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FORMAL REALIZATION OF CASE RELATIONSHIPS IN ODISIA

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ABSTRACT

Semantic parameters such as agency and affectedness are known to affect the realization of case-relationships. Case relation is a semantico-syntactic relationship in which abstract case features (roles) are mapped with their surface (morphological and syntactic) reflex. Arguments of a predicate (e.g. verb) play some semantic role (also called thematic role or θ -role) by virtue of the meaning of the predicate. This paper reviews work on formal realization of case relationships in Odia from the perspective of automated analysis by a natural language processing system. It compares different approaches like Fillmorean case and Chomskyan θ -role while analyzing a suitable formalism for describing case system of Odia. 'Case' in the sense of Paninian Karaka which, as a syntactico-semantic role, is assigned to the nouns as arguments of verbs will also be examined. The analysis ultimately shows how a case analyzer for Odia can be developed for natural language understanding system.

KEYWORDS

Odia, formal realization, case relationships.

1.0 INTRODUCTION

The notion of case is a universal feature of language, as if it forms a part of the human language faculty. Case theory provides an approach to the representation of sentence meaning and case is important in accounting for the way the structure of sentences relates to that of meanings. In other words, case relates the deep semantic-logical structure of sentence to the surface formal (syntactic) structure of language. Although different languages have different case systems, case as a grammatical property/principle is universal.

Fillmore (1968) characterized the relationships between the verb and noun phrase as "semantically relevant syntactic relationships" and called them *cases*. The case assignment comes from the deep structure, even though the surface structure is different. So, for example, the sentence "John opened the door with the key" is semantically equivalent to "The door was opened by John with the key."

Case relations [Cook 1979; Bruce 1975] describe the relation between a verb and the other components (typically nouns) of a single *proposition*. [A proposition, in logic (specifically in predicate calculus), is the semantic content of a sentence. Grossly, it is a simple sentence expressing a statement. It contains a predicate and a number of arguments related to the predicate.] Thus case relation is a semantico-syntactic relationship in which abstract case features (roles) are mapped with their surface (morphological and syntactic) reflex.

Principles and Parameters theory (Chomsky 1981) considers case-theory and theta-theory as the essential components of grammatical principles which play an important role in assigning semantic and structural well formedness to the expressions of language.

Following sections will have a discussion on this notion with reference to case systems of Odia language.

2.0 THEORETICAL BACKGROUND

Nouns of sentence bear some particular grammatical relations like *subject*, *object*, *indirect object*, etc. These are *not* the same as *thematic relations* (theta-relations), but have some correspondence with them. Grammatical relations represent how an NP (noun phrase) is functioning in the sentence syntactically. The morphology associated with grammatical relations is called *case*. For example, the *nominative case* is found with subjects, and the *accusative case* is found with objects. However, representation of case relations differs from language to language. In morphologically rich languages, nouns take special forms and there are special markers. On the other hand, English being a morphologically poor language, NPs in sentences bear no obvious case markings. Grammatical relations are represented by the position of the noun in the sentence. Following sentences (1) and (2) demonstrate case marking in English.

1) Ram slapped Shyam.

Ram-subject slapped-PAST Shyam-object [Ram-NOM slapped-PAST Shyam-ACC]

2) Shyam slapped Ram.

Shyam-subject slapped-PAST Ram-object [Shyam-NOM slapped-PAST Ram-ACC]

Both the nominative and accusative cases are present semantically/logically, but are marked by null (zero) marker. The information is coded in the positions of these NPs. This is called *abstract Case*. (Abstract Case normally has a capital C to distinguish it from morphological case).

In morphologically rich languages like Sanskrit and Odia, nouns which bear particular grammatical relations (or case relations) take special forms (called as case forms) marked with overt suffixes (case endings). For example, in Odia, subjects are marked with zero suffix, objects are marked with *-ku*/zero and indirect objects and certain adjuncts with *-ku*. A more detailed discussion will be followed.

We can, therefore, infer that all nouns indeed get case and *Case* is a general property of language. Furthermore, it seems to be associated with a syntactic phenomenon — the grammatical function (relations) of NPs, and reflects semantic relationships. If it is indeed a syntactic property, then it should have a structural trigger. In the case theory of Chomsky (1981), NPs are given *Case* if and only if they appear in specific positions in the sentence. In particular, nominative case is assigned in the specifier of finite verb, and accusative case is assigned to a complement/sister of the verb. Prepositions also assign what is often called 'dative' or other cases to their complement NPs.

