A CLASSIFICATION OF LANGUAGE SIGNS

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As a way of developing and stabilizing my domainal role theory[1], I wish , in this short paper, to present a clear application of it to the problem of classifying language signs, i.e. words in spoken language and signs (i.e. in a narrower sense) in sign language. Let the presentation orientate itself towards the adjoining diagram.

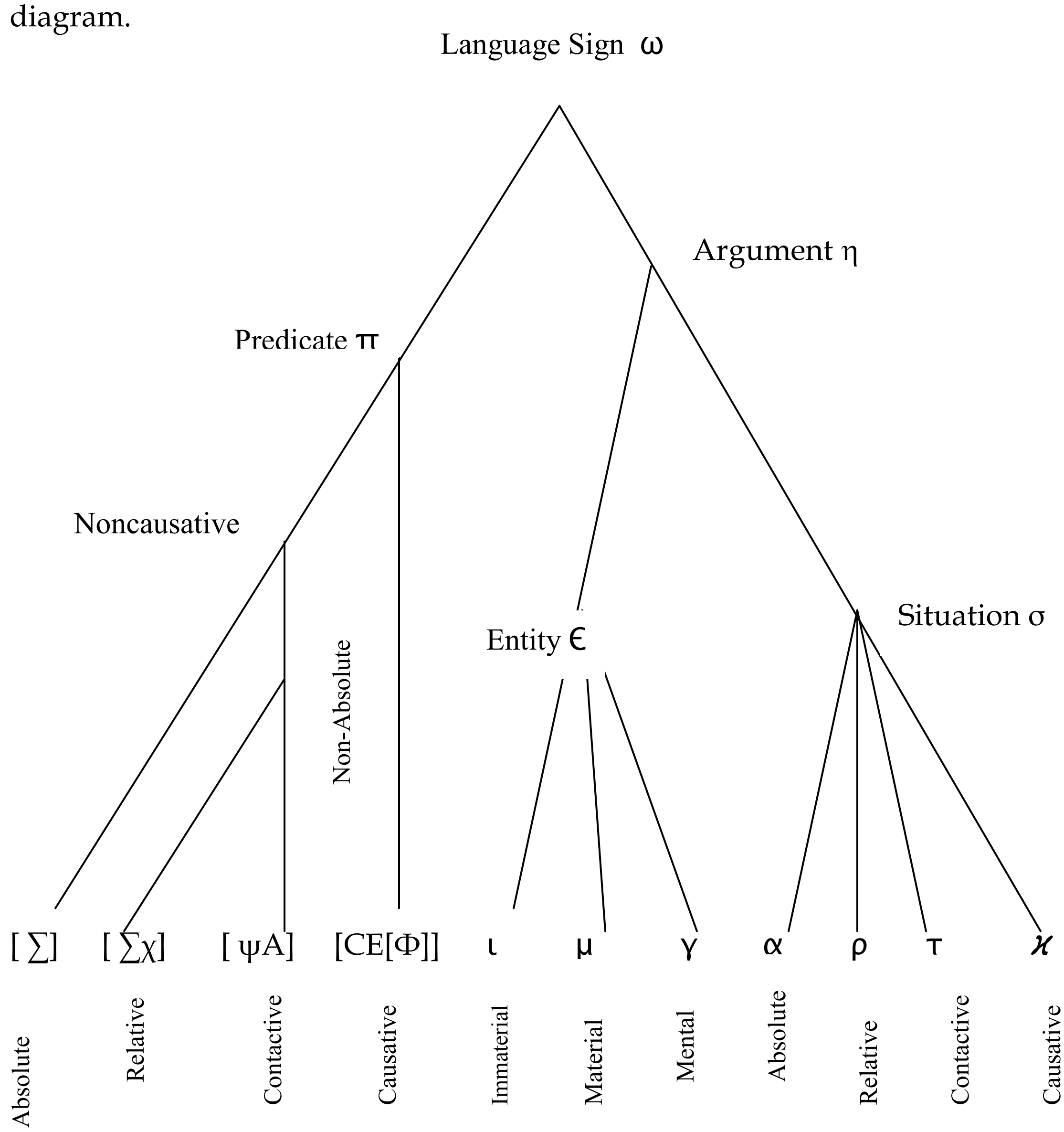

Diagram: Classification of language signs

First and foremost, in order to accord with modern predicate logic, signs ω split into predicates π and argumentsη.

