

Alternations: From Lexicon to Grammar And Back Again

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Abstract

An excellent example of a phenomenon bridging a lexicon and a grammar is provided by grammaticalized alternations (e.g., passivization, reflexivity, and reciprocity): these alternations represent productive grammatical processes which are, however, lexically determined. While grammaticalized alternations keep lexical meaning of verbs unchanged, they are usually characterized by various changes in their morphosyntactic structure.

In this contribution, we demonstrate on the example of reciprocity and its representation in the valency lexicon of Czech verbs, VALLEX how a linguistic description of complex (and still systemic) changes characteristic of grammaticalized alternations can benefit from an integration of grammatical rules into a valency lexicon. In contrast to other types of grammaticalized alternations, reciprocity in Czech has received relatively little attention although it closely interacts with various linguistic phenomena (e.g., with light verbs, diatheses, and reflexivity).

1 Introduction

Contemporary linguistic theories usually divide a language description into two components, a lexicon and a grammar. The grammar consists of general patterns rendered in the form of formal rules that are applicable to whole classes of language units. The lexicon, on the other hand, represents an inventory of language units with their specific properties. Nevertheless, the distribution of linguistic information between the grammar and the lexicon is not given by the language itself but it is purely an empirical issue. Thus linguistic frameworks can substantially differ from each other in the design of the grammar and the lexicon. In some theories a central role is performed by the grammar component, e.g., Chomskyan generative transformational grammar (Chomsky, 1965), while others put emphasis on the lexical component, e.g., the Lexical-Functional Grammar (Kaplan and Bresnan, 1982), the Head-Driven Phrase Structure Grammar (Pollard and Sag, 1994), and the Meaning-Text Theory (Mel'čuk, 1988).

There are several linguistic phenomena, e.g., agreement and semantics, which are consistently treated across various linguistic theories either in the grammar or lexical component, respectively. However, a language is typically abundant with borderline phenomena whose treatment either as grammatical or as lexical ones is strongly theory dependent. Moreover, some phenomena represent products of a close interaction between the grammar and the lexicon. An excellent example of linguistic phenomena bridging these components is provided by grammaticalized alternations, e.g., passive, reflexive and reciprocal alternations. These alternations represent fully (or almost fully) productive grammatical processes which are, however, lexically determined.

Grammaticalized alternations typically preserve lexical meaning and deep syntactic structure of verbs; however, they are characterized by various changes in surface syntactic structures. Morphologically rich languages provide an excellent opportunity to study grammaticalized alternations as the surface syntactic changes are manifested by changes in morphological expressions of the valency complementations affected by the alternations, as can be illustrated by examples with the Czech verb *potkat* 'meet' in (1). The deep syntactic structure of this verb is formed by two valency complementations 'Actor' (ACT) and

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‘Patient’ (PAT), which are expressed in the unmarked structure of grammaticalized alternations (active, unreciprocal and irreflexive) as subject in the nominative and direct object in the accusative, respectively (1b). This verb allows for the reciprocity of ACT and PAT, see (1c). Comparing with the unreciprocal structure in (1b), this structure is characterized by the following changes: (i) as subject, coordinated ACT in the nominative is expressed; this results in the change in verb agreement, and (ii) the direct object position corresponding to PAT is occupied by the clitic reflexive pronoun *se* expressed in the accusative; this reflexive pronoun corefers with the subject position.

Despite the changes in unreciprocal and reciprocal structures of the verb *potkat* ‘meet’, the meaning of the verb remains unchanged: in both structures, it denotes the same situation when two or more individuals accidentally or intentionally come together. Thus these changes cannot be explained as a consequence of polysemy of the given verb. The main difference between unreciprocal and reciprocal structures of this verb rather lies in the fact that the reciprocal structure (unlike the unreciprocal one) denotes complex event involving two propositions, which can be describe in the following way: *Peter met Claire in the theater and at the same time Claire met Peter in the theater*. This semantics is characteristic of reciprocal structures in general (Evans et al., 2007).

