

## Chapter 4

# Lexical Semantic Relations and Semantic Structures of Bangla Verbs

### 4.0 Introduction

In this chapter I adopt an entailment-based approach in order to define the proto-role attributes within lexical semantic relations. These semantic relations represent a “grammatically relevant” subset of relations among participants in the event or state denoted by the predicate, extracted from a large number of facts about meaning. The semantic relations are formally constructed as *typed feature structures*<sup>1</sup>. I organize the types in a *multiple inheritance hierarchy model*. Technically the inheritance network imposes the following stipulation on the composition of CVs: For a V1 and V2 to unify, the semantic type of one must be a subtype of that of the other, or the two must have a unique common subtype in the hierarchy.

The chapter is divided into the following sections. In section 1, I review various meaning representation theories: (i) the system of thematic roles (first introduced by Gruber (1965)), (ii) the decomposition model of Pinker (1989) and Jackendoff (1990) and (iii) Dowty’s (1991) entailment approach. An overview of this chapter is presented in section 2. I adopt the entailment-based partial decomposition approach (closely similar to the model proposed by Davis (2001)) for representing the meaning component of verbs. In section 3 I postulate a number of semantic relations that subsume the semantic types of several Bangla verbs. I organize them in a multiple inheritance hierarchy. Towards the end of this chapter I produce

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<sup>1</sup> Carpenter (1992) made an in-depth treatment of these formal foundations. The LKB system works on *typed feature structure* alone. The advantage of using typed feature structure in place of untyped one will be clear in the subsequent chapter.

two tables in which various semantic relations and set of V1s whose semantic types are subtypes of these semantic relations are listed. For each set of V1s the V2s that the members of the set are compatible with are also recorded in the tables. Although I discuss in this chapter semantic relations with reference to Bangla V1s, it is worth mentioning here that the same semantic relations or their subtypes represent the meaning component of V2s also.

## 4.1 Various Approaches to Semantic Representation

This section first examines the traditional notion of thematic roles (Gruber 1965, Fillmore 1968 and many others) as a small set of undecomposable primitives. The work of Dowty (1991) introduces the notion of proto-agent and proto-patient, which are presumably associated with a set of semantic entailments. Wechsler (1995) and Davis (2001) follow the entailment view to represent lexical semantic structure of verbal predicates. The decomposition model of Jackendoff (1990) and Pinker (1989) analyze the notion of thematic roles configurationally as function-argument organization.

### 4.1.1 Thematic roles and a critique

Traditionally thematic roles are assumed to be a small set of undecomposable discrete elements including agent, patient, theme, experiencer, recipient, source, goal and others that are assigned to the arguments of a verb. For example, in a sentence like *ritu rɔmake ækʈa boɟ dilo* ‘Ritu gave Ramaa a book’, Ritu might be classified as playing an agent role because she brings about the event of giving. Since Ramaa receives the *boɟ* ‘book’, she might be classified as playing a recipient role. *ækʈa boɟ* ‘a book’ is the theme because it undergoes a change of possession. The early proposals took thematic roles to have the following characteristics as listed by Davis (2001):

- 1a. There is a small fixed set of thematic roles
- b. Thematic roles are atomic
- c. Each argument of a verb is assigned exactly one thematic role
- d. Thematic roles are uniquely assigned within a verb
- e. Thematic roles are non-relational. For example, the presence of a patient role in a predicator's list of roles does not imply the presence of an agent role as well.

These characteristics of thematic roles fail to hold up to the diagnostics and analyses of subsequent work. First, a small fixed set of thematic roles has never been agreed on. The feature *atomicity* has also been proved fallacious. Jackendoff (1990) points out that in the sentence 'John climbed the mountain' it is not 'the mountain' that is the GOAL, but the top of the mountain. He postulates the following structure for the transitive verb 'climb':

[<sub>Path</sub> TO ([<sub>Place</sub> TOP-OF ([<sub>Thing</sub> ])) ] ]

There is a GOAL and it is formally a location (the argument of TOP-OF) on the thing denoted by the direct object – not the thing itself. Thus, the semantics of the thematic role GOAL needs further decomposition into the constituent features such as TO, TOP-OFF and so on for accurate representation of the event. Consider the following two sentences in Bangla:

1. *chele-ṭa bari-ṭa-r dike e-lo*  
 boy-cl house-cl-gen towards come-3pt  
 'The boy came towards the house'

2. *chele-ṭa bari e-lo*  
 boy-cl house come-3pt  
 'The boy came home'

According to the traditional definition of thematic roles, *bari* 'house' will be assigned a thematic role goal or location in both cases. The sentence in (1) implies that the boy

traverses a path in order to reach the intended endpoint *baṛi* ‘house’. Nothing says that the boy reaches the destination, the house. The sentence in (2), on the other hand, entails that the boy reaches the endpoint. Thus the location entity *baṛi* ‘house’ is the ‘intended goal’ in (1) whereas in (2) it is the ‘goal reached’. In (1), *baṛi* ‘house’ is the argument of the post-positional phrase *dike* ‘towards’ and in (2) *baṛi* ‘house’ is the direct argument. Thus the feature *atomicity* does not hold.

Contrary to the claim stated in 1c, an argument may instantiate more than one thematic role. Let us consider, for example, the following sentence:

3. *ritu rohim-ke coṭa-lo*  
 Ritu Rohim-obj enrage-3 pt  
 ‘Ritu enraged Rohim’

Rohim is a patient because he is causally affected by the agent Ritu. The agent acts as a stimulus that has affected the mental state of the patient Rohim. Rohim undergoes a change in mental state as he becomes angry. Therefore Rohim is an experiencer as well.

The fundamental point about thematic roles, as many have noted it, is that they are not syntactic place-holders. They are semantic concepts. In a lexicalist framework such as HPSG where the lexical representation of a linguistic entity includes syntactic and semantic information at separate levels, linking principles map syntactic arguments to semantic roles specified in the semantic structure of the entity. Since agent, experiencer and theme can all occur in the subject position, the thematic role approach will force a not-so-elegant mapping principle stating that the subject can be an agent or an experiencer or a theme.

In the following sentence:

4. *ritu rama-ke haṣa-lo*  
 Ritu Ramaa-obj laugh-caus-3 pt  
 ‘Ritu made Ramaa laugh’

Ritu, being the causer, is given the role of agent. Ramaa is the affected being and therefore a patient. However, Ramaa also satisfies the requirement of agentivity because she does the action of laughing. One fundamental linking principle requires that the agent be mapped to the subject. The issue here is how to determine which of the two agents, the causer or the actor occupy the subject position.

Jackendoff reanalyzes the concept of theta-roles as particular structural configurations. GOAL, the object to which the motion proceeds, is, for example, the argument of the Path-function TO. Similarly SOURCE, the object from which the motion proceeds, appears structurally as the argument of the Path-function FROM. I will discuss the system of configuration in more detail with reference to Jackendoff and Pinker's work in section 4.1.3. The next subsection describes an alternative approach, which concentrates on identifying a set of semantic properties, referred to as proto-role entailments.

#### **4.1.2 An entailment view**

Dowty (1991) advocates an entailment-based view of lexical semantics without the thematic role primitives (such as agent, patient, recipient and so on). He proposed to cluster a set of semantic properties as proto-role entailments and grouped them into proto-agent and proto-patient properties. Following are the contributing properties of the Agent proto-role:

- a. Volitional involvement in the event or state
- b. Sentience (and/or perception)
- c. Causing an event or change of state in another participant
- d. Movement (relative to the position of another participant)
- e. (Exists independently of the event named by the verb)

And the contributing properties of the Patient proto-role are:

- a. Undergoes change of state
- b. Incremental theme
- c. Causally affected by another participant
- d. Stationary relative to movement of another participant
- e. (Does not exist independently of the event or not at all)

Davis (2001) sets up his model of lexical semantic representation of verbs following the entailment-based approach. He associates the agent proto-role and patient proto-role properties to the two *proto-role attributes* ACT and UND. The value of each proto-role attribute denotes an entity that plays a certain participant role in the denoted situation. Playing that role implies that a proto-role entailment associated with that attribute will hold of that entity by virtue of its participation in the situation. For example, the typed feature structure with the type designation *kamṛano relation* in figure 1 constitutes the linguistic representation of a biting event:

<i>kamṛano relation</i>	
ACT	biter
UND	bitten

**Figure: 1**

The value of the ACT attribute corresponds to the participant role ‘biter’ in the event of ‘biting’. The participant role ‘biter’ implies that it causally affects some other participant, the thing ‘bitten’. Being causally affected is a proto-role entailment, which is associated with the proto-role UND.

Davis postulated some more proto-role attributes. I list here these proto-role attributes and their associated entailments:

<b>ACT</b>	Causally affects or influences other participant(s) or event(s) Volitionally involved in event Has a notion or perception of other participant(s) in event or state Exerts forceful contact on other participant(s) in event Includes another participant in state or event Is superior compared to another participant Possesses another participant in state or event
<b>UND</b>	Causally affected or influenced by another participant in event Undergoes change of state in event Is incremental theme in event Moves with respect to another participant in event
<b>SOA</b>	Is conceived of or perceived by another participant in the event or state Is a resulting state or event caused in event Is an event or state that necessarily accompanies another event
<b>GRND</b>	Path traversed by another participant in event
<b>IMP-ON</b>	Is forcefully impinged upon in the event
<b>PART</b>	Is included in or part of another participant in state or event
<b>INF</b>	Is inferior compared to another participant
<b>POSSD</b>	Is possessed by another participant in the state or event

In addition to these, Davis refers to some other attributes: **MEANS**, **SOURCE**, **VIA** and **ENDPOINT**. I will make some revisions in the list of entailments which will be discussed in the next section.

In this system nothing prevents a participant from being denoted by the entailments associated with two different proto-role attributes. For example, the predicator *dou̇rono* ‘run’ has a single participant who initiates motion (an ACT proto-role entailment) and is affected by the movement (an UND proto-role entailment) as illustrated in Figure 2:

<i>dou̇rono relation</i>	
ACT	[1] runner
UND	[1]

**Figure: 2**

The following subsection discusses the configurational system of semantic representation. I do not organize the semantic structure of verbs on a single plane. Instead, I adopt the idea of Davis who argues for introducing some structure in the semantic representation of verbs.

The next subsection discusses the decompositional analysis, which advocates configurational representation of meaning components.

### 4.1.3 Representation of concepts configurationally

The decompositional model of Jackendoff (1990) and Pinker (1989) proposes a structured representation of the meaning component. This approach advocates a relational view of thematic roles, in which thematic roles are not taken as atomic, but can be defined as a set of positions within semantic structures, themselves built out of a set of primitive elements. Jackendoff, for instance, identifies the following categories as semantic primitives: Thing, Event, State, Action, Place, Path, Property and Amount. Each of these categories can be elaborated into a function-argument organization. For example, one way of representing an Event category is shown below. The function used to describe this event is GO:

$$[\text{Event}] \rightarrow [\text{Event GO}([\text{Thing}], [\text{Path}])]$$

The entity that traverses a path trajectory, traditionally called the theme, is presented configurationally as the first argument of the function GO. The second argument Path denotes the path traversed. This structure is seen in the sentence ‘Bill went to New York’. Similarly Pinker identifies the following functions: ACT, GO, HAVE and BE. He states his linking rules with reference to positions in the lexical semantic representation of a predicate especially within the main event. For instance the first argument of dyadic ACT in the main event is designed to be linked to the subject and the second argument to the object. For events of the GO and BE, only the first argument is linked directly to the subject. The other argument, which represents a PLACE category is realized as an argument of the prepositional phrase and is not directly linked to an NP.

The usefulness of the configurational representation of semantic roles in an entailment-based approach becomes evident in the purview of *linking theory* and *periphrastic compounding mechanism* as proposed in the present work. First I will examine how the configurational representation of lexical semantic structure of verbs affects the linking between semantic roles and syntactic arguments. Consider, for example, the use of the verbs *deḡa* ‘give’ and *dækḡano* ‘show’ in the following sentences:

5a. *ritu rḡma-ke chobi-ṭa dækḡa-lo*

Ritu Ramaa-obj picture-cl show-3 pt  
 ‘Ritu showed Ramaa the picture’

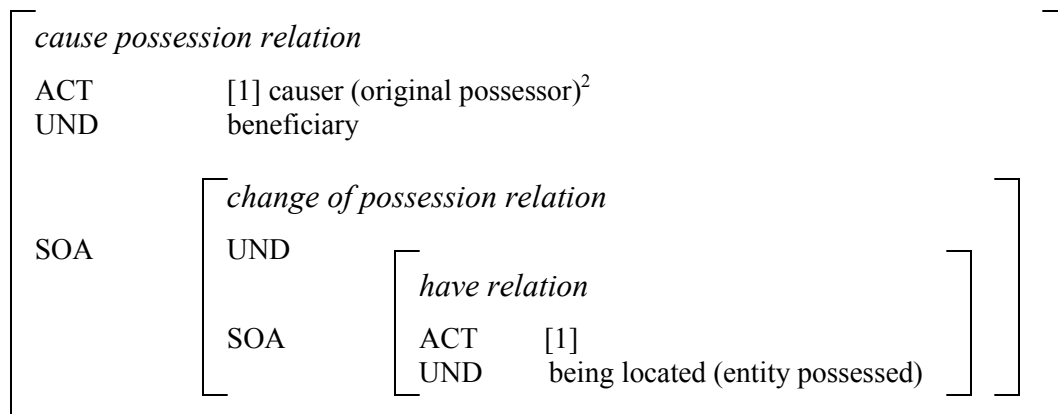
b. *ritu rḡma-ke chobi-ṭa di-lo*

Ritu Ramaa-obj picture-cl give-3 pt  
 ‘Ritu gave Ramaa the picture’

I propose that the following proto-role entailments hold of the two non-subject participants involved in the event denoted by the two verbs in (5):

- i. Being affected (either causally or being benefited)
- ii. Being located (either possessed entity or locatum)

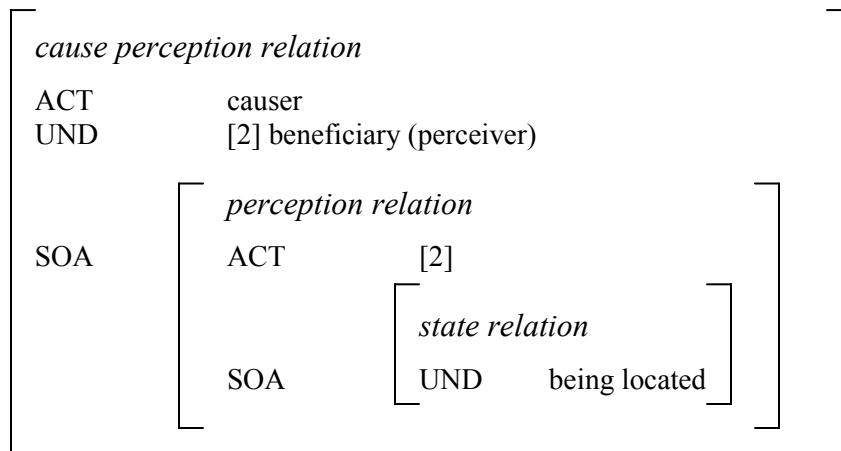
In my opinion the UND proto-role attribute entails these two semantic properties. The justification for associating the above entailments (in (i) and (ii)) with UND will be provided in this chapter. How should the semantic representation of the verbs in (5a) and (5b) be structured to ensure that the two participants represented by the two non-subject arguments on the argument-structure list bear entailments associated with the same proto-role attribute UND? A uniform level of semantic representation will require having two distinct proto-role attributes their values being linked to the two non-subject arguments. The postulation of two separate proto-role attributes in this case will be semantically unintuitive within the entailment-based theory of semantics. A configurational semantic structure, on the other hand, models the semantics of verbs in (5) as one event containing another as a part. The subevent is declared to be the value of SOA as illustrated in the following representation of the type *cause possession relation*. The semantic type of the verb *deqa* ‘give’ is a subtype of this semantic relation type:



**Figure: 3**

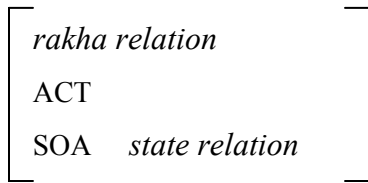
<sup>2</sup> The labels *causer*, *beneficiary* and so on are purely mnemonic. The interpretation of the proto-roles is determined by the type that contains the proto-role; in this case, for example, *cause possession relation*.

