Introducing *Pattern Matching Analysis* (PMA) as a Friend, if not a Variant, of Construction Grammar

Kow KURODA Hitoshi ISAHARA
National Institute of Information and Communications Technology (NICT), Japan

1 Introduction

Kuroda [6] proposed a framework called PATTERN MATCHING ANALYSIS (PMA henceforth) as a connectionism-compatible alternative to syntactic theories endorsed in many variants of Generative Grammar. It turned out that PMA was compatible with Construction Grammar [3, 5] in many respects. This paper tries to elaborate on their convervences, with reference to the resultative construction.

2 PMA Account of Resulatives

2.1 Goldbergian Account

Goldberg [5] proposed five "argument structure" constructions. Resulative Construction is one of them, illustrated by examples like (1):

(1) Bill hammered the metal flat.

Sentences like (1) are said to be instances of Resulative Construction because "resulative predicates" such as *flat* are licensed despite the fact that they are not licensed by matrix verbs like *hammer*. Goldberg claims that the fact is best accounted for when we assume that sentences like (1) are interpreted by making reference to a super-lexical "pairing" of a form F to an abstract meaning M in (2):

(2) F: Subj: x V: v Obj: y Xcomp: z;
M: x CAUSES y TO BECOME z [5, p. 3]

2.2 PMA Account

PMA provides a somewhat different, if not incompatible, picture of the phenomenon, by reinterpreting the core idea in Goldbergian constructions. Before elaborating our points, let us specify basic assumptions.

The specification in Figure 1 is the PMA of (1). In tables like this, the ith (sub)pattern, p_i, encodes the syntax and semantics of ith segment of p_0, called "base pattern."

p0:	Bill**	hammered**	the metal**	flat**
p1:	Bill*	V1	O1	--
p2:	S2	hammered*	O2	--
p3:	S3	R3	the metal*	--
p4:	S4	V4	O4	flat*

Figure 1: PMA of (1)

A subpattern has the following properties: A word (e.g., *hammer*) with a specific sense is mentally represented as a subpattern (e.g., "*S hammer** *O*") that instantiates a "surface-true" schema for a given language. For example, words are represented as patterns of the form SRO for English, and as patterns of the form SOR for Japanese, reflecting respective canonical word orders.

Each subpattern consists of two kinds of components: a "body" and its glues. Body refers to a word form w to be encoded by a subpattern, indicated by w^* and placed in orange cells. Glues are abstract, "invisible" elements like S (for subject, or external argument), O (for object, or internal argument(s)), P (for preposition and postposition), V

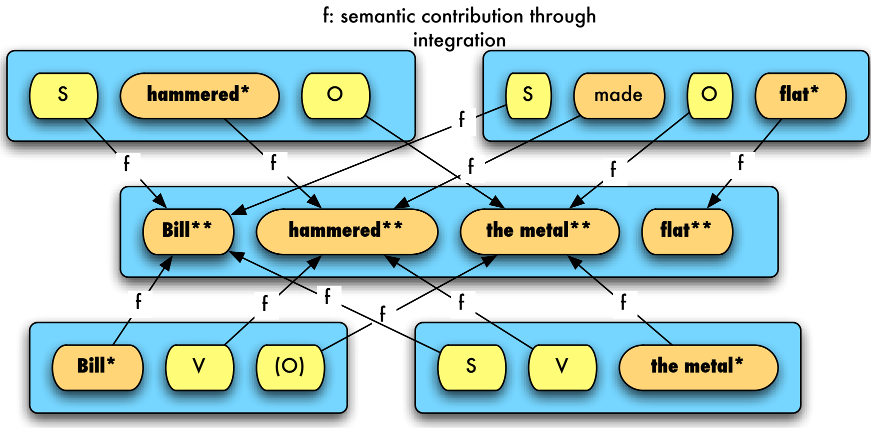

Figure 2: PMA of (1) graphically

(for verb), $R = \{ V, P \}$ (neutralization between V and P). They are placed in yellow cells. "—" in white cells indicates "null" specification.

Glues have their own semantics, by which "selectional restrictions" can be specified for a word. With the help of glues, each pattern is associated to "semantic frames" [4].

The syntax and semantics of a sentence (e.g., *Bill hammered the metal flat*) is given as the "integration" of relevant subpatterns. Integration of subpatterns is roughly a column-wise, vertical unification (but with certain kinds of "adjustments" allowed), whose operator is indicated by ξ. For example, the syntactic-semantic specification for (1) is given roughly as:

(3) [*Bill***] [*hammered***] [*the metal***] [*flat***], where *Bill*** = $\xi(\{$ *Bill**, S_2, S_3, S_4 $\})$, *hammered*** = $\xi(\{ V_1$, *hammered**, R_3, $V_4 \})$, *the metal*** = $\xi(\{ O_1$, O_2, *the metal**, O_4 $\})$, and *flat*** = $\xi(\{$ –, –, –, *flat** $\})$.

The diagram in Figure 2 illustrates how subpattern integration goes for (1). It is easy to see the base pattern as a "blend" of subpatterns [2].

PMA does not posit any theoretical constructs like (2). The relevant effect can be accounted for if the meaning of (4) is imported to the meaning of (1):

(4) Bill made the metal flat.

But the point is, How? The comparison of the PMAs in Figures 1 and 3 would make the point.

p0:	Bill**	made**	the metal**	flat**
p1:	Bill*	V1	O1	--
p2:	S2	made*	O2	A2
p3:	S3	R3	the metal*	--
p4:	S4	V4	O4	flat*

Figure 3: PMA of (4)

As p_2 in Figure 3 indicates, *make* has its own subject, object and predicate (S_2, O_2 and A_2) as its proper arguments. $p_2 = S_2$ *made** O_2 A_2, or more specifically A_2, licenses the occurrence of *flat* in (4). By contrast, as p_2 in Figure 1 indicates, the argument structure of *hammer* lacks the counterpart of A_2 in Figure 3.

Under this, PMA allows us to account for the resultative reading in (1) as follows:

(5) Sentence (1) is licensed when p_4 in Figure 1 is implicitly elaborated so that the meaning of V_4 is approximated by *made**, as is induced by *Bill*** V_4 *the metal*** *flat***, partial integration of $\{ p_1, p_3, p_4 \}$. This is a good example

of **implicit pattern completion** as a typical property of neural networks, especially, Hopfield nets.

The account above gives us interesting predictions such as the following:

Resultative construction, for one, and Goldbergian "argument structure" constructions in general, are both "lexically" and "collocationally" conditioned in that no such effects can be manifest unless a specific word or phrase with a specific sense is associated with a specific lexical context. In this sense, the account provided by PMA is basically compatible with findings and claims in Boas [1].

More specifically, only APs (and PPs if any) that appear in the context "*S* make *O* __" show the resultative construction effect: any other APs (and PPs) don't:the resultative reading for (1) is "induced" by the "argument structure" of *flat* that encodes an effect of causation.

Any "purely semantic" account of the argument structure elaboration effects (in terms of LCS [7]) would fail, because the phenomenon is also collocationally based.

References

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