- (1) a. *potkat* ‘meet’ ... ACT_{nom} PAT_{acc}
 reciprocity: ACT-PAT
- b. *Petr potkal Kláru v divadle.*
 Peter_{ACT.nom.sg} met_{pst.3sg} Claire_{PAT.acc.sg} in the theater.
 ‘Peter met Claire in the theater.’
- c. *Petr a Klára se potkali v divadle.*
 (Peter_{nom.sg} and_{conj} Claire_{nom.sg})_{ACT} REFL_{PAT.acc} met_{pst.3pl} in the theater
 ‘Peter and Claire met in the theater.’

While the surface syntactic formation of marked structures of grammaticalized alternations (passive, reflexive and reciprocal structures) is typically regular enough to be described by grammatical rules, a possibility to create these structures is lexically conditioned, i.e., this possibility is primarily given by the lexical meaning of verbs and thus it cannot be deduced from their deep and/or surface syntactic structures alone. For example, both the verbs *potkat* ‘meet’ and *absolvovat* ‘undergo’ are characterized by the same valency frames. However, only the former verb forms reciprocal structures, the latter one does not allow for reciprocity, see examples (1) and (2). The information on applicability of individual grammaticalized alternations thus must be stored in the lexicon.

- (2) a. *absolvovat* ‘undergo’ ... ACT_{nom} PAT_{acc}
- b. *Petr absolvoval operaci.*
 Peter_{ACT.nom.sg} underwent_{pst.3sg} operation_{PAT.acc.sg}
 ‘Peter has undergone an operation.’

In this contribution, we demonstrate on the example of reciprocity and its representation in the valency lexicon of Czech verbs, VALLEX how the linguistic description of complex (and still systemic) changes characteristic of grammaticalized alternations can benefit from the integration of grammatical rules into a valency lexicon.

Let us stress that the representation of reciprocity proposed in this paper is restricted to reciprocity of verbs. However, reciprocity is characteristic of other parts-of-speech as well, esp. of nouns, e.g., *dohoda jedné válčící strany s druhou stranou* ‘an agreement of one warring party with the other’ vs. *dohoda mezi válčícími stranami* ‘an agreement between warring parties’. Reciprocity of nouns has received little attention so far. Further, the interplay between reciprocity on the one hand and diatheses or reflexivity on the other is left aside here; this issue has not been sufficiently explored yet as well although their interactions brought about specific changes in surface syntactic structures. For example, in Czech, in contrast to the valency complementations involved in reciprocity in active light verb constructions, the valency complementations in reciprocity in passive light verb constructions have a strong tendency to be expressed as the valency complementations of nouns, e.g., *Dosud nebyla uzavřena dohoda válčících*

*stran*_{reciprACT:nominal}. ‘An agreement of warring party has not been made yet.’ vs. *?Válčícími stranami*_{reciprACT:verbal}
dosud nebyla uzavřena dohoda. ‘An agreement has not been made by warring party yet.’

2 Related Work

Grammaticalized alternations have been treated in the linguistic description of many languages as productive grammatical processes, the applicability of which can be fully predicted from syntactic structure of verbs. Thus their description entirely relies on the grammar alone, leaving the lexicon aside. As a result, an explicit representation of grammaticalized alternations of verbs is still missing in most contemporary lexical resources. Reciprocity, which serves here as an illustrative example of grammaticalized alternations, does not represent any exception. Although reciprocity is cross-linguistically attested as a widespread phenomenon, see esp. (Nedjalkov, 2007; König and Gast, 2008), from the important lexical resource, only FrameNet¹ introduces the information on reciprocity in the form of the non-lexical semantic frame ‘Reciprocity’; this frame indicates that its daughter frames are endowed with frame elements that can be used symmetrically. However, FrameNet does not provide any systematic way for deriving reciprocal structures. Similarly, despite being based on Levin’s classification of verbs within which reciprocity of English verbs is described in detail (Levin, 1993), VerbNet² does not explicitly distinguish between reciprocal structures and unreciprocal ones.

Reciprocity of Czech verbs has been theoretically elaborated within the Functional Generative Description in (Panevová, 1999; Panevová, 2007; Panevová and Mikulová, 2007). In these studies, the representation of reciprocity in a lexicon has been proposed as well. The theoretical results has been then applied in the Prague Dependency Treebank, and in the VALLEX lexicon, see Section 3. The systematic rule description of morphosyntactic changes brought about reciprocity has been introduced in (Skoumalová, 2001), (Urešová, 2011), and (Kettnerová et al., 2012b; Lopatková et al., 2016).

