Modeling situation types in a multi-resource setting

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Classical research scenarios can be explored anew given recent resource developments such as ImagAct[1], TypeCraft,[2] and Grammar modeling using Typed Feature Structures (TFS)[3]. Relative to ImagAct, a scene together with its caption is what we may call a *construction level sign*. The same scene together with a caption in a different language is a different construction level sign, since the 'form' part belongs to a different language; but we assume that the 'content' part of these signs is the same (provisos for when a scene has different interpretations – then there are as many 'contents' as there are interpretations).

We assume that the various lexical parts of a caption, and perhaps the syntactic structures of their combination, have an identifiable content by themselves, such that these contents add up to the meaning expressed by the caption as a whole. We outline a system of meaning representation where both a caption as a whole and its constituent parts are correlated with attribute-value matrices (AVMs), such that the 'sub'-AVMs of the parts are unified to form an AVM of the whole. The TFS format allows us to model the unification aspects of such systems, whereas TypeCraft allows us to represent the morpho-syntax and the semantics of each caption in an online database, independently of the processing mechanisms.

Exploring these research scenarios in the context of the resources mentioned, these resources can be made serve in applications such as translation, language teaching, typological research, and more. We demonstrate the approach as follows:

1) Captions in Norwegian of 150 ImagAct scenes have been morpho-syntactically annotated and stored in the online annotation and database system TypeCraft: each caption is provided with a scene identifier, residing in the system internal ImagAct url, and a selected English caption for the scene: Figure 1 shows an example from the TypeCraft annotation editor, and Figure 2 a view from the media-wiki presentation connected to the database.
2) German captions of the same 150 scenes are annotated in TypeCraft in the same way. The English captions (in addition to the scene urls) provide an immediate link between the Norwegian and German text collections, and the morpho-syntactic annotations now constitute a detailed parallel corpus for morphological, syntactic and semantic analysis, at construction as well as word level.
3) The 'content' of a scene may be roughly divided into a *situation type* component and an *aspectual/Aktionsart* component. Compared to what current linguistic frameworks refer to as 'semantic argument structure',[4] a situation type description is more detailed, but can be explicitly connected with the former, as well as with grammatical information; an AVM

[1] See Moneglia, M. (2013); http://lablita.dit.unifi.it/projects/IMAGACT.
[2] See Beermann and Mihaylov 2013; http://typecraft.org/tc2wiki/Main_Page.
[3] See Copestake 2002.
[4] See, e.g., Levin and Rappaport 2008.

format within TFS accommodating all these concerns is illustrated in Figure 3, where one sees 'grammatical functions' (GF) with referential links into three layers of semantic representation: ACT1, ACT2, …, role labels distinguishing among these participants, and SIT-TYPE opening for a far richer array of situation and aspect types, all layers with explicit links to the other layers.