There are four and only four predicate classes[2], viz absolute, relative, contactive and causative predicates. An absolute predicate is either a CHANGE BEARER B or NONCHANGE BEARER Z; [∑] =[B], [Z]. A relative predicate is [ΣX] where X represents REFERENCE R, COMITATIVE J, DIRECTION D, SOURCE S, MEDIATE M, GOAL G, MEASURE Q, MEMBER –OF K PART-OF W, AUGMENTATIVE –OF U, EQUATIVE-OF I, DIMINUTIVE-OF L. A contactive predicate is [ψA] where ψ =N, T with N as DYNAMIC CONTACTOR, and T as STATIC CONTACTOR; A represents CONTACTED. If [Φ] = [Σ], [ΣX], [ψA] then a causative predicate is [CE[Φ]] where C and E stand for CAUSER and CAUSED respectively.

Turning to arguments, it is noted that an argument is either an entity ϵ or a situation σ . There are three entity classes: immaterial ι , material μ, and mental γ[3]. An immaterial entity is a MASS a, SET k, UNIT u, NUMBER n, SPACE l, or TIME t. A material entity is a piece of MATTER m, ABIOTIC r, BIOTIC o, PLANT b, ANIMAL z, or HUMAN h. A mental entity is a PERCEPTION e, EMOTION f, COGNITION c, PSYCHOMOTOR v, COMMUNICATION s, or RATIOCINATION p. There are four situation classes: absolute α, relative ρ, contactive τ , and causative ϰ[4] .

The classification so far is condensable to :

1. $\omega = \pi, \eta$

2. π = [∑], [∑X], [ψA], [CE[ϕ]]

3. [∑] , [Z],[B]

4. χ = R, J, D, S , M, G, Q, K, W, U, I, L

(4b) ψ = N, T

5. η = Є, σ

6. Є = ι , μ , ϒ

7. ι = a, k, u, n, l, t

8. μ = m , r, o, b, z, h

9. ϒ = e, f, c, v, s, p

10. σ = α, ρ, τ, ϰ

In order to exemplify predicates and arguments in (13)- (20) we need the concepts of domain[5] and semantic equation[6] in (11) and (12) respectively.

11. $\delta = \iota'', \mu'', \Upsilon'', \alpha'', \rho'', \tau'', \sigma''$,

12. $\sigma = \eta_1 (\sigma) +, \ldots + \eta_n (\sigma)$

13(a) The ball blackens.

(13b) Br(m″)

(13c) Br (m″) = r(α)

(14a) The ball becomes black.

(14b) Br(m″) Kk (m″)

(14c) $Br(m'') \; K \; k(m'') = r(\rho) + k(\rho)$

(15a) Fatuma kicks the ball.

(15b) $N \; h(\nu'') \; A \; r(m'')$

(15c) $Nh(\nu'') \; A \; r(m'') = h(\tau) + r(\tau)$

(16[a]) The farmer slaughters a bull.

(16b) $Ch(\nu'') \; E \; [Bz(o'')]$

(16c) $Ch(\nu'') \; E \; [Bz(o'')] = h(\varkappa) + z(\varkappa)$

(17a) Fatuma gives Ali a ball.

(17b) $Ch_1(\nu'') \; E \; [Nh_2(\nu'') \; A \; r(m'')]$

(17c) $Ch_1(\nu'') \; E \; [Nh_2(\nu'') \; Ar(m'')] = h_1(\varkappa) + h_2(\varkappa) + r \, \varkappa)$

(18a) Fatuma (h) opened the door (r_2) with a key (r_1).

(18b) $Ch(\nu'') \; E[Cr_1(m'') \; E \; [Br_2(m'')]]$

(18c) $Ch(\nu'') \; E[Cr_1(m'') \; E \; [Br_2(m'')]] = h(\varkappa) + r_1(\varkappa) + r_2(\varkappa)$

(19a) Fatuma teaches Ali theoretical physics at home.

(19b) $[Ch_1(\Upsilon)E \; [Nh_2(\Upsilon) \; Ak(\Upsilon)]] \; Rl(h'')$

(19c) $[Ch_1(\Upsilon)E \; [Nh_2(\Upsilon) \; Ak(\Upsilon)]] \; Rl(h'') = h_1(\varkappa) + h_2(\varkappa) + k(\varkappa) + l(\varkappa)$

(20a) Writing leads to fame.

(20b) $C \; \varkappa \; (s'') \; E \; [B\alpha \; (f'')]$

(20c) $C \; \varkappa \; (s'') \; E \; [B\alpha \; (f'')] = \varkappa(\varkappa) + \alpha(\varkappa)$

From this paper, four conclusions are drawable.