3 VALLEX and FGD

In this section, we describe main tenets of valency theory of the Functional Generative Description within which we formulate a representation of grammaticalized alternations. The proposed representation is then applied in the valency lexicon of Czech verbs, VALLEX³ (Lopatková et al., 2016). The main output is a qualitatively and quantitatively enhanced version of this lexicon available for human users as well as for NLP applications which allows for obtaining all surface manifestations of Czech verbs.

The Functional Generative Description (FGD)⁴ represents a stratificational dependency-oriented theoretical framework, see esp. (Sgall et al., 1986). Valency – as one of the core concepts – is related primarily to the tectogrammatical (deep syntactic) layer of the linguistic description, i.e., the layer of linguistically structured meaning, esp. (Panevová, 1994). Valency structure of verbs is captured in the form of valency frames. According to a main descriptive principle of the valency theory of FGD, differences in valency frames correlate with differences in lexical meaning; thus each meaning of a verb should be characterized by a single valency frame. As grammaticalized alternations bring about changes in valency frames of a verb while preserving its lexical meaning, they collide with this principle. We further demonstrate how this collision can be overcome when we carefully distribute the information on grammaticalized alternations between the lexicon and the grammar.

The valency theory of FGD has been applied in several valency lexicons, VALLEX, PDT-Vallex (Urešová, 2011),⁵ and EngVallex (Urešová et al., 2016).⁶ VALLEX, being the most elaborated one, forms a solid basis for the lexical component of FGD. For the purpose of representation of grammaticalized alternations, VALLEX is divided into a lexical part (i.e., the data component) and a grammatical part (i.e., the grammar component) (Kettnerová et al., 2012a).

¹<http://framenet2.icsi.berkeley.edu>

²<http://verbs.colorado.edu/verb-index/vn/reference.php>

³<http://ufal.mff.cuni.cz/vallex/3.0/>

⁴FGD serves as the theoretical framework for the Prague Dependency Treebank (PDT), see <http://ufal.mff.cuni.cz/pdt3.0/>.

⁵<http://lindat.mff.cuni.cz/services/PDT-Vallex/>

⁶<http://lindat.mff.cuni.cz/services/EngVallex/>

Data component. The data component consists of an inventory of lexical units of verbs (corresponding to their individual meanings) with their respective valency frames underlying their deep syntactic structures. Each valency frame is modeled as a sequence of frame slots corresponding to valency complementations of a verb labeled by (rather coarse-grained) tectogrammatical roles such as ‘Actor’ (ACT), ‘Patient’ (PAT), ‘Addressee’ (ADDR), ‘Effect’ (EFF), ‘Direction’, ‘Location’, ‘Manner’, etc. Further, the information on obligatoriness and on possible morphological forms is specified for each valency complementation. The valency frames stored in the data component describe unmarked structures of grammaticalized alternations (i.e., active, unreciprocal, irreflexive). In addition to information on various other syntactic properties, each lexical unit of a verb bears information on the possibility to create marked syntactic structures of grammaticalized alternations (i.e., passive, reciprocal and reflexive).

The data component of VALLEX stores valency information on 2 722 verb lexemes (associating lexical units and verb forms of a verb). These verb lexemes are represented by 4 586 verb lemmas and describe 6 711 lexical units (VALLEX thus covers more than 96% of verb occurrences in the sub-corpus of the Czech National Corpus SYN2000).⁷

Grammar component. The grammar component represents a part of the overall grammar of Czech. It stores formal rules directly related to valency structure of verbs. These rules allow users to derive marked structures of grammaticalized alternations (i.e., passive, reciprocal or reflexive).⁸ Let us stress that grammaticalized alternations typically preserve deep syntactic structures of lexical units of verbs, i.e., the number and type of their valency complementations remain unchanged; it is their morphosyntactic structure that changes. These changes are manifested by changes in morphological forms of the valency complementations affected by grammaticalized alternations. The rules contained in the grammar component thus describe the systemic changes in morphological forms of the given valency complementations. Further, these rules can determine changes in lexical expressions of valency complementations involved in grammaticalized alternations.