The ‘giving’ event embeds a subevent, which indicates that the object ‘picture’ undergoes a change of possession. A subevent entails a resulting state or event caused in an event or an event or state that necessarily accompanies another event. The subevent is always represented as the value of the feature SOA. The following feature structure description of the *cause perception relation*, which subsumes the semantic type of the verb *dækhano* ‘show’ (illustrated in (5a)), allows two ACT to be present at two levels.



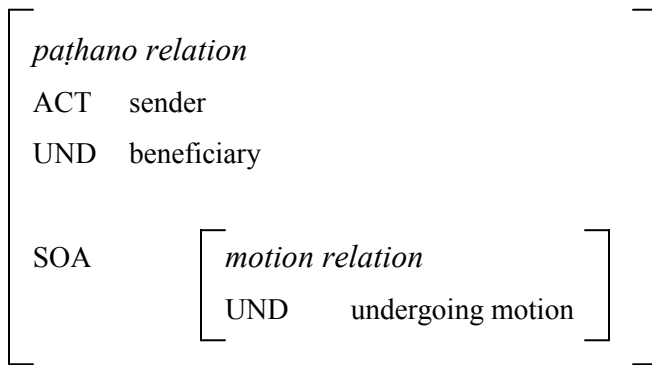
**Figure: 4**

The value of the embedded ACT structure-shares with that of the top-level UND thus showing that it plays the role of a non-actor participant in the main event. The semantic types of verbs such as *šonano* ‘make one hear, tell’, *cenano* ‘introduce’ are subtypes of *cause perception relation*. Thus a configurational representation of the meaning component of verbs enables us to avoid proliferation of proto-role attributes and yet correctly define the linking between semantic roles and syntactic arguments. Configurational representation of semantic structure also acts as a constraint for generating legitimate CV sequences only. The semantics of the V2 *rakha* ‘keep’, for example, requires the V1s (that select this V2) to have in their semantic structure an actor and an associated subevent that implies stativity. The stative subevent is structurally present as the value of the top-level SOA much like the following feature structure description:



**Figure: 5**

The semantic representation of the V1 *paṭhano* ‘send’ does not meet these requirements as it contains a motion subevent as shown in the following figure:



**Figure: 6**

The subevent, the value of SOA, is a subtype of *motion relation*, which cannot denote stativity. On the other hand, the semantic representation of the verb *deḡa* ‘give’ embeds a stative subevent (see figure 4). This explains why the verb *deḡa* ‘give’ selects the V2 *rakha* ‘keep’ but *paṭhano* ‘send’ does not as illustrated in the following sentences:

- 6a. *ritu rḡma-ke ṭaka-ṭa di-e rekh-eche, jḡkhon dḡrkar ni-e ni-o*  
 Ritu Ramaa-obj money-cl give-cp keep-3 pr pft whenever necessary take-cp take-2 ft imp  
 ‘Ritu has left the money with Ramaa, take it when you need it’

b. *ritu rɔma-ke ʔaka-ʔa paʔhi-eche / \*paʔhi-e rekh-eche*

Ritu Ramaa-obj money-cl send-3 pr pft send-cp keep-3 pr pft

‘Ritu sent money to Ramaa’

A mono-stratal representation would have introduced three proto-role attributes inside the semantic structure of both verbs *deqa* ‘give’ and *paʔhano* ‘send’ with their value denoting the causer Ritu, the beneficiary Ramaa and the theme *ʔaka* ‘money’ that is intended to undergo change of possession in the event of *deqa* ‘give’ in (6a) and *paʔhano* ‘send’ in (6b). This information is sufficient for the purpose of linking. But such a representation fails to show that the V1 *deqa* ‘give’ selects the V2 *rakha* ‘keep’ because it embeds a subevent of *stative type*, while the V1 *paʔhano* ‘send’ does not, because the embedded subevent within the semantic structure of *paʔhano* ‘send’ represents the *motion relation*. In other words the selection of *rakha* ‘keep’ is determined by the accompanying subevent and not by the nature of the main event. A configurational and structured representation of semantic relation essentially allows one to encode such variation in the semantic structure of verbs. The next section presents an overview of the chapter.

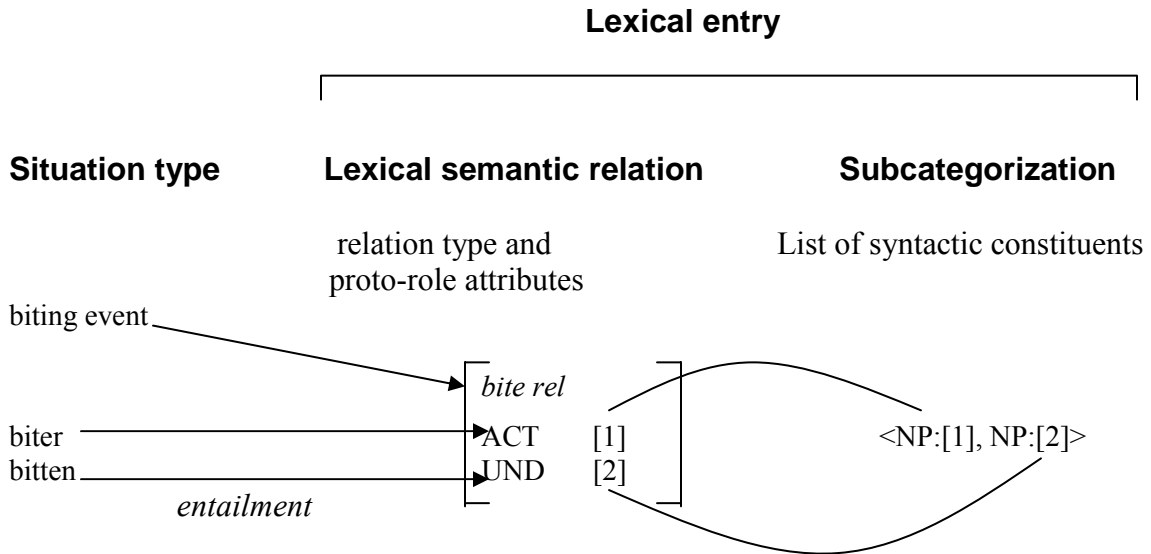
## 4.2 Overview

### 4.2.1 The use of entailments in representing semantic relations for verbs

A lexical semantic relation is represented as a *typed feature structure*<sup>3</sup>. Every proto-role attribute inside a semantic relation is associated with a set of entailments as described in section 4.1.2. The values of these proto-role attributes denote the participants involved in a situation of the type denoted by that semantic relation. Davis conceptualizes semantic relations as a level of representation, which is distinct both from “syntactic argument structure and from a non-linguistic level of events and states involving entities in (the mental projection of) the world, which is the level at which the entailments hold” (Davis 2001, p. 78). He has demonstrated the idea in the following manner:

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<sup>3</sup> Technical concepts such as *typed feature structure*, *unification*, *subsumption*, *constraint and well-formedness*, *multiple inheritance hierarchy* are explained in chapter 1.



**Figure: 7**

In figure 7, the left hand side represents the biting event in which two participants, the biter and the bitten thing, are involved. The *bite rel* in the center is, as stated earlier, a linguistic representation of the biting event. The values of the proto-role attributes ACT and UND within *bite rel* are linguistic objects denoting the two participants in the particular biting event. On the right hand side in figure 7, there is a list of syntactic arguments of the verb ‘bite’, whose semantic content corresponds to the value of ACT and UND. The linking mechanism defines the correspondence between the syntactic arguments and the semantic roles inside *bite rel*. Davis has formalized the *attribute-to-entailment condition* that relates the semantic roles inside the semantic relation to “situations in the world and their participants”:

### **Attribute-to-Entailment Condition:**

Let  $A$  be a proto-role attribute in feature structures of type  $rel$ , representing situations of type  $S$ . Then there exists a particular role  $Q$  such that:

- $Q(x, y) \rightarrow P(x)$ , where  $P$  is a proto-role entailment associated with  $A$ .  
The notation  $Q(x, y)$  indicates that a participant  $x$  in a situation  $y$  plays the participant role  $Q$ .
- If the value of  $A$  denotes  $a$  in a feature structure of type  $rel$  denoting situation  $s$ , then  $Q(a, s)$ .

(Davis 2001, p. 81)

Therefore, every participant represented in a predicator's lexical semantics has at least one proto-role entailment holding of it.

Unlike Davis, Jackendoff and Wechsler identify two representational levels: the level of syntactic constituents that directly corresponds to the conceptual constituents and the units of the conceptual structure. Conceptual semantics, the theory of conceptual structure,

... is concerned most directly with the form of the internal mental representations that constitute conceptual structure and with the formal relations between this level and other level of representation.

(Jackendoff 1990, p. 15)

According to Jackendoff the semantic level is, thus, the direct mental representation of the world. One advantage of separating the linguistic level of semantic representation from the actual situation in the world outside is the following: we can avoid participating in the debate over the ontological status of events and entities, and avoid addressing the question on whether for the purpose of linguistic semantics it makes more sense to treat semantics as

being about the external world or some mental representation of it<sup>4</sup>. I adopt Davis's model of entailment based lexical semantic representation in the present work.

#### 4.2.2 Semantic content of a verb

There are varied opinions and wide-ranging speculation regarding what and how much should be incorporated into the lexical semantic representation of a verb. I take the popular approach<sup>5</sup>, which sets its goal to identify those aspects of lexical semantics that are “grammatically relevant”; in other words, the semantic factors that determine the argument taking capacity of a verb and account for the range of alternations that the verb undergoes.

I will quote here from Pinker (1989) in support of this viewpoint:

... There is a set of semantic elements and relations that is much smaller than the set of cognitively available and culturally salient distinctions, and verb meanings are organized around them. ... The set would consist of symbols that have cognitive content, such as “causation”, and “location”, but not all cognitively meaningful concepts are members of this privileged semantic machinery. Thus a verb like ‘to butter’ would specify information about butter and information about causation, but only the causation part of it would trigger or block lexical rules or other lexical processes.

(Pinker 1989, p. 166)

Within the purview of Indo-Aryan languages, I propose to include those aspects of meaning also into the semantic representation of a V1 that play a role in determining the rightful choice of V2s by V1s. In order to ensure that a V1 makes only the right selection of V2s and

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<sup>4</sup> Jackendoff, for example, had to participate in the debate because he considered that the level of semantic representation directly instantiate the external world (see Jackendoff 1990, p. 11-15 for details).

<sup>5</sup> Pinker (1989), Jackendoff (1990), Levin (1993), Levin and Rappaport (1995, 1998) and Wechsler (1995) work in this direction. Davis has also agreed on the fundamental assumption that there are semantic regularities in the syntactic expression of arguments. He has, however, posed a very relevant problem. He cites the difference in subcategorization between two apparently synonymous verbs such as the following: ‘Few passengers waited for / awaited the train’ and comments that in cases like this the differences must be laid to some unelucidated semantic difference between the alternating verbs.

that only legitimate CV sequences are guaranteed, we sometimes require encoding of more fine-grained semantic information in the semantic structure of a V1 than would be needed for the selection of the right kind of syntactic arguments. Let me explain the idea in detail. The following are some Bangla inchoative verbs: *phoṭa* ‘blossom’, *copṣano* ‘get dampened’, *ghumono* ‘sleep’ and *jaga* ‘wake up’. These are monadic verbs. Syntactically they license one argument. The denotation of the argument is an undergoer participant that experiences a change of state. The event entails both the change and the resultative state that follows the change. The formal representation of *inchoative relation* is given in 4.3.1.6. The syntactic argument is mapped to the undergoer participant by some principle of linking theory. As far as the mapping between the syntactic argument of a verb and the semantic role inside its lexical semantic structure is concerned, the aforementioned meaning component sufficiently characterizes the status of the argument of the inchoative verb. However, as I will show here, the semantic information encoded for inchoative verbs is not sufficient for them to choose V2 members correctly. For example, V1 *phoṭa* ‘blossom’ and *jaga* ‘wake up’ select the V2 *oṭha* ‘rise’ whereas the V1 *copṣano* ‘get dampened’ and *ghumono* ‘sleep’ select the V2 *pōra* ‘fall’. Why do the two sets of inchoative verbs select different V2s? I attempt here to put forth a linguistic explanation by examining the *nature of change* that the participant undergoes. It is worthwhile to note that the two sets of verbs entail two different and contrastive kinds of *change*. For example, the undergoer participant involved in the event type denoted by the verbs *jaga* ‘wake up’ comes in a state of being active. In contrast, the participant involved in *ghumono* ‘sleep’ event ‘attains a state of non-activity’. In the previous chapter I argued that the semantics of the V2s *oṭha* ‘rise’ and *pōra* ‘fall’ represent two contrastive *manner relations* - *upward manner relation* and *downward manner relation* respectively. The former entails coming about or commencement of a situation, while the latter implies that the situation has already obtained or the situation has taken place (see subsection 3.2.2). I propose that the V1s *phoṭa* ‘blossom’ and *jaga* ‘wake up’ and the V2 *oṭha* ‘rise’, on the one hand, and the V1s *ghumono* ‘sleep’ and *copṣano* ‘get dampened’ and the V2 *pōra* ‘fall’, on the other, are type compatible. To ensure that this is so I assume that the semantic type of both the V1s *phoṭa* ‘blossom’ and *jaga* ‘wake up’ and the V2 *oṭha* ‘rise’ are subtypes of the *upward manner relation*, while the V1s *ghumono* ‘sleep’ and *copṣano* ‘get

dampened’ and the V2 *pōra* ‘fall’ are subtypes of *downward manner relation*<sup>6</sup>. The *upward manner relation* corresponds to situations in which the participant undergoing a change of state bears one the following entailments:

- i. To come to a state of being active
- ii. To get involved in a situation that begins
- iii. To come in a state of vitality

The *downward manner relation*, on the other hand, characterizes the following entailments:

- i. To come to a state of inactivity
- ii. To be a participant in a situation already taken place
- iii. To loose one’s existence or vitality

The discussion on individual verbs in section 4.3 will show that many verbs, which otherwise represent similar meaning components, characterize entailments associated with different *manner relation* and accordingly select either the V2 *oṭha* ‘rise’ or the *pōra* ‘fall’. I get, so far, only two V1s that select both V2s *oṭha* ‘rise’ and *pōra* ‘fall’. They are *hāpano* ‘pant’ and *bhaša* ‘float’.

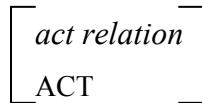
I postulate various semantic relations in the next section. I will arrange them in a multiple inheritance hierarchy. This provides the basis for relating semantically defined classes of verbs to one another, with the members of a given class sharing a part of their semantics and not needing to specify semantic commonalities in each individual lexical entry.

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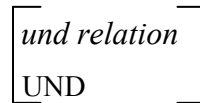
<sup>6</sup> I want to repeat at this point that all semantic relations that we will be discussing in this chapter instantiate the THEM value within a verb’s semantic predicator.

### 4.3 Lexical Semantic Relations and their representation

The proto-role attributes ACT and UND are introduced within the types *act relation*, *und relation* respectively as illustrated below. They represent two basic semantic types:



**Figure: 8**



**Figure: 9**

The other basic semantic relation is *soa relation*, which contains the proto-role attribute SOA. In my system the value of SOA is always a subevent that either accompanies the main event or is resulted from the main event. The entailments associated with the ACT and UND proto-role attributes have been stated in 4.1.2. The entity denoted by the value of these proto-role attributes might bear some additional entailments of which I will be discussing in the remainder of this chapter.

#### 4.3.1 Semantic relations representing monadic verbs with argument mapped to the value of the UND

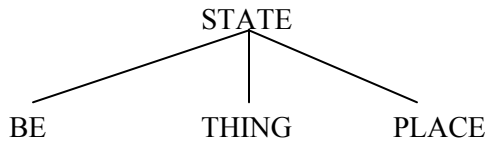
This section presents the semantic structure of verbs that have the following characteristics:

The argument that occupies the subject position satisfies one or more than one of the entailments associated with the UND proto-role attribute.

