translation. In (3), the original English verb carries an evaluative meaning that might be considered as having a NONNEG polarity (the verb meaning implies downgrading of a strongly negative polarity). The Czech translation then only describes a certain nonspecific shift in polarity, not offering any specific information about the polarity orientation without a prior context.

1. (a) HeACT-SOURCE softenedEVAL the talkPAT-TARGET about a recession.

(b) Svá slovaPAT o recesi přehodnotilELUSIVE.

The last group to be mentioned here are the *Verbs of Communication*. Their meaning is the same as that of ordinary Communication Verbs, i.e., sharing a verbal message with another entity. Evaluative Communication Verbs though involve a semantic indication of the positive or negative attitude of the speaker. The group contains lemmas such as “brblat, čertit se, lkát, libovat si, ohradit se, pochvalovat si, stěžovat si, žalovat, etc.” This class, unfortunately, does not behave homogenously enough considering the number and type of positions in the valency frame. The Target of the sentiment expressed by these verbs is in most cases the “message” (usually occupying the EFF or PAT position), as in (4a), for some verbs, it is the semantic addressee (ADDR or PAT position) (4b), in some cases, the Target of the sentiment may even be split into both the positions of the PAT and EFF (4c).

1. (a) StěžovalEVAL si úřadůmADDR na nedostatek informacíPAT-TARGET.

(b) A jáACT-SOURCE s panem ministremPAT-TARGET musím polemizovatEVAL.

(c) StěžovalEVAL si jimADDR na synaPAT-TARGET, že lžeEFF-TARGET.

All the above mentioned classes apply also to the verbs in the original Sublex.

Target Functor Mismatch

In Czengvallex, it is often the case that frame elements do not align proportionally. There are two general types of disproportion in the data. In some cases, the aligned frame elements do not match in value; we call this type a “functor mismatch”. In the case of the other type, we term it a “zero alignment,” one or more frame elements do not have a counterpart in the parallel frame (Šindlerová, Fučíková and Urešová 2015).

Both functor mismatch and zero alignment are often caused by conversive translations, i.e., the translated verb depicts the situation from a different perspective than the original one. In the text, though, the perspectives match because one of the verbs is used in an agent-backgrounding[[4]](#footnote-4) diathesis (e.g., a passive, as in (5)), while the other verb involves the backgrounding of the semantic agent already in its unmarked form.

1. (a) An airline buy-out billPAT-TARGET was approvedEVAL by the HouseACT-SOURCE.

(b) ZákonACT-TARGET o skupování aerolinek prošelEVAL SněmovnouDIR2-SOURCE reprezentantů.

Example (6) represents another case of zero alignment influencing not only the labeling of the Target, but also the evaluative strength of the translated verb. Both sentences include a semantic backgrounding of an Agent position. The English sentence involves a participial verb form implying a covert, coreferential agent. The Czech translation then changes the perspective of the clause from “the management” to “the employees,” choosing an intransitive verb. The loss of the implicit Source of evaluation results in the lowering of the evaluative strength of the verb.

1. (a) …by eliminatingEVAL the typically long New York commutesPAT-TARGET between office and home, management will expect employees to work 40 hours a week in Dallas , rather than a 35-hour work week in New York…

(b) …díky tomu, že odpadneEVAL typicky dlouhé newyorské dojížděníACT-TARGET mezi kanceláří a domovem, bude management od zaměstnanců v Dallasu očekávat 40hodinový pracovní týden…

Thus, it may happen that in the process of translation, the loss of the Source of evaluation from the evaluative meaning may lead to the use of a verb that implies a Source interpreted as the Author of the text, or even to a complete loss of evaluative strength of the verb. Nevertheless, it is highly improbable that a zero alignment in the data would affect the Target at any time.

Conversive translations do not constitute a notable portion of PCEDT verb translations, but this is probably caused by the fact that the English translations of the Czech sentences in the treebank were made with a special regard to the treebank purpose, and the maximal possible syntactic similarity to the original sentence was explicitly declared in the instructions. In commonly produced translations, we expect more substantial portion of conversive translations to appear.

Another type of mismatch is represented by the Abstract Cause – Subject Alternation, where a single lemma may function in dual perspective configuration. One (the causative) having the semantic agent in the syntactic subject, semantic patient in the object and an oblique cause, which is also affected by the sentiment value as a “secondary target”. The other involves the abstract cause shifted into the subject position and a strongly backgrounded agent, see e.g., the case of the verb “pobuřovat” (to offend) in (7).

1. (a) A poll of South Koreans showed overwhelming opposition to efforts to curb dog-meat consumption just because itACT-TARGET offendsEVAL foreignersPAT-SOURCE.

(b) Z průzkumu veřejného mínění mezi Jihokorejci vyplynulo , že většina obyvatel je proti snahám ukončit konzumaci psího masa jen proto, že toACT-TARGET cizincePAT-SOURCE pobuřujeEVAL.

(c) Z průzkumu veřejného mínění mezi Jihokorejci vyplynulo , že většina obyvatel je proti snahám ukončit konzumaci psího masa jen proto, že tímMEANS-TARGET cizincePAT-SOURCE pobuřujíEVAL [oni]ACT-TARGET.[[5]](#footnote-5)

Lost Evaluation

Even though the analysis of truly evaluative verbs brought some significant findings, it may be even more interesting to look at the lemmas that were excluded during the manual revision. Since most of them originated as corpus translations of evaluative verbs, it was initially uncertain as to what happened to the originally subjective content during the translation. We were able to identify four major reasons explaining why the translated verbs did not come out as evaluative.