In the current stage of the project, the grammar component of VALLEX stores rules for the following grammaticalized alternations:

- *Diatheses.* Diatheses represent a core type of grammaticalized alternations. In Czech linguistics, five types of diatheses are distinguished (Panevová et al., 2014): passive, deagentive, resultative, dispositional and recipient passive diatheses; they are covered by 17 formal rules, detailed description can be found in (Lopatková et al., 2016).
- *Reflexivity.* Reflexivity represents a peripheral type of grammaticalized alternations in Czech (Kettnerová et al., 2014). Reflexive structures denote the actions which ACT performs on himself; thus two valency complementations – one of which being expressed as subject – share the same reference, e.g., *Petr_{ACT} se viděl v zrcadle.* ≈ *Petr_{ACT} viděl sám sebe_{PAT}* (= *Petra_{PAT}*) *v zrcadle.* ‘Peter_{ACT} saw himself_{PAT} in the mirror.’ In VALLEX, reflexivity is covered by 4 formal rules.
- *Reciprocity.* Reciprocity (similarly as reflexivity) represents a peripheral type of grammaticalized alternations; on reciprocity we further illustrate the representation of grammaticalized alternations in VALLEX, see the following Section 4.

4 Reciprocity

The description of reciprocity (as well as other types of grammaticalized alternations) may benefit from the distinction between a *situational meaning* and a *structural meaning*. The situational meaning portrays a situation described by a lexical unit of a verb which is characterized by a set of situational participants

⁷<http://ucnk.ff.cuni.cz/>

⁸In this contribution, we leave aside lexicalized alternations. These alternations associate pairs of lexical units of verbs characterized by systemic shifts in their lexical meaning which are exhibited across groups of semantically similar verbs. Changes in surface syntactic structures of these lexical units result from changes in their deep structures. For example, two lexical units of the verb *znít* ‘sound’ (e.g., *Sálem zní chorál.* ‘A choral singing sounds in the hall.’ – *Sál zní chorálem.* ‘The hall sounds with choral singing.’) manifest similar changes in their deep and surface syntactic structures as lexical units of the verbs *hučet* ‘roar’, *chrastit* ‘rattle’, *bzučet* ‘buzz’, *blýskat se* ‘shine’, *vonět* ‘smell’, etc. For representation of lexicalized alternations in VALLEX see esp. (Kettnerová et al., 2012a).

related by particular relations (Mel’čuk, 2004; Apresjan, 1992).⁹ This type of the verbal meaning can be characterized by semantic roles, by lexical conceptual structures, by semantic graphs, etc. For the purpose of simplification, we further describe the situational meaning by a set of semantic roles assigned to situational participants; we explicitly call attention to relations among participants only where it is relevant. As for the structural meaning, it represents a structural part of the meaning of a lexical unit of a verb – in FGD, it corresponds to the valency frame and its members are represented by individual valency complementations.

Grammaticalized alternations differ from each other in systemic changes in the correspondence between situational participants and valency complementations and their mapping onto surface syntactic positions. Reciprocity is characterized by a symmetrical relation into which two situational participants enter;¹⁰ as a result of this symmetry, each valency complementation onto which these two situational participants are mapped in unreciprocal structure corresponds to both situational participants at the same time. Despite the complex correspondence between situational participants and valency complementations, the mapping of valency complementations onto surface syntactic positions is maintained, see Figure 1.

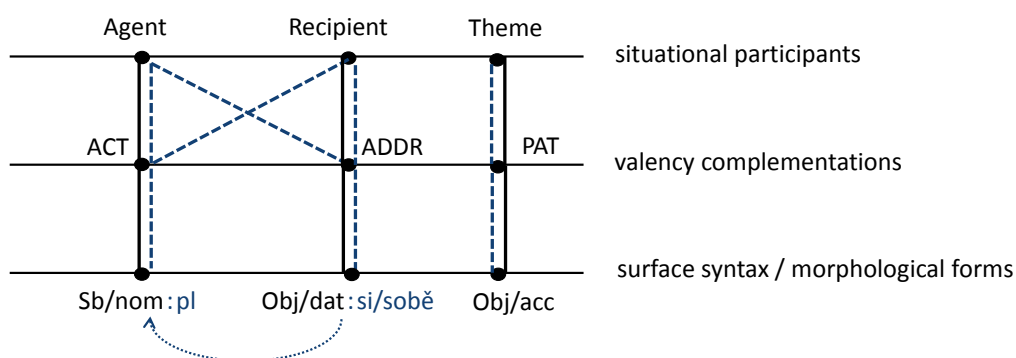


Figure 1: Correspondence among situational participants, valency complementations and their morphological forms for example (3); the solid lines mark the correspondence in the unreciprocal structure, the dashed lines mark the correspondence in the reciprocal structure.