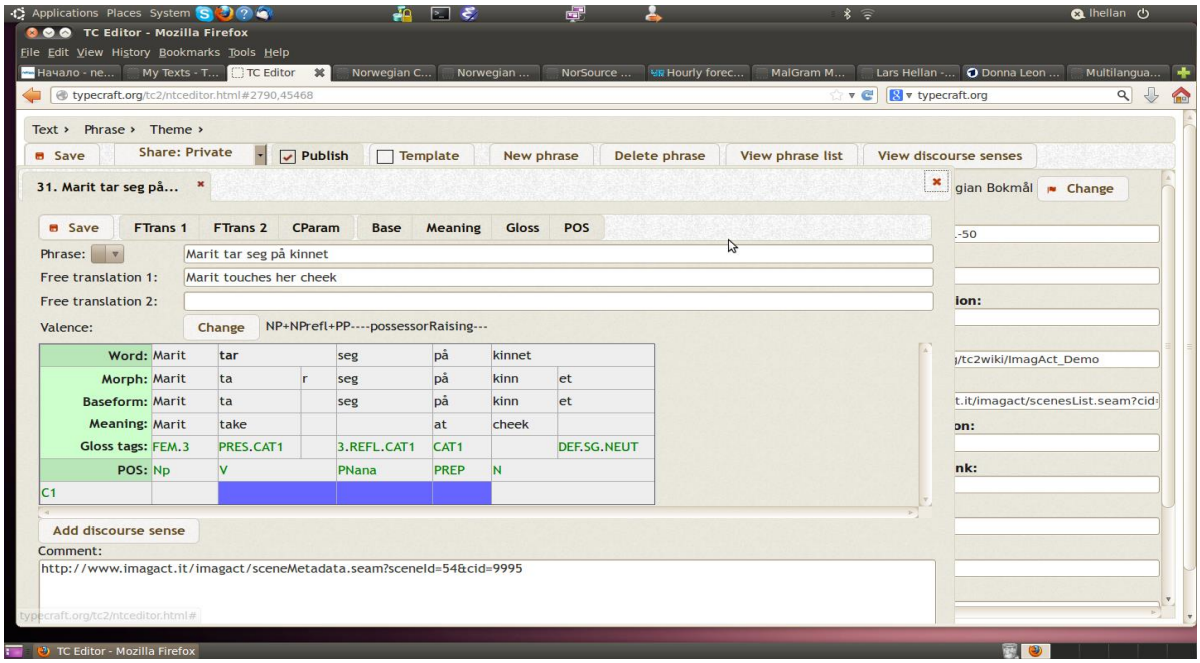

Fig. 1 – Annotation in TypeCraft Editor

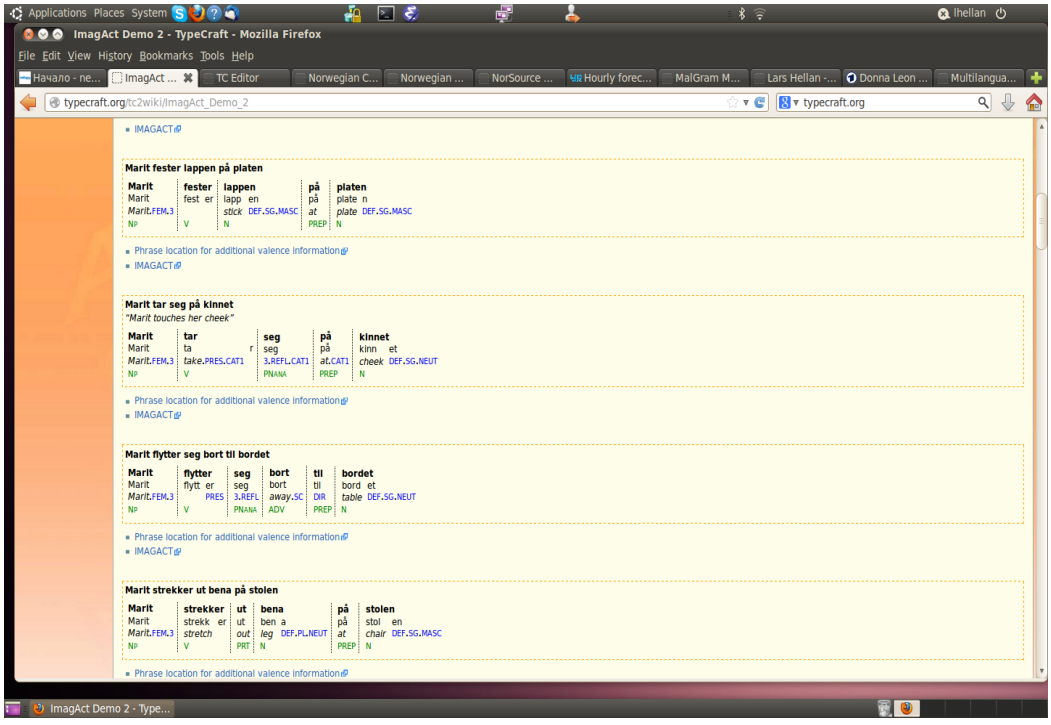

Fig. 2 – View of annotation in TypeCraft wiki (second item being the export from Editor shown in Figure 1)

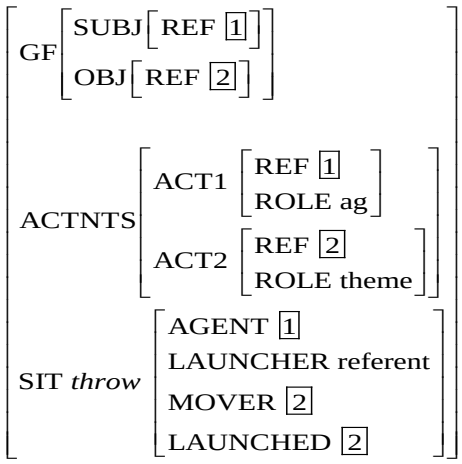

Fig. 3 – AVM showing syntactic and three layers of semantic specification

We develop a system of situation types that concisely (and non-circularly, as far as labeling of notions is concerned) allows us classify all the scenes, both from the viewpoint of holding them apart, and from the viewpoint of accounting for their compositionality relative to each language. To illustrate the design of a situation type system, it will look be a multiple inheritance hierarchy, where 'sub-sorting' attributes and their values are regulated by the following principles (cf. Copestake 2002): *[A]* A given type introduces the same attribute(s) no matter in which environment it is used. *[B]* A given attribute is declared by one type only (but occurs with all of its subtypes).

