Mapping out a construction inventory with LFG's (Lexical) Mapping Theory

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'The relation between the meaning and the syntax of lexical items is among the more frustrating issues in linguistics: on the one hand it seems clear that the meaning of a lexical item determines at least to some degree the syntactic behavior of its participant roles; on the other hand, attempts to characterize the relation explicitly tend not to be very successful' (Zaenen 1993: 129). This paper brings together several recent LFG proposals which have tackled this issue and provided a partial solution, and new research that complements them. I will demonstrate that together they can, for the first time, be considered a complete stand-alone tool to map out an inventory of constructions involving argument alternations in a language. I will exemplify this model with a handful of most common alternations, providing formalisations of the semantic and syntactic changes occurring at a-structure, as well as the corresponding f-structures. The concept of an optionally used argument position in the proposed model corresponds to Needham and Toivonen's (2011) and Toivonen's (2013) concept of 'derived arguments', but is not yet formalised. However, since a formalisation of 'derived arguments' is offered in the flexible semantic composition approach of Asudeh et al. (2008) and Asudeh and Giorgolo (2012), and the Asudeh at al.'s model does not have an adequate Mapping Theory component (assuming only that 'some version of Mapping Theory' would derive the required syntactic subcategorization frames for the predicates from argument structure; 2008: 79), it conceivable that, with some adjustments, the present approach and Asudeh et al.'s approach could be demonstrated to be complementary.

In the present model, predicates are considered to be related to each other by lexical derivations (e.g. *open*$_{tr}$ and *open*$_{intr}$), via 'voice' alternations (e.g. active and passive), simple semantic extensions (e.g. *eat*$_{intr}$ and *eat*$_{tr}$), and alternative basic mappings (e.g. *spray paint on the wall* vs *spray the wall with paint*). Argument structure is considered to be a repository of valency templates which instantiate particular operations (e.g. anticausativisation, passivisation) and alternative mapping options. Particular classes of verbs fit particular templates. The templates provide the output which can be related to f-structure and c-structure via projections, as proposed by Butt et al. (1997) (with an important difference that the proposed model of a-structure does not involve atomic semantic roles, as these have long been considered inadequate, see e.g. Levin and Rappaport Hovav 2005). Some alternations are morphologically marked and others unmarked; the proposed model interfaces correctly with different types of morphological realisation as well as with (morphological and) syntactic realisation as in the periphrastic passive. (In this way, I concur with researchers who have argued that LMT is inadequately labelled as 'lexical'.)

The component parts of the present model – feature decomposition of basic argument functions; the interpretation of the features [+/– r/o]; the basic lexical valency template < arg_1 arg_2 arg_3 arg_4 ... arg_n>, the rules for mapping participants to the argument positions, the markedness hierarchy of syntactic functions, and the argument-to-function mapping principle – have been used in many variants of LMT, but the particular formulations are taken from Kibort (particularly 2007 and 2013).

Operations on argument structure can be classified into: morphosyntactic (meaning-preserving) and morphosemantic/morpholexical (meaning-altering), see e.g. Sadler and Spencer (1998: 208, 211). Morphosyntactic operations do not affect the semantic interpretation of the predicate or its arguments, they affect only the final mapping of grammatical functions to arguments by increasing their markedness (so that monotonicity is preserved). This will be illustrated with the **passive** and **locative inversion** constructions. Another meaning-preserving construction is the **impersonal**, where there is no disruption to the final mapping of functions to arguments, but the impersonal morphology introduces an obligatory non-overt *pro* with a particular set of agreement features. Morphosemantic operations change the interpretation of the roles of the predicate's participants, and therefore they need to be located in the lexical semantics (Ackerman and Moore 2013: 10ff). In this way, the (L)MT algorithm that determines grammatical functions can remain monotonic and be entirely dependent on the classificatory features (2013: 18). Morphosemantic operations will be illustrated with the **instrument-causer alternation**, the ***swarm* alternation**, the **dative shift**, and the **anticausative**.

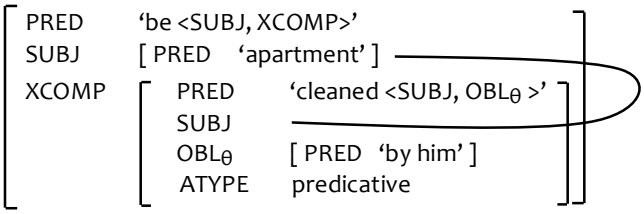
The important new component of the present proposal regards the type of the semantic information required by the mapping mechanism. I draw four crucial insights from Zaenen (1993): [1] lexical meanings of verbs do not model our knowledge of the world, but represent conventionalised meanings of words; [2] the lexical meaning of a verb encodes the verb's availability to be interpreted in a certain range of ways, according to some semantically definable characteristics (which Zaenen terms *dimensions* and the present proposal terms *semantic markers*, but which are not equivalent to semantic roles); [3] the only type of semantic information that is relevant to the system of rules which maps participants to functions is the participant's ability to map onto particular syntactic functions (this ability is captured via (L)MT's intrinsic features, which in Zaenen's model actually