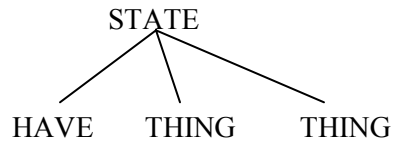
##### 4.3.1.1 State relation

Jackendoff (1990) and Pinker (1989) conceptualize two major semantic categories: EVENT and STATE. The *state relation* corresponds to two kinds of event types: (a) a participant located at a place and (b) a participant in a state of possessing the other participant in the

situation. Pinker has represented the category STATE in terms of two predicates BE and HAVE as shown in the figures below:



**Figure: 10**



**Figure: 11**

Following Pinker’s analysis, the verb *ach* ‘be’ in the sentence in (7) can be represented as an instance of the BE predicate. Ritu is the THING argument and *ghor* ‘house’ is the PLACE argument. The verb *ach* ‘be’ in (8) represents the HAVE predicate. The subject Minu is the possessor and the object *ækta boi* ‘one book’ is the object possessed:

7. *ritu ghor-e ach-e*

Ritu room-loc be-3 pr

‘Ritu is in the room’

8. *minu-r æk-ta boi ach-e*

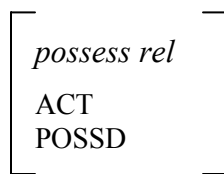
Minu-gen one-cl book have-3 pr

‘Minu has a book’

Pinker recognizes the cognitive relation between the two state predicates: “If X HAVE Y, then Y BE (place-function) X” (Pinker 1989, p. 190). Thus Pinker notionally accepts the verb ‘have’ to be a representative of a location-locatum relation, somewhat similar to the other state verb ‘be’, as exemplified in (7) above. Yet he prefers to postulate two separate predicates for representing the two verbs ‘be’, equivalent to *ach* ‘be’ in (7) and ‘have’, equivalent to *ach* ‘have’ in (8). The advantage of postulating two separate predicates BE and HAVE becomes apparent when we examine the strategy of *linking*. For example, Ritu in (7) and *ækta boi* ‘one book’ in (8) denote the entities being located. However, in (7), the

argument occurs in the subject position whereas it occupies the object position in (8). If both these entities were taken to be arguments of the same predicate, Pinker’s model would have failed to justify their mapping to different syntactic functions as per requirement.

Davis follows Pinker’s analysis in representing verbs of possession. He has, however, considered the possessor to be an actor. Thus the *possess rel* includes two proto role attributes as shown below:



**Figure: 12**

The value of ACT denotes the participant entailed to be the possessor and the value of POSSD denotes the possessed object. Davis has not defined the other stative predicate in terms of semantic relation. Therefore, it is not clear how he would have related the two stative predicates in his model or if he would have left them unrelated.

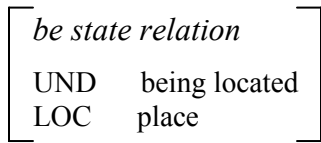
I adapt Pinker’s notion of stativity in my grammar by postulating a subtype of *und relation*. I call it *state relation*. The value of UND in *state relation* denotes a participant that is entailed to ‘be located’<sup>7</sup>. The type *be state relation* is a subtype of the type *state relation*. This semantic relation subsumes the semantic type of the following verbs:

- (A) *thaka* ‘stay’    *ach\_I* ‘be’    *rɔɔa* ‘remain’    *hɔɔa* ‘be’

---

<sup>7</sup> Within the framework of Role and Reference grammar (1984, 1997) two semantic macro-roles, actor and undergoer, have been postulated. As Van Valin notes (2001, p. 30-31), each of these macro-roles represents a grouping of thematic relations mainly for the purpose of defining generalized linking constraints. Along with other thematic relations such as patient, experiencer, recipient the theme (a cluster of semantic roles such as thing located, thing moved, thing given and so on) is represented as undergoer.

The *be state relation* is also a subtype of *loc relation* as shown in figure 13:

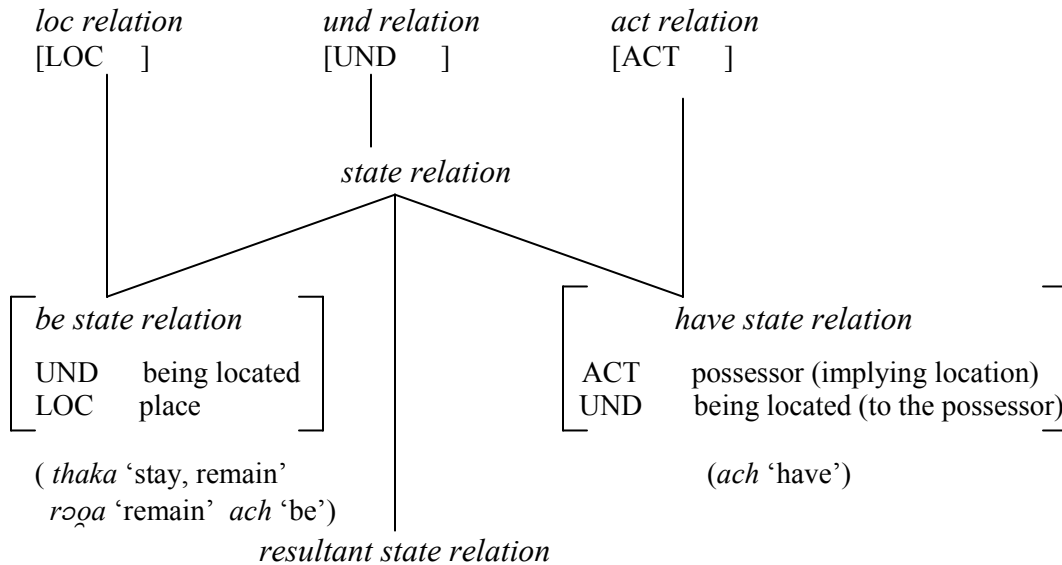


**Figure: 13**

The value of LOC denotes a place or stationary frame of location. The *have state relation* is a subtype of *act relation* and *state relation*. The value of ACT in *have state relation* denotes a possessor who is a human location. An actor marked locative is found in Bangla as illustrated below:

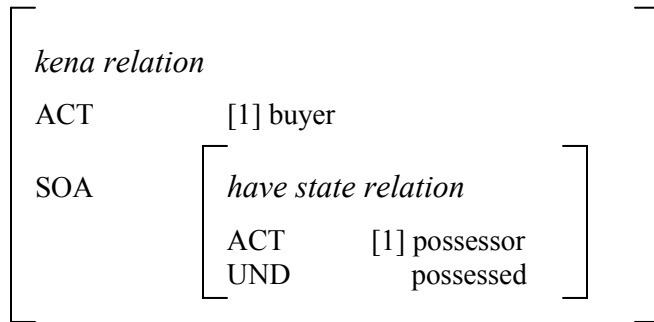
9. *bagh-e manuṣ kha-ḡ*  
 tiger-loc human being eat-3 pr  
 ‘Tiger eats human being’

The *state relation* and its subtypes are presented in a hierarchy in figure 14:



**Figure: 14**

The *have state relation* is the value of SOA for verbs *kena* ‘buy’ and *neqa* ‘take’. The semantics of these verbs entails that the actor who buys or takes a thing is also the eventual possessor. This information is represented by co-indexing the values of top-level ACT and embedded ACT. Here I present the feature structure for *kena relation*:



**Figure: 15**

The *resultant state relation* corresponds to the stative situation that follows change of state. For example, it constitutes the value of SOA within the semantic representation of *inchoative verbs* (see 4.3.1.6).

#### 4.3.1.2 Change of state relation

The *change of state relation* corresponds to a situation in which a participant is entailed to undergo a change of state. This relation type subsumes the semantics type of the following verbs:

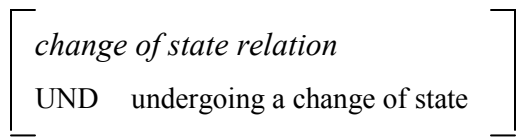
- (B) *bhaṇa* ‘break’      *chēṛa* ‘tear’      *khola* ‘open’      *khōṣa* ‘fall off’      *oba* ‘evaporate’  
*ghoca* ‘disappear’      *opcano* ‘spill’      *mōra* ‘die’      *phola* ‘happen’      *phaṭa* ‘explode’  
*oḷṭano* ‘tumble’      *thāṭlano* ‘get smashed’      *mōckano* ‘get twisted’

These verbs represent the function described by the operator BECOME in Dowty’s work. It is defined as

$$\text{BECOME}(p) =_{\text{def}} \sim pTp,$$

where p is a state, T is a dyadic operator meaning “And Next”.

The semantic representation of the *change of state relation* is given in figure 16:



**Figure: 16**

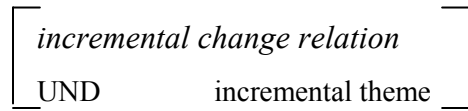
#### 4.3.1.3 Incremental change relation

There is another kind of change of state verb that denotes an event type in which the participant undergoes an incremental change (Dowty (1991) first used the term *incremental theme*):

(C) *kɔma* ‘diminish’      *phurono* ‘get exhausted’      *ɖoba* ‘sink’      *gɔla* ‘melt’  
*pɔca* ‘rot’      *nebha* ‘be extinguished’      *pora* ‘burn’

The event denoted by verbs of class (C), unlike that denoted by those of class (B), characterizes an internal development. The participant involved in the event undergoes a gradual change. Dowty’s *degree achievement* predicates (Dowty 1979) express similar characteristics.

The *incremental change relation* is presented in figure 17:



**Figure: 17**

#### 4.3.1.4 Inherently directed motion relation

*Motion verbs* represent an event of movement. The following motion verbs are known as *inherently directed motion verbs*:

(D) *dhoka* ‘enter’      *berono* ‘come out’      *nama* ‘descend’      *šɔra* ‘go off’      *jaqa* ‘go’  
*aša* ‘come’      *pɔra* ‘fall’      *oħa* ‘rise’      *gɔrano* ‘roll’      *egono* ‘proceed’

These verbs denote an event type that entails the following:

1. Two participants are involved in the situation. One is the entity that undergoes movement and the other is the stationary reference frame with reference to which the path is defined.
2. The moving object traverses some path.
3. The direction of movement acquires prominence. For example,

‘up’ for *oħa* ‘rise’

10a. *ritu gach-e uħ-lo*  
 Ritu tree-loc rise-3 pt  
 ‘Ritu climbed the tree’

‘down’ for *nama* ‘descend’

- b. *ritu nice nam-lo*  
Ritu downstairs descend-3 pt  
‘Ritu came down’

‘down toward’ for *gɔɾano* ‘roll’

- c. *bolṭa nice-r dike gɔɾa-cche*  
ball-cl down-gen towards roll-3 pr cont  
‘The ball is rolling downward’

‘toward Place’ for *egono* ‘proceed’

- d. *ritu mondir-er dike ego-lo*  
Ritu temple-gen towards proceed-3 pt  
‘Ritu proceeded towards the temple’

‘from Place’ for *šɔra* ‘go off’

- e. *tumi ekhan theke šɔr-o*  
you here from go off- 2 pr imp  
‘Go off from here’

‘to Place’ for *phera* ‘return’

- f. *ritu ɔnek rat kore bari pher-e*  
Ritu very night prt house return-3 pr  
‘Ritu comes home very late at night’

‘to Here’ for *aša* ‘come’

- g. *ritu gɔtokal ekhane eš-eche*  
Ritu yesterday here come-3 pr pft  
‘Ritu came here yesterday’

‘to There’ for *jaqa* ‘go’

h. *ritu agamikal dilli ja-be*  
Ritu tomorrow Delhi go-3 ft  
‘Ritu will go to Delhi tomorrow’

‘To in Place/Thing’ for *dhoka* ‘enter’

i. *ritu ghor-e dhuk-lo*  
Ritu room-loc enter-3 pt  
‘Ritu entered the room’

‘from in Place/Thing’ for *berono* ‘come out’

j. *gorto theke æk-ta idur bero-lo*  
hole from one-cl rat come out-3 pt  
‘A rat came out of the hole’

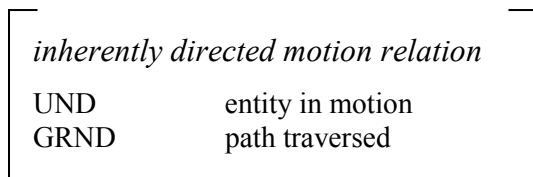
Jackendoff (1990) identifies the ambiguous nature of the non-stationary participant. He shows the contrast between the two verbs ‘enter’ and ‘roll’ in English. According to him the participant involved in the action of ‘entering’ in (11a) is an actor whereas the role of the participant who is rolling in (11b) is ambiguous in nature.

- 11a. Bill entered the room  
b. Bill rolled down the hill

Bill may or may not perform the function of ‘rolling down’ willfully. Jackendoff observes, ‘any actor, if animate, is subject to this ambiguity’. All these observations of Jackendoff are valid for Bangla *inherently directed motion verbs*. However, in Bangla (and also in English) all these verbs license inanimate subjects as shown in the following sentences:

- 12a. *šohore hu-hu kore nodi-r jol dhuk-che*  
 city-loc streaming prt river-gen water enter-3 pr cont  
 ‘The river waters are streaming into the city’
- b. *šurjo purbo akaš-e oth-e*  
 sun east sky-loc rise-3 pr  
 ‘The sun rises in the eastern sky’
- c. *brišti por-che*  
 rain fall-3 pr cont  
 ‘It is raining’
- d. *bol-ṭa nicer dike gora-cche*  
 ball-cl down-gen towards roll-3 pr cont  
 ‘The ball is rolling downward’

The participant that is realized as the subject in the sentences in (12) is not entailed to be a volitional or “willful doer” (a term used by Jackendoff). On the other hand, all these participants, animate or otherwise, undergo movement, an entailment associated with the UND proto role attribute. Davis describes the inherently directed motion verbs as representing a motion relation. This is given in figure 18:



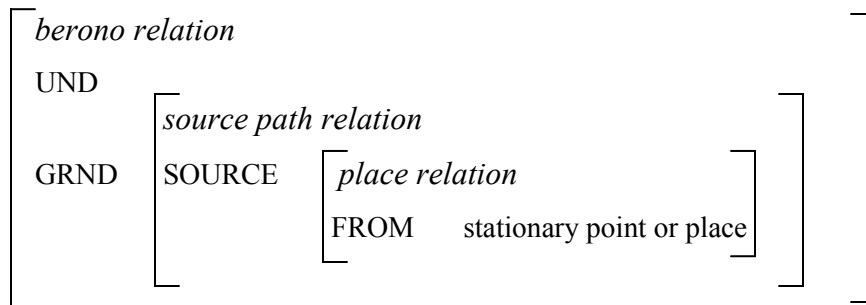
**Figure: 18**

Davis represents the stationary participant in the event by introducing an attribute GRND that entails “the trajectory traversed by the moving object”. In Jackendoff’s system the semantic category PATH represents this entailment.

I make a slight modification to the entailment associated with GRND. There are motion verbs that denote traversal through a trajectory, but unlike inherently directed motion verbs, the event denoted by these verbs does not include stationary reference points. These verbs are *douřono* ‘run’, *hāřta* ‘walk’, *cola* ‘move’, *bæřano* ‘roam’, *řāřrano* ‘swim’, *ora* ‘fly’. I will describe the semantic type of these verbs in section 4.3.2.1. To accommodate these two types of motion verbs, I assume that the proto-role GRND entails the following:

1. A trajectory traversed by the moving object
2. A trajectory defined with respect to a stationary reference frame

The value of GRND within the *inherently directed motion relation* denotes the trajectory defined with respect to a stationary reference frame. I postulate a type *path relation* that represents the value of GRND. The type *path relation* further subsumes various subtypes. Each of them contains an attribute analogous to Jackendoff’s path and place functions that denote the start, end or intermediate points of the path of a moving object. The representation of the semantics of the verb *berono* ‘come out’, for example, is given in figure 19:



**Figure: 19**

Here the value of GRND is *source path relation*, which is a subtype of *path relation*. The proto role attribute within *source path relation* is SOURCE. The value of SOURCE denotes a place or region from where the moving object, as denoted by the value of UND, comes out.