First, it is to be noted that formalization in domainal role theory is clearly an elaboration on that in predicate[7] calculus; in fact it can be made more compact as shown in (14)′ –(20)′.

(14)′ r[BK]k *OR* [BK] rk

(15)′ h[NA]r *OR* [NA]hr

(16)′ h[CE[B]]z *OR* [CE[B]]hz

(17)′ h_1[CE[NA]]h_2 r *OR* [CE[NA]]h_1 h_2 r

(18)′ h[CE[CE[B]]] r_1 r_2 OR [CE[CE[B]]] h r_1 r_2

(19)′ ϰ [BR]l *OR* [BR] ϰl

(20)′ ϰ [CE[B]]$^{\alpha}$ OR [CE[B]]ϰ α

Second, taking Ugandan Sign Language (USL) as a test language, it is hypothesizable that generation of predicates from semantic roles (or functions) meshes very well with the isomorphism between syntax and semantics as shown in (21-(26)[8].

(21) <S||V> ≅ [Σ]

(22) <SX||V> ≅ [ΣX]

(23) <SO||V> ≅ [ΨA]

<21>(24) <SO||V> ≅ [CE[Σ]]

<22>(25) <SO X||V> ≅ [CE[ΣX]]

<23>(26) <S O O ||V> ≅ [CE[ΨA]]

Third, without recourse to the syntactic functions in spoken language, the basic sentence patterns of English and USL can be compared as follows:

Universal Predicate	Basic English Sentence Pattern	Basic USL Sentence Pattern
[Σ]	$<\eta_{I}[X]>$	$<\eta \Vert [\Sigma]>$
[ΣX]	$<\eta_{I}[\Sigma X]\eta>$	$<\eta_{I}\ \eta \Vert [\Sigma\chi]>$
[ΨA]	$<\ \eta_{I}[\Psi A]\eta>$	$<\eta_{I}\ \eta \Vert\ [\Psi A]>$
[CE[Σ]]	$<\eta_{II}[CE[\Sigma]]\eta_{I}>$	$<\eta_{II}\ \eta_{I} \Vert [CE[\Sigma]]>$
[CE[ΣA]]	$<\eta_{II}[CE[\Sigma\chi]]\eta_{I}\eta>$	$<\eta_{II}\ \eta_{I}\ \eta \Vert [CE[\Sigma\chi]]>$
[CE[ΨA]]	$<\eta_{II}[CE[\Psi A]]\eta_{I}\eta>$	$<\eta_{II}\ \eta_{I}\ \eta \Vert [CE[\Psi A]]>$

Fourth, and finally, this paper seems to adumbrate the idea of a grammar without nouns, verbs, adjectives, and prepositions. In such a predicate grammar, a search for "word" classes in sign language would no longer be a captivating occupation, for aural-oral signs of spoken language and visual-gestural signs of signed language are subsumable under predicates and arguments.

NOTES

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[1] In K.B.Kiingi (30th May 2012) A FORMALIZED DOMAINAL ROLE THEORY (updated version) http://www.luganda.com

[2] The four predicate classes [Σ], [ΣX], [ΨA] , and CE[ϕ], where ϕ = [Σ], [Σχ], [ΨA] are motivated by considering change or nonchange as absolute, relative, contactive or causative in the fundamental sciences, i.e. logic, mathematics, and physics (particularly mechanics: dynamics and statics).

[3] Just like the four predicate classes, the entity classes are extracted from the fundamental sciences: logic, mathematics, physics, chemistry, biology, and psychology.

[4] The predicate classes [Σ], [Σχ], [ΨA] and [CE[ϕ], give rise to absolute, relative, contactive, and causative situations respectively.

[5] A semantic domain is a finite or nonfinite argument within which another given argument persists either statically or dynamically; e.g. h(n″) h(l″), h(t″), h(m″), h(o″), h(ϒ″).

[6] A semantic equation is a relation between a situation (or state-of-affairs) and the products thereof.

[7] Note that (semantic) predicate generation , e.g. CE[B], [CE[NA]], [CE[CE[B]]] in (16) –(18). C, E, B, N, and A are semantic roles.

[8] Here, S = Subject, X = Nonobject, O = Object, V = Predicator (or, loosely, Verb). Again , here, Nonobject is what some linguists and grammarians variously refer to as Complement or Adverbial.