represent the verb's semantic valency); [4] we need to identify classes of verbs that differ in their mapping patterns and attribute the distinctions to some semantic characteristics, but it is not necessary for the mapping mechanism to 'understand' the semantics in order to achieve correct mappings; the mapping system needs to 'see' only the appropriate labels in the lexical entries of verbs to allow the verb to appear with a particular syntactic configuration of its participants. For simplicity, in the present version of the model I encode the verb's participants with the relevant semantic markers labelled with numbers corresponding to the argument position on which they are allowed to map (e.g. 1 can map to arg_1, 4 can map to $arg_{4\text{-}n}$, 41 can map to $arg_{4\text{-}n}$ or arg_1, etc. according to language-specific mapping principles which will be illustrated in detail). Any language has a limited number of grammatical functions and a limited number of alternations, therefore the marker+argument position combinations end up corresponding to the traditionally identified semantic roles (e.g. 1 is typically an agent, but 41 is an 'intermediary' instrument or means that can be interpreted as a causer, etc.). Importantly, morphosemantic alternations are correctly captured with reference to the meaning component, while morphosyntactic alternations are correctly captured as involving only a manipulation of the syntactic intrinsic features.

Following specific rules, a-structure mappings produce the output for f- and c-structure in the form of templates (which can be re-drawn as AVMs) such as:

$passive_{pers}$	$passive_{impers}$	instr-as-causer	dative-shift
1 2	1	41 2	1 42 23
< arg_1 arg_2 ... >	< arg_1 ... >	< arg_1 arg_2 ... >	< arg_1 arg_2 arg_3 ... >
OBL_θ SUBJ	OBL_θ	SUBJ OBJ	SUBJ OBJ OBJ_θ

When the a-structure operation has no morphological exponence or is realised with simple derivational morphology marked on the verb, the corresponding f-structures are straightforward (but had to be omitted from the abstract for reasons of space). However, when the realisation of an alternation involves syntax, the construction needs to be analysed more carefully to establish the correct f-structures. The periphrastic passive is a case in point: what is passive is not the main verb, but the construction which is expressed using a verb complex. The same verb complex can, however, also be used in a non-passive construction. Therefore, as was demonstrated in Kibort (2012): [a] the passive is correctly captured at a-structure (as above); [b] a morphological derivation (V --> $[V_{Part}]_{A/\ V}$) produces a resultative participle which can be a full-fledged adjective, and has the right semantic orientation to suit the a-structure of the passive construction; [c] the verb complex used in both the passive and non-passive constructions should be analysed at f-structure as a copula + predicative adjective, for example as in the following slightly simplified f-structure for *The apartment was cleaned by him*:



The proposed model allows to create a straightforward construction inventory for a language, with the available a-structure operations being represented in the same way across languages regardless of their realisation. It can also be used without any additional mechanisms for applicative constructions and monoclausal morphological causatives. With some further distinctions regarding the subject grammatical function, it can handle syntactically ergative languages. It can also represent operations involving coindexation of referents. It may be a helpful step forward for computational grammars: although it is far from representing full lexical knowledge, it is sufficient to capture the fact that some alternations are determined by semantic factors, and to relate the alternating variants to one another. (One remaining issue which any LFG-based valency model will need to tackle and decide on is whether the current way of handling XCOMP dependents is satisfactory.)

♦Ackerman, F. & J. Moore. 2013. Proto-properties in a comprehensive theory of argument realization. In: King, T.H. & V. de Paiva (eds) *From Quirky Case to Representing Space. Papers in Honor of Annie Zaenen.* CSLI. 9-20. ♦Asudeh, A., M. Dalrymple & I. Toivonen. 2008. Constructions with lexical integrity: templates as the lexicon-syntax interface. *Proceedings of LFG08*. ♦Asudeh, A. & G. Giorgolo. 2012. Flexible composition for optional and derived arguments. *Proceedings of LFG12*. ♦Butt, M., M. Dalrymple & A. Frank. 1997. An architecture for linking theory in LFG. *Proceedings of LFG97*. ♦Kibort, A. 2007. Extending the applicability of Lexical Mapping Theory. *Proceedings of LFG07*. ♦Kibort, A. 2012. Participles, adjectives, and the role of argument structure. *Proceedings of LFG12*. ♦Kibort, A. 2013. Objects and Lexical Mapping Theory (abstract). *Proceedings of LFG13*. ♦Levin, B. & M. Rappaport Hovav. 2005. *Argument Realization.* CUP. ♦Needham, S. & I. Toivonen. 2011. Derived arguments. *Proceedings of LFG11*. ♦Sadler, L. & A. Spencer. 1998. Morphology and argument structure. In: Spencer, A. & A. Zwicky (eds) *The Handbook of Morphology*. Blackwell. 206-236. ♦Toivonen, I. 2013. English benefactive NPs. *Proceedings of LFG13*. ♦Zaenen, A. 1993. Unaccusativity in Dutch: an integrated approach. In: Pustejovsky, J. (ed.) *Semantics and the Lexicon.* Kluwer. 129-161.