#### 4.3.1.5 Change of location relation

This semantic relation corresponds to an event in which the participant is entailed to undergo change of location. The *change of location relation* subsumes the semantic type of the following verbs:

(E) *põuchono* ‘reach’      *čara* ‘depart’

The event is punctual and does not imply any internal development. In this respect these verbs are similar to those of class (B) and the BECOME function (see 4.3.1.2) correctly describes the event. Consider, for example, the following sentences:

13a. *ritu bari põucho-lo*

Ritu house reach-3 pt

‘Ritu reached home’

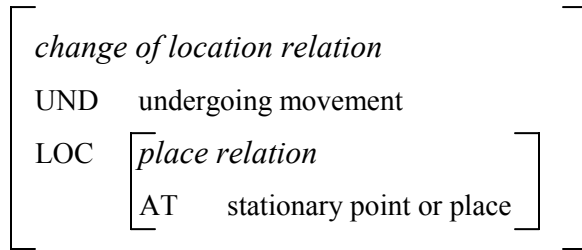
b. *tren thik šomǝ sęšan čar-lo*

train right time station depart-3 pt

‘The train departed the station in right time’

The event *põuchono* ‘reach’ in (13a) signifies ‘Ritu’s arrival at home’ and implies her non-existence at that place a moment prior to the event of arrival. Similarly the event *čara* ‘depart’ in (13b) entails ‘the departure of the train’ from ‘the station’ and the train is absent from the station immediately after the departure. These verbs are subtypes of *und relation* and *loc relation*. The value of the proto-role attribute LOC inside the *loc relation* refers to a

stationary point or place. The feature structure for the semantic representation of the event denoted by the verb *pō̄uchono* ‘reach’ is depicted in figure 20:

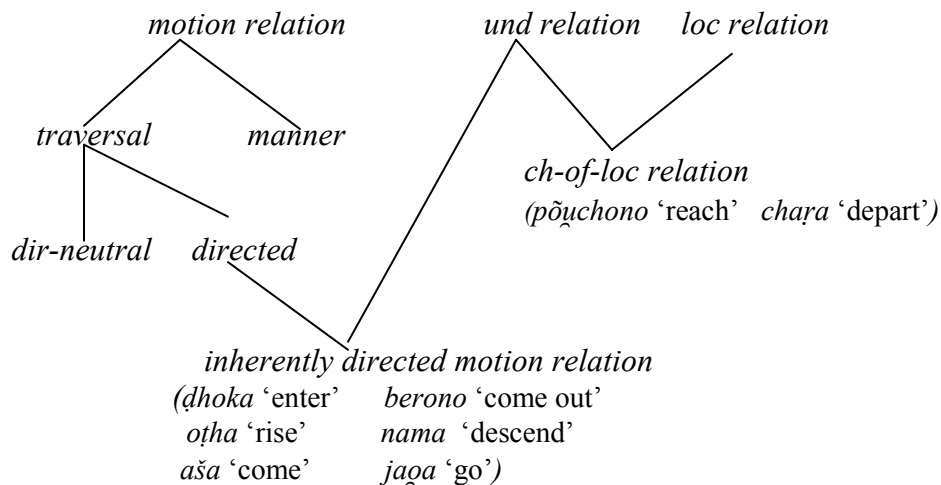


**Figure: 20**

Unlike verbs of the previous class (section 4.3.1.4), these verbs do not necessarily entail movement as the sentences in (14) shows:

14. *ritu-r mrittu šoᅇbad aj pō̄uch-eche*  
 Ritu-gen death news today reach-3 pr pft  
 ‘The news of Ritu’s death reached (us) today’

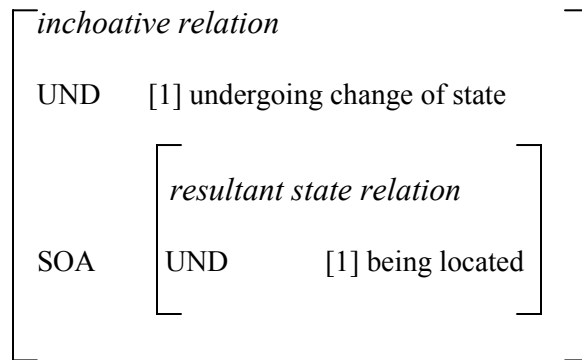
The following hierarchy presents the *change of location relation* and *inherently directed motion relation*:



**Figure: 21**

### 4.3.1.6 Inchoative relation

Inchoative verbs denote event types in which the participant that undergoes a change of state is also entailed to be located at a resultant state that follows the change. Therefore the semantic structure of these verbs embeds a subevent of the type *resultant state relation* as shown in the following figure:



**Figure: 22**

The semantic types of the following verbs are the subtype of *inchoative relation*:

- (F1) *ghumono* ‘sleep’    *jhimono* ‘doze’                      *šoqa* ‘lie down’  
 (F2) *thama* ‘stop’            *thitono* ‘become quite’  
 (F3) *phola* ‘swell’            *jola* ‘blaze, shine’                      *paka* ‘ripen’                      *phota* ‘blossom’  
           *bāca* ‘survive’            *ghama* ‘perspire’                      *gɔjano* ‘sprout’  
 (F4) *bhɔra* ‘fill’

For instance, the verb *ghumono* ‘sleep’ denotes an event type in which the participant is entailed both to undergo a change of state, from being active to being non-active, and to remain in that non-active state, i.e., the state of ‘sleeping’. The embedded subevent denotes the resultant state. That the event denoted by verbs of *inchoative relation* includes a resultant state becomes evident when these verbs occur in the context of the stative verb *ach* ‘be’. The stative segment of the event is focused. Verbs of class (F) are compatible with the *ach* ‘be’

predicate as illustrated in the sentences in (15) in contrast with those of classes (B) and (C) (as exemplified in (16)):

15a. *šara akaš megh-e dhek-e ach-e*

whole sky cloud-loc cover-cp be-3 pr

‘The whole of the sky is covered with clouds’

b. *tar du-cokh jol-e bhor-e ach-e*

he-gen two-eye water-loc fill-cp be-3 pr

‘Her eyes are filled with tears’

c. *gari-ṭa them-e ach-e*

car-cl stop-cp be-3 pr

‘The car is standing (still)’

16a. *\*šurjo pošcim akaše dub-e ach-e*

sun west sky-loc set-cp be-3 pr

‘The sun sets in the western sky’

b. *\*tak theke poṛ-e glaš-ṭa bheṅ-e ach-e*

shelf from fall-cp glass-cl break-cp be-3 pr

‘The glass has fallen down from the shelf and remained in a broken state’

c. *\*roudr-e jamakapoṛ šuki-e ach-e*

sun-loc clothes dry-cp be-3 pr

‘The clothes dry in the sun’

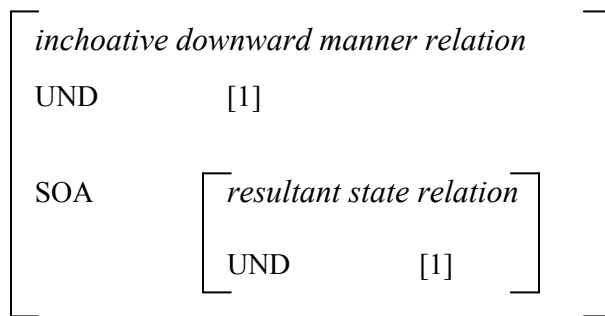
The inchoative verbs are categorized into different subclasses depending on the following two factors:

1. Whether the entity that undergoes a change of state is an *incremental theme* or not (see subsection 4.3.1.3 for the definition of incremental theme), and
2. Whether the nature of the change indicates a *upward manner* or *downward manner* (see subsection 4.2.2)

I will describe the event type of verbs of each subclass of (F) separately.

#### 4.3.1.6.a Inchoative downward manner relation

This semantic relation is a subtype of *inchoative relation* and *downward manner relation*. The representation of this semantic relation is given in the following figure:



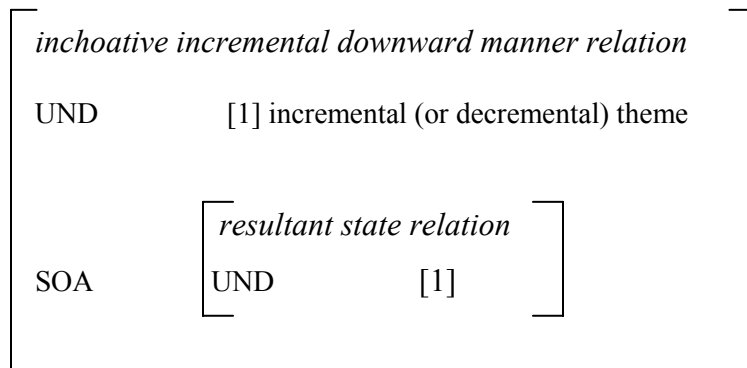
**Figure: 23**

Verbs of class (F1) belong to this type. These verbs denote an event type in which the participant is entailed both to undergo a change of state and to come to a state of being non-active. The hierarchy of semantic relations reflect this by classifying the semantic type of these verbs not only a subtype of *inchoative relation*, but as subtype of both *inchoative relation* and *downward manner relation*. The *downward manner relation* entails that the UND participant comes to state of inactivity.

#### 4.3.1.6.b Inchoative incremental downward manner relation

Verbs of class (F2) repeated below belong to this type, which is a subtype of both *inchoative relation* and *downward manner relation*. This semantic relation is depicted in figure 24:

(F2) *thama* ‘stop’      *thitono* ‘become quite’



**Figure: 24**

Like verbs of class (F1) the semantics of these verbs also implies that the participant comes into a state of inactivity. The change is gradual and not instantaneous. For instance, the sentence in (17a) suggests that *brišfi* ‘the rain’ has not stopped entirely but it is slowing down gradually:

17a. *brišfi them-e aš-che*

rain stop-cp come-3 pr cont

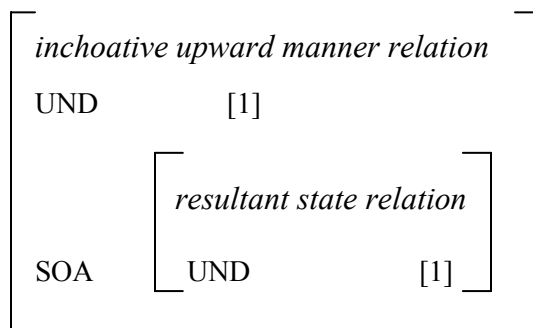
‘The rain is slowing down gradually / The rain is about to stop’

The event types denoted by verbs of class (F1), however, do not indicate that the change is gradual. Therefore the following sentence is bad:

17b. \**bacca-ṭa šu-e aš-che*  
 child-cl lie down-cp come-3 pr cont  
 ‘The child is about to lie down’

#### 4.3.1.6.c Inchoative upward manner relation

This semantic relation is different from the previous two semantic relations in that it is a subtype of *upward manner relation*. The following figure describes this semantic relation:



**Figure: 25**

The semantic types of verbs of class (F3) (repeated below) are subtype of *inchoative upward manner relation*:

(F3) *phoṭa* ‘blossom’      *phola* ‘swell’      *jɔla* ‘blaze, shine’      *paka* ‘ripen’  
*bāca* ‘survive’      *gɔjano* ‘sprout’

The semantics of these verbs entail that the participant that undergoes a change of state attains a state of wholeness or vitality, a characteristic inherited from the *upward manner relation*.

#### 4.3.1.6.d Inchoative incremental upward manner relation

The semantic type of verbs of class (F4) such as *bhōra* ‘fill’ belong to this semantic type, which is similar to the one specified in 4.3.1.6.c except that this verb entails a gradual change of state. The following feature structure describes this semantic relation:

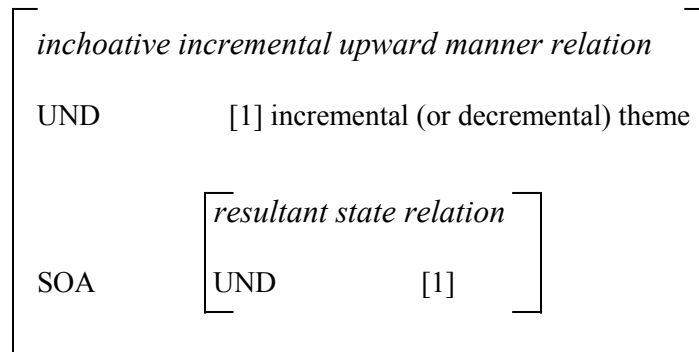


Figure: 26

#### 4.3.1.7 Mental inchoative relation

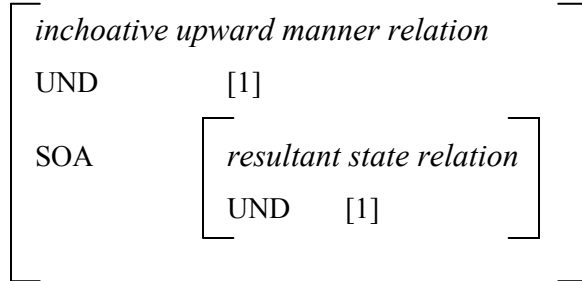
Verbs expressing emotional state of a participant are variously called *experiencer verbs*, *verbs of emotion* and *psych verbs*. Croft (1991) categorizes them into four major types. I will discuss the **inchoative mental verb** type in this subsection. Other types will be dealt with in detail in subsection 4.3.3.1.

The type includes English ‘get+adj’ verb phrases such as ‘get mad at’, ‘get bored with’ etc. In Bangla the following verbs are inchoative mental verbs:

(G) *khæpa* ‘be angry’      *cōṭa* ‘be angry, take offence’      *raga* ‘be angry’  
*tata* ‘be heated, get excited’

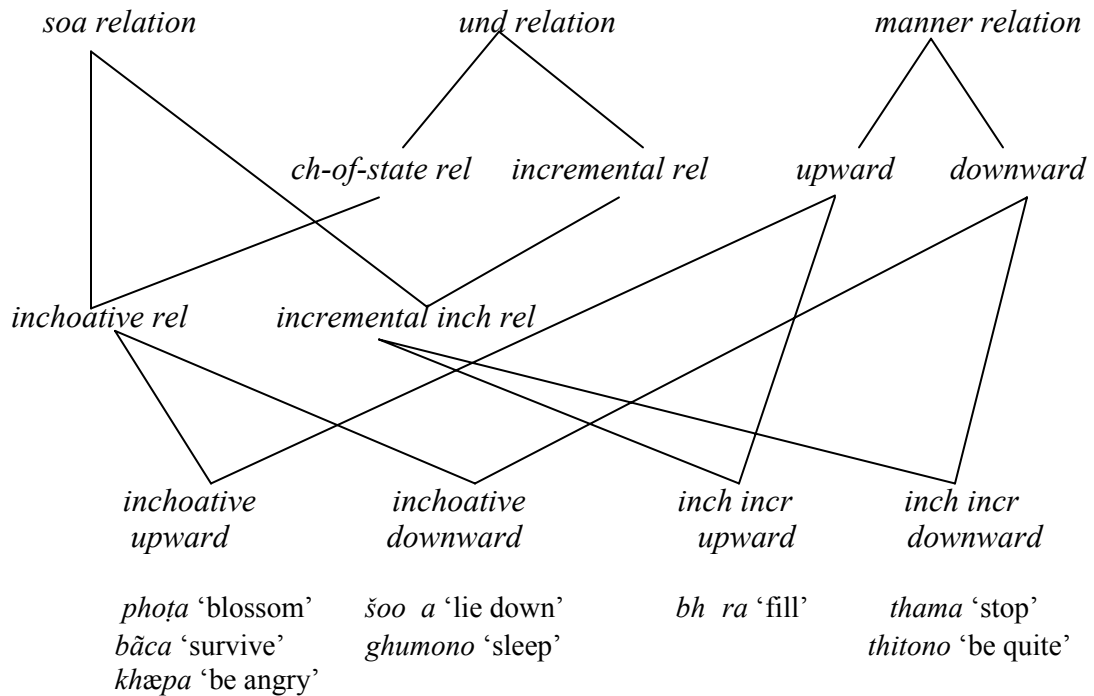
The situation denoted by the semantic type of these verbs entail that an experiencer participant undergoing a psychological change of state is emotionally stimulated or

energized. The semantic types of these verbs are classified to be the subtypes of *inchoative upward manner relation*. This is given in figure 27:



**Figure: 27**

In the present work I do not differentiate mental inchoative verbs from other inchoative verbs (see class F3) whose semantic types are the subtype of *inchoative upward manner relation* because verbs of these two classes select the same set of V2s (see table 1 in section 4.4). I present a type hierarchy of various *inchoative relations* in figure 28 (Abbreviation of type names are used here and elsewhere without further comments):



**Figure: 28**

#### 4.3.1.8 Nondislocative motion relation

Verbs of class (H1) and (H2) indicate only the internal motion of the subject, with no implication with respect to their location, change of location or configuration vis-à-vis any other object.

