Modelling Dynamics – A Frame-based Classification of Eventities

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In this talk, we will deal with the problem of assigning Aktionsarten, i.e. the determination of classes of events and similar entities ('eventities', Zaefferer 2002). Generally, this is done with the aim to attribute a common semantic description to eventities of the same class – and thus to verbs coding such eventities. The most prominent and prevailing classification is Vendler's (1957), which tried to classify English verbs into the well-known classes *states*, *activities*, *achievements*, and *accomplishments*. Most attempts to classify verbs differ in the classifying criteria they assume. Amongst those are telicity (inherent boundedness), dynamicity, durativity, causativity, repetivity, punctiformity, and others (cf., e.g., Egg 1994, Filip 2011, Rapp 1997, Schalley 2004, Wanner 1999).

It is generally accepted that there are problems with the classification of verbs, however, because any such classification has to take the complements of verbs and other modifications into account (cf., e.g., Beavers in press, Filip 2008, 2011, Jackendoff 1996, Rothstein 2004). Examples are given in (1)–(3). Their Vendler classification (provided on the right hand side) shows that an unambiguous class assignment is not possible for any of these verbs (*eat*, *push*, *cross*), but only for the underlying eventities or state of affairs as expressed by the whole utterance.

(1)	a.	*John ate an apple.*	accomplishment
	b.	*John was eating an apple.*	activity
(2)	(a., b.: Jackendoff 1996: 309, c. adapted from ibid:308)		
	a.	*Bill pushed the cart down the hill in two minutes.*	accomplishment
	b.	*Bill pushed the cart down the hill for two minutes.*	activity
	c.	*Bill pushed the cart for/*in two minutes.*	
(3)	(Beavers in press)		
	a.	*The settler will cross the border in an hour.*	achievement
	b.	*The settler will cross the desert in an hour.*	accomplishment
(4)	a.	*The army will cross the border in an hour.*	[ambiguous]
	b.	*The army crossed the border in an hour.*	accomplishment

Example (1) shows the outscoping effect of grammatical aspect (*ate* vs. *was eating*), (2a,b) the impact of temporal adverbial modification (*in* vs. *for two minutes*), (2a,c) the telicity difference triggered by the presence of the path PP *down the hill* (2a is telic, 2c not), and (3a,b) illustrate the effect of the direct object (*border* vs. *desert*), i.e. whether the referent of the direct object is simplex or complex (Beavers in press). Example (4a) is ambiguous between whether the army will perform the crossing at a particular point in time, or whether within the extended period of one hour the crossing of all soldiers will have been completed. The same utterance in the past tense is not ambiguous any more but an accomplishment, as shown in (4b).

Aspectual composition and the investigation how all those elements interplay in the construction of such sentences' interpretations and how appropriate interpretations can be predicted and generated has been a major focus of research (cf. previous references, and Dowty 1979, Krifka 1989, Tenny 1994, Verkuyl 1972, 1993, amongst others).

In contrast to this, we will approach this classification question from an onomasiological perspective and hence, rather than starting from linguistic expressions, ask the following questions: (i) "Which eventity classes are conceivable from a conceptual point of view? How do they differ from each other?" and (ii) "Can reflexes of these classes be found in natural language?" The first question concerns the nature of such conceptual classes, the second questions how such class concepts are coded in language and whether language distinguishes them.

Such an approach requires us to generate eventity classes using a language-independent approach, and to represent these eventity classes and in particular their internal structure. For this, we use modelling techniques from computer science, more specifically from the well-tested object-oriented paradigm, which has proven as very suitable for conceptual modelling more generally. The Unified Modelling Language (UML), the de-facto standard in object-oriented design and development, will provide the methodological background. Starting from some of its basic dynamic modelling elements – state, transition, and communication (causation) – we systematically generate a family of possible conceptual configurations, which are taken to represent eventity classes. The modelling elements are adapted from the UML (Schalley 2004), in particular from the UML's state diagrams. An extract of an example modelling for the class of achievements is given in Figure 1. Participant *x* undergoes a change of state (or 'transition') from an unspecified source state into a specified target state, with the transition not being conceptualized as durative in any way.

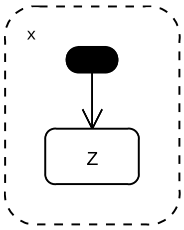

Figure 1. Achievement

In a systematic way, a language-independent classification is thus built up, resulting in a family of categories which we show to expose linguistically relevant differences (thereby addressing question (ii) above). Object-orientation hence allows for adequate conceptual models that are pertinent to linguistics and help support the forming of linguistic hypotheses and predictions. In particular, structural differences such as Beaver's (in press) distinction into atom, simplex, and complex are made explicit in the graphical modelling, as we will show. Finally, we demonstrate how such a classification can be represented through recursive frames (applying Schalley 2007), using attribute-value matrices (AVMs) as representation tool, and how this rather foreign concept of object-orientation can thus be embedded in a more customary linguistic representation format. An outline of the AVM representation for achievements is given in Figure 2.

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$$
\begin{bmatrix}
\text{T\_para} & \begin{bmatrix} \text{«inherited» } x : \texttt{Entity} \\ z : \texttt{StatalQuality} \end{bmatrix} \\
\text{Class} & \begin{bmatrix} \text{name} = \texttt{Achievement} \\ \text{super} = \texttt{ChangeOfState} \end{bmatrix} \\
\text{TempSpat} & \begin{bmatrix} \text{«inherited» time} : \texttt{TemporalQuality} = Interval \\ \text{«inherited» location} : \texttt{SpatialQuality} \end{bmatrix} \\
\text{SubStruc} & \begin{bmatrix} \text{«inherited» sourceState} : \texttt{Eventity} \\ \text{«inherited» transition} : \texttt{Transition} \\ \text{targetState} : \texttt{State} \end{bmatrix} \\
\text{Partic} & \begin{bmatrix} \text{«inherited» undergoer} = x \end{bmatrix} \\
\text{Qual} & \begin{bmatrix} \text{«inherited» srceQual} : \texttt{EventityQuality} = \_\__{unspecified} \\ \text{transQual} : \texttt{TransitionQuality} = instantaneous \\ \text{trgtQual} = z \end{bmatrix} \\
\text{Cond} & \left\{ \begin{array}{l} \text{«inherited» } \#\text{partic} \geq 1 \\ \text{«inherited» } \#\text{qual} \geq 1 \\ \text{«inherited» } \forall t \in \text{time } \exists q_i \in \text{qual} : \ holdsAt(q_i, t) \\ \text{«inherited» } \forall t_i, t_j \in \text{time}, holdsAt(srceQual, t_i), holdsAt(trgtQual, t_j) : t_i \leq t_j \end{array} \right\}
\end{bmatrix}
$$

Figure 2. AVM representation for achievements