A little more in-depth discussion is followed in the coming sections.

2.1 Argument Structure, Theta (Θ)-theory and case theory

Argument structure is the pattern of underlying relations between a predicate and its arguments / dependents. It is at the base of syntactic theory and syntax-semantics interface.

Argument is a term borrowed by linguistics from philosophy (specifically from predicate calculus) to describe the role played by particular types of referring expressions (i.e. a thing, person etc.) in the semantic structure of sentences. The semantic content of a sentence is called its *proposition* and it consists of a

predicate denoting an activity or event and *arguments* on which the predicate says something. For example, in the sentence *Rama killed Ravana*, *killed* is the predicate and *Rama* and *Ravana* are the arguments. Arguments of a predicate (e.g. verb) play some semantic role (also called thematic role or θ -role) by virtue of the meaning of the predicate.

Theta theory is concerned with the assignment of *thematic roles* (= semantic roles) to sentential constituents. By using lexical information (like theta roles) we are able to stop the X-bar rules from generating ungrammatical sentences. One way of encoding selectional restrictions is through the use of *thematic relations*. These are particular semantic terms that are used to describe the role that the argument plays with respect to the predicate.

The *predicate* defines the relation between the individuals being talked about and the real world as well as with each other. The *arguments* are the entities who are participating in the relation. *Argument Structure* defines the number of arguments that a predicate takes. Thus an intransitive predicate takes only one argument, a transitive predicate takes two arguments, and a ditransitive predicate takes three arguments. Some common thematic relations are:

Agent: The doer of an action (under some definitions must be capable of volition.)

Experiencer: The argument that perceives or experiences an event or state.

Theme (patient): The element undergoing the action or change of state.

Goal: The end point of a movement.

Recipient: A special kind of goal, found with verbs of possession (e.g., give).

Source: The starting point of a movement.

Location: The place an action or state occurs.

Instrument: A tool with which an action is performed.

Benefactive: The entity for whose benefit the action is performed.

In the sentence (3), we show argument structure and case.

3) Ram slapped Shyam.

Ram-Agent slapped-Predicate Shyam-Theme/Patient

SLAP <Agent, Theme>

Ram-NOM slapped-PAST Shyam-ACC

There is no one-to-one relationship between thematic relations and arguments. However, a *theta role* (or θ role) maps one-to-one with arguments. Theta roles are bundles of thematic relations that cluster on one argument. Often particular theta roles are referred to by the most prominent thematic relation that they contain. The thematic relations are things like agent, theme, goal, etc. but theta roles are bundles of thematic relations assigned to a particular argument.

The *Theta-Criterion* of Principles and Parameters theory (Chomsky 1981) defines that

a) Each argument is assigned one and only one theta role.

b) Each theta role is assigned to one and only one argument.

The thematic relation of an NP with the verb plays a role in semantic interpretation of the sentence.

The *case theory* of Principles and Parameters theory (Chomsky 1981) defines that

(a) Case is assigned under government, and

(b) No NP which is lexically realized will be without a case (case-filter).

Thus all NPs in a sentence/clause must be assigned case.

3.0 CASE SYSTEM OF ODISIA

Odia is an inflection-rich language. Nominal inflection in Odia reflects morphosyntactic property of the nouns. A noun, when occurs in a sentence, has some sort of relationship with other words or word groups, namely, nouns, adjectives and verbs. Adjectives only modify the noun in a noun phrase. Noun-noun relationship is captured or expressed by *genitive case marking*. But in relation to the verb-form in the clause/sentence a noun has to play the role of one of the arguments of the verb and it has to be marked accordingly in the sentence. This argument-verb relation (related to Chomskyan θ -role) is captured in Paninian notion of *Karaka* (case) relation and expressed in terms of *Vibhaktis* (or case marking) which include case suffixes and post-positions in Odia. Thus a nominal in Odia is obligatorily inflected for case (*karaka*) along with number (Das 2003: 96). Of course, both can have null value.