(H1) *kāpa* ‘tremble’ *dola* ‘rock’ *n ra* ‘move, shake’ *bara (gach)* ‘grow (of tree)’

(H2) *dhola* ‘doze’

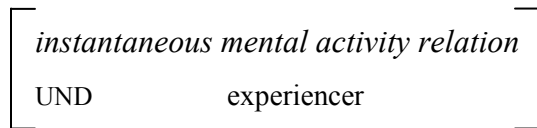
Pinker calls these verbs *manner of motion verbs*. Jackendoff distinguishes these verbs from other motion verbs by excluding the former from instances of the GO function. He postulates a new function MOVE to describe the semantics of manner of motion verbs. Jackendoff has noted that some verbs of this class can appear with a *Path* expression. Levin and Rappaport (1995) refer to these verbs as *internally caused verb* because the eventuality that they describe “cannot be externally controlled or can be controlled only by the person engaging in it” (Levin et al 1995, p. 90). According to Smith (1991), these are semelfactive verbs representing an instantaneous atelic event type. I consider *nondislocative motion relation* to be a subtype of *und relation* and *manner of motion relation*, a subtype of *motion relation*. The situation corresponding to *nondislocative motion relation* entails momentary and presumably repetitive nondislocative motion experienced by the participant at successive span of time. Verbs of class (H2) indicate that the participant is approaching a state of inactivity. For example, the participant who dozes, as the verb *dhola* ‘doze’ implies, is engaged in a non-energetic activity. Therefore I assume that the semantic type of verbs of class (H2) is a subtype of *downward manner relation*. In contrast, the verb *bara* ‘grow’ of class (H1) entails the growth of the participant involved in the event. The verbs of class (H1) denote an event that entails that the participant involved in the situation is not approaching a state of inactivity as opposed to those of class (H2). In the present work the semantic types of verbs of class (H1) is defined to be a subtype of *upward manner relation*. Thus I consider that the situation denoted by the verbs of these two subclasses (H1 and H2) correspond to contrastive nondislocative motion relations.

#### 4.3.1.9 Instantaneous mental activity relation

Verbs of this semantic type denote event types in which a participant is entailed to produce spontaneous emotive response to the stimulus that he or she experiences. Since the participant cannot exercise any control over his/her response, this entailment is associated with the UND proto-role attribute. In Bangla the semantic types of the following verbs are the subtype of this semantic relation:

(I) *ãtkano* ‘startle (as in fright)’      *cɔmkano* ‘startle’      *tɔla* ‘agitate’

The feature structure representation of this semantic type is the following:



**Figure: 29**

The following hierarchy presents a complete relational structure of the different semantic relations, which have been identified in this subsection:

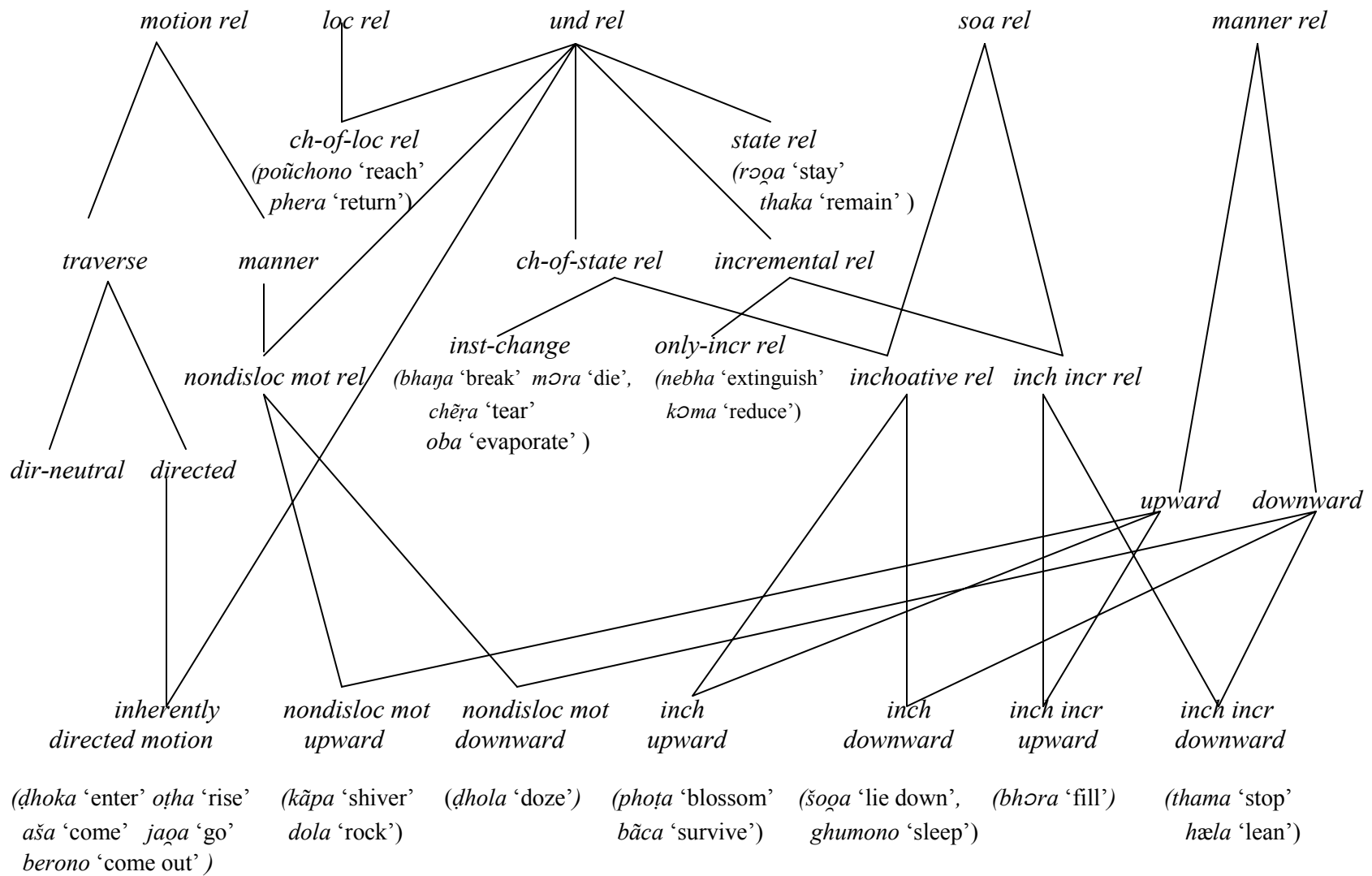


Figure: 30

## 4.3.2 Semantic relations representing monadic verbs with argument mapped to the value of the ACT

### 4.3.2.1 Self act motion relation

I illustrated two types of motion relation in the previous sections (see 4.3.1.4 and 4.3.1.8). They are *inherently directed motion relation* and *nondislocative motion relation*. In both cases the value of UND denotes the participant that undergoes motion. The following set of motion verbs denotes an event type in which the participant is a volitional actor who initiates the movement. He is also an undergoer because he undergoes movement.

(J) *doḡrono* ‘run’    *hāṭa* ‘walk’    *šātrano* ‘swim’    *cɔla* ‘move’    *oṛa* ‘fly’  
*choṭa* ‘run’    *bæṛano* ‘roam’

Following Davis I employ both ACT and UND attributes inside the semantic relation representing these verbs. Their values are structure-shared. Like *inherently directed motion relation*, this semantic relation type also includes the feature GRND. The entailment associated with the proto role GRND for the *self act motion relation* under consideration is “the trajectory traversed by the moving object”. The value of EXT within the *path relation* denotes the trajectory traversed by the moving object:

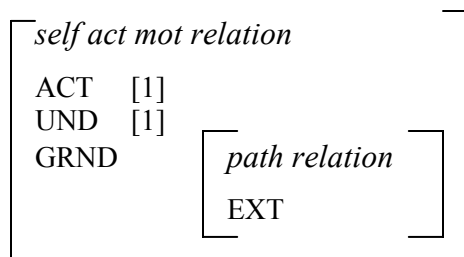


Figure: 31

### 4.3.2.2 Oriented inchoative relation

The event denoted by these verbs entails a motion oriented to a certain direction:

(K) *bɔša* ‘sit’            *dāṛano* ‘stand’            *šoqa* ‘sleep’

The semantics of these verbs indicates an orientation. In the case of the verb *bɔša* ‘sit’, for example, the orientation is towards the place where the participant takes his / her seat. The situation entails a resultant state as well. Unlike other inchoative verbs discussed in the previous sections, the actor participant involved in this type of inchoative relation is a sentient being. Therefore, the semantic structures of these verbs contain both ACT and UND and their values are structure shared. The following feature structure represents the semantic type for *bɔša* ‘sit’:

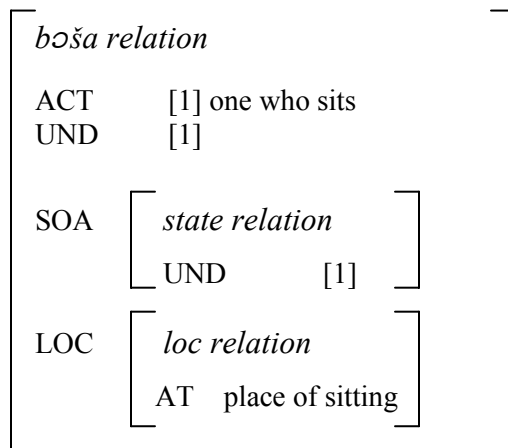


Figure: 32

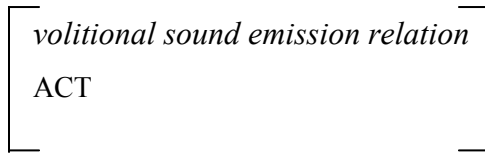
### 4.3.2.3 Volitional sound emission relation

This semantic relation corresponds to an event type in which an actor is entailed to be volitionally involved in an activity. This semantic type is also a subtype of *sound emission*

*relation* that entails emission of sound. The verbs of class (L) are subtypes of this semantic type.

(L) *haša* ‘laugh’      *kāda* ‘cry’      *gaḡa* ‘sing’      *cācano* ‘scream’      *bola* ‘speak’

The following feature structure represents this semantic type:



**Figure: 33**

I have postulated a set of semantic relations in 4.3.1 and 4.3.2 that represent the semantic types of intransitive verbs. In the following section, I will consider lexical semantic relations that represent the semantics of dyadic verbs.

### **4.3.3 Semantic relations representing dyadic verbs**

I identify two major event types that involve at least two participants. They are the following:

1. One participant (perceiver/ experiencer) has the notion of the other (perceived)
2. An activity (more precisely the ‘effect’ of an activity) is carried over from one participant (actor) to another participant (undergoer)

I use the following broad terms to refer to these event types:

- i. Notion relation
- ii. Transitive relation

The actor, participating in a transitive relation might have a notion of the undergoer entity. Nevertheless, I restrict the use of the term *notion relation* to represent the semantics of perception and psychological verbs (illustrated in the next subsection). The primary difference between *notion relation* and *transitive relation* is that in the former case, the perceiver does not physically act upon the perceived entity.

The transitive relation corresponds to an event type in which two participants are involved: one who initiates the event, the actor and the other who is in some sense the recipient of the effects of results of the action, the undergoer. In linguistic theory one popular way to interpret this kind of relation is in terms of ‘analysis of causation’, which implies that the effect of the action initiated by the actor is transferred to the undergoer. Wechsler (1995), on the other hand, argues that the situation under consideration should be interpreted from ‘the viewpoint of the affected entity’.

### **Analysis of Causation**

Scholars in their attempt to understand the nature of ‘causation’ have come up with two completely different viewpoints. They are: (i) **bi-event analysis of causation** and (ii) the analysis of causation in terms of **force-dynamic relations among participants**. The former approach interprets causation as a relation between the initiating and the resultant events, while the latter approach views it as a relation between the protagonists involved in the situation.

#### An analysis of causatives in terms of two events

Dowty (1979) gives an analysis of accomplishment verb in terms of a CAUSE operator, which is a kind of two-place sentential connectives. For example, he suggests that accomplishment sentences such as ‘John killed Mary’ and ‘John painted a picture’ will have a logical structure with roughly the form of (a) and (b) respectively:

- a. [[John does something] CAUSE [ BECOME ~[Mary is alive']]]
- b. [[John paints] CAUSE [ BECOME [a picture exists]]]

Dowty identifies the following advantage of the above representation:

“... accomplishments are semantically bipartite in a way that activities are not, that some state of affairs obtains over and above that which consists in the performance ... of the subservient activity”

(Dowty 1979, p. 92)

According to Levin and Rappaport (1995, p. 83), the meaning of verbs which have a complex semantic representation involving the predicate CAUSE involves two sub-events, each an argument of the predicate CAUSE. The bi-event analysis of accomplishments is also suggested in the works of generative semanticists. Levin and Rappaport (1995) adopt the bievent analysis for interpreting mainly achievement verbs, which show typical change of state alternation such as, ‘John broke the window’, ‘John sank the ship’. Levin et al. introduce a distinction between ‘internal’ causation and ‘external’ causation and argue that verbs showing ‘external’ causation participate in causative alternation. The ‘internal’ causation eventuality arises from the internal physical characteristics of the participant, typically an emotional reaction. They categorize English verbs ‘play’, ‘speak’, ‘blush’, ‘laugh’, ‘tremble’ as internally caused verbs. The externally caused verbs imply the existence of an “external cause” with the immediate control over bringing about the eventualities described by the verb. They identify transitive verbs of change of state such as ‘break’ and ‘cut’, verbs of movement and change such as ‘spin’, ‘rotate’ and ‘roll’ as externally caused verbs. They consider verbs of spatial configuration such as ‘hang’, ‘lean’, ‘sit’ and ‘lie’ to be externally caused verbs because ‘hanging’, ‘lying’ are postures that can be brought about by an external cause.

### Force-dynamic relations between participants

Talmy (1988) first introduced the concept of *force dynamics*. This system represents causation as individuals acting upon individuals, with some notion of transmission of force determining which participant is the ‘first’ in the causal order or the causal chain. Croft (1991) and Jackendoff (1990) adopt the concept of force-dynamic relation in interpreting the relation of causation.

Jackendoff elaborates Talmy’s fundamental concept of force-dynamic relation as follows:

Force dynamic concepts involve the interaction of two characters. One of these characters, the *agonist*, has a tendency toward performing or not performing some action; this tendency is opposed by the other character, the *antagonist*. Standard causation is the case in which the antagonist gets his/her/its way, and so the agonist ends up acting differently than his/her/its natural tendency. So, for example, in ‘Harry forced Sam to go away’, Sam the agonist, has an inherent tendency (or desire) not to go away; Harry, the antagonist, opposes this tendency and the outcome is that Sam indeed leaves.

(Jackendoff 1990, p. 130)

Both Jackendoff and Croft extend the force-dynamic model of causation for analyzing the event structure of various transitive verbs such as verb of possession (*deqa* ‘give’, *kena* ‘buy’, *paḥano* ‘send’, *bæca* ‘sell’ and so on), verbs of perception (such as *dækha* ‘see’, *šona* ‘hear’), verb of creation and consumption (*banano* ‘build’, *gɔra* ‘build, shape’, *khaqa* ‘eat’) and so on.

Levin (2000) argues against the causative analysis of verbs of creation and consumption. The bi-event analysis of accomplishment verbs tends to interpret all accomplishment verbs as causatives. Although Levin adopts a bi-event analysis of causation she proposes a criterion

of **temporal dependence** that distinguishes non-causative verbs from causative ones in her analysis. She considers the verb ‘eat’ as a bi-event verb. The two subevents involved in the consumption event would probably be an event of ingesting food and of the food diminishing in quantity. However verbs of consumption show a necessary temporal dependence between the two subevents. Levin argues that when the subevents are temporally dependent, they do not characterize cause and effect relation.

