CAUSATIVE CONSTRUCTIONS AND ASPECTUAL MEANINGS: A CASE STUDY FROM SEMITIC DERIVATIONAL MORPHOLOGY

REUT TSARFATY

Institute for Logic, Language and Computation
University of Amsterdam
`rtsarfat@science.uva.nl`

This work aims at identifying aspectual properties of events denoted by morphological causatives in Modern Hebrew (MH). The main purpose of this investigation is to establish a clear connection between causative constructions and aspectual meanings, two notions that are not so easily correlated. A secondary goal is to argue for the systematic aspectual contribution of Semitic derivational morphology. Our theory is inspired by Smith's causal chain and builds on a thematic account of Semitic derivational morphology. Combining a formal and empirical investigation we argue that the MH causative template *Hiph'il* shifts the viewpoint of an event onto its initiation and development phases, making it more appropriate for imperfective use.

1. Causative Constructions and Aspectual Meanings

MH exhibits three kinds of causative expressions that can be found across languages: (i) lexical causatives (ii) morphological causatives, and (iii) periphrastic causatives, illustrated in (1). The latter two kinds are termed causative constructions. Morphological causatives in MH are derived by fusing consonantal roots with the consonant/vowel skeleton known as the causative template *Hiph'il*.

(1)	Fred harag et Bill	Fred hemit et Bill	Fred garam leBil lamut
	Fred killed ACC Bill	Fred die.*Hiph'il* ACC Bill	Fred caused to-Bill to-die
	Fred killed Bill	Fred made Bill dead	Fred caused Bill to die

Morphological causatives in MH give rise to a wide range of meanings that does not necessarily coincide with causation in its strict sense. For example, the MH causative verb $he'ek\check{i}l$ (feed) is derived from the root $[a][\check{k}][l]$ (eat) although it is debatable whether 'feed' is equivalent to 'cause to eat'. This work aims at identifying the aspectual properties shared by such derived verbs.

As of yet, research into lexical semantics has not shown a systematic correlation between causative constructions and aspectual meanings. In particular, Levin 2000 shows that causatives cannot be reduced to any one kind of *Aktionsart*. However, causatives are valence increasing operations thereby encoding speakers' choice to incorporate an additional element (a cause) into the event description. This makes

them aspectually marked as well. Further, causatives are typically analyzed as complex situations consisting of two, causally related, events. Yet, Song 2001 makes the typological observation that the causing event is highly abstracted and has no specific lexical content. This allows us to restrict our analysis to the caused predicate and contrast its aspectual meaning with the respective unmarked predicate.

The key idea is that internal structure of events and the thematic content of their participants are intertwined. We view participants as elements in the temporal extension of an event, and show how marked thematic relations affect aspectual content. Such an approach allows one to formally investigate aspectual meanings in languages that do not grammaticalize aspect, yet mark thematic relations by formal means.

2. The Causal Chain

To make the desired link between aspectual meanings and causative constructions we devise a proposal inspired by the *causal chain* presented in Smith 1991. Smith uses the causal chain to distinguish aspectual classes (*Aktionsarten*) of verbal expressions based on how much of the chain is covered. The order from left to right is iconic to temporal precedence: CAUSE SUBJECT ACTION OBJECT RESULT[1]. Smith's schematic description is informal and does not allow to make precise predictions. In particular, it is unclear which situations are characterized by the CAUSE element.

To remedy this, I first draw a distinction between a 'cause' relation and a 'CAUSE' element. A 'cause' relation is a relation between any two adjacent elements in the causal chain. In the current account, a 'cause' relation entails temporal precedence. Using a simplified chain and the 'cause' relation we can represent the Aktionsarten.

(2)   a.   State .... RESULT

       b.   Activity ....SUBJECT ACTION................................

       c.   Achievement .... ACTION OBJECT RESULT

       d.   Accomplishment SUBJECT ACTION OBJECT RESULT

Causative constructions contribute a 'CAUSE' element which is crucially disjoint from elements already existing in the representation of a given situation[2]. The 'CAUSE' stands in 'precedes' and 'cause' relations to the elements in the given chain. Since not all situations map onto the entire span, the emergent chains give rise to the event interpretations in (3). The 'CAUSE', which is lexically underspecified, extends the representation to include the immediately preceding element.

(3)   a.   A caused state ....CAUSE RESULT

       b.   A caused activity CAUSE SUBJECT ACTION ....

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[1]We collapse INSTRUMENT into ACTION as they temporally overlap (cf. Smith 1991, page 34).
[2]I use the term CAUSE in its broad sense here, and the participant associated with the 'CAUSE' need not be an instigator and not even volitional. The observation which is pertinent to the aspectual account is that the 'CAUSE' element serves as a precondition for the initiation/progression of the caused event.

    c.   A caused achiev. ....CAUSE ACTION OBJECT RESULT

    d.   A caused accomp CAUSE SUBJECT ACTION OBJECT RESULT

Further, marking a 'CAUSE' focuses the linguistic description on the forces behind the initiation and development of the event, thus altering its aspectual viewpoint. A similar shift characterizes periphrastic constructions using the aspectual verbs 'start' and 'continue'. Smith 1991 terms such morphemes *super-lexical morphemes* as they "modulate the focus of a situation rather then determining the situation itself".