Now let's have an elaborate discussion on case-relation and case inflection in Odia. 'Case' is an important notion for any complete description of any language, hence a part of UG. Case relation is a semantico-syntactic relationship in which abstract case features (roles) are mapped with their surface (morphological and syntactic) reflex. Arguments of a predicate (e.g. verb) play some *semantic role* (also called *thematic role* or *θ -role*) by virtue of the meaning of the predicate. The θ -roles are like AGENT, THEME, EXPERIENCER, RECIPIENT, GOAL, SOURCE, LOCUS, INSTRUMENT and many others, not fixed in number [Radford, 1997:326]. These universal relations are expressed in surface structure of a particular language by some specific mechanism. In Odia these are expressed by means of case markers or *Vibhaktis* which include both case-suffixes and post-positions (Das 2003: 97-98).

Post-positions are free forms and they bear some meaning of case relations. Altogether there are six such groups to reflect the case relations operative in Odia – following the insights of traditional Odia and Sanskrit grammarians in this respect.

This analysis follows Pāṇinian framework which is more suitable than Fillmorean (which is more deeper) and Chomskyan (where structural case is assigned to positions) approach for describing case system of Odia. Traditional grammars have followed this approach, but somewhere the notional clarity had been lost. We use 'case' in the sense of Paninian *Karaka* which, as a syntactico-semantic role, is assigned to the nouns as arguments of verbs. It is a bit shallow (surface structure oriented) than θ -role.

At the first place we show a tentative correspondence between Karakas and θ -roles (4) and then Karakas and case markers (*Vibhaktis*) in Odia (5).

(4)

| CORRESPONDENCE BETWEEN CASE-ROLES AND THETA-ROLES | | | |
|---|--------------|-------------------|---------------------------------------|
| Case-Role | | | θ -Role |
| • Karta | Nominative | (K ₁) | Agent, experiencer, force |
| • Karma | Accusative | (K ₂) | Theme, patient, content, result, goal |
| • Karana | Instrumental | (K ₃) | Instrument |
| • Sampradana | Dative | (K ₄) | Beneficiary |
| • Apadana | Ablative | (K ₅) | Source |
| • | Genitive | (K ₆) | |
| • Adhikarana | Locative | (K ₇) | Location in time and space |

Genitive is not a case-role in Paninian sense. It shows a relationship between two nominals. On the basis of surface similarity of genitive suffixes with case suffixes (being a relational marker and different from number suffixes) we include them with the latter, although incorrectly. (Das 2003: 99)

In this article we use the term 'K-role' as Karaka role or case role. In Odia sentences, any argument of any verb has to have any one of these six K-roles (leaving K₆). These six K-roles are the only grammatically (formal) relevant relations in Odia language. The situation may be different for different languages.

(5)

CORRESPONDENCE BETWEEN CASE-ROLES AND CASE MARKERS IN ODIA

| Case-Role | Case-Markers |
|-------------------|---|
| (K ₁) | Φ |
| (K ₂) | Φ, -ku, -ki |
| (K ₃) | -re, द्वारा, dei |
| (K ₄) | -ku, -ki, paī |
| (K ₅) | -ru, -t ^h aru, -t ^h ū |
| (K ₆) | -r, -k(r) |
| (K ₇) | -re, -t ^h are, -t ^h i |

Further, /-ki/ can be considered as a variant of /-ku/. /-thare/ can be analyzed as ‘tha’ (meaning place) + /-re/. An exhaustive study of their occurrence and frequency in a huge corpus can establish the nature of context.

The problem we face here is that some of the case suffixes are overloaded with case-relations thus posing the problem of analysis. For instance, /-ku/ (and /-ki/) is mapped with K₂ and K₄; /-re/ is mapped with K₃ and K₇. To devise an automated case analyzer, we need to take care of these ambiguities. Any analyzer that considers only the case-forms or case suffixes will fail to resolve case ambiguity of this type. The problem will be addressed in the next section.

In addition to the above listed case-roles we may consider following case-relations (formally represented by some post-positions) which have some relevance in Odia and so are expressed in sentences.

(i) Purposive Case (K_p)

This refers to the purpose of action expressed by verb. In this θ-role the argument is not the beneficiary, even it may not be a direct participant in the activity, but the purpose of it is there. It is represented by markers like /-ku/, /paī/ ‘for’, /nimit/ ‘for’, etc. – same as K₄. Following examples may be considered for the purpose.