Sometimes, the verb lost its subjectivity during the translation, while the subjectivity was transferred to another participant or a verb modifier in the text. This happened especially when the translation included a light verb construction, or another instance of a semantically general verb in combination with an evaluative nominal element (phrasemes etc.), i.e., a single English verb was translated by a combination of a Czech verb and another lexical item to which the evaluation was transferred, see (8).

1. (a) AmericansACT-SOURCE didn't dislikeEVAL metricsPAT-TARGET; they simply ignored them.

(b) Ne že by AmeričanéACT-SOURCE neměli metrický systémPAT-TARGET rádiDPHR-EVAL, oni jej prostě ignorovali .

A different case is represented by originally evaluative verbs that were used in metaphorical, non-evaluative contexts, or specific jargon, in the parallel treebank, and therefore, they got into the pairing with a non-evaluative verb in the Czengvallex and the non-evaluative lemma was then harvested into the candidate list, see the case of the verb “to enjoy” translated by “zaznamenat” (notice) in (9).

1. (a) Hawker Siddeley said its core electrical products division enjoyed strong growth, with a 20% rise in operating profit during the period.

(b) Společnost Hawker Siddeley oznámila, že její divize základních elektrických produktů zaznamenala silný nárůst s 20% vzrůstem provozního zisku během tohoto období.

With verbs that did not possess an inherent, prior polarity, but only a “functional” context polarity, it was simply the case that the translation of the non-evaluative meaning of the lemma was collected, see (10).

1. (a) Market Airlines tried to restrict the program substantially by limitingNONEVAL the offerPAT to certain daysEFF of the week.

(b) Aerolinie se pokoušely tento program značně omezitNONEVAL tím, že nabídkuPAT vymezily na některé dnyTOWH v týdnu

(c) Advocates hope that such standards will improve treatment while limitingEVAL unnecessary testsPAT-TARGET and medical proceduresPAT-TARGET.

(d) Zastánci doufají , že tyto normy zlepší léčbu, když omezíEVAL zbytečné testyPAT a lékařské proceduryPAT.

And last, but not least, there was a number of English lemmas in the source material to Czech Sublex creation that were more “subjectivity clue verbs” lacking directly evaluative features. This applied especially to plain verbs of communication, such as “prohlašovat” or “uvádět”. This is connected to the fact that the Czech Sublex is aimed at a substantially narrower concept of evaluation than the original MPQA lexicon.

Conclusions and Future Work

The analysis showed that the relation between the valency frame patterns of evaluative verbs and the positions of the Source and Target of evaluation is complex. Generally, the verbs of similar evaluative meaning (verbs within our evaluative “semantic classes”) propagate sentiment to the same participants of the frame. Nevertheless, we have seen that there are some complicated cases.

For some of the identified verb classes of evaluative meaning, we observed that the sentiment value might attach to more than one position in the frame. There are essentially three major cases:

* One position in the verb frame is occupied by the Target, the other by an inherently Evaluative Expression, a Bad News/Good News item (Verbs of Success/Failure).
* The two affected positions receive a dual interpretation, depending on whether we choose the Author/Reader perspective, or the “Source in the text” perspective (Abstract Cause – Subject Alternation).
* The Target of the sentiment is split evenly between two positions in the frame (PAT and EFF of some Communication Verbs).

Also, the analysis partially answered the question regarding what happens to sentiments in translation. We have seen that in translating evaluative states, we come across numerous evaluation-changing phenomena, starting from the change of situation perspective, propagation of sentiment value to different participants, shifts from prior polarity verbs to context polarity verbs, lowering evaluative strength, and even the complete loss of sentiment value.

Considering the description of evaluative state using valency, and the above mentioned shifts in translation, it eventually appears that the FGDVT framework might not be the most suitable one for relating the positions of the evaluation Target and Source to syntactic participants of a kind because of its formal feature of shifting of cognitive roles, i.e., the formal labeling of obligatory participants on the basis of their position in the sentence, not their original, semantic value. Also, the syntactic actant labeling is strongly dependent on the morphosyntactic form of the expression, thus, e.g., a dative experiencer is likely to be labeled ACT, whereas an accusative experiencer is prohibited from being labeled ACT. Therefore, our semantic classes are not homogeneous with respect to the syntactic labeling of the Source and Target though they involve similar semantic participants.

In the future, we would like to enrich and deepen our analysis using the annotated parallel treebank data, focusing on the syntactic mismatches in evaluative constructions in a greater detail.

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1. An evaluative state is a part of text where the speaker expresses evaluation towards any entity. An evaluative state consists of the Source, Target and Evaluative Expression. [↑](#footnote-ref-1)
2. For some of the classes we use a joint label for both verbs expressing positive and verbs expressing negative polarity value since the polarity orientation of the verb may be simply turned over in a text by means of a negation prefix. [↑](#footnote-ref-2)
3. Unfortunately, the FGDVT treats valency frames of verbs of this group differently. For verbs expressing the „experiencer“ of the liking feeling in direct case (accusative), the frame constitutes of an Actor tied to the subject position and the Patient tied to the object position. Nevertheless, for verbs like “zalíbit se”, which express the “experiencer” in an oblique case (dative), the syntactical subject position is labeled as Patient, whereas the oblique object is considered an Actor. [↑](#footnote-ref-3)
4. Some participants receive a semantic priority in the situation perspective. As such, they tend to be overtly expressed, receive prominent syntactical positions (e.g., subject, object) and prominent morphological forms (e.g., direct case). Others are linguistically constructed as being „in the background of” the situation, they are perceived as not necessary for the interpretation, too general, etc. They tend to remain unexpressed in the sentence, or they receive oblique morphological forms and syntactic positions outside the valency frame, etc. [↑](#footnote-ref-4)
5. The translation in (5c) is a possible variant not appearing directly in the PCEDT. [↑](#footnote-ref-5)