The symmetrical relation between two situational participants expressed in reciprocal structures has specific morphological and lexical markers. First, the surface position that is more prominent – prototypically subject (if subject is not involved, it is direct object) – has a plural meaning. This meaning can be expressed syntactically as coordination, morphologically as plural, or lexically as a collective noun. Second, the less prominent surface syntactic position is lexically expressed by the reflexive pronoun coreferring with the more prominent surface position. Reciprocity in Czech has thus the same marking as reflexivity; however, additional grammatical and/or lexical markers usually disambiguate between reciprocity and reflexivity, see also the comment on reciprocity and reflexivity at the end of this Section.

Let us exemplify the above described changes in morphosyntactic structure of reciprocal constructions on the verb *svěřovat* ‘to entrust’, example (3). The situational meaning of this verb is characterized by three situational participants: ‘Agent’, ‘Recipient’ and ‘Theme’; its structural meaning is described by the valency frame consisting of three valency complementations: ACT, ADDR, and PAT (3a). In unreciprocal constructions, each situational participant corresponds to a single valency complementation (‘Agent’ to ACT, ‘Recipient’ to ADDR, and ‘Theme’ to PAT), see Figure 1 and example (3b). In reciprocal constructions, ‘Agent’ and ‘Recipient’ enter into symmetry; as a result, ACT and ADDR with which ‘Agent’ and ‘Recipient’ are linked in unreciprocal structure, respectively, correspond to both these

⁹Such part of the verbal meaning is not syntactically structured, see esp. (Mel’čuk, 2004). Following the FGD principles, we do not formalize the concept of situational meaning here; instead, we use just intuitive and informal labels for situational participants.

¹⁰Rarely triplets of situational participants are in symmetry, e.g., *Petr, Jan a Pavel se sobě navzájem představili*. ‘Peter, John and Paul introduced themselves to each other.’. We leave these more complex cases of reciprocity aside here.

participants at the same time. Nevertheless, the mapping of ACT and ADDR onto surface syntactic position remains unchanged: ACT is still expressed as subject and ADDR as indirect object (3c) and (3d). In these reciprocal structures, the reciprocal relation between situational participants and their complex mapping onto valency complementations are grammatically marked (i) by the plural meaning of the subject position encoded by coordination (paratactic in (3c) or hypotactic in (3d)), and (ii) by the reflexive pronoun expressed in the indirect position, which corefers with subject.

- (3) a. *svěřovat* ‘entrust’ ... ACT_{nom} ADDR_{dat} PAT_{acc}
 reciprocity: ACT-ADDR
- b. *Jana svěřuje děti sestře Marii.*
 Jane_{ACT.nom.sg} entrusts_{pres.3sg} children_{PAT.acc} sister Mary_{ADDR.dat.sg}
 ‘Jane entrusts her children to her sister Mary.’
- c. *Jana a Marie si (vzájemně) svěřují děti.*
 (Jane_{nom.sg} and_{conj} Mary_{nom.sg})_{ACT} REFL_{ADDR.dat} (to each other) entrust_{pres.3pl} children_{PAT.acc}
 ‘Jane entrusts her children to Mary and at the same time Mary entrusts her children to Jane.’
- d. *Jana s Marií si (vzájemně) svěřují děti.*
 (Jane_{nom.sg} with_{prep} Mary_{instr.sg})_{ACT} REFL_{ADDR.dat} (to each other) entrust_{pst.3pl} children_{PAT.acc}
 ‘Jane entrusts her children to Mary and at the same time Mary entrusts her children to Jane.’

However, the reflexive pronoun, as one of the grammatical markers of reciprocity, is not prototypically expressed with the verbs that bear the feature of reciprocity in their lexical meanings, see (4c) and (5c).