(6)

- a. se p̄r̄iba paī hat̄ku jaici
he vegetable for market-to has gone
‘He has gone to market for vegetables’
- b. se p̄r̄iba aṅ̄iba paī hat̄ku jaici
he vegetable to bring for market-to has gone
‘He has gone to market to bring some vegetables’
- c. se p̄r̄iba aṅ̄iba-ku hat̄ku jaici
he vegetable to bring for market-to has gone
‘He has gone to market to bring some vegetables’
- d. se p̄r̄iba-ku bides̄ jaici
he to study for abroad has gone
‘He has gone abroad to study’

In the above sentences we can find how the nominal forms are marked for purpose θ-role, most clearly in (6a). In other sentences, i.e. in (6 b,c,d) we may think the relation to be between two verbs – one in infinitive form and the other in finite form. However, if we take infinitives as a type of deverbal nominal (referring to an event), at least functionally, then there would be no problem for them to get purpose case marking. Moreover, moving a step further we may amalgamate the whole purposive case role with K₄.

(ii) Causal Case (K_c)

When an action or event becomes a cause of another action (main action) the former may be case marked to its infinitive form by causal markers /jogū/, /kar̄ṅ̄ru/, /-ru/ ‘because of’, etc.

(7)

- b̄rsa heba ru b^hī k̄ṅ̄k̄ helā
rain be good crop was
‘Because of rain there was a good crop’.

However, we may include this K_c under K₅ considering the events as the source of cause.

(iii) Sociative Case (K_s)

To represent some noun-noun relation, either associative or dissociative – some post-positions (particles) as markers are used in Odia. For example, /s̄h̄k̄/ ‘with’, /s̄h̄it̄/ ‘with’, /bina/ ‘without’, etc. are used as in (8).

(8)

- a. ram̄ s̄h̄k̄ h̄r̄i skul ku ḡl̄a
Rama with Hari school to went
‘Hari went to school with Rama.’
- b. duk̄ bina suk̄ mulȳ kic̄ nahī
pain without pleasure value some is-not
‘Without pain there is no value of pleasure.’

This case marking may be included under K₅.

So far, for Odia language these six K-roles are the semantico-syntactic requirements of Odia sentence, especially of the verb in the sentence. However, all the verbs (more correctly, verb-forms) do not have the requirement of all and the same K-roles. The degree of requirement or relevance (or importance) varies from verb to verb according to the internal meaning of the verb itself. Also, sometimes, the verb phrase as a group decides the K-role of some arguments. Moreover, some K-roles like K₁, K₂ are more relevant (even necessary) than others which may be optional. This issue needs to be taken for more study under the sub-categorization of verbs. However, the examples in (9) and corresponding K-role structures in (10) may be considered as an illustration.

(9)

- a. ma d̄s̄ṭabeje piṅ̄dare so-il-e
mother 10 o’clock-LOC veranda-LOC sleep-TAM-AGR
‘Mother slept on veranda at 10 o’clock’.
- b. ma d̄s̄ṭablele piṅ̄dare pila ku sua-il-e
mother 10 o’clock-LOC veranda-LOC child-ACC sleep-CAUSE-TAM-AGR
‘Mother caused the child sleep on veranda at 10 o’clock.’
- c. ma b̄at̄ k^ha-il-e
mother rice-ACC eat – TAM-AGR
‘Mother ate rice.’
- d. ma pila ku b̄at̄ k^hua-il-e
mother child-DAT rice-ACC eat- CAUSE- TAM-AGR
‘Mother fed the child with rice’.
- e. se d̄s̄ṭa bele tebul re b̄hi r̄k̄-il-e

- he 10 o'clock-LOC table-LOC book put-TAM-AGR
 'He put the book on the table at 10 o'clock'.
 f. se tebul re cak᳚᳚ dwara b᳚hi r᳚k^ha-il-e
 he table-LOC servant-INST book put-CAUSE-TAM-AGR
 'He made the servant put the book on the table'.

(10)

- a. K₁ (K₇-Temporal)(K₇-Spatial)[so-]᳚ *K₂*K₃*K₄*K₅
 b. K₁ (K₇-T) (K₇-S) K₂ [sua-]᳚ *K₃*K₄ *K₅
 c. K₁ (K₇-T) (K₇-S) K₂ [k^ha-]᳚ (K₃) *K₄ (K₅)
 d. K₁ (K₇-T) (K₇-S) K₄ K₂ [k^hua-]᳚ (K₃) (K₅)
 e. K₁ (K₇-T) K₇-S K₂ [r᳚k^h-]᳚ *K₃ *K₄ *K₅
 f. K₁ (K₇-T) K₇-S K₃ K₂ [r᳚k^h-]᳚ *K₄ *K₅

From the illustrations (9) and (10) it is evident that all the verbs do not have same argument structure (K-role structure, in our terminology). Even different arguments of a verb do not have same status. Some are mandatory, some are optional (with different degree), and even some are not-possible (marked by *asterisk*). Optionality is marked by simple *brackets*.