If we follow Levin’s line of argument, verbs such as *deḡa* ‘give’, *khaḡano* ‘feed’, *paḡhano* ‘send’, *dækḡhano* ‘show’ will get non-causative interpretation because the events involved in the situation denoted by these verbs indicate temporal dependence. For example, the event of ‘giving’ necessarily accompanies a subevent denoting ‘change of possession’. The events of ‘feeding’ and ‘eating performed by an undergoer’ unfold together. Similarly the events of ‘showing by the causer’ and ‘seeing by the perceiver’ cannot be taken to be two temporally independent events. Moreover *khaḡano* ‘feed’, *dækḡhano* ‘show’ in Bangla are also morphologically marked for causativity. I regard these verbs as causatives and also maintain that the main event and the embedded event involved in the situation denoted by these verbs overlap temporally.

I propose a formal representational distinction between causative and non-causative relations in section 4.3.3.2. The non-causative relation embeds a subevent, which is always stative in nature. The semantic structure of *notion relation* is represented in the next section.

#### **4.3.3.1 Notion relation**

This relation is an adaptation of Wechsler’s (1995) basic semantic criterion which he calls ‘notion rule’. The situation represented by the notion rule entails that one participant has a “notion” of the other participant. Then the first and the second participants occupy the subject and the object position, in that order, in a sentence. The notion rule is intended to capture typical linking patterns of transitive psychological verbs and other predicates

involving mental processes. Croft identifies the following three types of psychological verbs<sup>8</sup>:

1. **Mental activity verbs.** The situation implies that the experiencer is engaged in an activity over which he/she has some control. Bangla verb *bhaba* ‘think’ is a mental activity verb.

2. **Experiencer-Subject verbs** are purely stative. An experiencer is characterized as simply being in a mental state regarding the stimulus. Croft includes English verbs such as ‘like’, ‘be surprised at’, ‘admire’, ‘enjoy’, ‘hate’ and ‘fear’ into this type. In Bangla one word experiencer-subject transitive verbs are very rare. Generally these verbs are themselves complex predicates, N+V composite such as *ghrina kora* ‘hate’, *pochondo kora* ‘like’, *bhoge paqa* ‘fear’ and so on.

3. **Experiencer-Object verbs** are causative in the sense that the stimulus involved causes the experiencer to enter into a mental state. Verbs such as ‘please’, ‘scare’, ‘frighten’ and ‘amuse’ have been classified as experiencer-object verbs.

In the case of experiencer-Subject verbs such as ‘fear’, ‘like’ etc, and Bangla *bhalobaša* ‘love’, the experiencer has a notion of the entity he is experiencing. Therefore, Wechsler’s notion rule correctly predicts that the experiencer will come before the experienced object in the semantic role list and consequently get mapped into the subject in a sentence. How does the rule explain the experiencer occupy the object position in case of experiencer-object verbs like ‘frighten’, ‘please’ and so on? Wechsler argues that in these cases the experiencer does not necessarily have a notion of the entity experienced. He presents the following sentence as an example:

18. ‘As manager of Macys department store, John has managed to please thousands of customers over the years. Most of them do not know John exist’

---

<sup>8</sup> Croft talks about another type of psychological verb, which he calls inchoative mental verbs, such as ‘become angry’ and so on. I have discussed these verbs in section 4.3.1.7.

Here,  $x$  pleasing  $y$  does not necessarily involve  $y$  having a notion of  $x$  as the sentence in (20) shows. Therefore the experiencer argument of an experiencer-object verb is not selected by the notion rule to become the subject in a sentence. Like Jackendoff, Wechsler also discusses only transitive experiencer verbs alone. I have identified two non-transitive semantic relations representing psychological verbs, namely **inchoative mental verb** and **instantaneous mental activity verb**, in the sub-subsection 4.3.1.7 and 4.3.1.9.

Jackendoff defines an experiencer as the person affected by the state or event, that is, as a kind of patient. The patienthood of these participants nicely fit them into the second position of Jackendoff's AFF function in the action tier<sup>9</sup>. For the subject-experiencer verbs, Jackendoff introduces a new function REACT that canonically maps the patient into the subject position. He argues that those with an experiencer in the subject can be thought of as giving the subject's *reaction* to the stimulus.

In Bangla the experiencer-object verbs can be categorized into the following classes:

1. The object is an experiencer:

(M) *khæpano* 'irritate'    *tatano* 'provoke, instigate'    *jɔmano* 'enliven'  
*ragano* 'enrage'    *cɔʃano* 'enrage'    *bācano* 'save, rescue'    *šarano* 'cure, repair'

19a. *chele-ra buɔ-ʃa-ke cɔʃa-lo*

boy-cl    old-cl-obj    enrage-3 pt

'The boys enraged the old man'

---

<sup>9</sup> Jackendoff postulates AFF ("affect") as an additional mainstream function with two argument positions. The first slot is filled by an actor and the second slot by a patient. Jackendoff thinks that the semantics of the arguments can be dissected into independent parts. For example, one sense of agent, the first argument of the action tier is the extrinsic instigator of action. Another sense is volitional actor. In this respect the concept of action tier comes close to Dowty's entailment approach.

b. *binu chele-der tata-cche*  
 Binu boy-cl-gen provoke-3 pr cont  
 ‘Binu is provoking the boys’

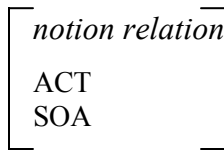
2. The object is a perceiver:

(N) *dækhano* ‘show’    *janano* ‘inform’    *cenano* ‘introduce’    *šekhano* ‘teach’  
*šonano* ‘make one hear, tell’

20a. *ritu mitul-ke frenc šekha-ǵ*  
 Ritu Mitul-obj French teach-3 pr  
 ‘Ritu teaches Mitul French’

b. *ritu baba-ke šobkichu jana-lo*  
 Ritu father-obj everything inform-3 pt  
 ‘Ritu informed (her) father (about) everything’

Davis represents the *notion relation* as a subtype of *act relation* and *soa relation*:



**Figure: 34**

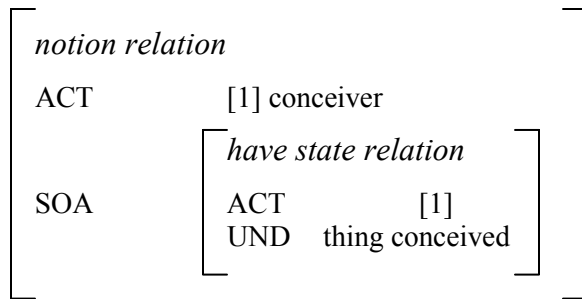
He comments that semantically the entailment of being ‘perceived of’ or ‘conceived of’ differs from the other entailments associated with UND. These participants are not felt to be affected in the way incremental themes or participants undergoing a change of state. Davis, therefore, associates the second participant to the SOA proto role attribute.

I follow the idea of Davis (2001) on *notion relation* but add a slight modification to the value of SOA. I consider the value of SOA to be a *state relation*. I divide the notion relation into

two types: *notion relation* and *perception relation*. The verbs representing *notion relation* are:

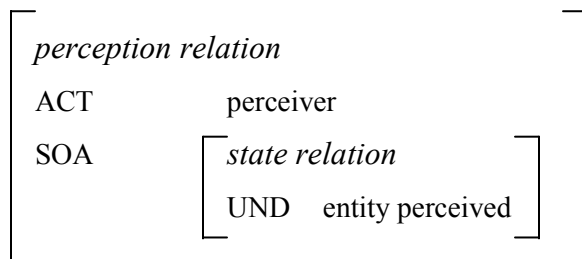
(O) *bhaba* ‘think’      *jana* ‘know’      *šekha* ‘learn’

I adopt Pinker’s analysis of the ‘know’ predicate as the value of SOA in *notion relation*. Pinker (1989) argues that the English verb ‘know’ should be represented by the HAVE predicate. Its first argument is the knower (the possessor of the knowledge) and the second argument is the knowledge itself (the possessed entity). I incorporate the idea to represent the *notion relation* as shown in the following figure:



**Figure: 35**

The *perception relation* differs from the *notion relation* in that the concept of possession is not implicit in the event denoted by this relation. Instead I assume that the thing perceived is entailed to exist, either in the physical world or in the world of abstraction. Thus the *perception relation* appears to be somewhat like the following:



**Figure: 36**

The following verbs represent this type:

(P) *dækha* ‘see’                      *šona* ‘hear’                      *cena* ‘recognize, identify’

I represent the experiencer object verbs as belonging to the type *causative relation*. It will be discussed in the section on *cause relation*.

#### 4.3.3.2 Transitive relation

I maintain that the type *transitive relation* is not equivalent to *cause relation*. *Cause relation* is a subtype of *transitive relation*. Another type of transitive relation is *effect relation*. The differences between these two semantic types are the following:

1. The actor proto-role in both relations is entailed to be a volitional participant. In case of *cause relation*, the initiator of the action is also a causer who causally affects the other participant in the event, namely the undergoer.
2. The *effect relation* will have an associated resultative eventuality that necessarily accompanies the main event. This idea reflects Levin’s notion of temporal dependence. For example, the verb *banano* ‘build’ in the following sentence entails the ‘making’ of a house.

21. *gopal æk-ṭa baṛi bani-eche*

Gopal one-cl house build-3 pr pft

‘Gopal has built a house’

In an unmarked situation, the event presumes that ‘the house’ has come into existence. It is interesting to note that ‘the house’ is incrementally built up as the event proceeds but the notion of ‘incrementality’ (and also decrementality as we will see below) is not equivalent to the ‘change of state’ that the undergoer argument participating in causative event

experiences. A subevent embedded in the causative event, on the other hand, denotes a non-stative eventuality. The non-stative eventuality implies either of the following situations:

a. The participant who initiates the embedded subevent is an actor

For example, the main event denoted by the verb *majano* ‘make one scrub (utensils)’ in the following sentence entails the existence of a subevent in which the undergoer participant of the top-level event is actually the actor who is doing the ‘scrubbing’ activity:

22. *ritu minoti-ke die bašon maj-a-lo*

Ritu Minoti-obj by utensils wash-caus-3 pt

‘Ritu made Minoti wash the utensils’

In (22), Ritu is the causer, ‘the extrinsic instigator’ (Jackendoff 1990, p. 129), and Minoti, the undergoer (causally affected), is forced to do the ‘scrubbing’. Therefore Minoti is the actor participant in the embedded subevent that corresponds to the event of ‘scrubbing’.

b. The participant involved in the subevent undergoes a change of state.

For example, the event denoted by the verb *bhaᅇa* ‘break’ indicates that the causer causes the undergoer to undergo a change of state. The subevent entails the broken state of the undergoer. The following sentence illustrates the event:

23. *ritu æk-ᅇa glas bhaᅇ-lo*

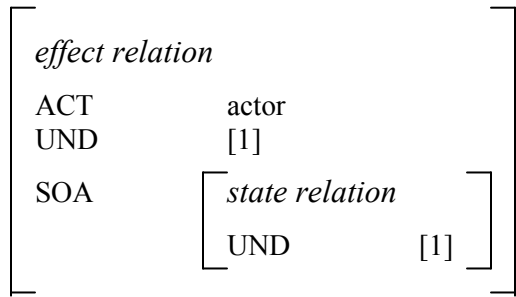
Ritu one-cl glass break-3 pt

‘Ritu broke a glass’

Besides these two main transitive relations, I will discuss one more subtype of transitive relations in this chapter. I will refer to it as *possession relation*.

#### 4.3.3.2.1 Effect Relation

This semantic type corresponds to an activity event, which entails a logical end-state for the participant that occupies the object position. The end-state is represented by the value of the top-level SOA as illustrated in figure 37:



**Figure: 37**

Following verbs characterize this semantic type:

(Q) *peša* ‘grind’      *baṭa* ‘grind’      *kocano* ‘cut into pieces’      *gūrono* ‘grind’  
*guṭono* ‘roll’      *bādhā* ‘bind’      *mocha* ‘mop’      *makha* ‘knead’  
*kaca* ‘wash clothes’      *dhoḡa* ‘wash, cleanse’

Following sentences present the use of some of the verbs listed above:

24. *ritu mōšla baṭ-e*  
 Ritu spice grind-3 pr  
 ‘Ritu grinds spices’

25. *ritu bašon dho-e*  
 Ritu utensils wash-3pr  
 ‘Ritu washes utensils’

26. *ritu kapoꝛ kac-e*

Ritu clothes wash-3 pr

‘Ritu washes clothes’

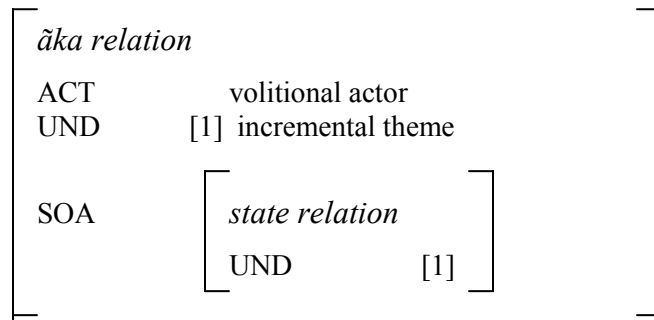
The *state relation* in figure 37 represents a stative eventuality. The value of ACT denotes a volitional participant who initiates the activity. As the activity proceeds, the effect, which is to be taken as the natural concomitant of the activity, affects the object argument. The actor’s activity and the effect experienced by the undergoer unfold together. What would be the semantic property of the top-level UND? I consider the following interpretation in the present work: The value of the top-level UND experiences a change of state. The embedded subevent denotes the ‘changed state’ of the undergoer. The UND within the value of SOA and the top-level UND are structure-shared as shown by the co-indexation in figure 37. Of course the semantics of ‘change of state’ as implied here is not equivalent to one we recommended in the context of discussing the type *change of state relation* (see section 4.3.1.2). The earlier formulation requires some semantic extension in order to accommodate the implication that I propose here. For instance, the activity of ‘pounding’ naturally implies a change of state that the spice goes through when it gets pounded. The case is not so simple for other verbs such as *mocha* ‘wipe’, *maja* ‘scrub (utensils)’ and *kaca* ‘wash clothes’. The event of ‘wiping’, for instance, presupposes that the place being wiped was previously not clean and the event of ‘wiping’ will make bring about a change to that ‘unclean’ state. Similarly ‘washing clothes’ presupposes the clothes were dirty before the washing was done.

The following two relation types specify the nature of change more specifically. In case of the verbs of creation, the undergoer argument characterizes the incremental theme, (Dowty 1991). In contrast, the object of the verb of consumption such as *khaḡa* ‘eat’ represents a decremental theme, that is, the object is reduced as the event proceeds.

#### 4.3.3.2.1.a Verb of creation

The following verbs entail the creation of the object entity:

(R) *āka* ‘draw, paint’    *kora* ‘do’    *lekha* ‘write’    *rādha* ‘cook’    *bona* ‘knit’



**Figure: 38**

The main difference between verbs of this type and those listed in (4.3.3.2) lies in the nature of the undergoer participant. For example, in the event of ‘painting’ the object is created in successive stages as the event proceeds. In contrast the verbs of *effect relation* in general do not entail incrementality.

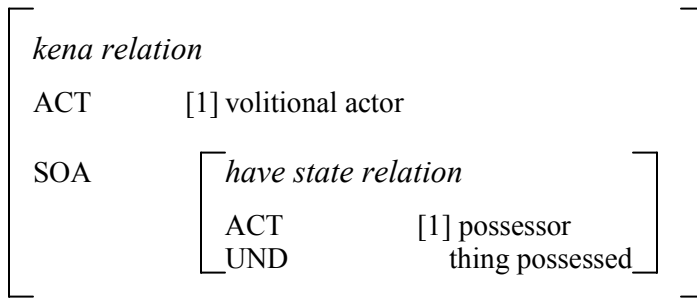
#### 4.3.3.2.1.b Verb of decremental theme

(S) *khaqa* ‘eat’

The verb *khaqa* ‘eat’ belongs to this category. The event of eating is accompanied with a subevent that entails that the thing being eaten is gradually diminishing.

#### 4.3.3.2.2 Possession relation

I have discussed this type above in section 4.3.1.1. The event implies that the actor actively participates in the action of acquiring the other participant. Therefore the top-level actor is co-indexed with the eventual possessor, the actor of the embedded *have state relation*.