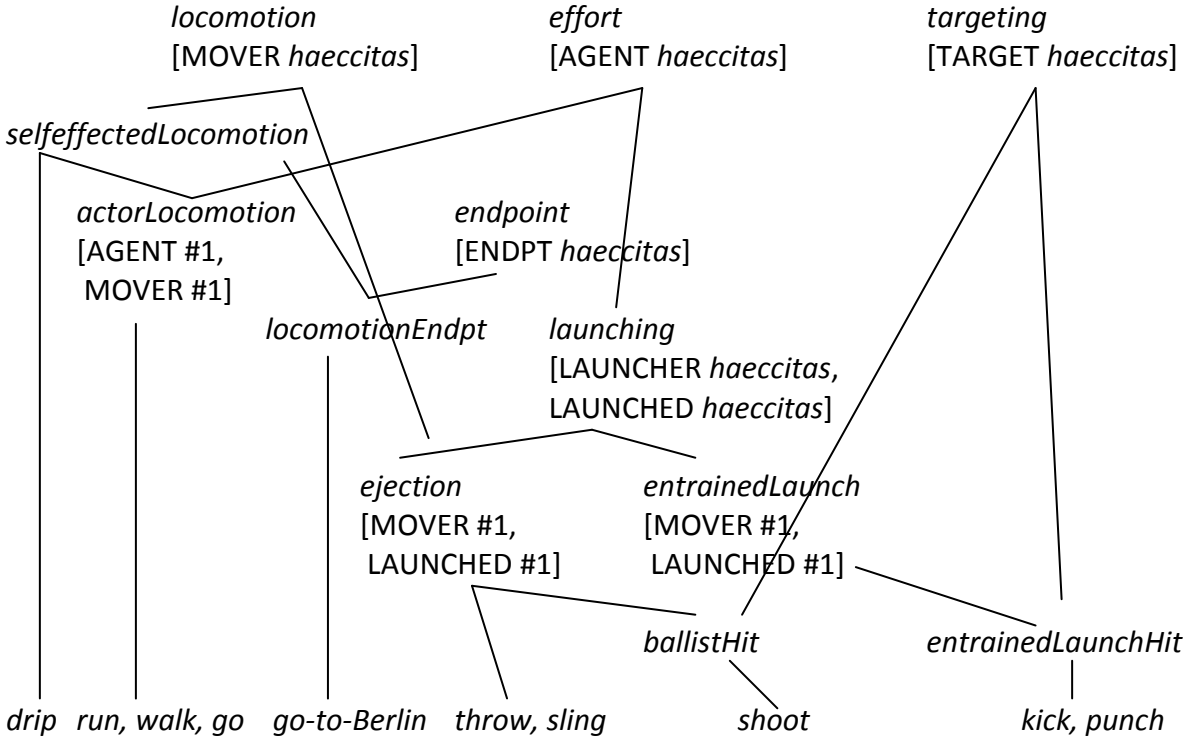

Fig. 4 – Excerpt of a possible situation-type hierarchy

The 'leaf' node names here do not represent English lexemes with the spelling indicated, or the meaning of such lexemes, but are indicators of the 'inherited' content resulting from the semantic categories represented by the types and attributes given in the hierarchy. The leaf nodes themselves thus either directly represent a scene of ImagAct, or subsume one or more scenes. Scene captions, when annotated in TypeCraft, get a value reflecting the scene type in question. (Related attempts at linking ImagAct to ontology have been made between the IMAGACT scenes and the BabelNet synsets; also a basic version of IMAGACT ontology has been linked to OWL, with a mapping onto the Lemon model (http://lemon-model.net/); what we are here presenting may eventually fit into these formats, but for the development of the situation hierarchy itself, the present format provides both preciseness and flexibility, and a linkage to the grammar system.)

Pulling these components together, TypeCraft allows for XML export of all annotations to other resources, among them the formalism of a TFS grammar exemplified in Figure 3. In this way, all the resources mentioned at the outset – ImagAct for semantic representation, TypeCraft for morpho-syntactic and semantic annotation, and the TFS formalism for holding these together in an independent formalism – can be developed in step, with the information types represented by each component supplementing each other and amenable for use in dedicated dimensions.

References

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