- (4) a. *diskutovat* ‘discuss’ ... ACT_{nom} ADDR_{s+instr} PAT_{acc,nad+instr,o+loc}
 reciprocity: ACT-ADDR
- b. *Přednášející diskutoval s kolegou hebrejsky.*
 lecturers_{ACT.nom.sg} discussed_{pst.3sg} with colleague_{ADDR.s+instr} Hebrew
 ‘The lecturer discussed with his colleague in Hebrew.’
- c. *Přednášející spolu diskutovali hebrejsky.*
 lecturers_{ACT.nom.pl} together discussed_{pst.3pl} Hebrew
 ‘The lecturers discussed with each other in Hebrew.’

Example (5) illustrates the above described changes in morphosyntactic structure of reciprocal constructions when subject is not involved. The reciprocity is grammatically marked by the plural meaning of the direct object position expressing PAT; in this case, the indirect position of EFF is not expressed on the surface (and the reciprocal interpretation is thus often stressed by lexical expressions like *spolu* ‘together’ or *vzájemně* ‘each other’).

- (5) a. *porovnat* ‘compare’ ... ACT_{nom} PAT_{acc} EFF_{s+instr}
 reciprocity: PAT-EFF
- b. *Článek porovnává prognózu se skutečností ...*
 paper_{ACT.nom.sg} compares_{pres.3sg} prognosis_{PAT.acc.sg} with reality_{EFF.s+instr.sg} ...
 ‘The paper compares the prognosis with the reality...’
- c. *Článek spolu / vzájemně porovnává prognózu a skutečnost ...*
 paper_{ACT.nom} together / each other compares_{pres.3sg} (prognosis_{acc.sg} and_{conj} reality_{acc.sg})_{PAT} ...
 ‘This paper compares the prognosis and the reality...’

In the data component of the VALLEX lexicon, the information on the possibility of a lexical unit of a verb to create reciprocal constructions is recorded in the attribute ‘reciprocity’ assigned to the given lexical unit; the value of this attribute is the pair (or triplet in exceptional cases) of the valency complementations involved in reciprocity (e.g., ACT-PAT for *potkat* ‘meet’ (1a), ACT-ADDR for *svěřovat* ‘entrust’ (3a) and *diskutovat* ‘discuss’ (4a), and PAT-EFF for *porovnat* ‘compare’ (5a)).

In VALLEX, reciprocity is indicated with more than 30% of lexical units of verbs, see Table 1; the vast majority belongs to the reciprocity affecting subject as the more prominent position. Let us stress that a single lexical unit may create reciprocal constructions involving different pairs of valency complementations, as is exemplified by (6).

LUs in total	6 711
LUs with indicated reciprocity	2 039
reciprocity involving subject	2 074
reciprocity not involving subject	93

Table 1: Basic statistics of reciprocity in VALLEX.

- (6) a. *lhát* ‘lie’ ... ACT_{nom} ADDR_{dat} PAT_{o+loc,dcc}
 reciprocity: ACT-ADDR
 reciprocity: ACT-PAT
- b. *Jan manželce lhal o svých výdajích.*
 John_{ACT,nom.sg} wife_{ADDR,dat.sg} lied_{pst.3sg} about his expenses_{PAT,o+loc}
 ‘John lied to her wife about his expenses.’
- c. *John a jeho manželka si lhali o svých výdajích.*
 (John_{nom.sg} and_{conj} his wife_{nom.sg})_{ACT} REFL_{ADDR,dat} lied_{pst.3pl} about their expenses_{PAT,o+loc}
 ‘John and his wife lied to each other about their expenses.’
- d. *John a jeho manželka o sobě soudci lhali.*
 (John_{nom.sg} and_{conj} his wife_{nom.sg})_{ACT} about REFL_{PAT,o+loc} judge_{ADDR,dat.sg} lied_{pst.3pl}
 ‘John and his wife lied to the judge about each other.’

Comment on reciprocity and reflexivity: With verbs allowing for reciprocity alongside with syntactic reflexivity, the lexical expressions bearing reciprocal meaning disambiguate between reciprocal and reflexive structures. For example, the Czech sentence in (6d) can be interpreted either as reciprocal (‘John and his wife lied to the judge about each other’), or as reflexive (‘John and his wife lied to the judge about themselves’); its homonymy can be eliminated by the presence of the lexical marker (e.g., *vzájemně* ‘each other’). The formal overlap between markers of reciprocity and reflexivity is not limited to Czech but it is attested as a pervasive cross-linguistic phenomenon, see (Maslova, 2008).