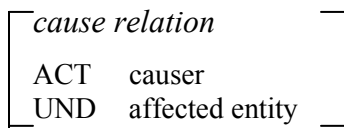
**Figure: 39**

The semantics of the following verb is a subtype of *possession relation*:

(T) *kena* ‘buy’

#### 4.3.3.2.3 Cause relation

I use the force-dynamic model of causation to represent the *cause relation* (discussed in detail above in 4.3.3). The relation involves a causer, the value of the ACT and an affected participant, the undergoer who is causally affected by the event as illustrated in the figure 40:



**Figure: 40**

This semantic type subsumes the semantics of the following verbs:

(U1) *oškano* ‘instigate’

*gōtano* ‘thrust’

*mɔʔkano* ‘snap’

*ãcrano* ‘scratch’

*mɔla* ‘pull one by the ear’

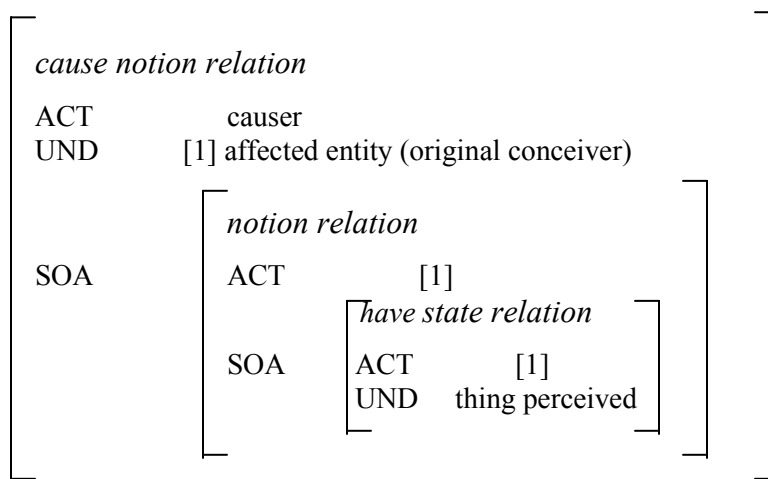
In the following subsection I postulate several subtypes of the *cause relation* type. Each of the following causative relations contains the proto-role attribute SOA whose value denotes a sub-event that is consecutive to the main event.

#### 4.3.3.2.3.a Cause notion relation

The following verbs are subtypes of this semantic relation:

(U2) *šekhano* ‘teach’                      *janano* ‘inform’  
       *bojhano* ‘make one understand, explain’

This semantic relation embeds the type *notion relation* as illustrated in figure 41:



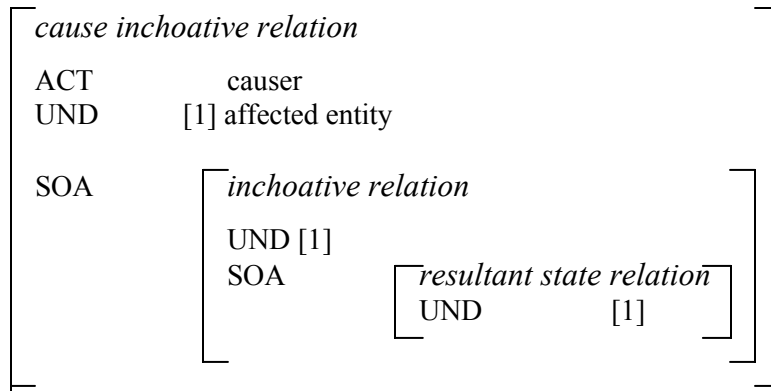
**Figure: 41**

The value of the top-level ACT entails to be the causer. The causer stimulates (or helps) the experiencer (denoted by the value of the top-level UND) to have the perception of the perceived entity, which is denoted by the value of the embedded UND. The value of the top-level UND and the embedded ACT are token-identical. This implies that the participant who is stimulated by an external cause is also a sentient being capable to perceive.

#### 4.3.3.2.3.b Cause inchoative relation

The event corresponding to the type *cause inchoative relation* involves two participants. The value of the top-level ACT and UND denotes the causer and the affected entity that undergoes

a change of state. The main event embeds a subevent of the type *inchoative relation*. The value of the top-level UND and the embedded UND within the *inchoative relation* are token-identical. Thus the matrix event implies that the participant that is causally affected not only undergoes a change of state but also remains in the state that follows the change of state. The semantic relation is shown in figure 42:



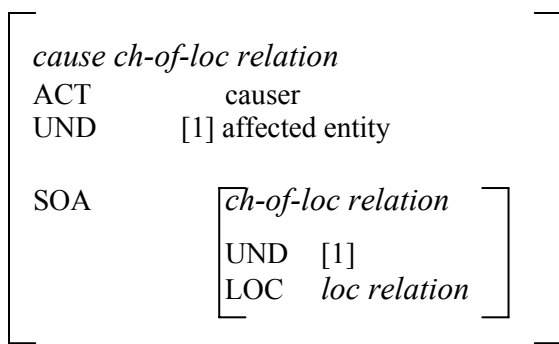
**Figure: 42**

The following verbs are the subtypes of *cause inchoative relation*:

- (U3) *chɔɾano* ‘spread’      *khola* ‘open’      *pōta* ‘plant’      *kɔmano* ‘reduce’  
*tola* ‘lift’      *cobano* ‘plunge’      *nabano* ‘bring down’  
*baɾano* ‘grow’      *šoɔano* ‘cause to lie down’

#### 4.3.3.2.3.c Cause change of location relation

The type *cause change of location relation* constitutes the linguistic description of an event type in which a causer (the value of ACT) is entailed to act upon an affected entity (the value of top-level UND) as a result of which the affected entity undergoes physical displacement. The value of top-level SOA is the feature structure of *change of location relation* that corresponds to the event of *changing location* (see 4.3.1.5). The semantic relation is depicted in figure 43:



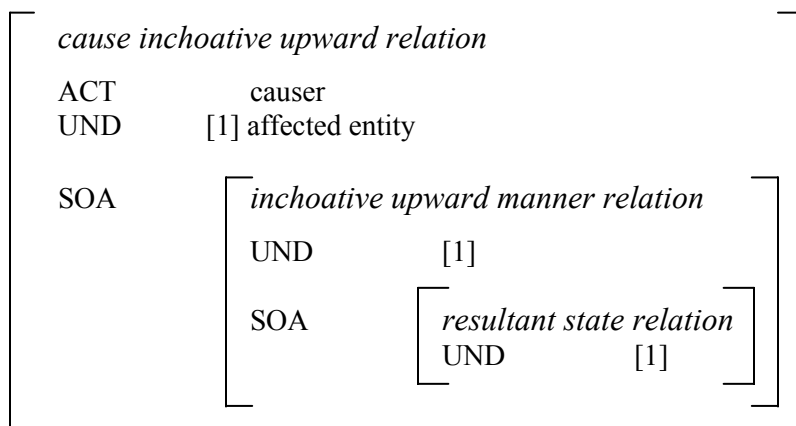
**Figure: 43**

The semantic type of the following verbs is a subtype of *cause change of location relation*:

(U4) *taṛano* ‘drive out, expel’      *khædano* ‘drive away’      *bhagano* ‘drive away’  
*hoṭano* ‘drive back’      *šorano* ‘remove’

#### 4.3.3.2.3.d Cause inchoative upward relation

Like the type *cause inchoative relation* (see 4.3.3.2.3.b), this semantic relation also embeds a subevent of *inchoative relation*. The only difference is that the embedded event (the value of top-level SOA) within the *cause inchoative upward relation* is defined to be of type *inchoative upward manner relation* as depicted in the following figure:



**Figure: 44**

The semantic types of the following verbs are subtypes of *cause inchoative upward relation*:

(U5) *bãcano* ‘save, rescue’    *šarano* ‘cure, repair’    *jɔmano* ‘enliven’  
*ragano* ‘enrage’    *khæpano* ‘irritate’    *matano* ‘cheer up’  
*tatano* ‘instigate, provoke’

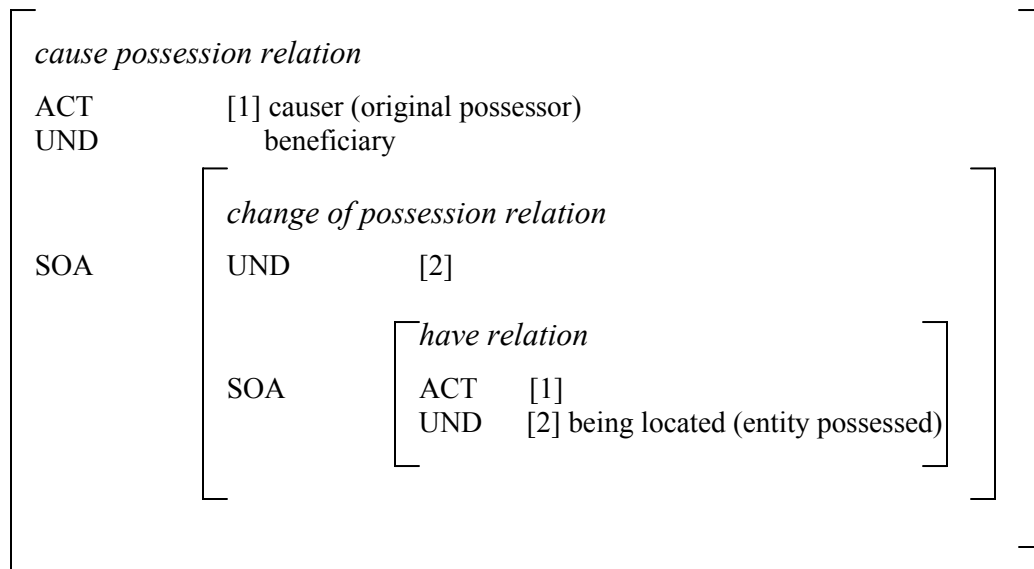
These verbs denote event types in which the affected entity is entailed to come to a state of *vitality* or *dynamism* (as opposed to *remain lethargic*). For instance, the event of *šarano* ‘cure’ expresses that a causer (of semantic role healer) cures the affected entity and the latter regains his energy or vitality. Similarly the verbs *ragano* ‘enrage’, *khæpano* ‘irritate’, *matano* ‘cheer up’ and *tatano* ‘instigate, provoke’ entails that a causer induces or stimulates an affected entity that consequently becomes energized and excited. This semantic entailments are inherited from the semantic type *upward manner relation* in the present analysis. That is why the subevent, the value of top-level SOA is defined to be a subtype of *upward manner relation*.

#### 4.3.3.2.3.e Cause possession relation

I discussed this semantic relation in section 4.1.3. This semantic relation denotes an event type in which a causer causes a recipient to receive a theme entity. As illustrated in the following lexical semantic structure, the value of the top-level ACT is the causer and the value of the top-level UND denotes the recipient entity. The theme that is meant to undergo change of possession constitutes the value of the embedded UND.

The prototypical verb that represents this semantic relation is the following:

(U6) *dega* ‘give’



**Figure: 45**

#### 4.3.3.2.3.f Cause directed motion relation

(U7) *paṭhano* ‘send’    *chōṛa* ‘throw’

I apply the same treatment to the causative motion verb *chōṛa* ‘throw’ and the causative transfer verb *paṭhano* ‘send’. The goal or beneficiary argument of the verb *paṭhano* ‘send’ is interpreted to be the endpoint intended to be reached. The verb *chōṛa* ‘throw’ also entails movement directed towards a goal as shown in the following sentence:

- 27a. *ami rituke / ritu-r dīke boḷ-ṭa chūr-lam*  
 I Ritu-obj Ritu-gen towards book-cl throw-1 pt  
 ‘I threw the book to Ritu / toward Ritu’

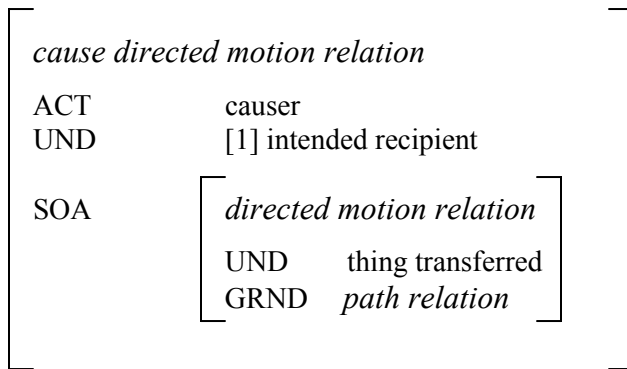
Similarly the verb *paṭhano* contains an intended goal in its semantic structure:

27b. *ami ritu-ke boḷ-ṭa paṭha-lam*

I Ritu-obj book-cl send-1 pt

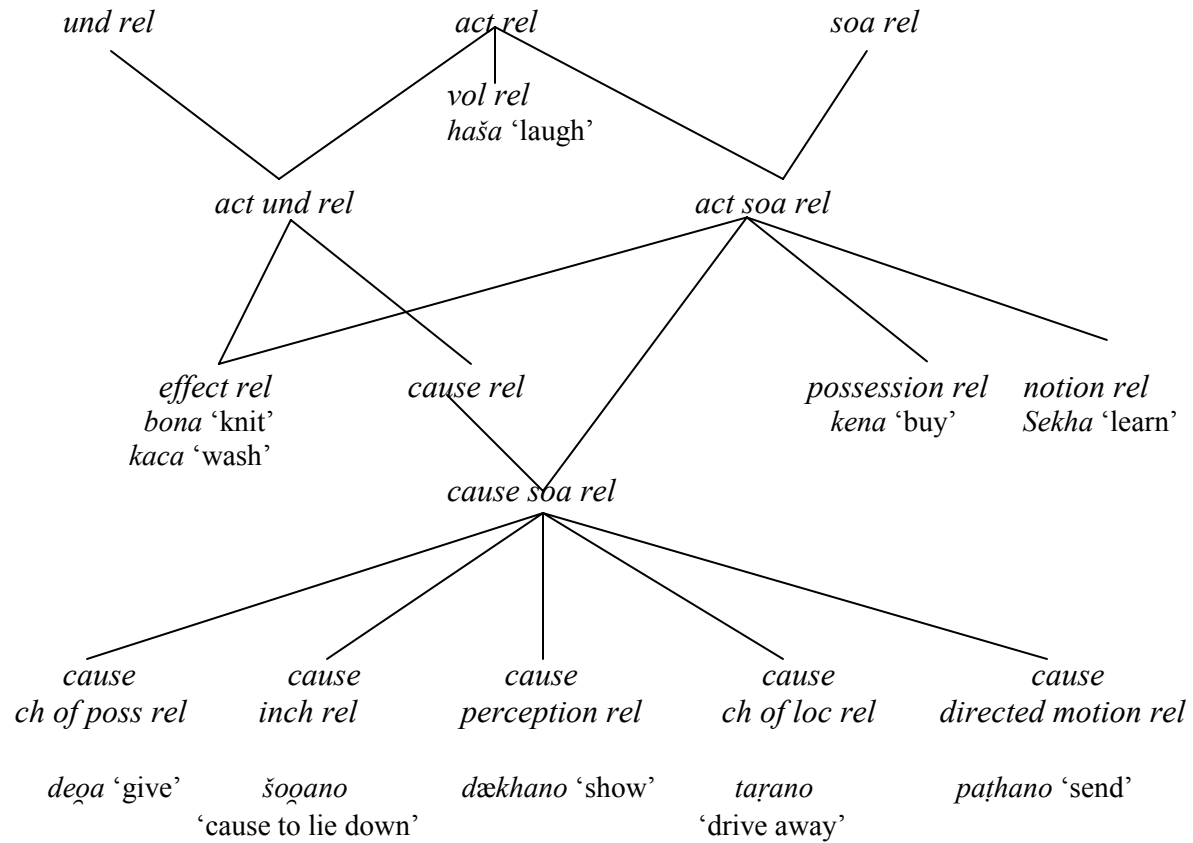
‘I sent the book to Ritu’

In this sense the *paṭhano* ‘send’ is distinct from other causative transfer verbs such as *gōchano* ‘foist something on someone’. The verb *gōchano* ‘foist something on someone’ entails a successful transfer whereas the event denoted by the verb *paṭhano* ‘send’ only implies that the object has been sent. I represent the *cause directed motion relation* in terms of the following feature structure description:



**Figure: 46**

The hierarchy in figure 47 presents the main semantic relations that I have discussed in section 4.3.3.



