

## Aspectual Composition in Minimal Recursion Semantics

Aspectual composition occurs when grammatical aspect (perfective and imperfective) and eventuality types (accomplishments, achievements, processes, states) carried by the verb phrase combine to trigger particular meanings. This aspectual composition may change the denotation of the eventuality type resulting to aspectual shifts (Moens and Steedman 1988, Jackendoff 1990, Pustejovsky 1995, Pulman 1997, Krifka 1998, de Swart 1998, Egg 2002).

An instance of this phenomenon is found in Modern Greek, where there is a contrast between perfective and imperfective aspect, overt in the morphology of the verb. The information grammatical aspect presents is affected by the eventuality it combines with, which is implicit in the meaning of the verb phrase. The accomplishment eventuality *write the letter* in (1) denotes a situation, which starts with the beginning of the *writing* and reaches a culmination with the completion of *the letter*. When this eventuality combines with perfective aspect in (1a), it retains its culmination point and the meaning does not change. When the same eventuality combines with imperfective aspect, it gets a shifted reading (1b) i.e. process or habitual reading.

- (1) a. O Giannis e -graps -e to gramma.  
the giannis Aug -write.Perf -3sg.Past the letter  
'Giannis wrote the letter' (basic reading)
- b. O Giannis e -graf -e to gramma.  
the giannis Aug -write.Imperf -3sg.Past the letter  
'Giannis was writing the letter' (process reading)  
'Giannis used to write the letter' (habitual reading)

The aspectual shifts involved are subtypes of type shifts, formalised with the usage of a functor argument relation:  $f(a)$ . In this case, there is a functor-argument relation between grammatical aspect and eventuality types (2):

- (2) *aspect(eventuality type)*

Aspect is instantiated into a perfective functor, which normally takes as argument accomplishments and achievements and an imperfective functor, which combines with processes and states. There are cases though where the argument is not the appropriate input for the functor as in (1b), where the imperfective combines with an accomplishment. However, there is no ungrammaticality involved but just reinterpretations occur, which remedy the conflict.

An explanation for these reinterpretations lies in the sphere of extralinguistic knowledge. In this case, the general relation  $f(Op(a))$  is used, where the operator  $Op$  added, given by pragmatic context. A major drawback of this approach is that these operators can not be appropriately constrained, so that they occur only where and when needed.

Different solutions have been provided where the operators are either constrained using a network of contingent aspectual relations (Moens and Steedman 1998), a *qualia structure*, where the possible selections are enlisted beforehand (Pustejovsky 1995) or underspecification in the selection is involved (Egg 2002).

The solution pursued in this paper is different. Following Michaelis (2004) and Pustejovsky (1995), we develop a highly constructed inventory of eventuality types, which consists of eventualities and their subeventualities. These interact with grammatical aspect, which adds or selects the whole or subparts of the eventualities according to its selection restrictions. Hence, there is no new material added by context but the one that is already there is appropriately constrained by grammatical aspect.

The analysis proposed follows the framework of Head-Driven Phrase Structure Grammar (HPSG) (Pollard and Sag 1994), using Minimal Recursion Semantics (MRS) for the semantic representations (Copestake et. al 2000). Hence, we introduce a number of relations, which

represent both the aspect functor and the eventuality type argument in (2). In the case of aspectual composition, the relations introduced are an aspectual relation of type *aspect-rel* and an eventuality relation of type *eventuality-rel*.

The *aspect-rel* introduces the features L(a)B(e)L and BINDS(3). The LBL has as value a *handle*, which identifies the relation and shows its scopal connection with other relations. The BINDS feature shows the eventuality the *aspect-rel* has to bind with and the event structure EVENT-STR feature the eventuality it gives back after the combination.

$$(3) \left[ \begin{array}{l} \textit{aspect-rel} \\ \text{LBL } \textit{handle} \\ \text{EVENT-STR } \textit{event-str} \\ \text{BINDS } \textit{event-str} \end{array} \right]$$

The eventualities are decomposed into parts so as aspect to be able to select the appropriate subpart in each case. Following Pustejovsky (1995), we support that each *eventuality-rel* has an event structure (EVENT-STR), whose value is a feature structure that consists of the subevents EVENT1 and EVENT2. Hence, the *transition-rel* in (4) introduces apart from the attributes LBL and SCOPE, the attribute EVENT-STR, which consists of two eventualities: an EVENT1 with value *process* and an EVENT2 with value a *state*. Their temporal ordering is guaranteed by the RESTR(iction) attribute, which states that there is a precedence temporal relation between EVENT1 and EVENT2.

$$(4) \left[ \begin{array}{l} \textit{transition-rel} \\ \text{LBL } \textit{handle} \\ \text{EVENT-STR } \textcircled{3} \left[ \begin{array}{l} \textit{event-str} \\ \text{EVENT1 } \textcircled{1} \textit{process} \\ \text{EVENT2 } \textcircled{2} \textit{state} \\ \text{RESTR } \{ \textcircled{1} \prec \textcircled{2} \} \end{array} \right] \end{array} \right]$$

In the aspectual composition, there is also an imperfective functor which places different constraints according to what its argument is. It consists of two arguments and is a type-selecting operator (Michaelis 2004). It selects process eventualities and returns an output of the same eventuality as the input. When it combines with transition eventualities as in (1b), it selects only the *process* subeventuality, which is appropriate for its selection type. This is guaranteed by the constraint in (5b), which states that when the input is a *transition-rel* then the output is just the *process* subevent.

$$(5) \quad \text{a. } F_{\textit{imperf}}(X,Y) = Z$$

$$\text{b. if } Y = \left[ \begin{array}{l} \textit{transition-rel} \\ \text{EVENT1 } \textcircled{1} \textit{process} \\ \text{EVENT2 } \textcircled{2} \textit{state} \end{array} \right], \text{ then } Z = \left[ \text{EVENT1} = \textcircled{1} \textit{process} \right]$$

Hence, when the *transition-rel* combines with the *imperf-rel*, this selects only the *process* subeventuality, leaving aside the EVENT2, which is the culmination point (6).

$$(6) \left[ \begin{array}{l} \textit{mrs} \\ \text{RELS } \left\langle \left[ \begin{array}{l} \textit{imperf-rel} \\ \text{LBL } \textcircled{1} \\ \text{EVENT-STR } F_{\textit{imperf}}(\textcircled{6},\textcircled{3}) \\ \text{BINDS } \langle \textcircled{3} \rangle \end{array} \right] , \left[ \begin{array}{l} \textit{transition-rel} \\ \text{LBL } \textcircled{2} \\ \text{EVENT-STR } \textcircled{3} \left[ \begin{array}{l} \text{EVENT1 } \textcircled{4} \textit{process} \\ \text{EVENT2 } \textcircled{5} \textit{state} \\ \text{RESTR } \{ \textcircled{4} \prec \textcircled{5} \} \end{array} \right] \end{array} \right] \right\rangle \end{array} \right]$$