3.   Modern Hebrew Morphological Causatives

Verbs in MH are derived from tri-consonantal roots plugged into templates of consonant/vowel skeletons termed *binyanim*. Doron 2003 argues that the templates alter thematic relations in a predictable way. Following Dowty 1991, it is widely accepted that thematic properties are selected in accord with the event denoted by the verb. Here we hypothesize that the converse also holds, i.e. that the event structure of a derived verb changes to accord with the altered thematic relations.

Similar to Doron 2003, we assume a narrow lexicon consisting of coarse-grained roots. Roots have basic meanings that can be *approximated* by plugging them into the so-called 'simple template' (a.k.a. *Pa'al*) which is morphologically and thematically unmarked. These basic meanings induce a preliminary classification of Aktionsarten. Doron shows that the causative template contributes an external participant that serves as the cause to the event at hand. The addition of an external participant that stands in a 'cause' and 'precedes' relation alters the event structure as described in the previous section, thus shifting its aspectual meaning in a predictable way.

4.   Formal Account

We formalize the theory using the Event Calculus (EC) of van Lambalgen and Hamm 2005, a formalism to reason about time and change that axiomatizes cause/effect relations. EC requires (at least) events (e, e'..), time instants (t_1, t_2..), and time dependent properties called *fluents* (f_1, f_2..). The schematic representation of aspectual classes (*eventualities*) in EC bears striking resemblance to our revised chain.

(4)   An *eventuality* is a structure $\langle f_1, f_2, e, f_3 \rangle$ where

    a. f_1 represents an activity which exerts a force,

    b. f_2 represents a changing object/state driven by the force of f_1,

    c. e represents a canonical goal, and

    d. f_3 represents the state of having achieved the goal.

Aktionsarten are defined in EC using these quadruples ([.] indicates the viewpoint)[3]

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[3]This formal representation is over-simplified. The eventuality quadruple is, in fact, an abbreviation for a *scenario*; a sequence of general statements universally quantified with respect to time that, together

(5) a. *States* (e.g. love, know) $\langle -, -, -, [f_3] \rangle$

  b. *Activities (wide)* (e.g. walk, push) $\langle [f_1], f_2, -, - \rangle$

  c. *Achievement* (e.g. fall, break) $\langle -, -, [e], f_3 \rangle$

  d. *Accomplishments* (e.g. build, create) $\langle [f_1], f_2, e, f_3 \rangle$

4.1.   The Causative Template *Hiphil*

Fusing a root with the causative template has the effect of filling in preceding empty slots, and shifting the viewpoint to the causing element. This gives rise to altered event representations. This proposal accounts for the aspectual meanings of a wide range of morphologically derived causatives in MH, as illustrated in (6)[4].

(6) a. *State* $\langle -, -, -, [f_3] \rangle \rightsquigarrow$ *Inchoative state* $\langle -, -, [e], f_3 \rangle$

    1. $[d][a][g]$ + *Pa'al* = $da'ag$ (be worried)

    2. $[d][a][g]$ + *Hiph'il* = $hid'id$ (make worry)

  b. *Achievement* $\langle -, -, [e], f_3 \rangle \rightsquigarrow$ *Progressive achievement* $\langle [f_1], f_2, e, f_3 \rangle$

    1. $[n][\breve{p}][l]$ + *Pa'al* = $na\breve{p}al$ (fall)

    2. $[n][\breve{p}][l]$ + *Hiph'il* = $hepil$ (fell, made fall, cause to fall)

  c. *Activity* $\langle [f_1], f_2, -, - \rangle \rightsquigarrow$ *Ingressive activity* $\langle [f_{0_1}], f_{0_2}, [f_1], f_2, -, - \rangle$

    1. $[r][k][d]$ + *Pa'al* = $rakad$ (dance)

    2. $[r][k][d]$ + *Hiph'il* = $hirkid$ (cause to dance, made dance)

  d. *Accomplish.* $\langle [f_1], f_2, e, f_3 \rangle \rightsquigarrow$ *Ingressive accomplish.* $\langle [f_{0_1}], f_{0_2}, [f_1], f_2, e, f_3 \rangle$

    1. $[a][\breve{k}][l]$ + *Pa'al* = $a\breve{k}al$ (eat)

    2. $[a][\breve{k}][l]$ + *Hiph'il* = $he'e\breve{k}il$ (feed)

In (6a), the state of 'being worried' comes about due to a certain cause, which gives the event an *inchoative* interpretation. In (6b), the event 'fall' is extended to include a preparatory phase that precedes and causes it, giving it the interpretation of a *progressive achievement* (which mirrors an accomplishment). In (6c) and (6d), the durative events are extended to include a preceding and parallel cause that continuously stimulates the 'caused' event, which provides it with an *ingressive* interpretation.