**Figure: 47**

#### 4.4 Choice of V2

I have recorded some major semantic types in the two tables (see column 3). They subsume the semantic types of quite a few Bangla verbs (listed in column 2). The V2s that a set of V1s selects and combines to form compound verbs are listed in the first column. The V2s *jaqa* ‘go’, *aša* ‘come’ and *deqa* ‘give’ are polysemous in nature as discussed in the previous chapter. Both variants are separately presented in the tables. It is to be noted that verbs of similar semantic relation type select identical set of V2s. For example, the semantic types of the V1s *bhaṇa* ‘break’, *chēra* ‘tear’, *khola* ‘open’, *khōša* ‘fall off’, *oba* ‘evaporate’, *ghoca* ‘disappear’, *mōra* ‘die’, *phaṭa* ‘explode’, *olṭano* ‘tumble’ and *thātlano* ‘get smashed’ are subtypes of the *instantaneous change of state relation*. As shown in table 1 all these verbs select the same V2 and that is *jaqa\_1* ‘go’. Even verbs whose semantic types represent different semantic relations can choose identical set of V2s. For instance, table 1 shows that V1s of the types *inchoative upward relation*, *mental inchoative upward relation* and *instantaneous mental activity relation* select the two V2s *oṭha* ‘rise’ and *jaqa* ‘go’. The intransitive verbs with an argument mapped to the value of UND are listed in Table 1. Table 2 represents both intransitive and transitive verbs with one argument mapped to the value of ACT.

V2	V1	Semantic relations
<i>jaḡa_1</i> ‘go’	<i>bhaḡa</i> ‘break’ <i>chēra</i> ‘tear’ <i>khola</i> ‘open’ <i>khḡsa</i> ‘fall off’ <i>oba</i> ‘evaporate’ <i>mḡra</i> ‘die’ <i>ghoca</i> ‘disappear’ <i>opcano</i> ‘spill’ <i>pḡra</i> ‘fall’ <i>phḡla</i> ‘happen’ <i>phaḡa</i> ‘explode’ <i>mḡckano</i> ‘get twisted’ <i>olḡano</i> ‘tumble’ <i>thāḡtilano</i> ‘get smashed’	Instantaneous change of state relation
<i>aṣa_2</i> ‘come’ <i>jaḡa_1</i> ‘go’	<i>rḡḡa</i> ‘stay’ <i>thaka</i> ‘remain’ <i>hḡḡa</i> ‘be’	State relation
<i>aṣa_1</i> ‘come’ <i>jaḡa_1</i> ‘go’	<i>chaḡa</i> ‘overcast’ <i>mḡja</i> ‘be silted up’ <i>ghera</i> ‘surround’ <i>ḡhaka</i> ‘cover’	Distributive Location relation
	<i>kḡma</i> ‘diminish’ <i>phurono</i> ‘get exhausted’ <i>ḡoba</i> ‘setting of the sun’ <i>gḡla</i> ‘melt’ <i>ṣukono</i> ‘become dry’ <i>pḡca</i> ‘rot’ <i>nebha</i> ‘get extinguished’	Incremental change of state relation
<i>pḡra</i> ‘fall’ <i>jaḡa_2</i> ‘go’	<i>ḡhola</i> ‘doze’	Nondislocative motion downward relation
<i>pḡra</i> ‘fall’ <i>neḡa</i> ‘take’ <i>jaḡa_2</i> ‘go’	<i>ghumono</i> ‘sleep’ <i>jhimono</i> ‘doze’	Inchoative downward manner relation
<i>pḡra</i> ‘fall’ <i>jaḡa_1</i> ‘go’ <i>aṣa_1</i> ‘come’	<i>thama</i> ‘stop’ <i>thitino</i> ‘become quiet’ <i>hæla</i> ‘lean’ <i>jhola</i> ‘hang’ <i>jhōka</i> ‘stoop, bend’	Inchoative incremental downward manner relation
<i>jaḡa_1</i> ‘go’ <i>deḡa_1</i> ‘give’	<i>poūchono</i> ‘reach’ <i>chaḡa</i> ‘depart’	Change of location relation

<b>V2</b>	<b>V1</b>	<b>Semantic relations</b>
<i>pɔɾa</i> ‘fall’	<i>dhoka</i> ‘enter’ <i>berono</i> ‘go out’ <i>šɔra</i> ‘go off’ <i>oṭha</i> ‘rise’ <i>aša</i> ‘come’ <i>jaṇa</i> ‘go’ <i>nama</i> ‘descend’	Inherently directed motion relation
<i>oṭha</i> ‘rise’ <i>jaṇa_1</i> ‘go’	<i>khæpa</i> ‘be angry’ <i>raga</i> ‘be angry’ <i>tata</i> ‘be heated, get excited’ <i>cɔṭa</i> ‘be angry, take offence’	Mental inchoative relation
	<i>phoṭa</i> ‘blossom’ <i>phola</i> ‘swell’ <i>jɔla</i> ‘blaze’ <i>paka</i> ‘ripen’ <i>bāca</i> ‘survive’ <i>gojano</i> ‘sprout’	Inchoative upward manner relation
	<i>ātkano</i> ‘startle (as in fright)’ <i>cɔmkano</i> ‘startle’ <i>ṭɔla</i> ‘agitate’	Instantaneous mental activity relation
<i>oṭha</i> ‘rise’ <i>jaṇa_2</i> ‘go’ <i>jaṇa_1</i> ‘go’ <i>cɔla</i> ‘move’	<i>kāpa</i> ‘shiver’ <i>dola</i> ‘rock’ <i>nɔɾa</i> ‘move’ <i>bara (gach)</i> ‘grow (of tree)’	Nondislocative motion upward relation
<i>oṭha</i> ‘rise’ <i>jaṇa_1</i> ‘go’ <i>aša_1</i> ‘come’	<i>bhɔra</i> ‘fill’	Inchoative incremental upward manner relation

**Table: 1**

V2	V1	Semantic relations
<i>aša_2</i> ‘come’ <i>oṭha</i> ‘rise’ <i>phæla</i> ‘drop’ <i>neṇa</i> ‘take’ <i>deṇa_2</i> ‘give’ <i>jaṇa_2</i> ‘go’ <i>cṇa</i> ‘move’ <i>mṇa</i> ‘die’ <i>bṇa</i> ‘sit’	<i>haša</i> ‘laugh’ <i>kāda</i> ‘cry’ <i>gaṇa</i> ‘sing’ <i>bṇa</i> ‘speak’ <i>cācāno</i> ‘scream’	Volitional sound emission relation
<i>aša_2</i> ‘come’ <i>phæla</i> ‘drop’ <i>neṇa</i> ‘take’ <i>jaṇa_2</i> ‘go’ <i>cṇa</i> ‘move’ <i>mṇa</i> ‘die’	<i>khata</i> ‘toil’	Volitional act relation
<i>cṇa</i> ‘move’ <i>neṇa</i> ‘take’ <i>phæla</i> ‘drop’ <i>jaṇa_2</i> ‘go’ <i>bæṇa</i> ‘roam’ <i>mṇa</i> ‘die’	<i>douṇo</i> ‘run’ <i>hāta</i> ‘walk’ <i>šātrano</i> ‘swim’ <i>cṇa</i> ‘move’ <i>bæṇa</i> ‘roam’ <i>oṇa</i> ‘fly’	Self act motion relation
<i>pṇa</i> ‘fall’ <i>neṇa</i> ‘take’	<i>bṇa</i> ‘sit’ <i>dāṇa</i> ‘stand’ <i>šoṇa</i> ‘lie down’	Oriented inchoative relation
<i>aša_2</i> ‘come’ <i>cṇa</i> ‘move’ <i>neṇa</i> ‘take’ <i>phæla</i> ‘drop’ <i>rakha</i> ‘keep’ <i>jaṇa_2</i> ‘go’ <i>mṇa</i> ‘die’ <i>bṇa</i> ‘sit’	<i>bhaba</i> ‘think’ <i>jana</i> ‘know’ <i>šekha</i> ‘learn’ <i>bojha</i> ‘understand’ <i>neṇa</i> ‘take’	Notion relation
<i>aša_2</i> ‘come’ <i>cṇa</i> ‘move’ <i>neṇa</i> ‘take’ <i>phæla</i> ‘drop’ <i>rakha</i> ‘keep’ <i>mṇa</i> ‘die’ <i>jaṇa_2</i> ‘go’ <i>bṇa</i> ‘sit’ <i>bæṇa</i> ‘roam’	<i>dækha</i> ‘see’ <i>šona</i> ‘hear’ <i>cena</i> ‘recognize, identify’	Perception relation

V2	V1	Semantic relations
<p><i>aša_2</i> ‘come’ <i>cōla</i> ‘move’  <i>neḡa</i> ‘take’ <i>deḡa_1</i> ‘give’  <i>phæla</i> ‘drop’ <i>jaḡa_2</i> ‘go’  <i>rakha</i> ‘keep’ <i>mōra</i> ‘die’  <i>bōša</i> ‘sit’ <i>bæṛano</i> ‘roam’</p>	<p><i>kena</i> ‘buy’</p>	<p>Possession relation</p>
<p><i>aša_2</i> ‘come’ <i>cōla</i> ‘move’  <i>neḡa</i> ‘take’ <i>deḡa_1</i> ‘give’  <i>phæla</i> ‘drop’ <i>rakha</i> ‘keep’  <i>mōra</i> ‘die’ <i>jaḡa_2</i> ‘go’  <i>bōša</i> ‘sit’ <i>tola</i> ‘lift’</p>	<p><i>banano</i> ‘build’ <i>gōra</i> ‘build’</p>	<p>Effect upward manner relation</p>
<p><i>aša_2</i> ‘come’ <i>cōla</i> ‘move’  <i>neḡa</i> ‘take’ <i>deḡa_1</i> ‘give’  <i>phæla</i> ‘drop’ <i>rakha</i> ‘keep’  <i>mōra</i> ‘die’ <i>jaḡa_2</i> ‘go’  <i>bōša</i> ‘sit’</p>	<p><i>peša</i> ‘grind’ <i>baṭa</i> ‘grind’  <i>kocano</i> ‘cut into pieces’  <i>ghōša</i> ‘rub’ <i>gūrono</i> ‘grind’  <i>guṭono</i> ‘roll’ <i>bādha</i> ‘bind’  <i>tola</i> ‘take a snap’ <i>mocha</i> ‘wipe’  <i>makha</i> ‘knead’ <i>kaca</i> ‘wash clothes’  <i>dhoa</i> ‘wash, cleanse’</p>	<p>Effect relation</p>
<p><i>aša_2</i> ‘come’ <i>cōla</i> ‘move’  <i>deḡa_2</i> ‘give’ <i>neḡa</i> ‘take’  <i>phæla</i> ‘drop’ <i>mōra</i> ‘die’  <i>jaḡa_2</i> ‘go’ <i>bōša</i> ‘sit’</p>	<p><i>khaḡa</i> ‘eat’</p>	<p>Consumption relation</p>
<p><i>neḡa</i> ‘take’ <i>deḡa_1</i> ‘give’  <i>phæla</i> ‘drop’ <i>joḡa_2</i> ‘go’  <i>bōša</i> ‘sit’ <i>mōra</i> ‘die’  <i>cōla</i> ‘move’</p>	<p><i>colkono</i> ‘scratch’ <i>rōḡrano</i> ‘rub’</p>	<p>Contact manner of motion relation</p>
<p><i>neḡa</i> ‘take’ <i>deḡa_1</i> ‘give’  <i>phæla</i> ‘drop’ <i>bōša</i> ‘sit’  <i>rakha</i> ‘keep’</p>	<p><i>ṭhækano</i> ‘touch’ <i>chōḡa</i> ‘touch’  <i>dhōra</i> ‘hold’</p>	<p>Contact relation</p>

V2	V1	Semantic relations
<p><i>aša_2</i> ‘come’ <i>cōla</i> ‘move’  <i>deḡa_1</i> ‘give’ <i>neḡa</i> ‘take’  <i>jaḡa_2</i> ‘go’ <i>rakha</i> ‘keep’  <i>phæla</i> ‘drop’</p>	<p><i>dækhano</i> ‘show’  <i>cenano</i> ‘introduce’  <i>šonano</i> ‘make one hear, tell’</p>	Cause perception relation
	<p><i>šekhano</i> ‘teach’ <i>janano</i> ‘inform’  <i>bojhano</i> ‘make one understand,  explain’</p>	Cause notion relation
<p><i>deḡa_1</i> ‘give’ <i>neḡa</i> ‘take’  <i>phæla</i> ‘drop’ <i>rakha</i> ‘keep’</p>	<p><i>chōrano</i> ‘spread’ <i>khola</i> ‘open’  <i>pōta</i> ‘plant’ <i>kōmano</i> ‘reduce’  <i>tola</i> ‘lift’ <i>nabano</i> ‘bring down’  <i>cobano</i> ‘plunge’ <i>baḡano</i> ‘grow’  <i>šoaoṇo</i> ‘cause to lie down’</p>	Cause Inchoative relation
<p><i>deḡa_1</i> ‘give’ <i>neḡa</i> ‘take’  <i>rakha</i> ‘keep’ <i>phæla</i> ‘drop’  <i>tola</i> ‘lift’</p>	<p><i>bācano</i> ‘save, rescue’  <i>šarano</i> ‘cure, repair’  <i>jagano</i> ‘awaken’ <i>khæpano</i> ‘irritate’  <i>jōmano</i> ‘enliven’ <i>ragano</i> ‘enrage’  <i>matano</i> ‘cheer up’  <i>tatano</i> ‘instigate, provoke’  <i>bhōrano</i> ‘cause to fill up’</p>	Cause Inchoative upward manner relation

V2	V1	Semantic relations
<i>deḡa_1</i> ‘give’	<i>oškano</i> ‘instigate’ <i>ācrano</i> ‘scratch’ <i>gōtano</i> ‘thrust’ <i>mɔḡkano</i> ‘snap’ <i>mɔla</i> ‘pull one by the ear’	Cause relation
<i>aša_2</i> ‘come’ <i>jaḡa_2</i> ‘go’ <i>deḡa_1</i> ‘give’ <i>neḡa</i> ‘take’ <i>rakha</i> ‘keep’ <i>phæla</i> ‘drop’ <i>cɔla</i> ‘move’ <i>mɔra</i> ‘die’ <i>bɔša</i> ‘sit’	<i>deoa</i> ‘give’	Cause possession relation
<i>deḡa</i> ‘give’ <i>neḡa</i> ‘take’ <i>jaḡa_2</i> ‘go’ <i>cɔla</i> ‘move’ <i>bɔša</i> ‘sit’	<i>taḡano</i> ‘drive out, expel’ <i>khædano</i> ‘drive away’ <i>bhagano</i> ‘drive away’ <i>hoḡano</i> drive back’ <i>šɔrano</i> ‘remove’	Cause change of location relation
<i>aša_2</i> ‘come’ <i>jaḡa_2</i> ‘go’ <i>deḡa_1</i> ‘give’ <i>neḡa</i> ‘take’ <i>cɔla</i> ‘move’ <i>bɔša</i> ‘sit’ <i>mɔra</i> ‘die’ <i>phæla</i> ‘drop’	<i>paḡhano</i> ‘send’ <i>chōḡa</i> ‘throw’	Cause directed motion relation
<i>aša_2</i> ‘come’ <i>jaḡa_2</i> ‘go’ <i>deḡa_1</i> ‘give’ <i>neḡa</i> ‘take’ <i>cɔla</i> ‘move’ <i>mɔra</i> ‘die’ <i>phæla</i> ‘drop’ <i>bæḡrano</i> ‘roam’	<i>bɔoa</i> ‘carry’ <i>ṡana</i> ‘pull’ <i>ṡhæla</i> ‘push’	Cause motion relation

**Table: 2**

## 4.5 Conclusion

I reviewed various meaning representation theories in this chapter. The discussion is not exhaustive, but it is intended to give some of the varieties of the approaches. I adopted Davis's model of lexical semantic structures, he calls them *lexical semantic relations*, that represent information about the lexical entailments that hold of participants in a given event within a *configurational structure* with a limited amount of semantic decomposition of events into subevents. Thus an argument may bear one proto-role in one subevent and a different one in another. These representations bear some resemblance to the decomposition model of Jackendoff (1989) and Pinker (1990). The idea of associating classes of entailments with proto role attributes follows Dowty's (1991) proposal of proto-role model, which relies on a set of entailments to determine the mapping between semantic roles and syntactic arguments. In this chapter, I presented a multiple inheritance hierarchy of lexical semantic relations for various classes of Bangla verbs. These semantic relations contain grammatically relevant semantic features. I mainly encoded those semantic features within the lexical semantic structure of V1s that would ensure the right kind of selection of V2s by these verbs.