The locative K-role (K₇) with varieties of temporal and spatial can optionally occur almost with all verbs. But it is mandatory in case of verbs like r᳚k^h-/ 'put'. A causative verb gets one more mandatory K-role than the root verb which may be intransitive or transitive.

Another observation we can make is that although the case markers for accusative (K₂) and dative (K₄) are same /-ku/ and its variant /-ki/, by syntactic behaviour they are different. An accusative /-ku/ can be deleted, (9 c,d,e,f), from the word, whereas the dative /-ku/ cannot (9d). But still, /-ku/ in Odia is overloaded with two case roles and it poses a problem for analysis.

3.1. Surface forms of the case inflected nouns in Odia

Now let us see the surface forms of the case inflected nouns in Odia. Case suffixes or post-positions are added to the nominal stem in the following canonical form.

(11)

[[W]_N + (NUMBER-HONORIFIC-DEFINITIVE) + CASE

Here the nominal base is appended with a marker representing number-gender/honorific-definiteness, if present – otherwise null, and then at the end there will be a case marker.

Sometimes, with the addition of case marker, the nominal base undergoes some change in form – in Odia it is mostly at the boundary. This changed form is called as *oblique form* of the base. The genitive form serves as the oblique base in Odia. It is to understand here that this is simply a surface morphological process very common with the languages. It is not triggered by any syntactic or semantic requirement of the language. Thus we have three forms of nominal base for case marking – direct, accusative-dative and oblique. For illustration consider the paradigm in (12).

(12)

| | /pila/ 'child' Noun: Human, -Honorific | | /guru/ 'teacher' Noun: Human, Honorific | |
|-------------------|---|-----------------------------------|--|-----------------------------------|
| | Singular | Plural | Singular | Plural |
| (K ₁) | pila | pila mane | guru | guru mane |
| (K ₂) | pila ku | pila man ᳚᳚ ku | guru ᳚᳚ ku | guru man ᳚᳚ ku |
| (K ₃) | pila dwara | pilaman ᳚᳚ ᳚᳚ dwara | guru ᳚᳚ ᳚᳚ dwara | guru man ᳚᳚ ᳚᳚ dwara |
| (K ₄) | pila ku | pila man ᳚᳚ ku | guru ᳚᳚ ku | guru man ᳚᳚ ku |
| (K ₅) | pila t ^h aru | pila man ᳚᳚ ᳚᳚ t ^h aru | guru ᳚᳚ ka t ^h aru | guru man ᳚᳚ ᳚᳚ t ^h aru |
| (K ₆) | pila ᳚᳚ | pila man ᳚᳚ ᳚᳚ ᳚᳚ | guru ᳚᳚ ka ᳚᳚ | guru man ᳚᳚ ᳚᳚ ᳚᳚ |
| (K ₇) | pila t ^h are | pila man ᳚᳚ ᳚᳚ t ^h are | guru ᳚᳚ ka t ^h are | guru man ᳚᳚ ᳚᳚ t ^h are |

Following observations may be made from the paradigm (12):

(13)

- (i) /-᳚᳚/ is a honorific marker; human-plural is honorific in Odia [animate-plurals in most cases are also honorific].
 (ii) Plural suffix /-mane/ becomes oblique /-man᳚᳚/ before case markers.
 (iii) The (minimal) genitive form serves as the oblique base for other case marking except nominative, accusative-dative.

4.0 CONCLUSION

The above analysis ultimately demonstrates the problem in an unambiguous analysis of case in Odia. A case analyzer is useful for developing a natural language understanding system and grammar analyzer.

The problem we face here is that some of the case suffixes of Odia have multiple mappings with case-relations. For example, /-ku/ (and /-ki/) is mapped with K₂ and K₄; /-re/ is mapped with K₃ and K₇. To devise an automated case analyzer, we need to take care of these ambiguities. Any analyzer that considers only the case-forms or case suffixes will fail to resolve case ambiguity of this type. We need additional information like the behavior of verb-forms and their contexts in sentences/phrases. An exhaustive study of verbs of Odia and their classification, as demonstrated in (10), can be helpful in resolving this problem of ambiguity. Then we will be able to extract the semantic role of the nominals in a sentence.

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