The same proposal accounts for the aspectual meanings of *denominal* causatives, i.e. causative verbs that are derived from nouns (which crucially do not exhibit an event structure of their own). We identify the object denoted by the noun with f_2, the template fills in f_1 with the essential 'cause', and the result gives rise to a variety of wide activities, including the emission verbs mentioned in Doron 2003, e.g. (7).

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with the EC axioms, defines the micro-theory of the event. Grammatical viewpoints are formalized using *integrity constraints* which relate the *reference point* of the eventuality to one of its components (see van Lambalgen and Hamm 2005). The default viewpoints presented here are specific to MH.

[4]Filling in a changing fluent f_2 always requires filling in its driving force f_1, in which case the 'CAUSE' element turns out to be a complex element $\langle f_1, f_2, -, - \rangle$, referred to in EC as a *dynamics*. The same complex element is required when the caused event is a durative one (i.e., activities) that already involve a dynamics. See Tsarfaty 2005 for the complete formalization.

(7) *noun* $\langle -, [f_2], -, - \rangle \rightsquigarrow$ *activity* $\langle [f_1], f_2, -, - \rangle$
    a. 1. $[r]['][\check{s}] + noun = ra'a\check{s}$ (noise)
         2. $[r]['][\check{s}] + Hiphil = her'i\check{s}$ (emit noise)

The analysis of denominal causatives serves to demonstrate the two core components of our theory. First, that the addition of a new participant adds also the aspectual context in which it operates, and second, that Semitic derivational morphology has an indispensable aspectual contribution.

5. Empirical Investigation

To support our theoretical findings we set out to find empirical evidence for aspectual choice in MH and for the development of verb forms' usage. We asked 22 native MH speakers (ages 3–30) to narrate a story based on a wordless picture book from two different viewpoints. Once while walking through the pictures ('Part I'), and once in retrospect, after the successful resolution of the plot ('Part II').

Figures 1– 4 summarize the results of our investigation. Figure 1 shows that the use of simple verb forms in the narratives decreases with age. Figure 3 shows a respective increase[5] in the use of causative verb forms. This joint distribution indicates that adult-like use of the morphological templates requires a longer acquisition phase than mastering the grammatical tenses[6] (already achieved by the age of 3, Berman and Slobin 1994). Figures 2- 4 show, for all age groups, a persistent increase in simple verb forms used in 'Part II' *relative* to 'Part I', along with a respective decrease in causative verb forms. This shows a preference for causative verbs to describe ongoing/incomplete events as they happen, and for simple verbs to describe complete/completed events and drive the story time-line forward.

We conclude that simple verb forms are morphologically unmarked, and semantically unmarked with respect to particular elements in the internal structure of an event. Thus, they refer to events in their entirety, which makes them appropriate for perfective use. Causative verbs, on the other hand, make explicit reference to elements in the internal structure of the event (i.e., its cause), and focus on its initiation and development phases. Therefore, their aspectual value is semantically marked, which makes them appropriate for describing imperfective situations.

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[5]With the exception of the peak at the age of 4, which may be understood as an *over-generalization* spike.
[6]Note that tense marking is obligatory while marked choices of the kind discussed here are voluntary.
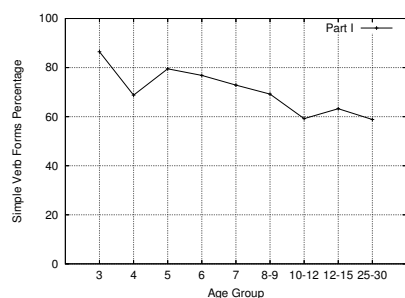
Figure 1: Percentage of simple verb forms used in the first story (average per age group)
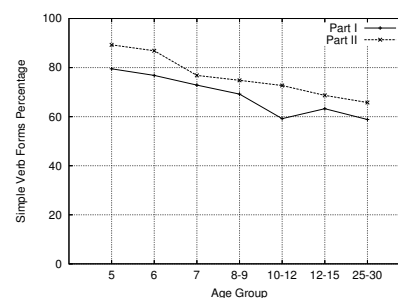

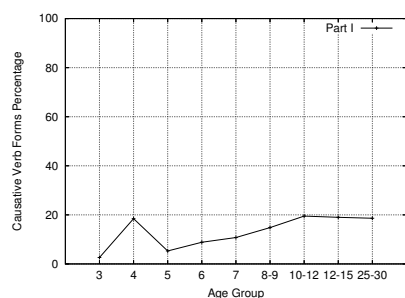Figure 2: Percentage of simple verb forms used in each of the stories (avg. per age group)

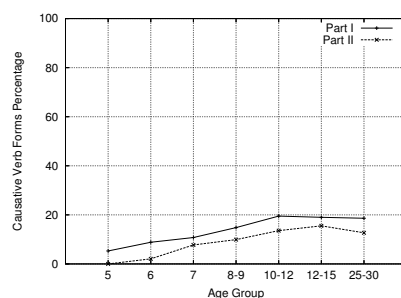Figure 3: Percentage of causative verb forms used in the first story (average per age group)

Figure 4: Percentage of causative verb forms used in each of the stories (avg. per age group)

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