5 System of Rules for Reciprocity in VALLEX

Reciprocity, as one of productive grammatical processes, can be described by grammatical rules. Let us demonstrate the system of rules characterizing changes in reciprocal surface syntactic structures of lexical units of verbs, as they are captured in the grammar component of VALLEX. We illustrate this system on one of the core types of reciprocity, on reciprocity involving ACT and ADDR (e.g., (3c), (3d) and (4c)); this type of reciprocity is indicated in the data component of the lexicon with 614 lexical units of verbs. The proposed rules – applied to the valency frames stored in the data component of the lexicon – allow for the derivation of grammatical patterns describing reciprocal structures. In case of reciprocity involving ACT and ADDR, two rules are successively applied to the relevant valency frames: the basic rule and one of the set of supplementary rules.

- *The basic rule.* The basic rule describes changes common for all lexical units of verbs allowing for the given type of reciprocity, namely a plural meaning of ACT and the resulting change in subject-verb agreement, see Figure 2.
- *The supplementary rules.* There are six supplementary rules formulated for reciprocity involving ACT and ADDR; their choice depends on the morphological form of ADDR; the overview of supplementary rules is given in Figure 3. These rules determine the morphological form of the reflexive pronoun expressing ADDR. Further, lexical expressions stressing reciprocal meaning are specified as their choice is conditioned by the form of ADDR.

Let us demonstrate one of the supplementary rules in more detail, see Figure 4 and example (7). This rule is applied to lexical units of verbs under the following conditions: they have the value ACT-ADDR in the attribute reciprocity (recipr: ACT-ADDR), their ADDR is in the dative (ADDR(dative)), and they are

Reciprocity ACT-ADDR		
Basic rule: change of verb form, agreement		
conditions:	recipr: ACT-ADDR ACT(nominative) & ADDR	
actions:	agreement: form of ACT:	number+gender+person, ACT * → nom : plural

Figure 2: The basic rule for the ACT-ADDR reciprocity (the asterisk indicates that all forms of ACT, the nominative as well as other possible morphological forms, are subject to the given change).

functor	original form		reciprocal form(s)	comment on the form of the reflexive pronoun	lexical expressions
ADDR	dat	→	<i>si / sobě</i>	dative clitic or strong form (with irreflexive verbs)	<i>navzájem, vzájemně</i> and/or <i>mezi sebou</i> 'each other, one another'
	dat	→	<i>sobě / ∅</i>	dative strong form (with reflexive verbs)	* <i>navzájem, vzájemně</i> and/or <i>mezi sebou</i> 'each other, one another'
	acc	→	<i>se / sobě</i>	accusative clitic or strong form	<i>navzájem, vzájemně</i> and/or <i>mezi sebou</i> 'each other, one another'
	gen	→	<i>sebe / ∅</i>	genitive strong form	* <i>navzájem, vzájemně</i> and/or <i>mezi sebou</i> 'each other, one another'
	s+instr 'with'	→	∅	not expressed (verbs with reciprocity feature in their lexical meanings)	<i>spolu</i> 'together' and/or <i>navzájem, vzájemně</i> and/or <i>mezi sebou</i> 'each other, one another'
	k+dat 'to'	→	<i>k sobě</i>	strong form in the respective case	<i>vzájemně, navzájem</i> 'each other, one another'
	<i>mezi+4</i> 'between'	→	<i>mezi sebe</i>		
	<i>na+4</i> 'to'	→	<i>na sebe</i>		
	<i>na+6</i> 'to'	→	<i>na sobě</i>		
	<i>proti+3</i> 'against'	→	<i>proti sobě</i>		
<i>před+4</i> 'before'	→	<i>před sebe</i>			
<i>před+7</i> 'before'	→	<i>před sebou</i>			

* emphasizing lexical expression must be present if the reflexive pronoun is not expressed on the surface

Figure 3: Reciprocity ACT-ADDR: change of forms of ADDR (overview).

represented by the reflexive lemmas (SE|SI).¹¹ The rule determines that in reciprocal structures, ADDR is expressed either in the strong form of the reflexive pronoun, or it is not expressed at all (*sobě / ∅*) (the asterisk indicates that all forms of ADDR, the dative as well as all other possible morphological forms, are subject to the given change). Further, the rule stipulates that in reciprocal structures, ADDR in the prescribed form is obligatorily present in the deep structure. In case that ADDR has the null lexical form, either of the listed lexical expressions must be expressed, see example (7c). The absence of the reflexive pronoun in reciprocal structures of reflexive verbs results from the haplology of the clitic form of the reflexive pronoun and the reflexive morpheme of verb lemmas, see (Rosen, 2014). As the haplology occurs, one of the main grammatical markers of reciprocal meaning is missing and its role is taken over by the lexical expressions (in reciprocal structures of irreflexive verbs, these lexical expressions emphasize the reciprocal meaning but they are not the main markers of reciprocity, see e.g. (3c)).

- (7) a. *svěřovat se* 'confide', reflexive variant ... ACT_{nom} ADDR_{dat} PAT_{s+instr}
reciprocity: ACT-ADDR

¹¹With these verbs, the particles *se* and *si* are classified as word-forming morphemes representing a part of their verb lemmas: *Reflexive tantum verbs* are verbs without corresponding irreflexive counterparts, e.g., *bát se* 'fear' (**bát*), *setkávat se* 'meet' (**setkávat*), *dít se* 'happen' (though the verb *dít* 'say' exists, it has completely different lexical meaning so these two verbs are classified as homographs). With *derived reflexive verbs*, the reflexive variants are systematically semantically related to their irreflexive variants, e.g., they express unintentional activities (e.g., *šířit* 'disseminate' – *šířit se* 'spread') or they signal reciprocity (*potkat* 'meet' – *potkat se* 'meet (together)', *svěřovat* 'entrust' – *svěřovat se* 'confide'), see also (Kettnerová and Lopatková, 2014).

Reciprocity ACT-ADDR Supplementary rule: ACT(nominative)-ADDR(dative), reflexive verbs		
conditions:	recipr: ACT-ADDR ADDR(dative) & SE SI	
actions:	form of ADDR: obligatoriness: lexical expressions:	* → sobě / ∅ ADDR if ADDR is not expressed, emphasizing lexical expression must be present on the surface <i>navzájem, vzájemně</i> and/or <i>mezi sebou</i> 'each other, one another'

Figure 4: The supplementary rule for the ACT_{nom} - $ADDR_{dat}$ reciprocity with reflexive verbs.

- b. *Jana se svěřuje Marii (se svými problémy).*
 $Jane_{ACT.nom.sg}$ confides_{pres.3sg} to $Mary_{ADDR.dat.sg}$ (with her troubles)_{PAT.s+instr}
 'Jane confides (her troubles) to Mary.'
- c. *Jana a Marie se vzájemně svěřují.*
 $(Jane_{nom.sg}$ and_{conj} $Mary_{nom.sg})_{ACT}$ to each other confide_{pres.3pl}
 'Jane and Mary confide to each other.'
- d. *Sobě se Jana a Marie svěřují, rodičům ale nikdy.*
 $REFL_{ADDR.dat}$ $(Jane_{nom.sg}$ and $Mary_{nom.sg})_{ACT}$ confine_{pres.3pl} but never to their parents
 'Jane and Mary confide to each other but never to their parents.'

In (7c) and (7d), the reciprocity of ACT and ADDR is expressed by (i) the coordinated ACT corresponding to subject (the basic rule, Figure 2) and (ii) either by the dative strong form of the reflexive pronoun *sobě* (7d), or in case that the reflexive pronoun is not present, by the lexical expression *vzájemně* 'each other' (7c) (the supplementary rule, Figure 4).

Conclusion

In this contribution, we have shown how the linguistic description of complex (but still systemic) changes characteristic of grammaticalized alternations can benefit from the integration of grammatical rules into a valency lexicon. As a case study, we have presented reciprocity in Czech: although a possibility to create reciprocal structures is lexically conditioned, their morphosyntactic structures can be derived by a set of formal rules. Based on detailed empirical observations, we have presented a model aiming at an economic and theoretically well-founded description of valency behavior of verbs as it has been developed for VALLEX, the Valency Lexicon of Czech Verbs.

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